General Disclaimer

One or more of the Following Statements may affect this Document

•	This document has been reproduced from the best copy furnished by the
	organizational source. It is being released in the interest of making available as
	much information as possible.

- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.
- This document is paginated as submitted by the original source.
- Portions of this document are not fully legible due to the historical nature of some
 of the material. However, it is the best reproduction available from the original
 submission.

Produced by the NASA Center for Aerospace Information (CASI)

NASA Technical Memorandum 83335

Bibliography of Lewis Research Center Technical Publications Announced in 1982



(NASA-TM-83335) BIBLIOGRAPHY OF LEWIS RESEARCH CENTER TECHNICAL PUBLICATIONS ANNOUNCED IN 1982 (NASA) 372 P HC A16/MF A01 CSCL 05B

N83-29124

Unclas G3/82 28125

April 1983



PREFACE

In 1982, Lewis Research Center's 934 research authors published 378 technical publications which were announced to and reached the worldwide scientific community. This number was almost the same as last year's 384 publications. The number of reports published per person per year has decreased slightly. In 1982, Lewis authors published approximately 61 percent of their research contributions in outside publications and the remainder as NASA research reports. Lewis authors primarily use society proceedings, seminar presentations, journal articles, and transactions to describe their work. Many have received awards for their contributions; among them are the following:

The 1982 Lewis Distinguished Paper Award was presented to Gary M. Johnson for his paper entitled "Surrogate-Equation Technique for Simulation of Steady Inviscid Flow."

In 1982, Marvin Goldstein, Lewis' Chief Scientist, was presented two prestigious awards. He received the Aeroacoustics Award for his important contributions to the theories of fan, jet, and jet-surface interaction noise including his comprehensive treatise *Aeroacoustics*, that has become a standard reference in the field and was published by McGraw-Hill. M. Goldstein also was presented the Pendray Aerospace Literature Award for outstanding literature contributions in aeroacoustics and unsteady aerodynamics which have significantly advanced those sciences and produced key elements in the design of high-speed fans and compressors for modern aircraft engines.

In 1982, 296 contractor-authored research reports were produced, a decrease from the previous year's output of 312. In addition, 21 patent applications were filed and 19 patents were issued.

All the publications in this collection were announced in the 1982 issues of STAR (Scientific and Technical Aerospace Reports) and IAA (International Aerospace Abstracts).

The arrangement of the material is by NASA subject category, as noted in the Contents. The Lewis-authored items are listed first, followed by the contractor items. Within each of these groups is listed report literature, in N-number sequence, followed by the journal and conference presentations, in A-number sequence.

The various indexes will help locate specific publications by subject, author, contractor organization, contract number, and report number.

George Mandel Chief, Publications Division

CONTENTS

P	age
AERONAUTICS (GENERAL)	1
AERODYNAMICS	3
AIR TRANSPORTATION AND SAFETY	13
AIR TRANSPORTATION AND SAFETY	14
AIRCRAFT INSTRUMENTATION	15
AIRCRAFT PROPULSION AND POWER	16
RESEARCH AND SUPPORT FACILITIES (AIR)	31
ASTRODYNAMICS	32
ASTRODYNAMICS	33
LAUNCH VEHICLES AND SPACE VEHICLES	34
SPACE TRANSPORTATION	35
SPACE TRANSPORTATION	36
SPACECRAFT DESIGN, TESTING AND PERFORMANCE	37
SPACECRAFT PROPULSION AND POWER	42
CHEMISTRY AND MATERIALS (GENERAL)	48
COMPOSITE MATERIALS	49
COMPOSITE MATERIALS	54
METALLIC MATERIALS	58
NONMETALLIC MATERIALS	66
NONMETALLIC MATERIALS	72
ENGINEERING (GENERAL)	76
COMMUNICATIONS	78
ELECTRONICS AND ELECTRICAL ENGINEERING	81
FLUID MECHANICS AND HEAT TRANSFER	87
INSTRUMENTATION AND PHOTOGRAPHY	95
LASERS AND MASERS	98
MECHANICAL ENGINEERING	99
	110
Animan, hearthing and transferance, and an animal and animal and animal animal and animal animal animal and animal	111
	117
ENERGY PRODUCTION AND CONVERSION	118
	139
	140
METEOROLOGY AND CLIMATOLOGY	141
	142
,,=,,••,,,•= ,,=,,= , , , , , , , , , ,	143
	144
	145
	146
**************************************	147
	148
NUMERICAL ANALYSIS	149
	150
	151
	155
WIDERO WID BIOLECOLME LUISTOS	I J J

OP.	TICS	3																														156
	\SM/																															157
	ID-																															159
THI	ERMO	מכ	Y N	AM:	I C	S	AN	D	ST	'nΑΤ	ΊS	TI	CA	L	PH	IYS	IC	S		:•				•			•			7		161
	INI																															162
URI	BAN	T	EC	HNO	OL	0G	Y	ΑŅ	ID	TR	AN	SP	OR	TA	TI	ON	١.		•		é.				•.		•					163
	rror																															165
	VAR																															166
SOI	_AR	P	ΗY	SI	CS	4	٠	•	•		•		•	•	•	٠	•	•	•	•	•		•	٠		•	•	•		,i	٠	167
SU	3JE(CT	I	NDI	EX	(KE	YW	10 F	RDS)			•				•	•	•	•	•		•		•	•.		•:			A-1
	1025																															B-1
	RPOF																															C-1
	YTR/																															D-1
REI	PORT	Γ//	AC!	CE:	SS	Ι0	N	NU	IMB	ER	Į	ND	EX	(IN	ICL	UD	ES(P	PA٦	EN	ITS)									E-1

01 AERONAUTICS (GENERAL)

N82-17083*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

AN EXPERIMENTAL STUDY OF AIRFOIL ICING CHARAC-TERISTICS

Robert J. Shaw, Ray G. Sotos, and Frank R. Solano 1982 37 p refs Presented at Twentieth Aerospace Sci. Conf., Orlando, Fla., 11-14 Jan. 1982; sponsored by AIAA

(NASA-TM-82790; E-1114) Avail: NTIS HC A03/MF A01

CSCL 01B

A full scale general aviation wing with a NACA 63 sub 2 A415 airfoil section was tested to determine icing characteristics for representative rime and glaze icing conditions. Measurements were made of ice accretion shapes and resultant wing section drag coefficient levels, it was found that the NACA 63 sub 2 A415 wing section was less sensitive to rime and glaze icing encounters for climb conditions.

N81-18004*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.
ADVANCED TECHNOLOGY FOR CONTROLLING POL-LUTANT EMISSIONS FROM SUPERSONIC CRUISE **AIRCRAFT**

Robert A. Duerr and Larry A. Diehl In NASA. Langley Research Center Supersonic Cruise Res. 1979, Pt. 1 Mar. 1980 p 535-549 (For primary document see N81-17981 09-01)

Avail: NTIS HC A23/MF A01 CSCL 13B

Gas turbine engine combustor technology for the reduction of pollutant emissions is summarized, Variations of conventional combustion systems and advanced combustor concepts are discussed. Projected results from far term technology efforts aimed at applying the premixed prevaporized and catalytic combustion techniques to aircraft combustion systems indicate a potential for significant reductions in pollutant emission levels.

N82-19132*# National Aeronautics and Space Administration, Washington, D. C.

BIBLIOGRAPHY OF NASA PUBLISHED REPORTS ON **GENERAL AVIATION, 1975 TO 1981**Jun. 1981 277 p

(NASA-TM-83307) Avail: NTIS HC A13/MF A01 CSCL

This bibliography lists 478 documents which relate to all heavier-than-air fixed wing aircraft exclusive of military types and those used for commercial air transport. An exception is the inclusion of commuter transport aircraft types within the general aviation category. NASA publications included in this bibliography are: conference publications (CP), reference publications (RP), technical memorandums (TM, TMX), technical notes (TN), technical papers (TP), and contractor reports (CR). In addition, papers and articles on NASA general aviation programs published by technical societies (AIAA, SAE, etc.) are included, as well as those listed in NASA's Scientific and Technical Aerospace Reports (STAR) Journal. Author and subject indexes are also provided to facilitate use of the bibliography.

N82-19145*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ENGINE TECHNOLOGY

Anthony C. Hoffman In NASA, Langley Research Center Elec. Flight Systems Feb. 1982 p 235-240 (For primary document see N82-19134 10-01)

Avail: NTIS HC A12/MF A01 CSCL 21E

Materials used in a presentation on development of engine technology for electric flight systems are presented. Component and system technology issues, NASA's role, and flight test requirements are outlined. J.D.H.

> ORIGINAL PAGE IS OF POOR QUALITY

N82-19146* | National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio,

POWER SYSTEMS Robert Finke In NASA, Langley Research Center Elec, Flight Systems Feb. 1982 p 241-246 (For primary document see

N82-19134 10-01)

Avail: NTIS HC A12/MF A01 CSCL 01C Materials illustrating a presentation of the development of power systems are presented. The technology issues and tradeoffs, the role of NASA, and testing requirements are outlined. J.D.H.

NB2-19147*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

ENVIRONMENTAL CONTROL SYSTEMS Frank Hrach In NASA, Langley Research Center Elec, Flight Systems Feb. 1982 p 247-252 (For primary document see N82-19134 10-01)

Avail: NTIS HC A12/MF A01 CSCL 06K

Materials illustrating a presentation on environmental control systems for electric flight systems are presented. The major technology issues, major development and application steps, the role of NASA, and required flight testing are outlined. J.D.H.

N82-21145*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OZONE AND AIRCRAFT OPERATIONS

Porter J. Perkins In NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol, and Environ. Inputs to Aviation stems Dec. 1981 p 40-44 refs (For primary document see NE2-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 04A

The cabin ozone problem is discussed. Cabin ozone in terms of health effects, the characteristics of ozone encounters by aircraft, a brief history of studies to define the problem, corrective actions taken, and possible future courses of action are examined. It is suggested that such actions include avoiding high ozone concentrations by applying ozone forecasting in flight planning procedures.

N82-21148*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA/LEWIS RESEARCH CENTER ICING RESEARCH PROGRAM c03

Peggy L. Evanich /n NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol, and Environ, Inputs to Aviation Systems Dec. 1981 p 64-75 (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 01C

Icing requirements for commercial aircraft, light transport and general aviation aircraft, and rotorcraft were studied. The objectives was to: establish the state of the art in aircraft icing, determining the aircraft industry's icing research and technology needs, and recommending both short and long term icing programs to NASA. It is shown that all three categories of aircraft need improved and new ice protection system, icing calculational techniques, icing performance sensitivity on current and modern airfoils, and new and improved icing facilities. The need for a general aviation pilot training film concerning flight into icing conditions is also identified.

N82-26219*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SUMMARY AND RECENT RESULTS FROM THE NASA ADVANCED HIGH SPEED PROPELLER RESEARCH **PROGRAM**

Glenn A. Mitchell and Daniel C. Mikkelson 1982 35 p refs Presented at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; sponsored by AIAA, SAE and ASME (NASA-TM-82891; E-1269; NAS 1.15:82891) Avail: NTIS

HC A03/MF A01 CSCL 01B

Advanced high-speed propellers offer large performance improvements for aircraft that cruise in the Mach 0.7 to 0.8 speed regime. The current status of the NASA research program on high-speed propeller aerodynamics, acoustics, and aeroelastics is described. Recent wind tunnel results for five 8- to 10-blade advanced models are compared with analytical predictions. Test

results show that blade sweep was important in achieving net efficiencies near 80 percent at Mach 0.8 and reducing near-field cruise noise by dB. Lifting line and lifting surface aerodynamic analysis codes are under development and some initial lifting line results are compared with propeller force and probe data. Some initial laser velocimeter measurements of the flow field velocities of an 8-bladed 45 deg swept propeller are shown. Experimental aeroelastic results indicate that cascade effects and blade sweep strongly affect propeller aeroelastic characteristics. Comparisons of propeller near-field noise data with linear acoustic; theory indicate that the theory adequate pradicts near-field noise for subsonic tip speeds but overpredicts the noise for supersonic tip speeds. Potential large gains in propeller efficiency of 7 to 11 percent at Mach 0.8 may be possible with advanced counter-rotation propellers.

A81-32548 * # The effect of inflow velocity profiles on the performance of supersonic ejector nozzles. A. R. Bishop (NASA, Lewis Research Center, Cleveland, Ohio). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 19th, St. Louis, Mo., Jan. 12-15, 1981, Paper 81-0273. 6 p. 5 refs.

The design of supersonic nozzles is becoming increasingly complex as conflicting requirements for low noise, higher efficiency, and wider operating range are driving the designer toward more variable geometry and multiple stream flows. Analysis techniques must be modified and expanded to take into account these additional complexities and still retain the rapid computational rate necessary for optimization and design studies. A nozzle analysis must handle more flow streams, more complex geometries, and more highly distorted initial profiles. This paper discusses some modifications to a method for calculating the performance characteristics of supersonic ejector nozzles and demonstrates the improvement in results the modifications provide. (Author)

A82-37678 * Keviar/PMR-15 polyimide matrix composite for a complex shaped DC-9 drag reduction fairing. R. T. Kawai, R. F. McCarthy, M. S. Willer (Douglas Aircraft Co., Long Beach, CA), and F. J. Hrach (NASA, Lewis Research Cervier, Cleveland, OH), AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1047. 9 p. 6 refs.

The Aircraft Energy Efficiency (ACEE) Program was established by NASA to improve the fuel efficiency of commercial transport aircraft and thereby to reduce the amount of fuel consumed by the air transportation industry. One of the final items developed by the program is an improved fairing which is the aft closure for the thrust reverser actuaiors on the JT8D nacelles on DC-9 aircraft. The reduced-drag fairing uses, in the interest of weight savings, an advanced composite construction. The composite material contains Kevlar 49 fibers in a PMR-15 matrix. Attention is given to the aerodynamic configuration, the material system, and aspects of fabrication development.

G.R.

N82-22142*# Toledo Univ., Ohio. Dept. of Chemical Engineering.
NUMERICAL SIMULATION OF ONE-DIMENSIONAL HEAT

NUMERICAL SIMULATION OF ONE-DIMENSIONAL HEAT TRANSFER IN COMPOSITE BODIES WITH PHASE CHANGE M.S. Thesis, 1980 Final Report

Kenneth J. DeWitt and Gurudutt Baliga Mar. 1982 88 prefs

(Contract NAG3-72)

(NASA-CR-165607; NAS 1,26:165607) Avail: NTIS

HC A05/MF A01 CSCL 20D

A numerical simulation was developed to investigate the one dimensional heat transfer occurring in a system composed of a layered aircraft blade having an ide deposit on its surface, The finite difference representation of the heat conduction equations was done using the Crank-Nicolson implicit finite difference formulation. The simulation considers uniform or time dependent heat sources, from heaters which can be either point sources or of finite thickness. For the ice water phase change, a numerical method which approximates the latent heat effect by a large heat capacity over a small temperature interval was applied. The simulation describes the temperature profiles within the various layers of the de-icer pad, as well as the movement of the ice water interface. The simulation could also be used to predict the one dimensional temperature profiles in any composite slab having different boundary conditions. M.G.

02 A組RODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery

For related information see also 34 Fluid Mechanics and Heat Transfer.

N82-110-24 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LOW SPEED TESTING OF THE INLETS DESIGNED FOR A TAMDEN-FAN V/STOL NACELLE

Robert C. Williams and Andres H. Ybarra (Vough Corp., Dallas) 1981 13 p refs Presented at the V/STOL Conf., Palo Alto, Calif., 7-9 Dec. 1981

(NASA-TM-82728, E-1031; AIAA-81-2627) Avail. NTIS

HC A02/MF A01 CSCL 01A

An approximately 0.25 scale model of a tandem fan nacelle. designed for a subsonic V/STOL aircraft, was tested in a Lewis wind tunnel. Model variables included long and short aft inlet cowls and the addition of exterior strakes to the short inlet cowl inlet pressure recoveries and distortion were measured at pitch angles to 40 deg and at combinations of pitch and yaw to 30 deg. Airspeeds covered a range to 135 knots (69 m/sec). The short aft inlet with added strakes had the best aerodynamic performance and is considered suitable for the intended V/STOL application

N82-11043* # National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

A SUMMARY OF V/STOL INLET ANALYSIS METHODS
Danny P. Hwang 1981 12 p reis Presented at the V/STOL
Conf., Palo Alto, Calif, 7-9 Dec. 1981 (NASA-TM-82725; E-1027) Avail: NTIS HC AGR/MF A01 CSCL 01A

Recent extensions and applications of the m hods are emphasized. They include the specification of the Kutte condition for a slotted inlet, the calculation of suction and tangential blowing for boundary layer control, and the analysis of auxiliary inlet geometries at angles of attack. A comparison is made with experiment for the slotted inlet. An optimum diffuser velocity distribution was developed.

N82-12043*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

INTERACTION OF UPSTREAM FLOW DISTORTIONS WITH HIGH MACH NUMBER CASCADES

Gerald W. Englert 1981 21 p refs Proposed for presentation at the 27th Ann. Ges Turbine Conf., London, 18-22 Apr. 1982; sponsored by ASME

(NASA-TM-82759; E-1078) Avail: NTIS HC A02/MF A01

Features of the interaction of flow distortions, such as gusts and wakes with blade rows of advance type fans and compressors having high tip Mach numbers are modeled. A typical disturbance was assumed to have harmonic time dependence and was described, at a far upstream location, in three orthogonal spatial coordinates by a double Fourier series. It was convected at supersonic relative to a linear cascade described as an unrolled annulus, Conditions were selected so that the component of this velocity parallel to the sxis of the turbomachine was subsonic, permitting interaction between blades through the upstream as well as downstream flow media. A strong, nearly normal shock was considered in the blade passages which was allowed curvature and displacement. The flows before and after the shock were linearized relative to uniform mean velocities in their respective regions. Solution of the descriptive equations was by adaption of the Wiener-Hopf technique, enabling a determination of distortion patterns through and downstream of the cascade as well as pressure distributions on the blade and surfaces. Details of interaction of the disturbance with the in-passage shock were discussed, influences of amplitude, wave length, and phase of the disturbance on lifts and moments of cascade configurations are presented. Numerical results are clarified by reference to an especially orderly pattern of upstream vertical motion in relation to the cascade parameters.

N82-13112*# National Aeronautics and Space Administration. Lewis Research Center, Cleve/and, Ohio.

THRUST MODULATION METHODS FOR A SUBSONIC V/STOL AIRCRAFT

Richard R. Woollett 1981 18 p refs Presented at V/STOL Conf., Palo Alto, Calif., 7-9 Dec. 1981; sponsored by AIAA and

(NASA-['M-82747; E-1063) Avail: NTIS HC A02/MF A01 CSCL 01A

Low speed wind tunnal tests were conducted to ascess four methods for attaining thrust modulation for V/STOL aircraft. The four methods were: (1) fan speed change. (2) fan nozzle exit area change, (3) variable pitch rotor (VPR) fan, and (4) variable inlet guide vanes (VIGV). The interrelationships between inlet and thrust modulation system were also investigated using a double slotted inlet and thick lip inlet. Results can be summarized as: (1) the VPR and VIGV systems were the most promising, (2) changes in blade angle to obtain changes in fan thrust have significant implications for the inlet, and (3) both systems attained required level of thrust with acceptable levels of fan blade M.D.K.

N82-13113* National Aeronautics and Space Administration Lawis Research Center, Cleveland, Ohio.

COMPUTATIONAL METHODS FOR INTERNAL FLOWS WITH EMPHASIS ON TURBOMACHINERY

William D. McNally and Peter M. Sockol 1981 79 p refs Presented at the Symp, on Computers in Flow Predictions and Fluid Dyn. Exp. at the ASME Winter Ann. Meeting, Washington, D.C., 16-20 Nov. 1981

(NASA-TM-82764; E-1085) Avail: NTIS HC A05/MF A01 CSCL DIA

Current computational methods for analyzing flows in turbomachinery and other related internal propulsion components are presented. The methods are divided into two classes. The inviscid methods deal specifically with turbomachinery applications. Viscous methodo, deal with generalized duct flows as well as flows in turbon - hinery passages. Inviscid methods are categorized into the instential, stream function, and Euler aproaches. Name was a des are treated in terms of parabolic, partially parate and elliptic procedures. Various grids used in association wats these procedures are also discussed.

N82-13114*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE EFFECT OF ROTOR BLADE THICKNESS AND SURFACE FINISH ON THE PERFORMANCE OF A SMALL AXIAL FLOW TURBINE

Richard J. Roelke and Jeffrey E. Haas 1982 13 p refs Proposed for presentation at the Gas Turbine Ann. Meeting, London, 18-22 Apr. 1982; sponsored by ASME Prepared in cooperation with Army Aviation Research and Development Command, Cleveland

(Contract DE-AIO1-77CS-51040)

(NASA-TM-82726; DOE/NASA/51040-34; TR-81-C-29) Ava., NTIS HC A02/MF A01 CSCL 21E

An experimental investigation was conducted to determine the effect of blade profile inaccuracies and surface finish on the aerodynamic performance of a 11.13 cm tip diameter turbine. The as-received cast rotor blades had a significantly thicker profile than the design intent and a fairly rough surface finish. Stage test results showed an increase of one point in efficieny by smoothing the surface finish and another three points by thinning the blade profiles to near the design profile. Most of the performance gain between the as-cast thick and the thinned rotor blades both with the same surface finish, was attributed to reduced trailing edge losses of the recontoured blades. Author

N82-14061*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ANALYTIC INVESTIGATION OF EFFECT OF END-WALL CONTOURING ON STATOR PERFORMANCE

Robert J. Boyle, Harold E. Rholik, and Louis J. Goldman Nov. 1981 12 p refs

(NASA-TP-1943; E-719) Avail; NTIS HC A02/MF A01 CSCL

Calculations show improved stator performance when the tip end wall was contoured so that the inlift area was greater

than the exit area. Comparisons are made with previously published experimental data. The results of a parametric analysis of the effect contour geometry on the efficiency of a highly loaded axial stator are given. The meximum stator efficiency gain is about 0.8 percentage point, and this represents a 22 percent reduction in stator losses. The degree to which endwall contouring reduces the forces driving secondary flows was also examined. The driving forces for both cross channel and radial secondary flow were reduced.

N82-15020 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPARISON OF TWO AND THREE DIMENSIONAL FLOW COMPUTATIONS WITH LASER ANEMOMETER MEASURE-

MENTS IN A TRANSONIC COMPRESSOR ROTOR
Rodrick V. Chima and Anthony J. Strazisar 1982 16 p refs
Proposed for presentation at the 27th Gas Turbine Conf., London, 18-22 Mpr. 1982; sponsored by ASME

(NASA-1M-82777; E-1007) Avail: NTIS HC A02/MF A01 CSCL ONA

A procedure for using an efficient axisymmetric code to genery ate downstream pressure input for more costly Euler codes is discussed. Two and three dimensional inviscio solutions for the flow within a transonic axial compressor rotor at design speed are compared to laser anemometer measurements at maximum flow and near stall operating points. Computational details of the 2-D axisymmetric stream function solution and the 3-D full Euler solution are described. Relative Mach number contours, shock location, and shock strength as measured and as predicted by the 3-D code are compared, Downstream of the rotor the inviscid computations agree with earth other but predict higher pressure ratios than those measured. Euler codes require a downstream pressure as input. Since that pressure controls the computed mass flow and shock system, it must be consistent with an inviscid solution.

N82-16049*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPLICATION OF IMAGE PROCESSING TECHNIQUES TO FLUID FLOW DATA ANALYSIS

Charles C. Giamati 1981 16 p Presented at the 11th Ann. Computer Output Microfilm (COMtec) Conf., Lincolnshire, III., 24-26 Feb. 1981

(NASA-TM-82760; E-1081) Avail: NTIS HC A02/MF A01 CSCL 01A

The application of color coding techniques used in processing remote sensing imagery to analyze and display fluid flow data is discussed. A minicomputer based color film recording and color CRT display system is described. High quality, high resolution images of two-dimensional data are produced on the film recorder. Three dimensional data, in large volume, are used to generate color motion pictures in which time is used to represent the third dimension. Several applications and examples are presented. System hardware and software is described,

N82-18176*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPARISON OF TWO PARALLEL/SERIES FLOW TUR-BOFAN PROPULGION CONCEPTS FOR SUPERSONIC

R. W. Luidens, G. E. Turney, and J. Allen 1981 15 p refs Presented at the V/STOL Conf., Palo Alto, Conf., 7-9 Dec.

(NASA-TM-82743; AIAA-81-2637; E-1056) Avail: NTIS HC A02/MF A01 CSCL 01A

The thrust, specific fuel consumption, and relative merits of the tendem fan and the dual reverse flow front fan propulsion systems for a supersonic V/STOL sircraft are discussed. Consideration is given to: fan pressure ratio, fan air burning, and variable core supercharging. The special propulsion system components required are described, namely: the deflecting front inlet/nozzle, the aft subsonic inlet, the reverse pitch fan, the variable core supercharger and the low pressure forward burner. The potential benefits for these unconventional systems are indicated. Author

N82-24185* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL AND ANALYTICAL RESULTS OF TANGENTIAL BLOWING APPLIED TO A SUBSONIC V/STOL INLET Richard R. Burley and Danny P. Hwang 1982 18 p refs Proposed for presentation at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; sponsored by AIAA, SAE and ASME

(NASA-TM-82847; E-1217; NAS 1,15:82847) Avail: NTIS

HC A02/MF A01 CSCL 01A

Engine inlets for subsonic V/STOL aircraft must operate over wide range of conditions without internal flow separation, Experimental and analytical investigations were conducted to evaluate the effectiveness of tangential blowing to maintain attached flow to high angles of attack. The inlet had a relatively thin lip with a blowing slot located either on the lip or in the diffuser. The height and width of these slots was varied. Experimentally determined flow separation boundaries showed that lip blowing achieved higher angle of attack capability than diffuser blowing. This capability was achieved with the largest slot circumferential extent and either of the two slot heights. Predicted (analytical) separation boundaries showed good agreement except at the highest angles of attack,

N82-25213*# National Aeronautics and Space Administration.
Lawis Research Center, Cleveland, Ohio,
SOME ASPECTS OF CALCULATING FLOWS ABOUT

THREE-DIMENSIONAL SUSSONIC INLETS

H, C. Kao 1981 19 p refs Presented at the 17th Joint Propulsion Conf., Colorado Springs, Colo., 27-29 Jul. 1981 (NASA-TM-82789; E-941; NAS 1.15:827/9) Avail: NTIS HC AD2/MF A01 CSCL 01A

Various three dimensional inlet models were calculated based or the potential flow model. Results are presented in the forms of surface static pressure, flow angularity, surface flow pattern, and inlet flow field. It is indicated that the extension of the lower lip can reduce the adverse pressure gradient and increase the flow separation bound.

N82-26234*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LASER ANEMOMETER MEASUREMENTS IN AN ANNULAR CASCADE OF CORE TURBINE VANES AND COMPARISON WITH THEORY

Louis J. Goldman and Richard G. Seashultz Jun. 1982 47 p.

(NASA-TP-2018; E-876; NAS 1.60:2018) Avail: NTIS HC A03/MF A01 CSCL 01A

Laser measurements were made in an annular cascade of stator vanes operating at an exit critical velocity ratio of 0.78. Velocity and flow angles in the blade to blade plane were obtained at every 10 percent of axial chord within the passage and at 1/2 axial chord downstream of the vanes for radial positions near the hub, mean and tip. Results are presented in both plot and tabulated form and are compared with calculations from an inviscid, quasi three dimensional computer program. The experimental measurements generally agreed well with these theoretical calculations, an indication of the usefulness of this analytic approach.

N82-26240*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AERODYNAMIC PERFORMANCE OF HIGH TURNING CORE TURBINE VANES IN A TWO DIMENSIONAL CASCADE
John R. Schwab 1982 20 p refs Presented at the 18th
Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; sponsored by AIAA, SAE and ASME

(NA SA-TM-82894; E-1272; NAS 1.15:82894) Avail: NTIS HC A02/MF A01 CSCL 01A

Experimental and theoretical aerodynamic performance data are presented for four uncooled high turning core turbine vanes with exit angles of 74.9, 75.0, 77.5, and 79.6 degrees in a two dimensional cascade. Data for a more conservative 67.0 degree vane are included for comparison. Correction of the experimental aftermix kinetic energy losses to a common 0.100 centimeter trailing edge thickness yields a linear trend of increased loss from 0.020 to 0.025 as the vane exit angle increases from 67.0 to 73.6 degrees. The theoretical losses show

a similar trend. The experimental and theoretical vane surface velocity distributions generally agree within approximately five percent, although the suction surface theoretical velocities are generally higher than the experimental velocities as the vane exit angle increases

N82-26241*# National Aeronautics and Space Administration Lewis Revearch Center, Cleveland, Ohio

PERFORMANCE OF A 2D-CD NONAXISYMMETRIC EXHAUST NOZZLE ON A TURBOJET ENGINE AT ALTI-TUDE

David M Straight 1982 28 p refs Presented at 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; sponsored by AIAA, SAE and ASME

(NASA-TM-82881; E-1257; NAS 1.15:82881) Avail: NTIS

HC A03/MF A01 CSCL 01A

Baseline thrust and cooling data obtained with a 2D-CD versatile research exhaust nozzle mounted on a turbojet engine in an altitude chamber are presented. The tests covered a range of nozzle pressure ratios, nozzle pressure ratios, nozzle throat areas, and internal expansion area ratios. The thrust data obtained show good agreement with theory and scale model results after correcting the data for leakage and bypass cooling flows. Additional work is needed to improve predictability of cooling performance.

N82-28247*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTER PROGRAM FOR CALCULATING FULL POTEN-TIAL TRANSONIC, QUASI-THREE-DIMENSIONAL FLOW THROUGH A ROTATING TURBOMACHINERY BLADE ROW

Charles A. Farrell Jun. 1982 57 p refs

(NASA-TP-2030; E-1013, NAS 1.60:2030) Avail: NTIS

HC A04/MF A01 CSCL 01A

A fast, reliable computer code is described for calculating the flow field about a cascade of arbitrary two dimensional airfoils. The method approximates the three dimensional flow in a turbomachinery blade row by correcting for stream tube convergence and radius change in the throughflow direction. A fully conservative solution of the full potential equation is combined with the finite volume technique on a body fitted periodic mesh. with an artificial density imposed in the transonic region to insure stability and the capture of shock waves. The instructions required to set up and use the code are included. The name of the code is OSONIC. A numerical example is also given to illustrate the output of the program

N82-28249*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

A SUMMARY OF V/STOL INLET ANALYSIS METHODS Danny P. Hwang and John M. Abbatt 1982 17 p refs be presented at the 13th Congr. of the Intern. Council of the Aeronautical Sci. and Aircraft Systems and Technol. Conf., Seattle. 22-27 Aug. 1982; sponsored by the American Inst. of Aeronautics and Astronautics Previously announced in IAA as A82-16902 (NASA-TM-82885; E-1263; NAS 1.15.82885) Avail: NTIS HC A02/MF A01 CSCL 01A

For abstract see A82-16902

N82-28250*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

COMPARISON OF LASER ANEMOMETER MEASURE-MENTS AND THEORY IN AN ANNULAR TURBINE CASCADE WITH EXPERIMENTAL ACCURACY DETER-MINED BY PARAMETER ESTIMATION

Louis J. Goldman and Richard G. Seasholtz 1982 15 p refs Proposed for presentation at Symp. on Engr. Appl. of Laser Velocitmetry, Phoenix, Ariz., 14-19 Nov. 1982; sponsored by ASME

(NASA-TM-82860; E-1228; NAS 1.15:82860) Avail: NTIS HC A02/MF A01 CSCL 01A

Experimental measurements of the velocity components in the blade to blade (axial tangential; lane were obtained with an axial flow turbine stator passage and were compared with calculations from three turbomachinery computer programs. The theoretical results were calculated from a quasi three dimensional inviscid code, a three dimensional inviscid code, and a three

dimensional viscous code. Parameter estimation techniques and a particle dynamics calculation were used to assess the accuracy of the laser measurements, which allow a rational basis for comparison of the experimenal and theoretical results. The general agreement of the experimental data with the results from the two inviscid computer codes indicates the usefulness of these calculation procedures for turbomachinery blading. The comparison with the viscous code, while generally reasonable, was not as good as for the inviscid codes.

N\$2-29270*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Chio

VELOCITY GRADIENT METHOD FOR CALCULATING VELOCITIES IN AN AXISYMMETRIC ANNULAR DUCT

Theodore Katsanis Jul. 1982 23 p refs (NASA-TP-2029; E-1104; NAS 1.60:2029) Avail: NTIS HC A02/MF A01 CSCL 01A

The velocity distribution along an arbitrary line between the inner and outer walls of an annular duct with axisymmetric swirling flow is calculated. The velocity gradient equation is used with an assumed variation of meridional streamline curvature, Upstream flow conditions can vary between the inner and outer walls, and an assumed total pressure distribution can be specified, S.L.

A82-19778 * # Three-dimensional flow calculations including boundary layer effects for supersonic inlets at angle of attack. J. Vadyak, J. D. Hoffman (Purdue University, West Lafayette, IN), and A. R. Bishop (NASA, Lewis Research Center, Wind Tunnel and Flight Div., Cleveland, OH). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0061. 13 p. 23 refs. Grant No. NsG-3311.

An analysis is presented for calculating the steady threedimensional flow field in supersonic mixed-compression inlets at incidence. A zonal modeling approach is employed to obtain the solution. The supersonic core flow is computed using a second-order pentahedral bicharacteristic algorithm. The bow shock wave and the reflected internal shock train are determined using a threedimensional discrete shock fitting procedure. The boundary layer flow adjacent to both the centerbody and the cowl is computed using a second-order implicit finite difference method. The flow in a shock wave-boundary layer interaction region is computed using an integral formulation. The culmination of the present research effort is the development of a production-type computer program capable of analyzing flow in a variety of mixed-compression aircraft inlets. Numerical results and experimental correlations are presented to illustrate application of the analysis.

A82-35195 * # Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet, R. R. Burley and D. P. Hwang (NASA, Lewis Research Center, Cleveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1084 12 p. 9 refs.

(Previously announced in STAR as N82-24165)

Tangential blowing for control of strong normal shock A82-37684 * # - Boundary layer interactions on inlet ramps. M, F. Schwendemann (Northrop Corp., Hawthorne, CA) and B. W. Sanders (NASA, Lewis Research Center, Cleveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1082. 10 p. 8 refs. Contract

The use of tangential blowing from a row of holes in an aft facing step is found to provide good control of the ramp boundary layer, normal shock interaction on a fixed geometry inlet over a wide range of inlet mass flow ratios. Ramp Mach numbers of 1.36 and 1.96 are investigated. The blowing geometry is found to have a significant effect on system performance at the highest Mach number. The use of high-temperature air in the blowing system, however, has only a slight effect on performance. The required blowing rates are significantly high for the most severe test conditions. In addition, the required blowing coefficient is found to be proportional to the normal shock pressure rise.

A82-37716 * # Aerodynamic performance of high turning core turbine vanes in a two-dimensional cascade. J. R. Schwab (NASA, Lewis Research Center, Cleveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1288. 19 p. 6 refs.

Experimental and theoretical aerodynamic performance data are presented for four uncooled high turning core turbine vanes with exit angles of 74,9,75,0,77.5, and 79.6 degrees in a two-dimensional cascade. Data for a more conservative 67.0 degree vane are included for comparison. Corection of the experimental aftermix kinetic energy losses to a common 0.100 centimeter trailing edge thickness yields a linear trend of increased loss from 0,020 to 0,025 as the vane exit angle increases from 67.0 to 79.6 degrees. The theoretical losses show a similar trend. The experimental and theoretical vane surface velocity distributions generally agree within approximately five percent, although the suction surface theoretical velocities are generally higher than the experimental velocities as the vane exit angle increases. (Author)

A82-37937 * # Three-dimensional shock structure in a transpnic flutter cascade. D. R. Boldman, A. E. Buggele, and A. J. Decker (NASA, Lewis Research Center, Cleveland, OH). AIAA Journal, vol. 20, Aug. 1982, p. 1146-1148. 5 refs.

Rapid double-pulse holography was employed to obtain detailed, two-dimensional images of the shock forming during simulated flutter in a transonic flowfield, The experiment comprised a linear cascade of airfolls externally oscillated in torsion and viewed tangentially at the shock surface. Three biconvex airfoils were subjected to harmonic pitching motion about the midchord axis at a frequency of 0.53 while immersed in a Mach 0.81 flow. Failure to produce observable shocks led to use of choked flow with a Mach number near one, of which 50 holograms were taken. The images revealed a narrow shock surface with a spanwise variation in the shock properties. The method is concluded to be useful for examining transonic flowfield shocks in the presence of airfoil flutter.

A summary of V/STOL inlet analysis methods. D. P. A82-40921 * # Hwang and J. M. Abbott (NASA, Lewis Research Center, Cleveland, DH). In: International Council of the Aeronautical Sciences, Congress, 13th and AIAA Aircraft Systems and Technology Conference, Seattle, WA, August 22-27, 1982, Proceedings, Volume 1, (A82-40876 20-01) New York, American Institute of Aeronautics and Astronautics, 1982, p. 402-409. 24 refs.

The methods used to analyze the aerodynamic performance of V/STOL linets at the NASA Lewis Research Center are briefly described. Recent extensions and applications of the method are emphasized. They include the specification of the Kutta condition for a slotted inlet, the calculation of suction and tangential blowing for boundary layer control, and the analysis of auxiliary inlet geometries; A comparison is made with experiment for the slotted inlet and also for tangential blowing. Finally, an optimum inlet diffuser valocity distribution is developed.

N82-11041*# Flow Research, Inc., Kent, Wash.
CALCULATIONS OF TRANSONIC POTENTIAL FLOW OVER **CASCADES** Final Report

Wen-Huei Jou Oct. 1981 36 p refs (Contract NAS3-22129)

(NASA-CR-165471; FRR-182) Avail: NTIS HC A03/MF A01 CSCL 01A

Transonic flow through a cascade was studied by using the full potential equation and the finite volume method of Jameson and Caughey. The C-type computational grid is generated by an electrostatic analogy and simple shearing transformation. The solution algorithm includes an option of using either an artificial density or an artificial viscosity formulation of the dissipative term. Using the developed code, flows through a cascade of NACA 0012 airfoils and flows through a cascade of shockless blades were computed, it is found that the designed flow through the shockless blade is accurately predicted, the artificial density formulation shows more tolerance to the mesh irregularity, and the C-type mesh does not extend very far upstream for a small pitch-cord ratio.

N82-16044*# Universities Space Research Association. Columbia, Md.

CAS22 - FORTRAN PROGRAM FOR FAST DESIGN AND ANALYSIS OF SHOCK-FREE AIRFOIL CASCADES USING FICTITIOUS-GAS CONCEPT Final Report

Djordje S. Dulikravich and Helmut Sobieczky (DFVLR-Inst. fuer Theoretische Streemungsmechanik, Goettingen, West Germany) Washington NASA Jan, 1982 59 p refs (Contract NAS3-22532)

(NASA-CR-3507) Avail: NTIS HC A04/MF A01 CSCL 01A A user-oriented computer program, CAS22, was developed that is applicable to aurodynamic analysis and transonic shock-free redesign of existing two-dimensional cascades of airfoils. This FORTRAN program can be used: (1) as an analysis code for full-potential, transonic, shocked or shock-free cascade flows; (2) as a design code for shock-free cascades that uses Sobleczky's fictitious-gas concept; and (3) as a shock-free design code followed automatically by the analysis in order to confirm that the newly obtained cascade shape provides for an entirely shock-free transonic flow field. A four-level boundary-conforming grid of an O type is generated. The shock-free design is performed by implementing Sobieczky's fictitious-gas concept of elliptic continuation from subsonic into supersonic flow domains. Recomputation inside each supersonic zone is performed by the method of characteristics in the rheograph plane by using isentropic gas relations. Besides converting existing cascade shapes with multiple shocked supersonic regions into shock-free cascades, CAS22 can also unchoke previously choked cascades and make them shock free.

N82-17122*# McDonnell-Douglas Corp., St. Louis, Mo.
TESTS OF A D VENTED THRUST DEFLECTING NOZZLE BEHIND A SIMULATED TURBOFAN ENGINE Final Report T. L. Watson Washington NASA Jan, 1982 139 p refs (Contract NAS3-21733) MDC-A6930)

(NASA-CR-3508; HC A07/MF A01 CSCL 01A NTIS

A D vented thrust passecting nozzle applicable to subsonic V/STOL aircraft was tested behind a simulated turbofan engine in the verticle thrust stand. Nozzle thrust, fan operating characteristics, nozzle entrance conditions, and static pressures were measured. Nozzle performance was measured for variations in exit area and thrust deflection angle. Six core nozzle configurations, the effect of core exit exial location, mismatched core and fan stream nozzle pressure ratios, and yaw vane presence were evaluated. Core nozzle configuration affected performance at normal and engine out operating conditions. Highest vectored nozzle performance resulted for a given exit area when core and fan stream pressure were equal, its is concluded that high nozzle performance can be maintained at both normal and engine out conditions through control of the nozzle entrance Mach number with a variable exit area.

N82-18180*# United Technologies Research Center, East Hartford, Conn.

AN EXPERIMENTAL INVESTIGATION OF GAPWISE PERIODICITY AND UNSTEADY AERODYNAMIC RESPONSE IN AN OSCILLATING CASCADE. VOLUME 2: DATA REPORT. PART 1: TEXT AND MODE 1 DATA Report

Franklin O. Carte Dec. 1981 411 p refs.

(Convract NAS3-22018)

(NASA-CR-165457-Vol-2-Pt-1; R81-914618-28-Vol-2-Pt-1)

Avail: NTIS HC A16/MF A01 CSCL 01A

Tests were conducted a linear cascade of airfoils oscillating in pitch to measure the unsteady pressure response on selected blade along the leading edge plane of the cascade, over the chord of the center blade, and on the sidewall in the plane of the leading edge. The tests were conducted for all 96 combinations 2 mean camberline incir ance angles 2 pitching amplitudes 3 reduced frequencies and b interblade phase angles. The pressurdata were reduced to Fourier coefficient form for direct comparison, and were also processed to yield integrated loads and particularly, the aerodynamic damping coefficient. Data obtained during the test program, reproduced from the printout of the data reduction program are complied. A further description of the contents of this report is found in the text that follows.

N82-18184*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.

NUMERICAL ANALYSIS AND FORTRAN PROGRAM FOR THE COMPUTATION OF THE TURBULENT WAKES OF TURBOMACHINERY ROTOR BLADES, ISOLATED AIRFOILS AND CASCADE OF AIRFOILS Final Report - Ph.D. Thesis Mar. 1980

C. Hah and B. Lakshminarayana Washington NASA Feb. 1982 171 p refs (Grant NsG-3012)

(NASA-CR-3509: PSU-TURBO-81-4) Avail: NTIS HC A08/MF A01 CSCL 01A

Turbulent wakes of turbomachinery rotor blades, isolated airfoils, and a cascade of airfoils were investigated both numerically and experimentally. Low subsonic and incompressible wake flows

were examined A finite difference procedure was employed in the numerical analysis utilizing the continuity, momentum, and turbulence closure equations in the rotating, curvilinear, and nonorthogonal coordinate system. A nonorthogonal curvilinear coordinate system was developed to improve the accuracy and efficiency of the numerical calculation. Three turbulence models were employed to obtain closure of the governing equations. The first model was comprised to transport equations for the turbulent kinetic energy and the rate of energy dissipation, and the second and third models were comprised of equations for the rate of turbulent kinetic energy dissignation and Reynolds stresses, respectively. The second model handles the convection and diffusion terms in the Reynolds stress transport equation collectively, while the third model handles them individually. The numerical results demonstrate that the second and third models provide accurate predictions, but the computer time and memory storage can be considerably saved with the second model.

N82-19159* Pennsylvania State Univ. University Park. Dept. of Aerospace Engineering

APPLICATION OF AN AIRFOIL STALL FLUTTER COMPUTER PREDICTION PROGRAM TO A THREE-DIMENSIONAL WING: PREDICTION VERSUS EXPERIMENT M.S. Thosis Anthony J Mulfoletto Mar 1982 136 p refs

(Grant NsG-3304) (NASA-CR-168586) Avail: NTIS HC A07/MF A01 CSCL

01A

An sarodynamic computer code, capable of predicting unsteady and C sub m values for an airfuil undergoing dynamic stall, is used to predict the amplitudes and frequencies of a wing undergoing torsional stall flutter. The code, developed at United Technologies Research Corporation (UTRC), is an empirical prediction method designed to yield unsteady velocity of normal force and moment, given the airfoil's static coefficient characteristics and the unsteady aerodynamic values, alpha, A and B In this experiment, conducted in the PSU 4' x 5' subsonic wind tunnel, the wing's elastic axis, torsional spring constant and initial angle of attack are varied, and the oscillation amplitudes and frequencies of the wing, while undergoing torsional stall flutter, are recorded. These experimental values show only fair comparisons with the predicted responses. Predictions tend to be good at low velocities and rather poor at higher velocities

N82-19178*# Hamilton Standard, Windsor Locks, Conn.
EVALUATION OF WIND TUNNEL PERFORMANCE TEST-INGS OF AN ADVANCED 45 DEG SWEPT 8-BLADED PROPELLER AT MACH NUMBERS FROM 0.45 TO 0.85

C. Rohrbach, F. B. Metzger, D. M. Black, and R. M. Ladden Washington NASA Mar. 1982 129 p refs

(Contract NAS3-20769)

(NASA-CR-3505) Avail: NTIS HC A07/MF A01 CSCL 01A The increased emphasis of fuel conservation in the world and the rapic increase in the cost of jet fuel has stimulated a series of studies of both conventional and unconventional propulsion systems for commercial aircraft. The results of these studies indicate that a fuel saving of 15 to 30 percent may be realized by the use of an advanced high-speed turboprop (Prop-Fan) compared to aircraft equipped with high bypass turbofan engines of equivalent technology. The Prop-Fan propulsion system is being investigated as part of the NASA Aircraft Energy Efficient Program. This effort includes the wind tunnel testing of a series of 8 and 10-blade Prop-Fan models incorporate swept blades. Test results indicate efficiency levels near the goal of 80 percent at Mach 0.8 cruise and an altitude of 10.67 km (35,000 ft). Each successive swept model has shown improved efficiency relative to the straight blade model. The fourth model, with 45 deg swept blades reported herein. shows a net efficiency of 78,2 at the design point with a power loading of 301 kW/sq meter and a tip speed of 243,8 m/sec (800 ft/sec.) Author

N82-21158*# Vought Corp., Dallas, Tex.
V/STOL TANDEM FAN TRANSITION SECTION MODEL TEST

William E Simpkin Mar 1982 156 p refs (Contract NAS3-22155)

(NASA-CR-165587, NAS 1.26:165587, TR2-53200/2R-53085) Avail NTIS HC A08/MF A01 CSCL

An approximately 0.25 scale model of the transition section of a tandem fan variable cycle engine nacelle was tested in the NASA Lewis Research Center 10-by-10 foot wind tunnel. Two 12-inch, tip-turbine driven fans were used to simulate a tandem fan engine. Three testing modes simulated a V/STOL tandem fan airplane. Parallel mode has two separate propulsion streams for maximum low spend performance. A front inlet, fan, and downward vectorable nozzle forms one stream. An auxilliary top inlet provides air to the aft fan - supplying the core engine and aft vectorable nozzle. Front nozzle and top inlet closure, and removal of a blocker door separating the two streams configures the tandem fan for series mode operations as a typical aircraft propulsion system. Transition mode operation is formed by intermediate settings of the front nozzle, blocker door, and top inlet. Emphasis was co the total pressure recovery and flow distration at the aft fan face. A range of fan flow rates were tested at tunnel airspeeds from 0 to 240 knots, and ungles-of-attack from -10 to 40 deg for all three modes. In addition to the model variables for the three modes, model variants of the top inlet were tested in the parallel mode only. These lip variables. were, aft lip boundary layer bleed holes, and Three position turning vane. Also a bellmouth extension of the top inlet side lips was tested in parallel mode.

N#2-22210*# Universities Space Research Association, Columbia, Md. DESIGN OF SUPERCRITICAL CASCADES WITH HIGH SOLIDITY

Jose M. Sanz Feb. 1982 8 p refs

(Contract NAS3-2253)

(NASA-CR-165600; NAS HC A02/MF A01 CSCL 01A NAS 1,26:165600)

The method of complex characteristics of Garabedian and Kom was successfully used to design shockless cascades with solidities of up to one. A code was developed using this method and a new hodograph transformation of the flow onto an ellipse. This code allows the design of cascades with solidities of up to two and larger turning angles. The equations of potential flow are solved in a complex hodograph like domain by setting a characteristic initial value problem and integrating glong suitable paths. The topology that the new mapping introduces permits a simpler construction of these paths of integration,

NS2-Z2211*# Bosing Commercial Airplane Co., Seattle, Wash, AERODYNAMIC ANALYSIS OF VTOL INLETS AND DEFINI-TION OF A SHORT, BLOWING-LIP INLET Fine! Report J. Syberg and A. L. Jones Apr. 1982 61 p refs

(Contract NAS3-22369)

(NASA-CR-165617; NAS 1,26:165617; D6-51418) Avail; NTIS HC A04/MF A01 CSCL 01A

The results indicated that, without boundary layer control, either a very long inlet or an inlet with a very high contraction ratio lip will be required to meet the stringent design requirements, it is shown that active boundary layer control is an effective means of preventing separation and that a significant reduction in inlet size can be achieved by removing only a small amount of bleed in the throat region of the inlet. A short, blowing-lip model was designed and fabricated. This model features on adjustable, blowing slot located near the hilite on the windward side of the inlet.

N82-22214*# Thermo Mechanical Systems Co., Canoga Park, Calif.

DEVELOPMENT OF A LOCALLY MASS FLUX CONSERVA-TIVE COMPUTER CODE FOR CALCULATING 3-D VISCOUS FLOW IN TURBOMACHINES Final Report

Leonard Walitt Apr. 1962 118 p refs (Contract NAS3-20834; DA Proj. 1L1-52209-AH-76) (NASA-CR-3539; NAS 1,26:3539; SR-34) Avail; NTIS HC A06/MF A01 CSCL 01A The VANS successive approximation numerical method was extended to the computation of three dimensional, viscous, transonic flows in turbomachines. A cross-sectional computer code, which conserves mass flux at each point of the crosssectional surface of computation was developed. In the VANS numerical method, the cross-sectional computation follows a

blade-to-blade calculation. Numerical calculations were made for an exial annular turbine cascade and a transonic, centrifugal impeller with splitter vanes. The subsonic turbine cascade computation was generated in blade-to-blade surface to evaluate the accuracy of the blade-to-blade mode of marching. Calculated blade pressures at the hub, mid, and p radii of the cascade agreed with corresponding measuremeits. The transonic impeller computation was conducted to test the newly developed locally mass flux conservative cross-sectional computer code. Both blade-to-blade and cross sectional modes of calculation were implemented for this problem. A triplet point shock structure was computed in the inducer region of the impeller, in addition, time-averaged shroud static pressures generally agreed with measured shroud pressures, it is concluded that the blade-to-blade computation produces a useful engineering flow field in regions of subsonic relative flow; and cross-sectional computation, with a locally mass flux conservative continuity equation, is required to compute the shock waves in regions of supersonic relative.

N82-24166°# Ohio State Univ., Columbus, Dept. of Aeronautical and Astronautical Engineering.

RIME ICE ACCRETION AND ITS EFFECT ON AIRFOIL PERFORMANCE Ph.D. Thesis. Finel Report

Michael B. Bragg Mar. 1982 182 p refs (Grant NAG3-28)

(NASA-CR-165599; NAS 1,26:165599) Avail: NTIS

HC A09/MF A01 CSCL 01A

A methodology was developed to predict the growth of rime ice, and the resulting aerodynamic penalty on unprotected, subcritical, airfoil surfaces. The system of equations governing the trajectory of a water droplet in the airfolf flowfield is developed and a numerical solution is obtained to predict the mass flux of super cooled water droplets freezing on impact. A rime ice shape is predicted. The effect of time on the ice growth is modeled by a time-stepping procedure where the flowfield and droplet mass flux are updated periodically through the ice accretion process. Two similarity parameters, the trajectory similarity parameter and accumulation parameter, are found to govern the accretion of rime ice, in addition, an analytical solution is presented for Langmuir's classical modified inertia parameter. The aerodynamic evaluation of the effect of the ica accretion on sirfoil performance is determined using an existing airfoil analysis code with empirical corrections. The change in maximum lift coefficient is found from an analysis of the new iced sirfoil shape. The drag correction needed due to the severe surface roughness is formulated from existing iced airfoil and rough airfoil data, A small scale wind tunnel test was conducted to determine the change in airfoil performance due to a simulated rime ice shape.

N62-26229*# United Technologies Research Center, East Hartford, Conn.

AN EXPERIMENTAL INVESTIGATION OF GAPWISE PERIODICITY AND UNSTEADY MERODYNAMIC RESPONSE IN AN OSCILLATING CASCADE. 1: EXPERIMENTAL AND THEORETICAL RESULTS Final Report

Franklin O. Carta Washington NASA Jun. 1982 103 p refs (Contract NAS3-22018)

(NASA-CR-3513; NAS 1.26:3513; R81-914618-27) Avail:

NTIS HC A06/MF A01 CSCL 01A

Tests were conducted on a linear cascade of airfoils oscillating In pitch to measure the unsteady pressure response on selected blades along the leading edge plane of the cascade, over the chord of the center blade, and on the sidewall in the plane of the leading edge. The pressure data were reduced to Fourier coefficient form for direct comparison, and were also processed to yield integrated loads and, particularly, the aerodynamic damping coefficient. Results from the unsteady Verdon/Caspar theory for cascaded blades with nonzero thickness and camber were compared with the experimental measurements. The three primary results are: (1) from the leading edge plane blade data, the cascade was judged to be periodic in unsteady flow over the range of parameters tested; (2) the interblade phase angle was found to be the single most important parameter affecting the stability of the oscillating cascade blades; and (3) the real blade theory and the experiment were in excellent agreement for the several cases chosen for comparison.

N82-26230°# Mossachusetts Inst. of Tech., Cambridge Gas Turbine and Plasma Dynamics Lab.

A FORTRAN PROGRAM FOR CALCULATING THREE DIMENSIONAL INVISCID AND ROTATIONAL FLOWS WITH SHOCK WAVES IN AXIAL COMPRESSOR BLADE ROWS: USER'S MANUAL Finel Report

William T. Thompkins, Jr. Washington Jun, 1982 179 p

(Grant NsG-3234)

(NASA-CR-3560; NAS 1 26:3560) Avail; NT/S

HC A09/MF A01 CSCL 01A

A FORTRAN-IV computer program was developed for the calculation of the inviscid transonic/supersonic flow field in a fully three dimensional blade passage of an axial compressor rotor or stator. Rotors may have dampers (part span shrouds). MacCormack's explicit time marching method is used to solve the unsteady Euler equations on a finite difference mesh. This technique captures shocks and smears them over several grid points. Input quantities are blade row geometry, operating conditions and thermodynamic quantities. Output quantities are three velocity components, density and internal energy at each mesh point. Other flow quantities are calculated from these variables. A short graphics package is included with the code, and may be used to display the finite difference grid, blade geometry and static pressure contour plots on blade to blade calculation surfaces or blade suction and pressure surfaces. The flow in a low aspect ratio transonic compressor was analyzed and compared with high response total pressure probe measurements and gas fluorescence static density measurements made in the MIT blowdown wind tunnel. These comparisons show that the computed flow fields accurately model the measured shock wave locations and overall aerodynamic performance.

R W

N82-26237*# Purdue Univ , Lafayette, Ind. Thermal Sciences and Propulsion Center.

THE DESIGN AND INSTRUMENTATION OF THE PURDUE ANNULAR CASCADE FACILITY WITH INITIAL CATA ACQUISITION AND ANALYSIS

R Charles Stauter and Sanford Fleeter May 1982 136 p refs

(Grant NsG-3285)

(NASA-CR-167861; NAS 1,26:167861; ME-TSPG-TR-82-11)

Avail NTIS HC A07/MF A01 CSCL 01A

Three dimensional aerodynamic data, required to validate and/or indicate necessary refinements to inviscid and viscous analyses of the flow through turbomachine blade rows, are discussed. Instrumentation and capabilities for pressure measurement, probe insertion and traversing, and flow visualization are reviewed. Advanced measurement techniques including Laser Doppler Anemometers, are considered. Data processing is reviewed. Predictions were correlated with the experimental data. A flow visualization technique using helium filled soap bubbles was demonstrated.

Author

N82-26239*# Universities Space Research Association, Columbia, Md.

GRID3C: COMPUTER PROGRAM FOR GENERATION OF C TYPE MULTILEVEL, THREE DIMENSIONAL AND BOUNDARY CONFORMING PERIODIC GRIDS Final Report

Djordje S Dulikravich Mar 1982 26 p refs

(Contract NAS3-22532)

(NASA-CR-167846; NAS 1.26:167846) Avail: NTIS

HC A03/MF A01 CSCL 01A

A fast computer program, GRID3C, was developed for accurately generating periodic, boundary conforming, three dimensional, consecutively refined computational grids applicable to realistic axial turbomachinery geometries. The method is based on using two functions to generate two dimensional grids on a number of coaxial axisymmetric surfaces positioned between the centerbody and the outer radial boundary. These boundary fitted grids are of the C type and are characterized by quasi-orthogonality and geometric periodicity. The built in monorthogonal coordinate stretchings and shearings cause the grid clustering in the regions of interest. The stretching parameters are part of the input to GRID3C. In its present version GRID3C can generate and store a maximum of four consecutively refined three dimensional grids. The output grid coordinates can be calculated either in the Cartesian or in the cylindrical coordinate system.

Author

N82-28253*# Universities Space Research Association, Columbia Md

FAST GENERATION OF THREE-DIMENSIONAL COMPUTA-TIONAL BOUNDARY-CONFORMING PERIODIC GRIDS OF C-TYPE Final Report

Djordje S. Dulikravich Jun 1982 30 p refs Presented at Symp on Numerical Generation of Curviliner Coordinating Systems and Use in Numerical Solution of Partial Differential Equations, Nashville, 13-16 Apr 1982

(Contract NAS3-22532)

(NASA-CR-165596, NAS 1.26:165596) HC A03/MF A01 CSCL 01A Avail: NTIS

A fast computer program, GRID3C, was developed to generate multilevel three dimensional. C type, periodic, boundary conforming grids for the calculation of realistic turbomachinery and propeller flow fields. The technique is based on two analytic functions. that conformally map a cascade of semi-infinite slits to a cascade of doubly infinite strips on different Riemann sheets. Up to four consecutively refined three dimensional grids are automatically generated and permanently stored on four different computer sapes. Grid nonorthogonality is introduced by a separate coordinate shearing and stretching performed in each of three coordinate directions. The grids are easily clustered closer to the blade surface, the trailing and leading edges and the hub or shroud regions by changing appropriate input parameters. Hub and duct (or outer free boundary) have different axisymmetric shapes. A vortex sheet of arbitrary thickness emanating smoothly from the blade trailing edge is generated automatically by GRID3C, Blade cross sectional shape, chord length, twist angle, sweep angle, and dihedral angle can vary in an arbitrary smooth fashion in the spanwise direction

N82-29269*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering

CALCULATION OF THE FLOW FIELD INCLUDING BOUNDA-HY LAYER EFFECTS FOR SUPERSONIC MIXED COMPRES-SION INLETS AT ANGLES OF ATTACK

Joseph Vadyak and Joe D. Hoffman Jul. 1982 406 p refs

(Grant NsG-3311)

(NASA-CR-167941; NAS HC A18/MF AC1 25%L D1A NAS 1.26:167941) NTIS Avail:

The flow field at such sonic mixed compression aircraft inlets at angle of attack is seculated. A zonal modeling technique is employed to Larein the solution which divides the flow field into different amputational regions. The computational regions consist of a supersonic core flow, boundary layer flows adjacent to both the forebody/centerbody and cowl contours, and flow in the shock wave boundary layer interaction regions. The zonal modeling analysis is described and some computational results are presented. The governing equations for the supersonic core flow form a hyperbolic system of partial differential equations, The equations for the characteristic surfaces and the compatibility equations applicable along these surfaces are derived. The characteristic surfaces are the stream surfaces, which are surfaces composed of streamlines, and the wave surfaces, which are surfaces tangent to a Mach conoid. The compatibility equations are expressed as directional derivatives along streamlines and bicharacteristics, which are the lines of tangency between a wave surface and a Mach conoid.

N82-32310*# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.

THREE DIMENSIONAL FLOW MEASUREMENTS IN A TURBINE SCROLL

W. Tabakoff, B. V. R. Vittal, and B. Wood Jul. 1982 55 p refs (Grant NAG3-26)

(NASA-CR-167920; NAS 1.26:167920) Avail: NTIS

HC A04/MF A01 CSCL 01A

A study was conducted to determine experimentally the flow behavior in combined scroll nozzle assembly of a radial inflow turbine. Hot film anemometry technique was used to measure the three dimensional flow velocity in the scroll. The through flow and secondary flow velocity components are measured at various points in three scroll sections.

N82-33347*# Cessna Alteraft Co., Vandalia, Ohio. Accessory

IMPACT OF ADVANCED PROPELLER TECHNOLOGY ON AIR-CRAFT/MISSION CHARACTERISTICS OF SEVERAL GENERAL AVIATION AIRCRAFT Final Report

NTIS

Avail:

Ira D, Keiter Sep. 1982 82 p refs

(Contract NAS3-21719)

(NASA-CR-167984; NAS HC A05/MF A01 CSCL 01A 1.26:167984)

Studies of several General Aviation aircraft indicated that the application of advanced technologies to General Aviation propelling can reduce fuel consumption in future aircraft by a significant amount. Propeller blade weight reductions achieved through they use of composites, propeller efficiency and noise improvements achieved through the use of advanced concepts and improved propeller analytical design methods result in aircraft with lower operating cost, acquisition cost and gross weight. Author

A82-15459 * The three-dimensional boundary layer on a rotating helical blade, P. J. Morris (Pennsylvania State University, University Park, PA), Journal of Fluid Mechanics, vol. 112, Nov. 1981, p. 283-296, 8 refs. Grant No. NsG-3265.

The laminar boundary layer on a twisted helical blade is considered. The blade geometry is the same as that proposed by Horlock and Wordsworth (1965). However, the blade is twisted about the leading edge in the manner described by Miyake and Fujita (1974). The flow may be considered to be the analog, in a rotating reference frame, of the flat-plate boundary layer in a stationary frame. It is shown that a coordinate system which is orthogonal in the blade surface may be developed. With the appropriate scaling of the dependent variables a solution for the boundary layer flow is readily obtained. The systems of ordinary differential equations for the stream function of the primary flow and the cross-flow are solved numerically.

A82-17759 * # A finite element formulation of Euler equations for the solution of steady transonic flows, A. Ecer and H. U. Akay (Purdue University, Indianapolis, IN). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0062. 11 p. 14 refs. Grant No. NsG-3294.

The main objective of the considered investigation is related to the development of a relaxation scheme for the analysis of inviscid, rotational, transonic flow problems. To formulate the equations of motion for inviscid flows in a fixed coordinate system, an Eulerian type variational principle is required. The derivation of an Eulerian variational principle which is employed in the finite element formulation is discussed. The presented numerical method describes the mathematical formulation and the application of a numerical process for the direct solution of steady Euler equations. The development of the procedure as an extension of existing potential flow formulations provides the applicability of previous procedures, e.g., proper application of the artificial viscosity for supersonic elements, and the accurate modeling of the shock.

Characteristics of the flow in the annulus-wall A82-17933 * # region of an axial-flow compressor rotor blade passage. R. M. Davino (Pennsylvania State University, University Park, PA). American Institute of Aeronautics and Astronautics Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0413. 20 p. 32 refs. Grant No. NsG-3212.

Three-dimensional characteristics of the mean velocity and turbulence structure in the annulus-wall region of a moderately loaded compressor rotor have been investigated experimentally by employing triaxial hot-wire probes. Results are presented which indicate that the flow within and downstream of the rotor passage is highly complex due to the interaction of the annulus wall boundary layer, blade boundary layers, tip leakage flow, and passage secondary flow. An understanding of the reported viscous flow interactions is important for establishing improved aerodynamic design criteria and efficiency, for predicting noise levels, and for determining the stall, surge, vibration, and flutter characteristics of turbomachinery.

(Author)

A82-19301 * # Interaction of compressor rotor blade wake with well boundary layer/vortex in the end-well region. B. Lakshminarayana and A. Ravindranath (Pennsylvania State University, University Park, PA). Americar Society of Mechanical Engineers, International Symposium on Applications of Fluids Mechanics and Heat Transfer to Energy and Environmental Problems, University of Patras, Patras, Greece, June 29-July 3, 1981, Paper 81-Gr/GT-1, 12 p. 11 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3012.

This paper reports the experimental study of the threedimensional characteristics of the mean velocity of the rotor walke inside the annulus- and hub-wall boundary layers. The measurements were taken with a rotating three-sensor hot wire behind the rotor. This set of measurements probably represents the first set of comprehensive measurements taken inside the annulus- and hub-wall boundary layers. The wake was surveyed at several radial locations inside the boundary layer region and at several axial locations. Interaction of the wake with the annulus wall boundary layer, secondary flow, tip-leakage flow, and the trailing vortex system results in slower decay and larger width of the wake. The presence of a strong vortex and its merger with the wake is also observed. The end-wall boundary layers and the secondary flow were found to have a substantial effect on both the decay characteristics and the profile of the wake. These and other measurements are reported and interpreted in this paper, (Author)

A82-22063 * # Effects of blade loading and rotation on compressor rotor wake in end wall regions. B. Lakehminarayana, T. R. Govindan, and B. Reynolds (Pennsylvania State University, University Park, PA). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0193. 11 p. 9 refs. Grant No. NsG-3012.

This study was carried out to understand the effects of blade loading and rotation on the rotor end wall flow structure, including the wake. The measurements were taken with a stationary three sensor hot wire located at the exit of a compressor rotor. The signal was ensemble averaged to derive all the three components of velocity and six components of stresses at the exit. Measurements were made at two different rotational speeds (1753 and 1010 rpm) and at two differing blade loadings at several radii near the hub and the annulus wall. The wake decay in the annulus wall region is found to be much more rapid than the mid span regions. Furthermore, both the loading and rotation of the blade have appreciable influence on the end wall flow and wake structure, interaction of the azzulus and hub wall boundary layers (and secondary flow resulting from these) have appreciable influence on the wake structure in the endwall regions.

(Author)

A82-22081 * # Aerodynamic characteristics of airfoils with ice accretions. M. B. Bragg and G. M. Gregorek (Ohio State University, Columbus, QH). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0282. 15 p. 19 refs. Grant No. NAG3-28.

Results of a wind tunnel test to evaluate the performance of an airfoil with simulated rime ice are presented with theoretical comparisons, A NACA 65A413 airfoil was tested in the OSU 6 x 22 inch Transonic Airfoll Wind Tunnel at a Reynolds number near three million and Mach numbers from 0.20 to 0.80. The model was tested in four configurations to determine the aero-dynamic effects of the roughness and shape of a rime ice accretion. The simulated rime ice shape was obtained analytically using a time-stepping dry ice accretion computer code, Lift, drag, moment coefficients, and pressure distributions for the clean and simulated rime ice cases are reported. The measured degradation in airfoil performance is compared to an analytical method which uses existing airfoil analysis computer codes with empirical corrections for the surface roughness. A discussion of the empirical surface roughness correction and uses of other airfoil computer methods is included. (Author)

A82-26137 * Measurement and prediction of mean velocity and turbulence structure in the near wake of an airfoil. C. Hah and B. Lakshminarayana (Pennsylvania State University, University Park, PA). Journal of Fluid Mechanics, vol. 115, Feb. 1982, p. 251-282. 18

16/s. Grant No. NsG-3012.

An experimental investigation of the near wake of a thin airfoil at various incidence angles is reported in this paper. The airfoil (NACA 0012 basic thickness form) was located in a wind tunnel, and the wake structure was measured using hot-wire sensors. The measurements of mean-velocity, turbulence intensity and Reyncidsstress components across the wake at several distances downstream show the complex natural of the near wake and its ssymmetrical behavior. The asymmetry in the wake property, which is maintained up to a length of 1.5 chords downstream of the trailing edge of the blade, is dependent on the incidence angle of the inlet flow. The streamwise velocity defect in an asymmetric wake decays more slowly compared to that of a symmetric wake. The streamline curvature due to the blade loading has a substantial effect on the mean velocity profile as well as the turbulence structure. The numerical study of the same wake indicates that the existing turbulence closure models need some modification to account for the asymmetric characteristics of the wake. (Author)

A82-29003 * # Multigrid simulation of asymptotic curved-duct flows using a semi-implicit numerical technique. K. N. Ghia, U. Ghia, C. T. Shin, and D. R. Reddy (Ciccinnati, University, Cincinnati, OH). In: Computers in flow predictions and fluid dynamics experiments: Proceedings of the Winter Annual Meeting, Washington, DC, November 15-20, 1981, (A82-29001 13-02) New York, American Society of Mechanical Engineers, 1981, p. 11-25, 19 refs, Grants No. AF-AFOSR-80-0160; No. NsG-3267.

Asymptotic flows inside curved ducts of rectangular as well as polar cross section are analyzed using the Navier-Stokes equations in terms of the axial velocity and vorticity and the cross-flow stream function. Numerical solutions of the three second-order coupled elliptic partial differential equations governing this flow are obtained efficiently using the coupled alternating-direction implicit (ADI) method as well as the multigrid strongly-implicit (SI) scheme. For the flow configuration studied, the ADI method is found to be more sensitive to the time steps used than is the SI scheme. Use of the multigrid-coupled-strongly-implicit (MG-SI) scheme makes it possible to efficiently obtain fine-grid solutions for configurations having strong secondary flow. It is shown that, for this asymptotic curved-duct flow, the similarity parameter of significance is the Dean's number K rather than the Reynolds number Re, Results are obtained for curved ducts with square cross sections for K up to 900. which here corresponds to Re = 9,000 for this internal flow configuration.

A82-31933 * # Finite volume calculation of three-dimensional potential flow around a propeller. W.-H. Jou (Flow Industries, Inc., Kent, WA). American Institute of Aeronautics and Astronautics and American Society of Mechanical Engineers, Joint Thermophysics, Fluids, Plasma and Heat Transfer Conference, 3rd, St. Louis, MO, June 7-11, 1982, AIAA Paper 82-0957. 7 p. 10 refs. Contract No. NAS3-22148.

The finite volume scheme of Jameson (1977) is used to calculate potential flow around a propeller rotating at high speed. An H-type mesh is generated and used successfully in the calculations. A test calculation with a thick blade cross section shows that the present code is capable of computing the propeller flow at the advance Mach number 0.8. The possible physical mechanisms which may play an important role in the propeller aerodynamics are discussed. V.L.

A82-31939 * # Application of a finite element algorithm for the solution of steady transonic Euler equations. H. U. Akay and A. Ecer (Purdue University, Indianapolis, IN). American Institute of Aeronautics and Astronautics and American Society of Mechanical Engineers, Joint Thermophysics, Fluids, Plasma and Heat Transfer Conference, 3rd, St. Louis, MO, June 7-11, 1982, AIAA Paper 82-0970.10 p. 12 refs, Grant No, NsG-3294.

A finite element algorithm for the solution of two-dimensional, steady Euler equations is presented which, through a Clebsch-type transformation for the velocity vector, solves the conservation of mass equation with one primary variable and two additional equations for the convection of two new variables. The accuracy and efficiency of this scheme is discussed, and the second-order accuracy

attained in the analysis of the convection of the vorticity is demonstrated together with the efficient treatment of rotational and irrotational flow subregions. A sample problem is used to show the accuracy of the numerical scheme and its convergence characteristics.

A82-31947 * // Modeling parameter influences on MHD switt combustion nozzle design. D. G. Lilley (Oklahoma State University, Stillwater, OK), A. K. Gupta (MIT, Cambridge, MA), and A. A. Busnaina, American Institute of Aeronautics and Astronautics and American Society of Mechanical Engineers, Joint Thermophysics, Fluids, Plasma and Heat Transfer Conference, 3rd, St. Louis, MO, June 7-11, 1982, AIAA Paper 82-0984, 10 p. 12 rets, Contract No. DE-QC01-79ET-15518; Grant No. NAG3-74.

Attention is given to a research project which has the goal to develop a two-stage slagging gasifier-combustor in the form of a high-intensity combustor, taking into account a suitable aerodynamic design of the second stage nozzle which will prevent the separation of the boundary layer as the flow turns from axial to radial direction. The specific objectives of the present investigation are to test the effect of various second-stage nozzle geometries, flow rates, swirl number, and distribution in the first and second stages upon the corresponding flowfield in the second stage. Special emphasis is given to the avoidance of boundary layer separation as the flow turns from axial to radial direction into the MHD disk generator.

G.R.

A82-31964 * # Three dimensional flow field inside the passage of a low speed axial flow compressor rotor. M. Pouagare, K. N. S. Murthy, and B. Lakshminarayana (Pennsylvania State University, University Park, PA). American Institute of Aeronautics and Astronautics and American Society of Mechanical Engineers, Joint Thermophysics, Fluids, Plasma and Heat Transfer Conference, 3rd, St. Louis, MO, June 7-11, 1982, AIAA Paper 82-1006, 13 p. 13 rofs. Grant No. NsG-3266.

Measurements of the subsonic flow in the rotor passage of a single stage axial flow compressor were made to study the nature of the flow field and to verify the existing numerical codes. The velocity and pressure fields were measured across the entire rotor passage at six axial locations and at five radial locations, A five-hole probe, rotating with the rotor, was used to measure the three components of velocity, the static and the total pressure. The experimental results are compared with the predictions from Katsanis and McNally's computer program. The agreement between the two is good for most of the cases. (Author)

A82-31965 * # Three dimensional turbulent boundary layer development on a fan rotor blade. B. Lakshminarayana, C. Hah, and T. R. Govindan (Pennsylvania State University, University Park, PA). American Institute of Aeronautics and Astronautics and American Society of Mechanical Engineers, Joint Thermophysics, Fluids, Plasma and Heat Transfer Conference, 3rd, St. Louis, MO, June 7-11, 1982, Al/A Paper 82-1007. 10 p. 12 refs. Grant No. NsG-3266.

This paper is concerned with an experimental study undertaken to measure the boundary layer growth on a fan rotor blade. The measurements were carried out using a miniature 'X' configuration hot wire probe at various chordwise and radial locations on both surfaces of the blade. The streamwise and radial velocity profiles as well as the corresponding intensity components are interpreted and correlated. The validity of conventional velocity profiles such as the 'law of the wall' for the streamwise profile and the hodograph plot for the cross flow profile are examined. The measured values of boundary-layer gross properties are compared with the predictions based on a momentum-integral technique. (Author)

A82-35280 * Three-dimensional flow field in the tip region of a compressor rotor passage. I - Mean velocity profiles and annulus wall boundary layer. B. Lakshminarayana, M. Pouagare (Pennsylvania State University, University Park, PA), and R. Davino (General Electric Co., Aircraft Engine Group, Evendale, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 16-22, 1982, Paper 82-GT-11. 12 p. 15 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3212. A rotating three-sensor, hot-wire probe has been used along with rotor blade

static pressure measurements to investigate the complex inviscid and viscid effects in the annulus wall flowfield, including the three components of mean velocity, turbulence intensity, and turbulence stress inside the rotor blade passage. It is found that the tip leakage flow originates near quarter-chord, with peak values occurring near mid-chord. The leakage flow, which is in the form of a jet within the blade row, is augmented by the blade rotation and travels further away-from the suction surface than that observed in stationary blade rows and cascades. This leakage flow tends to roll up between the mid-passage and the pressure surface near the tip region; the vortex formation does not occur within the passage in this particular case.

A82-35281 * # Investigation of the tip-clearance flow inside and at the exit of a compressor rotor passage. I - Mean velocity field, A. Pandya and B. Lakshminarayana (Ponnsylvania State University, University Park, PA). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1983, Paper 82-GT-12, 12 p. 14 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3212.

A stationary two-sensor hot-wire probe has been used in combination with an ensemble averaging technique to measure the flow in the tip clearance region of a compressor rotor with emphasis on the leakage flow development inside the ip-clearance region and at the exit of the rotor. It is found that the presence end interaction of leakage flow, annulus boundary layer, and the scraping vortex is the dominant feature at mid-chord position. The rotation of the blade augments the leakage flow, resulting in the movement of the leakage jet toward the nide passage. The blade-to-blade distribution of properties is shown to be highly nonuniform, except in the downstream and upstream regions.

V.L.

A82-35379 * Flow distributions and discharge coefficient effects for jet array impingement with initial crossflow. L. W. Florschuotz and Y. Isoda (Arizona State University, Tempe, AZ). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-G7-156. 10 p. 11 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3075,

To model the impingement cooled mid-chord region of gas turbine airfolls in cases where an initial crossflow is present, the paper presents experimentally determined flow distributions for jet arrays with the spanwise rows of holes, which range from uniform to highly nonuniform. The jet flow after impingement is constrained to exit in a single direction along the channel formed by the jet orifice plate and the impingement surface. The streamwise distributions and crossflow velocities are presented for ratios of the initial crossflow rate to the total jet flow rate ranging from zero to unity. For crossflow to jet velocity ratios greater than a value somewhat less than unity, jet orfice discharge coefficients do not remain constant, but decrease significantly, showing a secondary dependence on x/d, where x is the channel height and d is the jet hole diameter.

A82-35416 * # Three-dimensional flow field in the tip regio; of a compressor rotor passage, II - Turbulence properties, B. Lakshminarayana, M. Pouagare (Pennsylvania State University, University Park, PA), and B. Davino (General Electric Co., Aircraft Engine Group, Evendale, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-G7-234, 10 p. 9 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3212.

The turbulence proporties in the annulus walt region of an axial flow compressor rotor was measured using a triaxial, hot-wire probe rotating with the rotor. The flow was surveyed across the entire passage at five axial locations (leading edge, 1/4 chord, 1/2 chord, 3/4 chord, and the trailing edge location) and at six radial locations in a low-speed compressor rotor. The data derived include all three-components of turbulence intensity and three-components of turbulence stress. A comprehensive interpretation of the data with emphasis on features related to rotation, leakage flow, annulus wall boundary layer, and blade boundary layer interactions is included. All the components of turbulent intensities and stresses are found to be high in the leakage-flow mixing region. The radial component of intensities and stresses is found to be much higher than the corresponding streamwise components. The turbulent spectra clearly reveal the decay process of the inlet-guide-vane wake within the retor passage.

(Author)

A82-35427 * # A study of viscous flow in stator and rotor passages. Y. Shedran and W. Tabakoff (Cincinnati, University, Cincinnati, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-248.17 p. 21 refs. Members, \$2.00; nonmembers, \$4.00. Army-sponsored research; Contract No. NAS3-21609.

A numerical technique to predict the viscous behavior in the three-dimensional domain of rotating and stationary blade passages is presented. The analysis is based upon the numerical integration of the incompressible Navier-Stokes equations. An approach is taken to combine the three momentum equations and the continuity equation into two sets of vorticity transport-stream function equations,

These equations are expressed along families of arbitrarily defined orthogonally intersecting surfaces placed within the blade passage. Unlike the stream surfaces, the arbitrary surfaces allow fluid to flow across. The numerical code employs a nonorthogonal body fitted coordinate system on each of the intersecting surfaces. The solution process involves the iterative combination of the solutions on the two families of intersecting surfaces for a complete scutton. The results of flow in thin blade stationary and rotating polar ducts is presented.

(Author)

A82-35459 * # Aerodynamic damping measurements in a transonic compressor. E. F. Crawley (MIT, Cambridge MA). American Society of Mewhanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-287, 12 p. 15 refs. Members, \$2.00; nonnembers, \$4.00 Grant No. NsG-3079.

A mothod has been devoloped and demonstrated for the direct measurement of aerodynamic damping in a transonic compressor. The method is based on the inverse solution of the structural dynamic equations of motion of the blade-disk system. The equations are solved inversely to determine the forces acting on the system. If the structural dynamic equations are transformed to multiblade or modal coordinates, the damping can be measured for blade-disk modes, and related to a reduced frequency and interblade phase angle. This method of damping determination was demonstrated using a specially instrumented version of the MIT Transonic Compressor run in the MIT Blowdown Compressor Tost Facility. No regions of aeroelastic instability were found. In runs at the operating point, the rotor was aerodynamically excited by a centrolled two-per-revolution lixed up-stream disturbance. The disturbance was sharply terminated midding through the test Analysis of the data in terms of multiblade modes led to a direct measurement of aerodynamic damping for three interblade phase angles.

(Author)

A82-35460 * In-plane inertial coupling in tuned and severely inistuned bladed disks. E.F. Crawley (MIT, Cambridge, MA). American Society of Mechanical Engineers, International Gas Turbine Contronce and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-288. 9 p. 8 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3079.

A model has been developed and verified for blade-disk-shaft coupling in rotors due to the in-plane rigid body modes of the disk. An analytic model has been developed which couples the in-plane rigid body modes of the disk on an elastic shaft with the blade bending modes. Bench resonance test were carried out on the M.I.T. Compressor Rotor, typical of research rotors with flexible blades and a thick rigid disk. When the rotor was carefully tuned, the structural coupling of the blades by the disks was confined to zero and one node! diameter modes, whose modal frequencies were greater than the blade cantillever frequency. In the case of the tuned rotor, and in two cases where severe misturing was intentionally introduced, agreement between the predicted and observed natural frequencies is excellent. The analytic model was then extended to include the effects of constant angular rotation of the disk. (Author)

A82-35571 * # Rapid approximate determination of nonlinear solutions - Application to serodynamic flows and design/optimization problems. S. Sighara (Nielsen Engineering and Research, Inc., Mountain View, CA). In: Transonic aerodynamics; Transonic Perspective Symposium, Moffett Field, CA, Fabruary 18-20, 1981, Technical Papers. (A82-35553 17-02) New York, American Institute of Aeronautics and Astronautics, 1982, p. 637-861, 16 refs. Contract No. NAS3-20836.

Stahara et at. (1978) have considered the use of an approximation technique which employs two or more nonlinear base solutions determined by the full computational method to prodict ontire familities of related nonlinear solutions. The present investigation provides results for several applications of that method which demonstrate both its accuracy and its utility for enginearing applications. Attention is given to the perturbation concept and methods, aspects of coordinate straining, aspects of analytical formulation, and an application to surface properties. In a discussion of the results, single and multiple parameter perturbation scansidered along with a combination of the approximation method with optimization procedures. The results show that it is possible to combine in certain cases large savings in computational cost with improved optimization.

A82-37711 * Investigation of rotational transpole flows through ducta using a finite element acheme. H. U. Akay and A. Ecer (Purdue University, Indianapolis, IN). AIAA, Shai, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1267, 8 p. 5 rets. Grant No. NSG-3294

An application of the finite element method is presented in order to study the flow through a two-dimensional channel including the choked and nearly-choked flow conditions. The mathematical procedure provides a combined treatment of potential and Euler equations, where the steady Euler equations are solved through the integration of a pseudo-time system which is equivalent to a relaxa-

tion scheme; the isentropic, potential flow equations are embedded in this formulation. To analyze the transprác flow through a channel with near-choked flow conditions, the flow through a parallel channel with a 10 percent circular arc bump is calculated as a sample problem.

A82-37535 * 7.wo dimensional ategnation point flow of a dusty gas near an oscillating plate. J. Fernandez de la Mora (Yale University, New Haven, CT). Acta Mechanica, vol. 43, no. 3-4, 1982, p. 261-265, 11 refs. Grant No. NsG-3107.

Necessary improvements to a paper on the flow of a dusty gas by Datta and Mishra (1980) are presented. Particular attention is given to the importance of particle phase compressibility and the hyperbolic nature of the particle momentum conservation equation which prohibits downstream (wall) boundary conditions for the solid phase. Fundamental differences between particulate and ordinary flow boundary layers are discussed, and the correct conservation equations are written.

C.R.

A82-37938 * Coriolis resonence' within a rotating duct. M. Kurosaka and J. E. Caruthers (Tennessee, University, Tullahoma, TN). AIAA Journal, vol. 20, Aug. 1982, p. 1148-1150, Grant No. NAG3-86.

An investigation of the unsteady disturbances of a fixed frequency within a radial duct rotating at a set speed is presented. The flow is assumed to be compressible, inviscid, and of a fluid which is a perfect gas. Equations are developed for the steady and the unsteady parts of the flow in cylindrical coerdinates. The unsteady fisturbances are expressed by Fourier decomposition in angular position, distance into the duct, and in time, it is found that a resonance is possible when the frequency of flow disturbances is twice the shaft-rotation frequency, considering only the radial and tangential disturbances and not the radial and circumferential disturbances. The particular point at which the resonance occurrence is due to the Coriolis force, which is only present in the radial and tangential directions. It is noted that the Coriolis force can only be present in open-ended ducts, such as those found in centrifugal compressors.

M.S.K.

A82-41267 * Solution of the unsteady subsonic thin airfoli problem. M. H. Williams (Purdue University, West Lafayette, IN). Quarterly Journal of Mechanics and Applied Mathematics, vol. 35, Aug. 1982, p. 367-390. 16 refs. Grant No. NeG-3292.

The problem of a Italia alroil subject to simple harmonic disturbances in a uniform subsonic free stream is solved by extension of a technique developed earlier for a stationary strip vibrating in a uniform fluid. Explicit expressions are given for the lift and moment, accustic directivity pattern, and total accustic power for arbitrary upwash and, in particular, for the felementary disturbances'; plunge, pltch and a stationary transverse gust. Numerical results for a simple skewed gust are presented and compared to the high-frequency asymptotic theory of Martinez and Widnall. (Author)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For Mated Information see also 16 Space Transportation and 85 Urban Technology and Transportation.

N82-21148* National Agronautics and Space Administration Lewis Research Center, Cleveland, Ohio

NASA/LEWIS RESEARCH CENTER ICING RESEARCH PROGRAM

Peggy L Evanich In NASA Marshall Space Flight Center Proc. 5th Ann. Workshop on Meteorol, and Environ. Inputs to Aviation Systems Dec. 1981 p 64-75 (For primary document see N82-21139 12-01)

AVAIL NTIS HC A07/SEF A01 CSCL O1C

NS2-30297* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio AIRCRAFT ICING RESEARCH AT NASA

J. J. Reinmann, R. J. Shaw, and W. A. Olsen, Jr. 1982 17 p. refs. Presented at the 1st Intern. Workshop on Atmospheric lcing of Struct, Hanover, N.H., 1-3 Jun. 1982 (NASA-TM-82919; E-1307; NAS 1.15-82919) Avail. NTIS HC A02/MF A01 CSCL 01C

Research activity is described for: ice protection systems, icing instrumentation, experimental methods, analytical modeling for the above, and in flight research. The renewed interest in sircraft icing has come about because of the new need for All-Weather Holicopters and General Aviation alroraft. Because of increased fuel costs, tomorrow's Commercial Transport aircraft will also require new types of ice protection systems and better estimates of the aeropenalities paused by ice on unprotected surfaces. The physics of aircraft loing is very similar to the icing that occurs on ground structures and structures at sea; all involve droplets that freeze on the surfaces because of the cold air. Therefore all icing research groups will benefit greatly by sharing their research information.

N82-10021* Kansas Univ. Center for Research, Inc., Lawrence Flight Research Lab.

ICING TUNNEL TEST OF A GLYCOL-EXUDING POROUS LEADING EDGE ICE PROTECTION SYSTEM ON A GENERAL AVIATION AIRFOIL Final Report

David L. Kohlman, William G. Schweikhard, and Alan E. Albright Sep. 1981–37 p. refs (Grant NAG3-71)

(NASA-CR-165444; KU-FRL-464-1) Avail: NTIS HC A03/MF A01 CSCL 01C

Test results show that the system is very effective in preventing ice accretion (anti-ice mode) or removing ice from an airfoil. Minimum glycol flow rates required for anti-icing are a function of velocity, liquid water content in the air, ambient temperature, and droplet size. Large ice caps were removed in only a few minutes using anti-ice flow rates, with the shed time being a function of the type of ice, size of the ice cap, angle of attack, and glycol flow rate. Wake surveys measurements show that no significant drag penalty is associated with the installation or operation of the system tested.

N82-19196*# Little (Arthur D.), Inc., Cambridge, Mass AN ASSESSMENT OF THE CRASH FIRE HAZARD OF LIQUID HYDROGEN FUELED AIRCRAFT Final Report Feb. 1982 132 p. refs

(Contract NAS3-22482)

(NASA-CR-165526, ADL-85161) Avail: NTIS HC A07/MF A01 CSCL 01C

The crash fire hazards of liquid hydrogen fueled aircraft relative to those of mission equivalent aircraft fueled either with conventional fuel or with liquefied methane were evaluated. The aircraft evaluated were based on Lockheed Corporation design for 400 passenger, Mach 0.85, 5500 n. mile aircraft. Four crash scenarios were considered ranging from a minor incident causing some loss of fuel system integrity to a catastrophic crash. Major tasks included a review of hazardous properties of the alternate fuels and of historic crash fire data; a comparative

hazard eviuation for each of the three fuels under four crash scenarios a comprehensive review and analysis and an identification of areas further development work. The conclusion was that the crash fire hazards are not significantly different when compared in general for the three fuels, although some fuels showed minor advantages in one respect or another.

A.J.F.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

includes aircraft simulation technology. For related information see also 18 Spacecraft Design. Testing and Performance and 39 Structural Mechanics.

N82-11053*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. SELECTED BIBLIOGRAPHY OF NACA-NASA AIRCRAFT

ICING PUBLICATIONS

John J. Reinmann, comp. Aug. 1981 127 p (NASA-TM-81651; E-668) Avail: NTIS HC E15/MF A01 CSCL

A summary of NACA-NASA icing research from 1940 to 1962 is presented, it includes; the main results of the NACA icing program from 1940 to 1950; a selected bibliography of 132 NACA-NASA aircraft icing publications; a technical summary of each document cited in the selected bibliography; and a microfiche copy of each document cited in the selected bibliography

A82-17894 * # The NASA MERIT program - Developing new concepts for accurate flight planning. R. Steinberg (NASA, Lewis Research Center, Cleveland, Oh). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL. Jan. 11-14, 1982, Paper 82-0340, 6 p.

It is noted that the rising cost of aviation fuel has necessitated the development of a new approach to upper air forecasting for flight planning. It is shown that the spatial resolution of the present weather forecast models used in fully automated computer flight planning is an important accuracy-limiting factor, and it is proposed that man be put back into the system, although not in the way he has been used in the past. A new approach is proposed which uses the application of man-computer interactive display techniques to upper air forecasting to retain the fine scale features of the atmosphere inherent in the present data base in order to provide a more accurate and cost effective flight plan. It is pointed out that, as a result of NASA research, the hardware required for this approach already exists.

Performance degradation of propeller/rotor systems due to rime ice accretion. K. D. Korkan (Texas A & M. University, College Station, TX), L. Dadone (Boeing Vertol Co., Philadelphia, PA), and R. J. Shaw (NASA, Lewis Research Center, Cleveland, OH). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0286, 14 p. Grants No. NAG3-109; No. NAG3-242,

A theoretical model has been established which is applicable to both propeller and helicopter systems that determines the effect of rime ice accretion on the thrust coefficient, power coefficient, and efficiency as a function of time in a natural icing condition. Theoretical comparisons have been made with experimentally determined decrease in propeller thrust coefficient and efficiency for five natural icing conditions with good agreement. The present analytical model is also applicable to the helicopter case, where the method predicts radial and azimuthal rotor blade ice shapes in addition to torque rise as a function of time in a natural icing condition.

NTIS

N82-11052*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.

ICING TUNNEL TESTS OF A COMPOSITE POROUS LEADING EDGE FOR USE WITH A LIQUID ANTI-ICE

David L. Kohlman Sep. 1981 21 p refs (Grant NAG3-71) (NASA-CR-164966; KU-FRL-464-3)

HC A02/MF A01 CSCL 01C

The efficacy of liquid ice protection systems which distribute a glycol-water solution onto leading edge surfaces through a porous skin was demonstrated in tests conducted in the NASA

Lewis icing research tunnel using a composite porous leading edge panels. The data obtained were compared with the performance of previously tested stainless steel leading edge with the same geometry. Results show: (1) anti-ice protection of a composite leading edge is possible for all the simulated conditions tested; (2) the glycol flow rates required to achieve anti-ice protection were generally much higher than those required for a stainless steel panel; (3) the low reservoir pressures of the glycol during test runs indicates that more uniform distribution of glycol, and therefore lower glycol flow rates, can probably be achieved by decreasing the porosity of the panel; and (4) significant weight savings can be achieved in fluid ice protection systems with composite porous leading edges. The resistance of composite panels to abrasion and erosion must yet be determined before they can be incorporated in production systems. A.R.H.

N82-33375*# Douglas Aircraft Co., Inc., Long Feach, Calif. ADVANCED TURBOPROP TESTBED SYSTEMS STUDY Final Report

I. M. Goldsmith Jul. 1982 255 p refs

(Cont act NAS3-22347)

(NASA-CR-167895; NAS 1,26:167895; ACEE-22-FR-1699A) Avail: NTIS HC A12/MF A01 CSCL 01C

The proof of concept, feasibility, and verification of the advanced prop fan and of the integrated advanced prop fan aircraft are established. The use of existing hardware is compatible with having a successfully expedited testbed ready for flight. A prop fan testbed aircraft is definitely feasible and necessary for verification of prop fan/prop fan aircraft integrity. The Allison T701 is most suitable as a propulsor and modification of existing engine and propeller controls are adequate for the testbed. The airframer is considered the logical overall systems integrator of the testbed program.

A82-27098 * # Mathematical modeling of ice accretion on airfoils. C. D. MacArthur, J. L. Keller, and J. K. Luers (Dayton, University, Dayton, OH). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0284. 18 p. 8 refs. Grant No. NAG3-65.

The progress toward development of a computer model suitable for predicting icing behavior on airfolls over a wide range of environmental conditions and sirfolis shapes is reported. The LEWICE program was formulated to solve a set of equations which describe the physical processes which occur during accretion of ice on an airfoll, including heat transfer in a time dependent mode, with the restriction that the flow must be describable by a twodimensional flow code. Input data comprises the cloud liquid water content, mean droplet diameter, ambient air temperature, air velocity, and relative humidity. A potential flowfield around the airfoil is calculated, along with the droplet trajectories within the flowfield, followed by local values of water droplet collection efficiency at the impact points. Both glaze and rime ice condition: are reproduced, and comparisons with test results on icing of circular cylinders showed good agreement with the physical situation. M.S.K.

06 AIRCRAFT INSTRUMENTATION

includes cockpit and cabin display devices; and flight instruments.

For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.

N82-23241* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA/HAA ADVANCED ROTORCRAFT TECHNOLOGY AND TILT ROTOR WORKSHOP, VOLUME 5: PROPULSION SESSION

1980 211 p Workshop held at Palo Alto, Calif., 3-5 Dec. 1980

(NASA-TM-84207; NAS HC A10/MF A01 CSCL 01C 1.15:84207)

The expressed needs and priorities of the civil helicopter users, the existing research efforts, and technology requirements as perceived by leading airframe and engine manufacturers were addressed, compared, and evaluated. Specifically, the observations and conclusions of these areas as they relate to the helicopter propulsion system are reported.

Optical tip clearance sensor for sircraft engine controls. G. L. Poppet (General Electric Co., Aircraft Engine Business Group, Cincinnati, OH), D. T. F. Marple (General Electric Co., Schenectady, NY), and R. J. Baumbick (NASA, Lewis Research Center, Cleveland, OH). AlAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AlAA Faper 82-1131. 9 p. Contract No. NAS3-21843.

Aircraft gas turbine performance and efficiency are related to airfoil tip clear-

ance. The possibility has been considered to obtain optimum performance and efficiency by reducing clearance to a safe minimum with the aid of a closed-loop tip clearance control system, which utilizes a tip clearance sensor. The use of optical sensing methods appears to represent a potential solution to the tip clearance measurement problem. Principles of sensor operation are discussed along with dimensional considerations and diffraction limitations. A description is presented of the study of the feasibility of a certain sensor, taking into account the test rig system, the optical components, and the mounting tube. Attention is also given to the operation of the feasibility-study sensor, performance estimations, the optical fiber bundle, light beam refraction, and aspects of aircraft engine implementation.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

N82-13143°# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF FUEL-AIR-RATIO NONUNIFORMITY ON EMISSIONS OF NITROGEN OXIDES
Valerie J. Lyons Nov. 1981 14 p refs

Valerie J. Lyons Nov. 1981 14 p refs (NASA-TP-1798: E-648) Avail: NTIS HC A02/MF A01 CSCL 21E

The inlet fuel-air ratio nonuniformity is studied to deterine how nitrogen oxide (NOx) emissions are affected. An increase in NOx emissions with increased fuel-air ratio nonuniformity for average equivalence ratios less than 0.7 and a decrease in NOx emissions for average equivalence ratios near stoichiometric is predicted. The degree of uniformityy of fuel-air ratio profiles that is necessary to achieve NOx emissions goals for actual engines that use leain, premixed, prevaporized combustion systems is determined.

N82-13144*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A REAL TIME PEGASUS PROPULSION SYSTEM MODEL FOR VSTOL PILOTED SIMULATION EVALUATION

James R. Mihaloew, Stephen P. Roth (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.), and Robert Creekmore (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.) 1981 18 p refs Presented at VSTOL Conf., Palo Alto, Calif., 7-9 Dec. 1981; sponsored by AIAA and NASA. Ames Research Center (NASA-TM-82770; E-1004; AIAA-81-2663) Avail: NTIS HC A02/MF A01 CSCL 21E

A real time propulsion system modeling technique suitable for use in man-in-the-loop simulator studies was developed. This technique provides the system accuracy, stability, and transient response required for integrated aircraft and propulsion control system studies. A Pegasus-Harrier propulsion system was selected as a baseline for developing mathematical modeling and simulation techniques for VSTOL, Initially, static and dynamic propulsion system characteristics were modeled in detail to form a nonlinear aerothermodynamic digital computer simulation of a Pegasus engine. From this high fidelity simulation, a real time propulsion model was formulated by applying a piece-wise linear state variable methodology. A hydromechanical and water injection control system was also simulated. The real time dynamic model includes the detail and fieribility required for the evaluation of critical control parameters and propulsion component limits over a limited flight envelope. The model was programmed for interfacing with a Harrier aircraft simulation. Typical propulsion system simulation results are presented. M.D.K.

N82-13146*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA RESEARCH IN AIRCRAFT PROPULSION

Milton A. Beheim 1982 17 p Proposed for presentation at the 27th Ann. Intern. Gas Turbine Conf., London, 18-22 Apr. 1982; sponsored by ASME (NASA-TM-82771; E-1096) Avail: NTIS HC A02/MF A01

CSCL 21E

A broad overview of the scope of research presently being supported by NASA in aircraft propulsion is presented with emphasis on Lewis Research Center activities related to civil air transports, CTOL and V/STOL systems. Aircraft systems work is performed to identify the requirements for the propulsion system that enhance the mission capabilities of the aircraft. This important source of innovation and creativity drives the direction of propulsion research. In a companion effort, component research of a generic nature is performed to provide a better basis for design and provides an evolutionary process for technological growth that increases the capabilities of all types of aircraft. Both are important.

A.R.H.

N82-14090*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GAS TURBINE CERAMIC-COATED-VANE CONCEPT WITH C. NVECTION-COOLED POROUS METAL CORE

Albert F. Kascak (AVRADCOM Research and Technology Labs., Cleveland), Curt H. Liebert, Robert F. Handschuh, and Lawrence P. Ludwig Dec. 1981 14 p refs Sponsored in part by U.S. Army Aviation Research and Development Command, St. Louis (NASA-TP-1942; AVRADCOM-TR-81-C-7; E-732) Avail: NTIS HC A02/MF A01 CSCL 21E

Analysis and flow experiments on a ceramic-coated-porous-metal vane concept indicated the feasibility, from a heat transfer standpoint, of operating in a high-temperature (2500 F) gas turbine cascade facility. The heat transfer and pressure drop calculations provided a basis for selecting the ceramic layer thickness (to 0.08 in.), which was found to be the dominant factor in the overall heat transfer coefficient. Also an approximate analysis of the heat transfer in the vane trailing edge revealed that with trailing-edge ejection the ceramic thickness could be reduced to (0.01 in.) in this portion of the vane.

8.W.

N82-14094*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
THE USE OF OPTIMIZATION TECHNIQUES TO DESIGN

THE USE OF OPTIMIZATION TECHNIQUES TO DESIGN CONTROLLED DIFFUSION COMPRESSOR BLADING

Nelson L. Sanger 1982 18 p refs Proposed for presentation at the 27th Ann. Intern. Gas Turbine Conf.; London, Apr. 18-22, 1982; sporsored by ASME

(NASA-TR:-82763; E-1084) Avail: NTIS HC A02/MF A01 CSCL 21E

A method for automating compressor blade design using numerical optimization, and applied to the design of a controlled diffusion stator blade row is presented. A general purpose optimization procedure is employed, based on conjugate direc-

tions for locally unconstrained problems and on feasible directions for locally constrained problems. Coupled to the optimizer is an analysis package consisting of three analysis programs which calculate blade geometry, inviscid flow, and blade surface boundary layers. The optimizing concepts and selection of design objective and constraints are described. The procedure for automating the design of a two dimensional blade section is discussed, and design results are presented.

E.A.K.

N82-15039*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTER PROGRAM FOR AERODYNAMIC AND BLADING DESIGN OF MULTISTAGE AXIAL-FLOW COM-PRESSORS

James E. Crouse and William T. Gorrell Dec. 1981 105 p refs Prepared in cooperation with Army Aviation Research and Development Command, St. Louis, Mo.

(NASA-TP-1946; AVRADCOM-TR-80-C-21; E-280) Avail; NTIS HC A06/MF A01 CSCL 21E

A code for computing the aerodynamic design of a multistage axial-flow compressor and, if desired, the associated blading geometry input for internal flow analysis codes is presented. Compressible flow, which is assumed to be steady and axisymmetric, is the basis for a two-dimensional solution in the meridional plane with viscous effects modeled by pressure loss coefficients and boundary layer blockage. The radial equation of motion and the continuity equation are solved with the streamline curvature method on calculation stations outside the blade rows. The annulus profile, mass flow, pressure ratio, and rotative speed are input, A number of other input parameters specify and control the blade row aerodynamics and geometry. In particular, blade element centerlines and thicknesses can be specified with fourth degree polynomials for two segments. The output includes a detailed aerodynamic solution and, if desired, blading coordinates that can be used for internal flow analysis codes, Author

N82-15040*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
EFFECT OF FUEL INJECTOR TYPE ON PERFORMANCE AND

EMISSIONS OF REVERSE-FLOW COMBUSTOR

Carl T. Norgren and Stephen M. Riddlebaugh Dec. 1981 40 p refs

(NASA-TP-1945; E-556) Avail: NTIS HC A03/MF A01 CSCL 21E

The combustion process in a reverse-flow combustor suitable for a small gas turbine engine was investigated to evaluate the effect of fuel injector type on performance and emissions. Fuel injector configurations using pressure-atomizing, spill-flow, air blast, and air-assist techniques were compared and evaluated on the basis of performance obtained in a full-scale expurimental combustor operated at inlet conditions corresponding to takeoff, cruise, low power, and idle and typical of a 16:1-pressure-ratio turbine engine. Major differences in combustor performance and emissions characteristics were experienced with each injector type even though the aerodynamic configuration was common to most combustor models. Performance characteristics obtained with the various fuel injector types could not have been predicted from bench-test injector spray characteristics. The effect of the number of operating fuel injectors on performance and emissions is also presented.

N82-15041*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
INTERACTIVE-GRAPHIC FLOWPATH PLOTTING FOR
TURBINE ENGINES

Robert R. Corban Nov. 1981 51 p refs (NASA-TM-82758; E-1074) Avail: NTIS HC A04/MF A01 CSCL 21E

An engine cycle program capable of simulating the design and off-design performance of arbitrary turbine engines, and a computer code which, when used in conjunction with the cycle code, can predict the weight of the engines are described. A graphics subroutine was added to the code to enable the engineer to visualize the designed engine with more clarity by producing an overall view of the designed engine for output on a graphics device using IBM-370 graphics subroutines. In addition, with the engine drawn on a graphics screen, the program allows for the interactive user to make changes to the inputs to the code for the engine to be redrawn and reweighed. These improvements allow better use of the code in conjunction with the engine program.

N82-16084*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

NASA RESEARCH ACTIVITIES IN AEROPROPULSION

John F. McCarthy, Jr. and Richard J. Weber 1982 30 p refs

Presented at the 24th Ann Conf on Aviation and Astronautics,
Tel Aviv. Israel, 17-18 Feb. 1982

(NASA-TM-82788; E-1113) Avail: NTIS HC A03/MF A01

NASA is responsible for advancing technologies related to air transportation. A sampling of the work at NASA's Lewis Research Center aimed at improved aircraft propulsion systems is described. Particularly stressed are efforts related to reduced noise and fuel consumption of subsonic transports. Generic work in specific disciplines are reviewed including computational analysis, materials, structures, controls, diagnostics, alternative fuels, and high-speed propellers. Prospects for variable cycle engines are also discussed.

NB2-18222* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohic.
EFFECTS OF FAN INLET TEMPERATURE DISTURBANCES
ON THE STABILITY OF A TURBOFAN ENGINE

Mahmood Abdelwahab Dec. 1981 3() p refs (NASA-TM-82699; E-982) Avail; NTIS HC A03/MF A01 CSCL 21F

21E The effects

The effects of steady-state and time-dependent fan inlet total temperature disturbances on the stability of a TF39-P-3 turbofan engine were determined. Disturbances were induced by a gaseous-hydrogen-fueled burner system installed upstream of the fan inlet. Data were obtained at a fan inlet Reynolds number index of 0.50 and at a low-pressure-rotor corrected speed of 90 percent of military speed. All tests were conducted with a 90 deg extent of the fan inlet circumference exposed to above-average temperatures.

N82-19145*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

ENGINE TECHNOLOGY

Anthony C. Hoffman In NASA. Langley Research Center Elec. Flight Systems Feb. 1982 p 235-240 (For primary document see N82-19134 10-01)

Avail: NTIS HC A12/MF A01 CSCL 21E

N82-19220* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
DILUTION JET BEHAVIOR IN THE TURN SECTION OF A
REVERSE FLOW COMBUSTER

Steven M, Riddlebaugh, Abraham Lipshitz (Ahuza, Halfa, Israel), and Isaac Grebei (Case Western Reserve Univ., Cleveland, Ohio) Jan. 1982, 15 p. refs. Presented at the 20th Aerospace Sci. Meeting, Orlando, Fla., 10-14 Jan. 1982; sponsored by AIAA (NASA-TM-82776; E-1107; AIAA-82-0192). Avail: NTIS

HC A02/MF A01 CSCL 21E

Measurements of the temperature field produced by a single jet and a row of dilution jets issued into a reverse flow combustor are presented. The temperature measurements are presented in the form of consecutive normalized temperature profiles, and jet trajectories. Single jet trajectories were swept toward the inner wall of the turn, whether injection was from the inner or outer wall. This behavior is explained by the radially inward velocity component necessary to support irrotational flow through the turn. Comparison between experimental results and model calculations showed poor agreement due to the model's not including the radial velocity component. A widely spaced row of jets produced trajectories similar to single jets at similar test conditions, but as spacing ratio was reduced, penetration was reduced to the point where the dilution jet flow attached to the wall.

N82-19222* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

PERFORMANCE OF SINGLE-STAGE AXIAL-FLOW TRAN-SONIC COMPRESSOR WITH ROTOR AND STATOR ASPECT RATIOS OF 1.63 AND 1.78, RESPECTIVELY, AND WITH DESIGN PRESSURE RATIO OF 1.82

Royce D. Moore and Lonnie Reid Feb. 1982 112 p refs (NASA-TP-1974; E-259) Avail: NTIS HC AQ6/MF A01 CSCL 21E

The overall and blade-element performance of a transonic compressor stage is presented over the stable operating flow range for speeds from 50 to 100 percent of design. The stage was designed for a pressure ratio of 1.82 at a flow 20.2 kg/sec and a tip speed of 455 m/sec. At design speed the stage achieved a peak efficiency of 0.821 at a pressure ratio of 1.817. The stage stall margin at design speed based on conditions at stall and peak efficiency was about 11 percent.

N82-21194*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

PRELIMINARY RESULTS ON PERFORMANCE TESTING OF A TURBOCHARGED ROTARY COMBUSTION ENGINE

P. R. Meng, W. J. Rice, H. J. Schock, and D. P. Pringle 1982 24 p. refs. Presented at the 1982 Soc. of Automotive Engrs. Intern. Congr. and Exposition, Detroit, 22-26 Feb. 1982 (NASA-TM-82772; E-1097; NAS 1.15:82772) Avail: MTIS

HC A02/MF A01 CSCL 21E

The performance of a turbocharged rotary engine at power levels above 75 kW (100 hp) was studied. A twin rotor turbocharged Mazda engine was tested at speeds of 3000 to 6000 rpm and boost pressures to 7 psi. The NASA developed combustion diagnostic instrumentation was used to quantify indicated and pumping mean effect pressures, peak pressure, and face to face variability on a cycle by cycle basis. Results of this testing showed that a 5900 rpm a 36 percent increase in power was obtained by operating the engine in the turbocharged configuration. When operating with lean carburetor jets at 105 hp (78.3 kW) and 4000 rpm, a brake specific fuel consumption of 0.45 lbm/lb-hr was measured.

N62-21195*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ANALYTICAL INVESTIGATION OF NONRECOVERABLE STALL

Leon M, Wenzel and William M. Bruton Feb, 1982 23 p

(NASA-TM-82792; E-1126; NAS 1.15:82792) Avail: NTIS HC A02/MF A01 CSCL 21E

A lumped parameter model of the TF34 engine is formulated to study nonrecoverable stall. Features of the model include forward and reverse flow, radial flow in the fan, and variable corrected speed. The purpose of the study is to point out those parameters to which recoverability is highly sensitive but are not well known. Experimental research may then be directed toward identification of the parameters in that category. Compressor performance in the positive flow region and radial flow in the fan are shown to be important but unknown parameters determining recoverability. Other parameters such as compressor performance during reverse flow and in-stall efficiency have relatively small impact on recoverability.

N82-22262*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio. THE ROLE OF MODERN CONTROL THEORY IN THE DESIGN OF CONTROLS FOR AIRCRAFT TURBINE ENGINES J. Zeller, B. Lehtinen, and W. Merrill 1982 17 p refs Presented at 12th Aerospace Sci. Conf., Orlando, Fla., 11-14 Jan. 1982; sponsored by AIAA (NASA-TM-82815; E-1162; NAS 1.15;82815) Avail; NTIS HC A02/MF A01 CSCL 21E

Accomplishments in applying Modern Control Theory to the design of controls for advanced aircraft turbine engines were reviewed. The results of successful research programs are discussed. Ongoing programs as well as planned or recommended future thrusts are also discussed.

NS2-22266* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio, STRUCTURAL DYNAMICS OF SHROUDLESS, HOLLOW FAN BLADES WITH COMPOSITE IN-LAYS R. A. Aiello, M. S. Hirschbein, and C. C. Chamis 1982 12 p refs Presented at the 27th Ann. Intern. Gas Turbine Conf., London, 18-22 Apr. 1982; sponsored by ASME (NA SA-TM-82816; E-1163; NAS 1.15:82816) Aveil: NTIS HC A02/MF A01 CSCL 21E

Structural and dynamic analyses are presented for a shroudless, hollow titanium fan blade proposed for future use in aircraft turbine engines. The blade was modeled and analyzed using the composite blade structural analysis computer program. (COBSTRAN); an integrated program consisting of mesh generators, composite mechanics codes, NASTRAN, and preand post-processors, Vibration and impact analyses are presented. The vibration analysis was conducted with COBSTRAN, Results show the effect of the centrifugal force field on frequencies, twist, and blade camber, Bird impact analysis was performed with the multi-mode blade impact computer program. This program uses the geometric model and modal analysis from the COBSTRAN vibration analysis to determine the gross impact response of the fan blades to bird strikes. The structural performance of this blade is also compared to a blade of similar design but with composite in-lays on the outer surface. Results show that the composite in-lays can be selected (designed) to substantially modify the mechanical performance of the shroudless, hollow fan blade. Author

N82-22269*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF SINGLE-STAGE AXIAL-FLOW TRAN-SONIC COMPRESSOR WITH ROTOR AND STATOR ASPECT RATIOS OF 1.63 AND 1.77, RESPECTIVELY, AND WITH DESIGN PRESSURE RATIO OF 2.05

Royce D. Moore and Lonnie %eid Apr. 1982 116 p refs (NASA-TP-2001; E-334; NAS 1,60:2001) Avail; NTIS HC A06/MF A01 CSCL 21E

The overall and blade-element performance of a transonic compressor stage is presented over the stable operating range for speeds from 50 to 100 percent of design. The stage was designed for a pressure ratio of 2.05 at a flow of 20.2 kg/sec and a tip speed of 455 m/sec. At design speed the rotor and stage achieved peak efficiencies of 0.849 and 0.831, respectively, at the minimum flow condition. The stage stall point occurred at a flow higher than the design flow.

N62-24201* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A PIECEWISE LINEAR STATE VARIABLE TECHNIQUE FOR REAL TIME PROPULSION SYSTEM SIMULATION

James R. Mihaloew and Stephen P. Roth (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.) 1982 16 g refs Presented at the 13th Ann, Pittsburgh Conf. on Modelling and Simulation, Pittsburgh, 22-23 Apr., 1982; sponsored by IEEE, ISA, SCS and SMCS

(NASA-TM-82851; E-1210; NAS 1.15:82851) Avail; NTIS HC A02/MF A01 CSCL 21E

The emphasis on increased aircraft and propulsion control system integration and piloted simulation has created a need for higher fidelity real time dynamic propulsion models. A real time propulsion system modeling technique which satisfies this need and which provides the capabilities needed to evaluate propulsion system performance and aircraft system interaction on manned flight simulators was developed and demonstrated using flight simulator facilities at NASA Ames, A piecewise linear state variable technique is used. This technique provides the system accuracy, stability and transient response required for integrated aircraft and propulsion control system studies, The real time dynamic model includes the detail and flexibility required for the evaluation of critical control parameters and propulsion component limits over a limited flight envelope. The model contains approximately 7,0 K bytes of in-line computational code and 14.7 K of block data. It has an 8.9 ms cycle time on a Xerox Sigma 9 computer, A Pegasus-Harrier propulsion system was used as a baseline for developing the mathematical modeling and simulation technique. A hydromechanical and water injection control system was also simulated. The model was programmed for interfacing with a Harrier aircraft simulation at NASA Ames. Descriptions of the real time methodology and model capabilities are presented.

N82-24203*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

FUTURE PROPULSION OPPORTUNITIES FOR COMMUTER **AIRPLANES**

William C, Strack Washington 1982 24 p refs Presented at the Commuter Airlines Meeting, Savannah, 24-26 May 1982; sponsored by the Society of Automotive Engineers (NASA-TM-82880; E-1256; NAS 1.15:82880) Avail: NTIS

HC A02/MF A01 CSCL 21E

Commuter airplane propulsion opportunities are summarized. Consideration is given to advanced technology conventional turboprop engines, advanced propellers, and several unconventional alternatives; regenerative turboprops, rotaries, and diesels, Advanced versions of conventional turboprops (including propellers) offer 15-20 percent savings in fuel and 10-15 percent in DOC compared to the new crop of 1500-2000 SHP engines currently in development, Unconventional engines could boost the fuel savings to 30-40 percent. The conclusion is that several important opportunities exist and, therefore, powerplant technology need not plateau.

N82-25250* National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

STGSTK: A COMPUTER CODE FOR PREDICTING MULTISTAGE AXIAL FLOW COMPRESSOR PERFORMANCE BY A MEANLINE STACE STACKING METHOD

Ronald J. Steinke May 1982 65 p refs (NASA-TP-2020; E-551; NAS 1.60:2020) Avail: NTIS

HC A04/MF A01 CSCL 21E

A FORTRAN computer code is presented for off-design performance prediction of axial-flow compressors. Stage and compressor performance is obtained by a stage-stacking method that uses representative velocity diagrams at rotor inlet and outlet meanline radii, The code has options for: (1) direct user input calculation of nondimensional stage characteristics; (2) adjustment of stage characteristics for off-design speed and blade setting angle; (3) adjustment of rotor deviation angle for off-design conditions; and (4) SI or U.S. customary units. Correlations from experimental data are used to model real flow conditions, Calculations are compared with experimental data,

N82-25255* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

EXHAUST EMISSIONS SURVEY OF A TURBOFAN ENGINE FOR FLAME HOLDER SWIRL TYPE AUGMENTORS AT SIMULATED ALTITUDE FLIGHT CONDITIONS

John E. Moss, Jr. Oct. 1981 47 p refs
(NASA-TM-82787; E-955; NAS 1.15.82787) Avail: NTIS
HC A03/MF A01 CSCL 21E

Emissions of carbon dioxide, total oxides of nitrogen, unburned hydrocarbons, and carbon monoxide from an F100 afterburning two spool turbofan engine at simulated flight conditions are reported. Tests were run at Mach 0.8 at altitudes of 10.97 and 13.71 km (36,000 and 45,000 ft), and (it Misch 1.2 at 13,71 km (45,000 ft). Emission measurements were made from intermediate power (nonafterburning) through maximum afterburning, using a single point gas sample probe traversed across the horizontal diameter of the exhaust nozzle. The data show that emissions vary with flight speed, altitude, power level, and radial position across the nozzle. Carbon monoxide emissions were low for intermediate and partial afterburning power. Unburned hydrocarbons were near zero for most of the simulated flight conditions. At maximum afterburning, there were regions of NOx deficiency in regions of high CO. The results suggest that the low NOx levels observed in the tests are a result of interaction with high CO in the thermal converter. CO2 emissions were proportional to local fuel air ratio for all test conditions.

N82-26293* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio. THRUST REVERSER FOR A LONG DUCT FAN ENGINE

Everett A. Johnston (GE, Cincinnati) and Edward W. flyan, inventors (to NASA) (GE, Cincinnati) Issued 14 Jul 1981 9 p

Filed 30 Mar. 1979 (NASA-Case-LEW-13199-1; US-Patent-4,278,220, US-Patent-Appl-SN-025301, US-Patent-Class-244-110B;

US-Patent-Class-60-226A) Avail: US Patent and Trademark Office CSCL 21E

A bypass duct outer cowl includes a fixed cascade disposed between axially spaced fixed cowl portions and a translatable cowl sleeve and blocker doors movably disposed on the respective radially outer and inner sides of the cascade. Actuation and linkage structure located entirely within the outer cowl provides for selectively moving the cowl sleeve rearwardly and rotating the blocker doors to a position across the bypass duct to cause the fan airflow to pass through the cascade in a thrust reversing manner Official Gazette of the U.S. Patent and Trademark Office

N82-26294*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

REAL TIME PRESSURE SIGNAL SYSTEM FOR A ROTARY **ENGINE Patent Application**

William J. Rice, inventor (to NASA) Filed 19 Feb. 1982 21 p. (NASA-Case-LEW-13622-1, US-Patent-Appl-SN-350473) Avail: NTIS HC A02/MF A01 CSCL 21E

Apparatus for developing a signal which is a composite of the pressures at four different points in the chamber of a rotary type engine is disclosed. The composite signal can be read by an IMEP meter or displayed on an oscilloscope. The physical arrangement of a Wankel engine and the correlation embodying the invention is shown. The profile of the inner surface of a Wankel engine housing and the profile of a three lobed rotor together with the positions of the transducers are also shown The timing diagrams depicting the active regions of the transducers and timing signals used in the correlator circuitry are illustrated

N82-26297*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

DEVELOPMENT POTENTIAL OF INTERMITTENT COMBUS-TION (I.C.) AIRCRAFT ENGINES FOR COMMUTER TRANS-PORT APPLICATIONS

Ridward A, Willis 1982 31 p refs Presented at the Commuter Parlines and Operations Meeting, Savannah, 23-24 May 1982 (NASA-TM-82869; E-1221; NAS 1.15:82869) Avail: NTIS HC A03/MF A01 CSCL 21E

An update on general aviation (g/a) and commuter aircraft propulsion research effort is reviewed. The following topics are

ORIGINAL PAGE IS OF POOR QUALITY

discussed: on several advanced intermittent combustion engines emphasizing lightweight diesels and rotary stratified charge engines. The current state-of-the-art is evaluated for lightweight, aircraft suitable versions of each engine. This information is used to project the engine characteristics that can be expected on near-term and long-term time horizons. The key enabling technology requirements are identified for each engine on the long-term time horizon.

Ne2-26298*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. PROPULSION OPPORTUNITIES FOR FUTURE COMMUTER

AIRCRAFT William C Strack 1982 27 p refs Presented at 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; aponsored by AIAA, SAE and ASME

[NASA-TM-82915; E-1304; NAS 1.15:82915] Avail: NTIS HC A03/MF A01 CSCL 21E

Circa 1990 propulsion improvement concepts are discussed for 1000 to 5000 SHP conventional turboprop powerplants including engines, gearboxes, and propellers. Cycle selection, power plant configurations and advanced technology elements are defined and evaluated using average stage length DOC for commuter aircraft as the primary merit criterion.

NB2-26299*# National Aetonautics and Space Administration. Lewis Research Center, Cleyeland, Ohio.

COMPARISON OF EXPERIMENTAL AND ANALYTICAL PERFORMANCE FOR CONTOURED ENDWALL STATORS Robert J. Boyle and Jeffrey E. Haas (Army Aviation Research and Development Command, Cleveland) 1982 15 p. refs. Presented at Eighteenth Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; sponspred by AIAA, SAE and ASME (NASA-TM-82877; NAS 1.15.82877;

AVRADCOM-TR-82-C-12) Avail: NTIS HC A02/MF A01 CSCL

Comparisons between predicted and experimental stator losses showed that the analysis was able to predict the change in stator loss when contoured endwalls with highly three dimensional passage geometry were used. The level of loss was predicted to within 75 percent of that measured. The predicted loss was due only to profile loss and boundary layer growth on the endwalls. The 25 percent difference was approximately 0.015 at design pressure ratio. The analysis was shown to predict the trend in stator flow angle, even for small stator geometries.

N82-26300*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA RESEARCH IN SUPERSONIC PROPULSION: A **DECADE OF PROGRESS**

L. H. Fishbach, L. E. Stitt, J. R. Stone, and J. R. Whitlow, Jr. 1982 40 p refs Presented at 18th Joint Prepulsion Conf., Cleveland, 21-23 Jun. 1982: sponsored by AIAA, SAE and

(NASA-TM-82862; NAS 1.15;82862) HC A03/MF A01 CSCL 21E

A second generation, economically viable, and environmentally acceptable supersonic aircraft is reviewed. Engine selection, testbed experiments, and noise reduction research are described. Author

N82-27311*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio, QCSEE UNDER-THE-WING ENGINE ACOUSTIC DATA

Harry E. Bloomer and Nick E. Samanich May 1982 28 p

(NASA-TM-82691; E-972; NAS 1.15:82691) Avail: NTIS HC A03/MF A01 CSCL 21E

Both an over-the-wing (OTW) and an under-the-wing (UTW) experimental engine are discussed. The UTW engine had a variable-geometry fan exhaust nozzle and a variable-pitch fan that provided quick-response reverse thrust capability. An automatic digital control enabled optimal engine operation under all steady-state conditions as well as during forward and reverse thrust transient operation. The engine was tested at the Engine Noise Test Facility alone and with wind and flap segments to

simulate an installation on a short-haul transport aircraft. The ringine acoustic configuration was varied to give 14 test configurations. All of the acoustic test results from the UTW program at Lewis are presented as 1/3-octave-band sound pressure level (SPL) tabulations for all of the test points and some narrow-band spectra and 1/3-octave-band data plots for selected conditions.

T.M.

N82-29324*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

QCSEE OVER-THE-WING ENGINE ACOUSTIC DATA

Harry E. Bloomer and Irvin J. Loeffler May 1982 28 p refs (NASA-TM-82708, E-990, NAS 1.15:82708) Avail: NTIS HC A03/MF A01 CSCL 21E

The over the wing (OTW) Quiet, Clean, Short Haul Experimental Engine (QCSEE) was tested at the NASA Lewis Engine Noise Test Facility. A boilerplate (nonflight weight), high throat Mach number, acoustically treated inlet and a D shaped OTW exhaust nozzle with variable position side doors were used in the tests along with wing and flap segments to simulate an installation on a short haul transport aircraft. All of the acoustic test data from 10 configurations are documented in tabular form. Some selected narrowband and 1/3 octave band plots of sound pressure icvel are presented.

N82-31329*# National Aeronautics and Space Administration. Lewis Research Center. Cleveland, Ohio.

VENTURI NOZZLE EFFECTS ON FUEL DROP SIZE AND NITRO-GEN OXIDE EMISSIONS

Susan M. Johnson Aug. 1982 17 p refs

(NASA-TP-2028; E-1029; NAS 1.60:2028) Avail: NTIS

HC A02/MF A01 CSCL 21E

The effect of a venturi nozzle on the Sauter mean diameter of a water spray produced by a simplex pressure atomizing injector in a swirling airflow was determined. A Malvern particle and droplet size distribution analyzer, Type S.T. 1800, was used to measure D sub 32 of the water sprays. The water spray was studied at ambient temperature (293 K) and atmospheric pressure. The venturi reduced D sub 32 by an average of 30 percent when installed with a simplex injector and air swirler. The venturi primarily improved atomization of the injector spray by increasing relative air velocity. The small drop size enhanced vaporization and therefore decreased oxides of nitrogen in a combustor. The decrease in drop size provided by the addition of a venturi explains the results obtained in a previous small scale research combustor wherein NOx emission indices decreased as a result of this hardware modification.

N82-32366* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ACTIVE CLEARANCE CONTROL SYSTEM FOR A TUR-BOMACHINE Patent

Richard P. Johnston, Walcolm H. Knapp, and Charles E. Coulson, inventors (to NASA) issued 11 May 1982 6 p Filed 25 Jul.

(NASA-Case-LEW-12938-1; US-Patent-4,329,114; US-Patent-Appl-SN-060449; US-Patent-Class-415-145;

US-Patent-Class-415-178; US-Patent-Class-60-726;

US-Patent-Class-69-39.29; US-Patent-Class-60-39.07) Avail: US Patent and Trademark Office CSCL 21E

An axial compressor is provided with a cooling air manifold surrounding a po/tion of the shroud, and means for bleeding air from the compressor to the manifold for selectively flowing it in a modulating manner axially along the outer side of the stator/shroud to cool and shrink it during steady state operating conditions so as to obtain minimum shroud/rotor clearance conditions. Provision is also made to selectively divert the flow of cooling air from the manifold during transient periods of operation so as to alter the thermal growth or shrink rate of the stator/shroud and result in adequate clearance with the compressor rotor.

Official Gazette of the U.S. Patent and Trademark Office

N62-33389*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ROTO® TIP CLEARANCE EFFECTS ON OVERALL AND BLADE-ELEMENT PERFORMANCE OF AXIAL-FLOW TRANSONIC FAN STAGE

Avail: NTIS

Royce D. Moore Sep. 1982 87 p refs (NASA-TP-2049; E-559; NAS 1.60:2049)

HC A05/MF A01 CSCL 21E

The effects of tip clearance on the overall and black-element performance of an axial-flow transonic fan stage are presented. The 50-centimeter-diameter fan was tested at four tip clearances (nonrotating) from 0.061 to 0.178 centimeter. The calculated radial growth of the blades was 0.040 centimeter at design conditions. The decrease in overall stage performance with increasing clearance is attributed to the loss in rotor performance. For the rotor the affects of clearance on performance parameters extended to about 70 percent of blade span from the tip. The stage still margin based on an assumed operating line decreased from 15.3 to 0 percent as the clearance increased from 0.061 to 0.178 centimeter.

A82-10952 * # Thermal and flow analysis of a convection, air-cooled ceramic coated porous metal concept for turbine vanes. F. S. Stepka (NASA, Lewis Research Center, Cleveland, OH). American Society of Mechanical Engineers and American Institute of Chemical Engineers, National Heat Transfer Conference, 20th, Milwaukee, WI, Aug. 2-5, 1981, Aside Paper 81-HT-48. 7 p. 9 refs. Members, \$2.00; nonmembers, \$4,00,

Analysis way made of the heat transfer and pressure drop through turbine venes made of a sintered, porous metal coated with a thin layer of ceramic and convection cooled by spanwise flow of cooling air. The analysis was made to determine the feasibility of using this concept for cooling very small turbines, primarily for short duration applications such as in missile engines. The analysis was made for gas conditions of approximately 10 and 40 atm and 1644 K and with turbine vanes made of felt-type porous metals with relative densities from 0.2 and 0.6 and ceramic coating thicknesses of 0.0% to 0.254 mm.

A82-19214 * # Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL. R. W. Luide: G. E. Turney, and J. Allen (NASA, Lewis Research Center, Clevelar. OH). American Institute of Aeronautics and Astronautics and NASA Ames Research Center, V/STOL Conference, Palo Alto, CA, Dec. 7-9, 1981, AIAA Paper 81-2637. 15 p. 5 refs.

The thrust, specific fuel consumption, and relative merits of the tandem fan and the dual reverse flow front fan propulsion systems for a supersonic V/STOL aircraft are discussed. Consideration is given to: fan pressure ratio, fan air burning, and variable core supercharging. The special propulsion system components required are described, namely: the reflecting front inlet/nozzle, the aft subsonic inlet, the reverse pitch fan, the variable core supercharger and the low pressure forward burner. The potential benefits for these unconventional systems are indicated.

(Author)

A82-19221 * # A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation. J. R. Mihaloew (NASA, Lewis Research Center, Cleveland, OH), S. P. Roth, and R. Creekmore (United Technologies Corp., Government Products Div., West Palm Beach, FL). American Institute of Aeronautics and Astronautics and NASA Ames Research Center, V/STOL Conference, Palo Alto, CA, Dec. 7-9, 1981, AIAA Paper 81-2663. 18 p. 6 refs.

A Pegasus-Harrier propulsion system is selected as a baseline for developing mathematical modeling and simulation techniques for VSTOL. Initially, static and dynamic propulsion system characteristics are modeled in detail to form a nonlinear aerothermodynamic digital computer simulation of a Pegasus engine. From this high fidelity simulation, a real-time propulsion model is formulated by applying a piecewise linear state variable methodology. A hydro-

mechanical and water injection control system is also simulated. It is noted that the real-time dynamic model includes the detail and flexibility required for evaluating critical control parameters and propulsion component limits over a limited flight envelope. C.R.

A82-19337 * # Aeroelastic characteristics of a cascade of mistuned blades in subsonic and supersonic flows. R. E. Kielb (NASA, Lewis Research Center, Structur() Dynamics Section, Cleveland, OH) and K. R. V. Kaza (NASA, Lewis Research Center, Cleveland; Toledo, University, Toledo, OH). American Society of Mechanical Engineers, Design Engineering Technical Conference, Hartford, CT, Sept. 20-23, 1981, Paper 81-DET-122, 12 p. 19 refs. Members, \$2,00; nonmembers, \$4.00.

An investigation of the effects of mistuning on flutter and forced response of a cascade in subsonic and supersonic flows is presented. The aerodynamic and structural coupling between the bending and torsional motions and the aerodynamic coupling between the blades are included. It is shown that frequency mistuning always has a beneficial effect on flutter. Additionally, the results indicate that frequency mistuning may have either a beneficial or an adverse effect on forced response, depending on the engine order of the excitation and Mach number.

(Author)

A32-20291 * # Dilution jet behavior in the turn section of a reverse flow combustor. S. M. Riddlebaugh (NASA, Lewis Research Center, Cleveland, OH), I. Greber (Case Western Reserve University, Cleveland, OH), and A. Lipshitz. American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0192, 13 p.

Measurements of the temperature field produced by a single jet and a row of dilution jets issued into a reverse flow combustor are presented. The temperature measurements are presented in the form of consecutive normalized temperature profiles, and jet trajectories. Single jet trajectories were swept toward the inner wall of the turn, whether injection was from the inner or outer wall. This behavior is explained by the radially inward velocity component necessary to support irrotational flow through the turn, Comparison between experimental results and model calculations showed poor agreement due to the model's not including the radial velocity component. A widely spaced row of jets produced trajectories similar to single jets at similar test canditions, but as spacing ratio was reduced, penetration was reduced to the point where the dilution jet flow attached to the wall.

(Author)

A82-34981 * # Turbine blade nonlinear structural and life analysis, R, L, McKnight, J. H, Laflen (General Electric Co., Cyncinnati, OH), G. R. Halford, and A. Kaufman (NASA, Lewis Research Center, Claveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 1 littly, Cleveland, OH, June 21-23, 1982, AIAA Paper 8, 1056, 9 p. 9 refs.

The utility of advanced structural analysis and life prediction techniques was evaluated for the life assessment of a commercial air-cooled turbine blade with a history of tip cracking. Three dimensional, nonlinear finite element structural analyses were performed for the blade tip region. The computed strain-temperature history of the critical location was imposed on a uniaxial strain controlled test specimen to evaluate the validity of the structural analysis method. Experimental results indicated higher peak stresses and greater stress relaxation than the analytical predictions. Life predictions using the Strainrange Partitioning and Frequency Modified approaches predicted 1200 to 4420 cycles and 2700 cycles to crack initiation, respectively, compared to an observed life of 3000 cycles.

(Author)

A82-34992 * Experimental study of the effects of secondary air on the emissions and stability of a lean premixed combustor. G. Roffe, R. S. V. Raman (General Applied Science Laboratories, Inc., Westbury, NY), and C. J. Marek (NASA, Lewis Research Center, Cleveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1072. 10 p. 7 refs. NASA-supported research.

A study of the effects of secondary air addition on the stability and emissions of a gas turbine combustor has been performed. Tests were conducted with two types of flameholders and varying amounts of dilution air addition. Results Indicate that NO(x) decreases with increasing dilution air injection, whereas CO is independent of the amount of dilution air and is related to the gas temperature

near the walls. The axial location of the dilution air addition has no affect on the performance or stability. Results also indicate that the amount of fecondary air entrained by the flameholder recirculation zone is dependent on the amount of dilution air and flameholder geometry. (Author)

A82-34995 * # Advancements in real-time engine simulation technology. J. R. Szuch (NASA, Lewis Research Center, Clevilland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1075, 9 p. 21 refs.

(Previously announced in STAR as N82-22915)

A82-34666 * MASA Broad Specification Fuels Combustion Technology program - Pratt and Whitney Airclaft Phase I results and status. B. P. Lohmann (United Technologies Corp., Commercial Products Div., East Hartord, CT) and J. S. Fear (NASA, Lewis Research Canter, Aerothermodynamics and Fuel Div., Cleveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA, Paper 82-1088, 12 p. 11 refs.

In connection with increases in the cost of fuels and the reduced availability of high quality petroleum crude, a modification of fuel specifications has been considered to allow acceptance of poorer quality fuels. To obtain the information upon which a selection of appropriate fuels for aircraft can be based, the Broad Specification Fuels Combustion Technology program was formulated by NASA. A description is presented of program-related investigations conducted by an American aerospace company. The specific objective of Phase I of this program has been to evaluate the impact of the use of broadened properties fuels on combustor design through comprehensive combustor rig testing. Attention is given to combustor concepts, experimental evaluation, results obtained with single stage combustors, the stage combustor concept, and the capability of a variable geometry combustor.

A82-35000 * # MASA/General Electric broad-specification fuels combustion technology pipgram - Phase I results and status. W. J. Dodds, E. E. Eksikkit, D. W. Bahr (General Electric Co., Aircraft Engine Business Group, Cincinnati, OH), and J. S. Fear (NASA, Lewis Research Center, Cleveland, OH). AIAA, SAE, and ASK/E, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1089. 12 p. 14 refs.

A program is being conducted to develop the technology required to utilize fuels with broadened properties in aircraft gas turbine engines. The first phase of this program consisted of the experimental evaluation of three different combustor concepts to determine their potential for meeting several specific emissions and performance goals, when operated on broadened property fuels. The three concepts were a single annular combustor; a double annular combustor; and a short single annular combustor with variable geometry. All of these concepts were sized for the General Electric CF6-80 engine. A total of 24 different configurations of these concepts were evaluated in a high pressure test facility, using four test fuels having hydrogen contents between 11.8 and 14%. Fuel effects on combustor performance, durability and emissions, and combustor design features to offset these effects were demonstrated. (Author)

A82-35017 * # In-flight acoustic results from an advanced-design propeller at Mach numbers to 0.8. K. G. Mackall, P. L. Lasagna, K. Walsh (NASA, Ames Research Center, Edwards, CA), and J. H. Dittmar (NASA, Lewis Research Center, Cleveland, OH). AlAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AlAA Paper 82-1120. 9 p. 6 refs.

Acoustic data for the advanced-design SR-3 propeller at Mach numbers to 0.8 and helical tip Mach numbers to 1.14 are presented. Several advanced-design propellers, previously tested in wind tunnels at the Lewis Research Center, are being tested in flight at the Dryden Flight Research Facility. The flight-test propellers are mounted on a pylon on the top of the fuselage of a JetStar airplane. Instrumentation provides near-fleid acoustic data for the SR-3. Acoustic data for the SR-3 propeller at Mach numbers up to 0.8, for propeller helical tip Mach numbers up to 1.14, and comparison of wind tunnel to flight data are included. Flowfield profiles measured in the area adjacent to the propeller are also included. (Author)

A82-35041 * # Evaluation of fuel injection configurations to control carbon and soot formation in small GT combustors. T. J. Rosfjord (United Technologies Research Center, East Hartford, CT) and D. Briehl (NASA, Lewis Research Center, Cleveland, OH). AIAA SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21:33, 1982, AIAA Paper 82-1175, 12 p. 6 refs.

An experimental program to investigate hardware configurations which attempt to minimize carbon formation and soot production without sacrificing performance

in small gas turbine combustors has been conducted at the United Technologies Research Center. Four fuel Injectors, embodying either airblast atomization, pressure atomization, or fuel vaporization techniques, were combined with nozule air swirlers and injector sheaths, and evaluated at test conditions which included and extended beyond standard small gas turbine combustor operation. Extensive testing was accomplished with configurations embodying either a spill return or a T-vaporizer injector. Minimal carbon deposits were observed on the spill return nozzle for tests using either Jet A or ERBS test fuel. A more extensive film of soft carbon was observed on the vaporizer after operation at standard engine conditions, with large carbonaceous growths forming on the device during off-design operation at low combustor inlet temperature. Test results indicated that smoking rates near the injector), the atomization quality of the injector and the fuel hydrogen content. (Author)

A82-35348 * # A computational design method for transonic turbomachinery cascades. H. Sobieczky (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für theoretische Strömunsgmechanik, Göttingen, West Germany) and D. S. Dullikravich (NASA, Lewis Research Center, Cleveland, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-117, 10 p. 17 refs, Members, \$2.00; nonmembers, \$4.00.

This paper describes a systematical computational procedure to find configuration changes necessary to modify the resulting flow past turbomachinery cascades, channels and nozies, to be shock-free at prescribed transonic operating conditions. The method is based on a finite area transonic analysis technique and the fictitious gas approach. This design scheme has two major areas of application. First, it can be used for design of supercritical cascades, with applications mainly in compressor blade design. Second, it provides subsonic inlet shapes including sonic surfaces with suitable initial data for the design of cupersonic (accelerated) exits, like nozzles and turbine cascade shapes. This fast, accurate and economical method with a proven pc::ntial for applications to three-dimensional flows is illustrated by some design examples. (Author)

A82-35373 * The use of optimization techniques to design controlled diffusion compressor blading. N. L. Sanger (NASA, Lewis Research Center, Cleveland, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-67-149. 11 p. 17 refs. Members, \$2.00; nonmembers, \$4.00. (Previously announced in STAR as N82-14094)

A82-35389 * MASA research in aircraft propulsion. M. A. Beheim (NASA, Lewis Research Center, Cleveland, OH), American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr., 18-22, 1982, Paper 82-GT-177. 10 p. Members, \$2.00; nonmembers, \$4.00.

(Previously announced in STAR as N82-13146)

A82-35409 * # The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine. R, J, Roelke (NASA, Lewis Research Center, Cleveland, OH) and J, E, Haas (U.S. Army, Propulsion Laboratory, Cleveland, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-222. 6 p. 9 refs. Members, \$2.00; nonmembers, \$4.00. (Previously announced in STAR as N82-13114)

A82-35456 * Structural dynamics of shroudless, hollow, fan blades with composite in-lays. R. A. Alello, M. S. Hirschbein, and C. C. Chamis (NASA, Lewis Research Center, Cleveland, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-284. 7 p. Members, \$2.00; nonmembers, \$4.00. (Previously announced in STAR as N82-22266)

A82-40521 * TF36 Convertible Engine System Technology Program.
K. L. Abdalla (NASA, Lewis Research Center, Cleveland, OH) and A. Brooks (General Electric Co., Lynn, MA). In: American Helicopter Society, Annual Forum, 38th, Anaheim, CA, May 4-7, 1982, Proceedings. (A82-40505 20-01) Washington, DC, American Helicopter Society, 1982, p. 163-165. 8 refs.

The ability of the helicopter to function efficiently at zero flight speed is counterbalanced by a limitation to rather low forward flight speeds. An ability to fly efficiently at high speed would provide very significant improvements in rotocraft productivity and economics. The implementation of such improvements would require the development of a suitable integrated power plant for both the vertical sind horizontal flight modes. The engine should be a shaft output engine in the vertical flight mode, in the horizontal mode, the propulsor cary be fan or propeller. A description is presented of a program concerned with the demonstration aconvertible turbofan/turboshaft engine. The program is nominally directed toward the demonstration of a propulsion system for an X-wing alreraft. However, the principles being investigated are applicable to any convertible turbofan/turboshaft engine application. At the current early stage of the program, no barrier problems have become apparent, and interesting possibilities for high speed rotorcraft flight are envisaged. —G.R.

N82-10037* Detroit Diesel Allison, Indianapolis, Ind. PROPULSION STUDY FOR SMALL TRANSPORT AIRCRAFT TECHNOLOGY (STAT) Contractor Final Report J. C, Gill, R. V. Earle, D. V. Staton, P. C. Stolp, D. S. Huelster, and B. A. Zolezzi 16 Dec. 1980 186 p refs (Contract NAS3-21995)

(NASA-CR-185499; DDA-EDR-10470) HC A09/MF A01 CSCL 21E Avail: NTIS

Propulsion requirements were determined for 0.5 and 0,7 Mach aircraft. Sensitivity studies were conducted on both these aircraft to determine parametrically the influence of propulsion characteristics on aircraft size and direct operating cost (DQC). Candidate technology elements and design features were identified and parametric studies conducted to select the STAT advanced engine cycle. Trade off studies were conducted to determine those advanced technologies and design features that would offer a reduction in DOC for operation of the STAT engines. These features were incorporated in the two STAT engines, A benefit assessment was conducted comparing the STAT engines to current technology engines of the same power and to 1985 derivatives of the current technology engines, Research and development programs were recommended as part of an overall technology devalopment plan to ensure that full commercial development of the STAT engines could be initiated in 1988.

N82-10038*# Detroit Diesel Allison, Indianapolis, Ind.
PROPULSION STUDY FOR SMALL TRANSPORT AIRCRAFT
TECHNOLOGY (STAT), APPENDIX & Final Report
[1980] 11 p refs

(Contract NAS3-21995)

(NASA-CR-165499-App-B; DDA-EDR-10470-App-B) Avail: NTIS HC A02/MF A01 CSCL 21E

Data are tabulated for two conceptual engines designed for small transport aircraft. These are the 1790 W (2400 shp) class engine and the 3579 kW (4800 shp) class engine for the 0.5 M sub N airplanes, respectively. All data points required to perform the STAT missions are provided including take-off, climb, cruise, loiter, and fuel allowances. The weight, dimensions, price, and maintenance costs are given as well as the installation criteria and equations used for adjusting horse-power for gearbox loss, and converting horse-power to thrust. Scaling equations are included.

A.R.H.

N82-10039*# United Technologies Research Center, East Hartford, Conn.

DEVELOPMENT OF LOW MODULUS MATERIAL FOR USE IN CERAMIC GAS PATH SEAL APPLICATIONS Final Report

H. E. Eaton and R. C. Novak Oct. 1981 83 p refs (Contract NAS3-22134)

(NASA-CR-165469; R81-915188-13) Avail: NTIS

HC A05/MF A01 CSCL 21E

Three candidate materials were examined: Brunsbond (R) Pad; plasma sprayed porous NiCrAlY; and plasma sprayed tow modulus microcracked zirconia, Evaluation consisted of mechanical, thermophysical, and oxidation resistance testing along with optical microscopy and a feasibility demonstration of attaching the material to a suitable substrate. The goals of the program were the following: feasibility of fastening or depositing the low modulus system onto a broad range of substrate alloys; feasibility of depositing or forming the low modulus system to a thickness of 0.19 cm to 0.38 cm; potential to attain a modulus of elasticity in the range of 3.4 to 6.9 GPa (0.5 to 1.0 MSI), and an ultimate strength of 17.2 MPa (2.5 ksi); suitable thermal conductivity; and static oxidation life of at least 1000 hours at 1311 K. The results of the program indicate that all three systems offer attractive properties as a strain isolator material.

N82-10040* General Electric Co., St. Petersburg, Fla. THERMAL-BARRIER-COATED TURBINE BLADE STUDY Final Report

P. A. Siemers and W. B. Hillig Aug. 1981 136 p. refs (Contract NAS3-21727)

(NASA-CR-165351; SRD-HC A07/MF A01 CSCL 21E

SRD-81-083) NTIS

The effects of coating TBC on a CF6-50 stage 2 high-pressure turbine blade were analyzed with respect to changes in the mean bulk temperature, cooling air requirements, and high-cycle fatigue. Localized spallation was found to have a possible deleterious effect on low-cycle fatigue life. New blade design concepts were developed to take optimum advantage of TBCs. Process and material development work and rig evaluations were undertaken which identified the most promising combination as ZrO2 containing 8 w/o Y2O3 applied by air plasma spray onto a Ni22Cr-10Al-1Y bond layer. The bond layer was applied by a low-pressure, high-velocity plasma spray process onto the base alloy. During the initial startup cycles the blades experienced localized leading edge spullation caused by foreign objects. T.M.

N82-11068*# Toledyne Continental Motors, Muskegon, Mich. LIGHTWEIGHT DIESEL ENGINE DESIGNS FOR COMMUT-ER TYPE AIRCRAFT

Alex P Brouwers Jul. 1981 70 p refs

(Contract NAS3-22149)

(NASA-CR-165470; Rept-995) Avail: NTIS HC A04/MF A01 CSCL 21E

Conceptual designs and performance of advanced technology lightweight diesel engines, suitable for commuter type aircraft power plants are defined. Two engines are discussed, a 1491 kW (2000 SHP) eight-cylinder engine and a 895 kW (1200 SHP) six-cylinder engine. High performance and related advanced technologies are proposed such as insulated cylinders, very high injection pressures and high compressor and turbine efficiencies. The description of each engine includes concept drawings, a performance analysis, and weight data. Fuel flow data are given for full and partial power up to 7620m altitude. The performance data are also extrapolated over a power range from 67; kW(900 SHP) to 1864 kW (2500 SHP). The specific fuel consumption of the 1491 kW (2000 SHP) engine is 182 g/hWh (.299 lb/HPh) at cruise altitude, its weight 620 kg (1365 lb.) and specific weight .415 kg/kW (.683 lb/HP). The specific fuel consumption of the 895 kW (1200 SHP) engine is 187 g/hWh (308 lb/HPh) at cruise altitude, its weight 465 kg (1025 lb) and specific weight .520 kg/kW (.854 lb/HP). R.J.F.

N62-12075*# General Electric Co., Lynn, Mass. Aircraft Engine

EFFECT OF A PART SPAN VARIABLE INLET GUIDE VANE ON TF34 FAN PERFORMANCE Final Report

Jose Alvarez and Paul W. Schneider Sep. 1981 133 p refs (Contract NAS3-21624)

(NASA-CR-165458: R81AEG030)

HC A07/MF A01 CSCL 21E

Experimental aerodynamic and performance data were obtained from a TF34 engine. Part span variable inlet guide vanes mounted in front of the fan on the TF34 engine were tested to demonstrate the feasibility of modulating air flow and thrust for vertical takeoff aircraft systems. The fan was mapped to stell for a range of speeds and variable inlet guide were settings. Modulated fan tip performance and unmodulated hub performance were evaluated with a without an extended fan bypass splitter. The effect of a crosswind distortion screen on performance was also evaluated.

N82-13145*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

SENSOR FAILURE DETECTION SYSTEM Final Report

E, C. Beattie, R. F. LaPrad, M. E. McGlone, S. M. Rock, and M. M. Akhter Aug. 1981 172 p refs Prepared in cooperation with Systems Control, Inc., Pale Alto, Calif. (Contract NAS3-22481)

NASA-CR-165515; PWA-5736-17) NTIS

HC A08/MF A01 CSCL 21E

Advanced concepts for detecting, isolating, and accommodating sensor failures were studied to determine their applicability to the gas turbine control problem. Five concepts were formulated

based upon such techniques as Kalman filters and a screening process led to the selection of one advanced concept for further evaluation. The selected advanced concept uses a Kalman filter to generate residuals, a weighted sum square residuals texhnique to detect soft failures, likelihood ratio testing of a bank of Kalman filters for isolation, and reconfiguring of the normal mode Kalman filter by eliminating the failed input to accommodate the failure. The advanced concept was compared to a baseline parameter synthesis technique. The advanced concept was shown to be a viable concept for detecting, isolating, and accommodating sensor failures for the gas turbine applications

N82-14062*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

CORE COMPRESSOR EXIT STAGE STUDY, VOLUME 4: DATA AND PERFORMANCE REPORT FOR THE BEST STAGE CONFIGURATION Final Report

D. C. Wisler Apr. 1981 204 p refs (Contract NAS3-20070)

(NASA-CR-165357; R80AEG314-Vol-4) NTIS

HC A10/MF A01 CSCL 21E

The core compressor exit stage study program develops rear stage blading designs that have lower losses in their endwell boundary sayer regions. The test data and performance results for the best stage configuration consisting of Rotor-B running with Stator-B are described. The technical approach in this efficiency improvement program utilizes a low speed research compressor. Tests were conducted in two ways: (1) to use four identical stages of blading to obtain test data in a true multistage environment and (2) to use a single stage of blading to compare with the multistage test results. The effects of increased rotor tip clearances and circumferential groove casing treatment are evaluated. E.A.K.

N82-14093*# General Electric Co., Cincinnati, Ohio. Engine Business Group.

CORE COMPRESSOR EXIT STAGE STUDY. VOLUME 5: DESIGN AND PERFORMANCE REPORT FOR THE ROTOR C/STATOR B CONFIGURATION

D. C. Wisler May 1981 101 p refs

(Contract NAS3-20070)

NTIS (NASA-CR-16535B: R81AEG287-Vol-5)

HC A06/MF A01 CSCL 21E

Rear stage blading designs that have lower losses in their endwall boundary layer regions were developed. The design of rotor-C and the performance results for rotor-C running with stator B are described. A low speed research compressor is utilized as the principal investigative tool, Four identical stages of blading are used to obtained data in a true multistage environment.

N82-14095*# AiResearch Mfg. Co., Phoenix, Ariz. POLLUTION REDUCTION TECHNOLOGY PROGRAM SMALL JET AIRCRAFT ENGINES, PHASE 3 Final Report

T, W. Bruce, F. G. Davis, T. E. Kuhn, and H. C. Mongia Dec. 1981 180 p refs

(Contract NAS3-20819)

(NASA-CR-165386; AiResearch-21-3615) HC A09/MF A01 CSCL 21E NTIS Avail:

A series of Model TFE731-2 engine tests were conducted with the Concept 2 variable geometry airblast fuel injector combustion system installed. The engine was tested to: (1) establish the emission levels over the selected points which comprise the Environmental Protection Agency Landing-Takeoff Cycle; (2) determine engine performance with the combustion system; and (3) evaulate the engine acceleration/deceleration characteristics. The hydrocarbon (HC), carbon monoxide (CO), and smoke goals were met. Oxides of nitrogen (NOx) were above the goal for the same configuration that met the other pollutant goals. The engine and combustor performance, as well as acceleration/deceleration characteristics, were acceptable. The Concept 3 staged combustor system was refined from earlier phase development and subjected to further rig refinement testing. The soncept met all of the emissions goals.

NE2-14066* AiResearch Mfg. Co., Phoenix, Ariz.
ERBS FUEL ADDENDUM; POLLUTION REDUCTION
TECHNOLOGY PROGRAM EMALL JET AIRCRAFT EN-GINES, PHASE 3 Final Report

T. W. Bruce, F. G. Davis, T. E. Kuhn, and H. C. Mongia [1982]

(Contract NAS3-20619)

(NASA-CR-165387; AiResearch-21-3619) HC A03/MF A01 CSCL 21E NTIS

A Model TFE731-2 engine with a low emission, variable geometry combustion system was tested to compare the effects of operating the engine on Commercial Jet-A aviation turbine fuel and experimental referee broad specification (ERBS) fuels. Low power emission levels were essentially identical while the high power NOx emission indexes were approximately 15% lower with the EBRS fuel, The exhaust smoke number was approximately 50% higher with ERBS at the takeoff thrust setting; however, both values were still below the EPA limit of 40 for the Model TFE731 engine. Primary zone liner wall temperature ran an average of 25 K higher with ERBS fuel than with Jet-A. The possible adoption of broadened proprties fuels for gas turbine applications is suggested.

N82-16080*# United Technologies Research Center, East Hartford, Conn.

RESEARCH AND DEVELOPMENT PROGRAM FOR NON-LINEAR STRUCTURAL MODELING WITH ADVANCED TIME-TEMPERATURE DEPENDENT CONSTITUTIVE RELA-TIONSHIPS Final Report

Kevin P. Walker 25 Nov. 1981 187 p refs (Contract NAS3-22055)

INASA-CR-165533; PWA-5700-50)

HC A09/MF A01 CSCL 21E

NTIS Avail:

Results of a 20-month research and development program for nonlinear structural modeling with advanced time-temperature constitutive relationships are reported. The program included: (1) the evaluation of a number of viscoplastic constitutive models in the published literature; (2) incorporation of three of the most appropriate constitutive models into the MARC nonlinear finite element program; (3) calibration of the three constitutive models against experimental data using Hastelloy-X material; and (4) application of the most appropriate constitutive model to a three dimensional finite element analysis of a cylindrical combustor

viscoplastic model to predict component structural response. M.D.K.

N82-16081* Pratt and Whitney Aircraft Group, East Hartford,

liner louver test specimen to establish the capability of the

STUDY OF CONTROLLED DIFFUSION STATOR BLADING. AERODYNAMIC AND MECHANICAL DESIGN REPORT E. Canal, E. C. Chisholm, D. Lee, and D. A. Spear Jan. 1981 97 p refs

(Contract NAS3-22008)

(NASA-CR-165500; PWA-5698-28) NTIS

HC A05/MF A01 CSCL 21E

Pratt & Whitney Aircraft is conducting a test program for NASA in order to demonstrate that a controlled-diffusion stator provides low losses at high loadings and Mach numbers. The technology has shown great promise in wind tunnel tests. Details of the design of the controlled diffusion stator vanes and the multiple-circular-arc rotor blades are presented. The stage, including stator and rotor, was designed to be suitable for the first-stage of an advanced multistage, high-pressure compressor. Author

N82-17174* General Electric Co., Cincinnati, Ohio. Aircraft Engine Group

CF6 JET ENGINE PERFORMANCE IMPROVEMENT: HIGH PRESSURE TURBINE ROUNDNESS

W. D. Howard and W. A Fasching Jan, 1982 136 p refs

(Contract NAS3-20629) (NASA-CR-165555; R82AEB115)

HC A07/MF A01 CSCL 21E

An improved high pressure turbine stator reducing fuel consumption in current CF6-50 turbofan engines was developed. The feasibility of the roundness and clearance response improvements was demonstrated. Application of these improvements will result in a cruise SFC reduction of 0.22 percent for new engines.

For high time engines, the improved roundness and response characteristics results in an 0.5 percent reduction in cruise SFC. A basic life capability of the improved HP turbine stator in over 800 simulated flight cycles without any sign of significant distress

N82-19221* // Garrett Turbine Engine Co., Phoenix, Ariz. COOLED VARIABLE-AREA RADIAL TURBINE TECHNOL-OGY PROGRAM Finel Report G. D. Large and L. J. Meyer Jan, 1982 303 p refs (Contract NAS3-22004)

(NASA-CR-165408) Avail: NTIS HC A14/MF A01 CSCL

The objective of this study was a conceptual evaluation and design analyses of a cooled variable-area radial turbine capable of maintaining nearly constant high efficiency when operated at a constant speed and pressure ratio over a range of flows corresponding to 50- to 100-percent maximum engine power. The results showed that a 1589k (2400 F) turbine was feasible that would satisfy a 4000-hour duty cycle life goal. The final design feasibility is based on 1988 material technology goals. A peak serodynamic stage total efficiency of 0,88 was predicted at 100 percent power. Two candidate stators were identified; an articulated trailing-edge and a locally movable sidewall, Both concepts must be experimentally evaluated to determine the optimum configuration. A follow-on test program is proposed for this evaluation. Author

NS2-21193* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COLD-AIR PERFORMANCE OF A 15.41-cm-TIP-DIAMETER AXIAL-FLOW POWER TURBINE WITH VARIABLE-AREA STATOR DESIGNED FOR A 75-kW AUTOMOTIVE GAS TURBINE ENGINE Final Report

Kerry L. McLallin, Milton G. Kofskey, and Robert Y. Wong Feb.

1982 33 p refs (Contract DE-AI01-77CS-51040)

(NASA-TM-82644; E-899; NAS 1.15:82644;

DOE/NASA/51040-20) Avail: NTIS HC A03/MF A01 CSCL

An experimental evaluation of the aerodynamic performance of the axial flow, variable area stator power turbine stage for the Department of Energy upgraded automotive gas turbine engine was conducted in cold air. The interstage transition duct, the variable area stator, the rotor, and the exit diffuser were included in the evaluation of the turbine stage. The measured total blading efficiency was 0,096 less than the design value of 0.85, Large radial gradients in flow conditions were found at the exit of the interstage duct that adversely affected power turbine performance. Although power turbine efficiency was less than design, the turbine operating line corresponding to the steady state road load power curve was within 0,02 of the maximum available stage efficiency Author at any given speed.

N82-21196*# Pratt and Whitney Aircraft Group, East Hartford, Commercial Products Div.

ENERGY EFFICIENT ENGINE SHROUDLESS, HOLLOW FAN **BLADE TECHNOLOGY REPORT**

C. J. Michael Dec. 1981 91 p refs (Contract NAS3-20646)

(NASA-CR-165586; NAS 1.26:165586; PWA-5594-199) Avail:

NTIS HC A05/MF A01 CSCL 21E

The Shroudless, Hollow Fan Blade Technology program was structured to support the design, fabrication, and subsequent evaluation of advanced hollow and shroudless blades for the Energy Efficient Engine fan component, Rockwell International was initially selected to produce hollow airfoil specimens employing the superplastic forming/diffusion bonding (SPF/DB) fabrication technique. Rockwell demonstrated that a titanium hollow structure could be fabricated utilizing SPF/DB manufacturing methods. However, some problems such as sharp internal cavity radii and unsatisfactory secondary bonding of the edge and root details prevented production of the required quantity of fatigue test specimens, Subsequently, TRW was selected to (1) produce hollow airfoil test specimens utilizing a laminate-core/ not isostatic press/diffusion bond approach, and (2) manufacture full-size hollow prototype fan blades utilizing the technology that evolved from the specimen fabrication effort. TRW established elements of blade design and defined laminate-core/hot isostatic press/diffusion bonding fabrication techniques to produce test specimens. This fabrication technology was utilized to produce full size hollow fan blades in which the HIP'ed parts were cambered/twisted/isothermally forged, finish machined, and delivered to Pratt & Whitney Aircraft and NASA for further evaluation.

N82-21197*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group

CF6 JET ENGINE DIAGNOSTICS PROGRAM: PRESSURE COMPRESSOR CLEARANCE INVESTIGATION M. A. Radomski Jan. 1982 48 p. ref

(Contract NAS3-20631)

(NASA-CR-165580; NAS 1.26:165580; R82AE8189) Avail:

NTIS HC A03/MF A01 CSCL 21E

The effects of high pressure compressor clearance changes on engine performance were experimentally determined on a CF6 core engine. The results indicate that a one percent reduction in normalized average clearance, expressed as a fraction of airfoil length, improves compressor efficiency by one percent. Compressor clearances are reduced by the application of rotor bore cooling. insulation of the stator casing, and use of a low coefficient of expansion material in the aft stages. This improvement amounts to a reduction of normalized average clearance of 0.78 percent, relative to CF6-60 compressor, which is equivalent to an improvement in compressor efficiency of 0.78 percent.

NS2-22263*# Cessna Aircraft Co., Wichita, Kans.

ADVANCED GENERAL AVIATION COMPARATIVE ENGINE/ AIRFRAME INTEGRATION STUDY Final Report, Jan. 1980 - Sep. 1981

George L. Huggins and David R. Ellis Sep. 1981 133 p refs (Contract NAS3-22221)

(NASA-CR-165564; NAS 1.26:165564; Cessna-AD-217) Avail:

NTIS HC A07/MF A01 CSCL 21E

The NASA Advanced Aviation Comparative Engine/Airframe Integration Study was initiated to help determine which of four promising concepts for new general aviation engines for the 1990's should be considered for further research funding. The engine concepts included rotary, diesel, spark ignition, and turboprop powerplants: a conventional state-of-the-art piston engine was used as a baseline for the comparison, Computer simulations of the performance of single and twin engine pressurized aircraft designs were used to determine how the various characteristics of each engine interacted in the assign process, Comparisons were made of how each engine performed relative to the others when integrated into an airframe and required Author to fly a transportation mission.

N82-22264*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

ENERGY EFFICIENT ENGINE EXHAUST MIXER MODEL TECHNOLOGY

H. Kozlowski and M. Larkin Jun. 1981 186 p. refs (Contract NAS3-20646)

(NASA-CR-165459; NAS 1.26:165459; PWA-5594-164) Avail:

NTIS HC A09/MF A01 CSCL 21E

An exhaust mixer test program was conducted to define the technology required for the Energy Efficient Engine Program. The model configurations of 1/10 scale were tested in two phases. A parametric study of mixer design options, the impact of residual low pressure turbine swirl, and integration of the mixer with the structural pylon of the nacelle were investigated. The improvement of the mixer itself was also studied. Nozzle performance characteristics were obtained along with exit profiles and oil smear photographs. The sensitivity of nozzle performance to tailpipe length, lobe number, mixer penetration, and mixer modifications like scalloping and cutbacks were established. Residual turbine swirl was found detrimental to exhaust system performance and the low pressure turbine system for Energy Efficient Engine was designed so that no swirl would enter the mixer. The impact of mixer/plug gap was also established, along with importance of scalloping, cutbacks, hoods, and plug angles on high penetration mixers.

> ORIGINAL PAGE IS OF POOR QUALITY

NS2-22265*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Product[®] Div. ADVANCED LOW-EMISSIDMS CATALYTIC-COMBUSTOR PROGRAM, PHASE 1 Final Report G. J. Sturgess Jun. 1981 158 p refs (Contract NAS3-20821) (NASA-CR-159656; NAS 1.26:159656; PWA-5589-19;

ESL-TR-79-23) Avail: NTIS HC A08/MF A01 CSCL 21E

Six catalytic combustor concepts were defined, analyzed, and evaluated. Major design considerations included low emissions, performance, safety, durability, installations, operations and development. On the basis of these considerations the two most promising concepts were selected, Refined analysis and preliminary design work was conducted on these two concepts. The selected concepts were required to fit within the combustor chamber dimensions of the reference engine. This is achieved by using a dump diffuser discharging into a plenum chamber between the compressor discharge and the turbine inlet, with the combustors overlaying the prediffuser and the rear of the compressor. To enhance maintainability, the outer combustor case for each concept is designed to translate forward for accessibility to the catalytic reactor, liners and high pressure turbine area. The catalyth reactor is self-contained with air-cooled canning on a rr lient mounting. Both selected concepts employed integrated engine-starting approaches to raise the catalytic reactor up to operating conditions. Advanced liner schemes are used to minimize required cooling air. The two selected concepts respectively employ fuel-rich initial thormal reaction followed by rapid quench and subsequent fuel-lean catalytic reaction of carbon monoxide, and, fuel-lean thermal reaction of some fuel in a continuously operating pilot combustor with fuel-lean catalytic reaction of remaining fuel in a radially-staged main combustor.

Author

N82-22267*# United Technologies Research Center, East Hartford, Conn.

INVESTIGATION OF SOOT AND CARBON FORMATION IN SMALL GAS TURBINE COMBUSTORS Final Report

T. J. Rosfjord Apr. 1982 54 p refs (Contract NAS3-22524)

(NASA-CR-167853; NAS 1.26:167853;

UTRC-R82-915387-16) Avail: NTIS HC A04/MF A01 CSCL

An investigation of hardware configurations which attempt to minimize carbon and soot-production without sacrificing performance in small gas turbine combustors was conducted. Four fuel injectors, employing either airblast atomization, pressure atomization, or fuel vaporization techniques were combined with nozzle air swirters and injector sheaths. Eight configurations were screened at sea-level takeoff and idle test conditions. Selected configurations were focused upon in an attempt to quantify the influence of combustor pressure, inlet temperature, primary zone operation, and combustor loading on soot and carbon formation. Cycle tests were also performed. It was found that smoke emission levels depended on the combustor fluid mechanics, the atomization quality of the injector and the fuel hydrogen content.

N82-22268*# Beech Aircraft Corp., Wichita, Kans. ADVANCED GENERAL AVIATION ENGINE/AIRFRAME INTEGRATION STUDY

Leon A. Zmroczek Mar. 1982 131 p refs

(Contract NAS3-22220)

(NASA-CR-165565; NAS HC A07/MF A01 CSCL 21E 1.26:165565) Avail: NTIS

A comparison of the in-airframe performance and efficiency of the advanced engine concepts is presented. The results indicate that the proposed advanced engines can significantly improve the performance and economy of general aviation airplanes. The engine found to be most promising is the highly advanced version of a rotary combustion (Wankel) engine. The low weight and fuel consumption of this engine, as well as its small size, make it suited for aircraft use.

N82-23246*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div. COMPUTER MODELING OF FAN-EXIT-SPLITTER SPACING EFFECTS ON F100 RESPONSE TO DISTORTION Final

M. Shaw and R. W. Murdoch Mar. 1982 115 p refs

(Contract NAS3-22739)

(NASA-CR-167879; NAS 1.26:167879; FR-15596) Avail:

NTIS HC A06/MF A01 CSCL 21E

The distortion response of the F100(3) engine was effected by the fan exit splitter configuration. The sensitivity for a proximate splitter fan is calculated to be slightly greater than a remote splitter configuration with identifial sirfoils. Predicted response was based upon a multiple segment parallel compressor Model modified to include a bypass ratio representation that effects the performance characteristics of the last rotor and intermediate case struts. The predicted distortion response required an accurate definition of row pre- and post-stall undistorted operation.

N82-23247*# Notre Dame Univ., Ind. Dept. of Electrical

ALTERNATIVES FOR JET ENGINE CONTROL Technical Progress Report, 1 Oct. 1980 - 30 Sep. 1981

Michael K. Sain 1981 140 p refs

(Grant NsG-3048)

(NASA-CR-168894; NAS 1.26:168894; TPR-12) Avail: NTIS

HC A07/MF A01 CSCL 21E

Research centered on basic topics in the modeling and feedback control of nonlinear dynamical systems is reported. Of special interest were the following topics: (1) the role of series descriptions, especially insofar as they relate to questions of scheduling, in the control of gas turbine engines; (2) the use of algebraic tensor theory as a technique for parameterizing such descriptions; (3) the relationship between tensor methodology and other parts of the nonlinear literature; (4) the improvement of interactive methods for parameter selection within a tensor viewpoint; and (5) study of feedback gain representation as a counterpart to these modeling and parameterization ideas.

Author

/482-23248* Fratt and Whitney Aircraft Group, East Hartford,

ANALYSIS OF HIGH LOAD DAMPERS Final Report S. T. Bhat, D. F. Buono, and D. H. Hibner 21 Aug. 1981 79 p refs

(Contract NAS3-22518)

(NASA-CR-165503; NAS 1.26:165503; PWA-5779-10) Avail:

NTIS HC A05/MF A01 CSCL 21E

High load damping requirements for modern jet engines are discussed. The design of damping systems which could satisfy these requirements is also discusseed. In order to evaluate high load damping requirements, engines in three major classes were studied; large transport engines, small general aviation engines, and military engines. Four damper concepts applicable to these engines were evaluated; multi-ring, cartridge, curved beam, and viscous/friction. The most promising damper concept was selected for each engine and performance was assessed relative to conventional dampers and in light of projected damping requirements for advanced jet engines. B.W.

N82-24202*# Garrett Turbine Engine Co., Phoenix, Ariz. STUDY OF ADVANCED PROPULSION SYSTEMS FOR SMALL TRANSPORT AIRCRAFT TECHNOLOGY (STAT) PROGRAM Final Report

C. F. Baerst, R. W. Heldenbrand, and J. H. Rowse, Mar. 1981 119:p refs

(Contract NAS3-21997)

(NASA-CR-165610; NAS 1,26:165510; Garrett-21-3911) Avail;

NTIS HC A06/MF A01 CSCL 21E

Definitions of takeoff gross weight, performance, and direct operating cost for both a 30 and 50 passenger airplane were established. The results indicate that a potential direct operating cost benefit, resulting from advanced technologies, of approximately 20 percent would be achieved for the 1990 engines. Of the numerous design features that were evaluated, only maintenance-related items contributed to a significant decrease in direct operating cost. Recommendations are made to continue research and technology programs for advanced component and engine develoment.

N62-25252*# Pennsylvania State Univ., University Park. Lab. of Turbomachinery.

THREE DIMENSIONAL MEAN VELOCITY AND TURBU-LENCE CHARACTERISTICS IN THE ANNULUS WALL REGION OF AN AXIAL FLOW COMPRESSOR ROTOR PASSAGE

R. Davino and B. Lakshminarayana May 1982 262 p rafs (Grant NsG-3212)

(NASA-CR-189003: NAS 1.26:169003: PSU/TURBO-82-2) Aveil: NTIS HC A12/MF A01 CSCL 21E

The experiment was performed using the rotating hot-wire technique within the rotor blade passage and the stationary hot-wire technique for the exitficw of the rotor blade passage. The measurements reveal the effect of rotation and subapquent flow interactions upon the rator blade flowfield and wake development in the annulus-wall region. The flow near the rotor blade tips is found to be highly complex due to the interaction of the annulus-wall boundary l/yer, the blade boundary layers, the tip leakage flow, and the secondary flow. Within the blade pessage, this interaction results in an appreciable radial inward flow as well as a defect in the mainstream velocity near the mid-passage. Turbulence levels within this region are very #gh. This indicates a considerable extent of flow mixing due to the viscous flow interactions. The size and strength of this loss core is found to grow with axial distance from the blade trailing edge. The nature of the rotor blade exit-flow was dominated by the wake development.

N82-25253*# Pennsylvania State Univ., University Park. Lab. of Turbomachinery.

INVESTIGATION OF THE TIP CLEARANCE FLOW INSIDE AND AT THE EXIT OF A COMPRESSOR ROTOR PAS-SAGE

A. Pandya and B. Lakshminarayana May 1982 147 p rafs (Grant NsG-3212)

(NASA-CR-169004; NAS 1.26:169004; PSU/TURBO-82-3) Avail: NTIS HC A07/MF A01 CSCL 21E

The nature of the tip clearance flow in a moderately loaded compressor rotor is studied. The measurements were taken inside the clearance between the annulus-wall casing and the rotor blade tip. These measurements were obtained using a stationary two-sensor hot-wire probe in combination with an ensemble averaging technique. The flowfield was surveyed at various radial locations and at ten axial locations, four of which were inside the blade passage in the clearance region and the remaining six outside the passage. Variations of the mean flow properties in the tangential and the radial directions at various axial locations were derived from the data, Variation of the leakage velocity at different axial stations and the annulus-wall boundary layer profiles from passage-averaged mean velocities were also estimated.

N82-25254*# General Electric Co., Evendale, Ohio. Materials and Processes Technology Labs.

COST/BENEFIT STUDIES OF ADVANCED MATERIALS TECHNOLOGIES FOR FUTURE AIRCRAFT TURBINE ENGINES: MATERIALS FOR ADVANCED TURBINE ENGINES

M. Stearns and L. Wilbers May 1982 49 p (Contract NAS3-20074)

(NASA-CR-167849; NAS 1,26:167849) NTIS

HC A03/MF A01 CSCL 21E

Cost benefit studies were conducted on six advanced materials and processes technologies applicable to commercial engines planned for production in the 1985 to 1990 time frame. These technologies consisted of thermal barrier coatings for combustor and high pressure turbine airfoils, directionally solidified eutectic high pressure turbine blades, (both cast and fabricated), and mixers, tail cones, and piping made of titanium-aluminum alloys. A fabricated titanium fan blisk, an advanced turbine disk alloy with improved low cycle fatigue life, and a long-life high pressure turbine blade abrasive tip and ceramic shroud system were also analyzed. Technologies showing considerable promise as to benefits, low development costs, and high probability of success were thermal barrier coating, directionally solidified eutectic turbine blades, and abrasive-tip blades/ceramic-shroud turbine systems. R.J.F.

NS2-25257*# United Technologies Corp., East Hartford, Conn. Commercial Products Div.

FRACTURE MECHANICS CRITERIA FOR TURBINE ENGINE HOT SECTION COMPONENTS Final Report

G. J. Meyers May 1982 123 p refs (Contract NAS3-22550)

(NASA-CR-167896; NAS 1,26,167896; PWA-5772-23) Avail:

NTIS HC A06/MF A01 CSCL 21E

The application of several fracture mechanics data correlation parameters to pradicting the crack propagation life of turbine engine hot section components was evaluated. An engine survey was conducted to determine the locations where conventional fracture mechanics approaches may not be adequate to characterize cracking behavior. Both linear and nonlinear fracture mechanics analyses of a cracked annular combustor liner configuration were performed. Isothermal and variable temperature crack propagation tests were performed on Hastelloy X combustor liner material. The crack growth data was reduced using the stress intensity factor, the strain intensity factor, the J integral, crack opening displacement, and Tomkins' model. The parameter which showed the most effectiveness in correlation high temperature and variable temperature Hastelloy X crack growth data was crack opening displacement.

N82-26295*# Pennsylvania State Univ. University Park INVESTIGATION OF SPRAY CHARACTERISTICS FOR FLASHING INJECTION OF FUELS CONTAINING DIS-SOLVED AIR AND SUPERHEATED EUELS Final Report, 1 Aug. 1980 - 31 Aug. 1981

S. P. Solomon, L. D. Chen, and G. M. Faeth. Washington NASA Jun. 1982 90 p refs

(Grant NsG-3306)

NAS NTIS (NASA-CR-3563: 1 26:3563) Avail:

HC A05/MF A01 CSCL 21E

The flow, atomization and spreading of flashing injector flowing liquids containing dissolved gases (jet/air) as well as superheated liquids (Freon II) were considered. The use of a two stage expansion process separated by an expansion chamber. ws found to be baneficial for flashing injection particularly for dissolved gas systems. Both locally homogeneous and separated flow models provided good predictions of injector flow properties. Conventional correlations for drop sizes from pressure atomized and airblast injectors were successfully modified, using the separated flow model to prescribe injector exit conditions, to correlate drop size measurements. Additional experimental results are provided for spray angle and combustion properties of sprays from flashing injectors

N82-27309* Pratt and Whitney Aircraft Group, East Hartford,

PERFORMANCE DETERIORATION DUE TO ACCEPTANCE TESTING AND FLIGHT LOADS; JT90 JET ENGINE DIAG-**NOSTIC PROGRAM**

W. J. Olsson 22 Jan. 1982 147 p refs

(Contract NAS3-20632)

(NASA-CR-165572; NAS 1,26:165572; PWA-5512-87) Avail:

NTIS HC A07/MF A01 CSCL 21E

The results of a flight loads test of the JT9D-7 engine are presented. The goals of this test program were to: measure aerodynamic and inertia loads on the engine during flight, explore the effects of airplane gross weight and typical maneuvers on these flight loads, simultaneously measure the changes in engine running clearances and performance resulting from the maneuvers, make refinements of engine performance deterioration prediction models based on analytical results of the tests, and make recommendations to improve propulsion system performance retention. The test program included a typical production airplane acceptance test plus additional flights and maneuvers to encompass the range of flight loads in revenue service; The test results indicated that aerodynamic loads, primarily at take-off, were the major cause of rub-indicated that aerodynamic loads, primarily at take-off, were the major cause of rub-induced deterioration in the cold section of the engine Differential thermal expansion between rotating and static parts plus aerodynamic toads combined to cause blade-to-seal rubs in the turbine. B.W.

> ORIGINAL PAGE OF POOR QUALITY

N82-27310*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group. CORE COMPRESSOR EXIT STAGE STUDY, VOLUME & Final Report, Oct. 1976 - Dec. 1981 D. C. Wisler Dec. 1981 97 p refs (Contract NAS3-20070)

(NASA-CR-165554; NAS 1.26; 165554; GE-R81AEG288) Avail: NTIS HC A05/MF A01 CSCL 21E

Rear stage blading designs that have lower losses in their endwall boundary layer regions webs studied. A baseline Stage A was designed as a low-spend model of stage 7 of a 10-stage compressor. Candidate rotors and stators were designed which have the potential of reducing endwall lossus relative to the baseline. Rotor B uses a type of meanline in the tip region that unloads the leading edge and loads the trailing edge relative to the baseline rotor A designs. Rotor C incorporates a more skewed (hub strong) radial distribution of total pressure and smoother distribution of static pressure on the rotor tip than those of rotor B. Candidate stator B embodies twist gradients in the endwall region. Stator C embodies sirfoil sections near the

endwalls that have reduced trailing edge loading relative to stator A. The baseline and candidate bladings were tested using four identical stages to produce a true multistage environment. Single-stage tests were also conducted. The test data were analyzed and performances were compared. Several of the candidate configurations showed a performance improvement A.R.H. relative to the baseline

N82-27316*# Naval Air Propulsion Test Center, Trenton, N.J. Propulsion Technology and Project Engineering Dept. NOTOR FRAGMENT PROTECTION PROGRAM: TICS ON AIRCRAFT GAS TURBINE NGINE ROTOR FAILURES THAT OCCURRED IN U.S. COMMERCIAL AVIATION DURING 1978 Final Report, 1977 - 1978 R. A. DeLucia and J. T. Salvino Sep. 1981 30 p. (NASA Order C-41581-B)

(NASA-CR-165388; NAS 1.26:165388; AD-A113767; NAPC-PE-23) Avail: NTIS HC A03/MF A01 CSCL 21/5

This report presents statistical information relating to the number of gas turbine engine rotor failures which occurred in commercial aviation service use. The predominant failure involved blade fragments, 82.4 percent of which were contained. Although fewer rotor rim, disk, and seal failures occurred, 33.3%, 100% and 50% respectively were uncontained. Sixty-five percent of the 16% revior failures occurred during the takeoff and climb stages of flight. Author (GRA)

N82-28296*# Pratt and Whitney Aircraft Group, East Hartford, Commercial Products Div

B747/JT9D FLIGHT LOADS AND THEIR EFFECT ON ENGINE RUNNING CLEARANCES AND PERFORMANCE DETERIORATION; BCAC NAIL/P AND WA JT9D ENGINE DIAGNOSTICS PROGRAMS

W. J. Olsson and R. L. Martin 19 Feb. 1982 74 p. refs Prepared in cooperation with Boeing Commercial Airplane Co.,

(Contracts NAS3-20632; NAS1-15325)

(NASA-CR-165573; NAS 1.26:165573; PWA-5512-88) Avail:

NTIS HC A04/MF A01 CSCL 21E

Flight loads on the 747 propulsion system and resulting JT9D blade to outer airseal running clearances during representative acceptance flight and revenue flight sequences were measured. The resulting rub induced clearance changes, and engine performance changes were then analyzed to validate and refine the JT9D-7A short term performance deterioration model. Author

N82-28297*# General Electric Co., Cincinnati, Ohio. Engine Group

CF6 JET ENGINE PERFORMANCE IMPROVEMENT: HIGH PRESSURE TURBINE ACTIVE CLEARANCE CONTROL

S. E. Rich and W. A. Fasching Jun. 1982 136 p refs (Contract NAS3-20629)

(NASA-CR-165556; NAS 1.26:165556; R82AEB198) NTIS HC A07/MF A01 CSCL 21E

An active clearance control system was developed which reduces fuel consumption and performance degradation. This system utilizes compressor discharge air during takeoff and fan discharge air during cruise to impinge on the shroud structure to improve the thermal response. The system was evaluated in component and engine tests, The test results demonstrated a performance improvement of 0.7 percent in cruise SFC. S.I.

N82-29323* Teledyne CAE, Toledo, Ohio.
COOLED VARIABLE NOZZLE RADIAL TURBINE FOR
ROTOR CRAFT APPLICATIONS

C. Rogo Mar 1981 205 p refs (Contract NAS3-22005; DA Proj. 1L1-62209-AH-76) (NASA-CR-165397; NAS 1,26:165397; Rept-1759) Avail: NTIS HC A10/MF A01 CSCL 21E

An advanced, small 2.27 kb/sec (5 lbs/sec), high temperature, variable area radial turbine was studied for a rotor craft application. Variable capacity cycles including single-shaft and free-turbine engine configurations were analyzed to define an optimum engine design configuration. Parametric optimizations were made on cooled and uncooled rotor configurations. A detailed structural and heat transfer analysis was conducted to provide a 4000-hour life HP turbine with material properties of the 1988 time frame. A pivoted vane and a moveable adewall geometry were analyzed. Cooling and variable geometry penalties were included in the cycle analysis. A variable geometry free-turbine engine configuration with a design 1477 K (2200 F) inlet temperature and a compressor pressure ratio of 16.1 was selected. An uncooled HP radial turbine rotor with a moveable sidewall nozzle showed the highest performance potential for a time weighted duty cycle

N82-31328*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.

DEVELOPMENT OF A SPINNING WAVE HEAT ENGINE Final Report

B. T. Zinn, E. A. Powell, and J. E. Hubbartt Aug. 1982 100 p refs

(Grant NAG3-96)

the cavity.

(NASA-CR-165611; NAS 1.26;165611) Avail: NTIS HC A05/MF A01 CSCL 21E

A theoretical analysis and an experimental investigation were conducted to assess the feasibility of developing a spinning wave heat engine. Such as engine would utilize a large amplitude traveling acoustic wave rotating around a cylindrical chamber, and it should not suffer from the inefficiency, noise, and intermittent thrust which characterizes pulse jet engines. The objective of this investigation was to determine whether an artificially driven large amplitude spinning transverse wave could induce a steady flow of air through the combustion chamber under cold flow conditions. In the theoretical analysis the Masleri and Moore perturbation technique was extended to study flat cylinders (pancake geometry) with completely open side walls and a central opening. In the parallel experimental study, a test moel was used to determine resonant frequencies and radial pressure distributions, as well as oscillatory and steady flow velocities at the inner and outer peripheries. The experimental frequency was nearly the same as the theoretical acoustic value for a model of the same outer diameter but without a central hole. Although the theoretical analysis did not predict a steady velocity component, simultaneous measurements of hotwire and microphone responses have shown that the spinning wave pumps a mean flow radially outward through

N82-32367*# Avco Lycoming Div., Stratford, Conn.
SMALL AXIAL TURBINE STATOR TECHNOLOGY PROGRAM
Final Report

W. Brockett and A. Kozak Apr. 1982 89 p refs (Contract NAS3-22109; DA Proj. 1L1-62209-AH-76) (NASA-CR-165602; NAS 1,26:165602; LYC-82-15) Avail: NTIS HC A05/MF A01 CSCL 21E

An experimental investigation was conducted to determine the effects of surface finish, fillet radius, inlet boundary layer thickness, and free-stream inlet turbulence level on the aerodynamic performance of a small axial flow turbine stator. The principal objective of this program was to help understand why large turbine efficiency is not maintained when a large turbine is scaled to a smaller size.

The stator used in this program as a one-sixth scale of a 762 mm (30 in.) diameter stator design with 50 vanes having a vane height of 17 mm (0.666 in.) and an aspect ratio of 1.77. A comprehensive overall test matrix was used to provide a complete engineering understanding of the effects of each variable over the full range of all the other variables. The range of each variable investigated was as follows: surface finish 0.1 micro (4 micro in.) to 2.4 micro (95 micro in.); boundary layer thickness 2 to 25 percent of channel height at each wall; fillet radius 0 mm (0 in.) to 1.0 mm (.040 in.) and turbulence 2 to 12 percent.

N82-32370*# Lockheed-Georgia Co., Marietta.

ADVANCED TURBOPROP TESTBED SYSTEMS STUDY. VOL-UME 1: TESTBED PROGRAM OBJECTIVES AND PRIORITIES, DRIVE SYSTEM AND AIRCRAFT DESIGN STUDIES, EVALUA-TION AND RECOMMENDATIONS AND WIND TUNNEL TEST PLANS

E. S. Bradley, B. H. Little, W. Warnock, C. M. Jenness, J. M. Wilson, C. W. Powell, and L. Shoaf Cleveland, Ohio NASA. Lewis Research Center Jul. 1982 368 p refs 2 Vol. (Contract NAS3-22346)

(NASA-CR-167928-Vol-1; NAS 1,26:167928-Vol-1;

LG81ER0202-Vol-1) Avail: NTIS HC A16/MF A01 CSCL 21E

The establishment of propfan technology readiness was determined and candidate drive systems for propfan application were identified. Candidate testbed aircraft were investigated for testbed aircraft suitability and four aircraft selected as possible propfan testbed vehicles. An evaluation of the four candidates was performed and the Boeing KC-135A and the Gulfstream American Gulfstream II recommended as the most suitable aircraft for test application, Conceptual designs of the two recommended aircraft were performed and cost and schedule data for the entire testbed program were generated. The program total cost was estimated and a wind tunnel program cost and schedule is generated in support of the testbed program.

N82-33390*# Akron Univ., Oido. Dept. of Mechanical and Civil Engineering.

ENGINE DYNAMIC ANALYSIS WITH GENERAL NONLINEAR FINITE ELEMENT CODES. PART 2: BEARING ELEMENT IMPLEMENTATION OVERALL NUMERICAL CHARACTERISTICS AND BENCHMAKING

J. Padovan, M. Adams, J. Fertis, I. Zeid, and P. Lam Oct. 1982 229 p refs

(Grant NsG-3283)

(NASA-CR-167944; NAS 1.26:167944) Avail: NTIS HC A11/MF A01 CSCL 21E

Finite element codes are used in modelling rotor-bearing-stator structure common to the turbine industry. Engine dynamic simulation is used by developing strategies which enable the use of available finite element codes, benchmarking the elements developed are benchmarked by incorporation into a general purpose code (ADINA); the numerical characteristics of finite element type rotor-bearing-stator simulations are evaluated through the use of various types of explicit/implicit numerical integration operators. Improving the overall numerical efficiency of the procedure is improved.

S.L.

N82-33391*# Pratt and Whitney Aircraft Group, East Hartford, Corin. Commercial Products Div.

STRUCTURAL TAILORING OF ENGINE BLADES (STAEBL) Interim Report

C. E. Platt, T. K. Pratt, and K. W. Brown Jun. 1982 359 p refs (Contract NAS3-22525)

(NASA-CR-167949; NAS 1.26:167949; PWA-5774-21) Avail: NTIS HC A16/MF A01 CSCL 21E

A mathematical optimization procedure was developed for the structural tailoring of engine blades and was used to structurally tailor two engine fan blades constructed of composite materials without midspan shrouds. The first was a solid blade made from superhybrid composites, and the second was a hollow blade with

metal matrix composite inlays. Three major computerized functions were needed to complete the procedure; approximate analysis with the established input variables, optimization of an objective function, and refined analysis for design verification.

N82-33392*# Teledyne Continental Motors, Mobile, Ala. Aircraft Products Div.

EXHAUST EMISSIONS REDUCTION FOR INTERMITTENT COM-BUSTION AIRCRAFT ENGINES Final Report

Bernard J. Rezy, Kenneth J. Stuckas, J. Ronald Tucker, and Jay E. Meyers May 1982 55 p reis

(Contract NAS3-19755)

(NASA-CR-167914; NAS NTIS 1.26;167914) Avail:

HC A04/MF A01 CSCL 21E

Three concepts which, to an aircraft piston engine, provide reductions in exhaust emissions of hydrocarbons and carbon monoxide while simultaneously improving fuel economy. The three chosen concepts, (1) an improved fuel injection system, (2) an improved cooling cylinder head, and (3) exhaust air injection, when combined, show a synergistic relationship in achieving these goals. In addition, the benefits of variable ignition timing were explored and both dynamometer and flight testing of the final engine configuration were accomplished.

N82-33393*# General Electric Co., Cincinnati, Ohio, Aircraft Engine Group.

THE CF6 JET ENGINE PERFORMANCE IMPROVEMENT: LOW PRESSURE TURBINE ACTIVE CLEARANCE CONTROL

B. D. Beck and W. A. Fasching Jun. 1982 159 p refs (Contract NAS3-20629)

(NASA-CR-165557; NAS 1.26:165557; R82AEB462) Avail: NTIS HC A08/MF A01 CSCL 21E

A low pressure turbine (LPT) active clearance control (ACC) cooling system was developed to reduce the fuel consumption of current CF6-50 turbofan engines for wide bodied commercial aircraft. The program performance improvement goal of 0.3% delta sfc was determined to be achievable with an improved impingement cooling system. The technology enables the design of an optimized manifold and piping system which is capable of a performance gain of 0.45% delta sfc.

N82-33394*# Pratt and Whitney Aircraft Group, East Hartford,

Conn. Commercial Products Div.

ENERGY EFFICIENT ENGINE: TURBINE TRANSITION DUCT MODEL TECHNOLOGY REPORT

K. Loach and R. Thurlin Aug. 1982 113 p refs (Contract NAS3-20646)

(NASA-CR-167996; NAS 1.26:167996; PWA-5594-215) Avail: NTIS HC A06/MF A01 CSCL 21E

The Low-Pressure Turbine Transition Duct Model Technology Program was directed toward substantiating the aerodynamic definition of a turbine transition duct for the Energy Efficient Engine. This effort was successful in demonstrating an aerodynamically viable compact duct geometry and the performance benefits associated with a low camber low-pressure turbine inlet guide vane. The transition duct design for the flight propulsion system was tested and the pressure loss goal of 0.7 percent was verified. Also, strut fairing pressure distributions, as well as wall pressure coefficients, were in close agreement with analytical predictions. Duct modification's for the integrated core/low spool were also evaluated. The total pressure loss was 1.59 percent. Although the increase in exit area in this design produced higher wall loadings, reflecting a more aggressive aerodynamic design, pressure profiles showed no evidence of flow separation. Overall, the results acquired have provided pertinent design and diagnostic information for the design of a turbine transition duct for both the flight propulsion system and the integrated core/low spool. J.M.S.

> ORIGINAL PAGE IS OF POOR QUALITY

A82-10457 * # Effects of vane/blade ratio and specing on fan noise. R. A. Kantola (General Electric Co., Power Generation Group, Lynn, MA) and P. R. Gliebe (General Electric Co., Aircraft Engine Group, Cincinnati, Oki, American Institute of Aeronautics and Astronautics, Aeroacoustics Conference, 7th, Palo Alto, CA, Oct. 5-7, 1981, Paper 81-2033. 16 p. 11 refs. Contract No. NAS3-22062.

The effects of vane/blade ratio and spacing on fan noise are investigated to develop a fan noise prediction scheme which is calibrated against experimental data. A 44 blade, 0.504 diameter fan is used to demonstrate the production of fan noise data free from excess noise caused by rotor turbulence interaction. Two stator sets consisting of a cut-off set with 86 vanes, and a cut-on set of 48 vanes are used, with a total range of spacing from 0,5 to 2,3 rotor chords. The model includes viscous wake interaction noise and the potential field interactions of both the rotor and stator. A free-field acoustic environment is achieved by covering the walls, ceiling and floor with 0.7 m polyurethane foam wedges, providing less than + or - 1 dB standing wave ratio at 200 Hz, Only a 3 dB drop in tone level occurs as the spacing is increased from 0.5 to 2.3 rotor chords, and results indicate that the rotor wakes impinging on the stator vanes are the principal noise source for subsonic rotor speeds.

A82-11999 * # Thermal expansion accommodation in a jet engine frame, M. H. Schneider (General Electric Co., Cincinnati, OH), (American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Houston, TX, Mar. 9-12, 1981.) ASME Transactions, Journal of Engineering for Power, vol. 103, Oct. 1981, p. 776-780, Contract No. NAS3-20643,

Design advancements to enhance stress accommodation in gas turbine engine frames are described. Consideration is given to mechanical stiffness to maintain an adequate spring rate, and to thermal stresses in both ambient and transient modes. Noting that thermal stresses occur due to differing temperatures at different parts of the frame, the matching of the thermal expansion rates of different structural materials is emphasized. Adequate stiffness is necessary to avoid dynamic reactions leading to case cracking as a result of normal imbalances of moving parts. Stress and deflection analysis of a total frame concept using a three-dimensional finite element stress analysis computer program, with modelling of all frame components, is presented, and illustrations are provided.

On the prediction of swirling flowfields found A82-12120 * # in axisymmetric combustor geometries. D. L. Rhode, D. G. Lilley, and D. K. McLaughlin (Oklahoma State University, Stillwater, OK). in: Fluid mechanics of combustion systems; Proceedings of the Fluids Engineering Conference, Boulder, CO, June 22, 23, 1981. (A82-12101 02-34) New York, American Society of Mechanical Engineers, 1981, p. 257-266, 32 refs. Grant No. NAG3-74.

The paper reports research restricted to steady turbulence flow in axisymmetric geometries under low speed and nonreacting conditions, Numerical computations are performed for a basic two-dingensional axisymmetrical flow field similar to that found in a conventional gas turbine combustor. Calculations include a stairstep boundary representation of the expansion flow, a conventional k-epsilon turbulence model and realistic accomodation of swirl effects. A preliminary evaluation of the accuracy of computed flowfields is accomplished by comparisons with flow visualizations using neutrally-buoyant helium-filled soap bubbles as tracer particles. Comparisons of calculated results show good agreement, and it is found that a problem in swirling flows is the accuracy with which the sizes and shapes of the recirculation zones may be predicted, which may be attributed to the quality of the turbulence model.

A82-16909 * # V/STOL propulsion control technology. H. Brown (General Electric Co., Cincinnati, OH). American Institute of Aeronautics and Astronautics and NASA Ames Research Center, V/STOL Conference, Palo Alto, CA, Dec. 7-9, 1981, AIAA Paper 81-2634. 10 p. Contract No. NAS3-22057.

Results of a NASA sponsored study of V/STOL Propulsion Control Analysis are presented. The study involved propulsion control requirements, design concepts and procedures, and control designs for supersonic V/STOL. A variable cycle engine with a remote augmented lift system was used as a basis for establishing typical operating requirements and control concepts, and a nonlinear engine model was developed for control development as a precursor to a real-time simulation capability. A simplified aircraft model was also used to investigate transition requirements, and a long-range technology plan was developed to define subsequent program requirements for achieving a real-time piloted simulation capability.

A82-17788 # A simple finite difference procedure for the vortex controlled diffuser. A. A. Busnaina and D. G. Lilley (Oklahoma State University, Stillwater, OK). American Institute of Aeronautics and Astronautics, Aeronauce Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0109, 9 p. 21 refs. USAF-supported research; Grant No. NAG3-74.

A simple prediction procedure for sudden expansion incompressible flows is developed and applied to the vortex controlled diffuser. Transient Navier-Stokes equations of an incompressible fluid are solved by means of their associated finite difference equations in terms of the primitive pressure velocity variables. A computer code is developed using a laminar flow simulation with free stip or no slip wall boundary conditions. In addition, pradicted results confirm that effectiveness increases with increases in duct length and bleed flow rate.

D.L.G.

A82-17796 * # An iterative finite element-integral technique for predicting sound radiation from turbofan inlets in steady flight. S. J. Horowitz, R. K. Sigman, and B. T. Zinn (Georgia Institute of Technology, Atlanta, GA). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0124. 9 p. 23 refs. Grant No. NsG-3036.

A new iterative solution technique for predicting the sound field radiated from a turbofan inlet in steady flight is presented. The sound field is divided into two regions: the sound field within and near the inlet which is computed using the finite element method and the radiation field beyond the inlet which is calculated using an integral solution technique. A continuous solution is obtained by matching the finite element and integral solutions at the interface between the two regions. The applicability of the iterative technique is demonstrated by comparison of experimental results with the theoretical results for several different inlet configurations with and without flow. These examples show that good agreement between experiment and theory is obtained within five iterations. (Author)

A82-17836 * # Water ingestion into jet engine axial compressors. T. Tsuchiya and S. N. B. Murthy (Purdue University, West Lafayette, IN). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 21-14, 1982, Paper 82-0196. 11 p. 14 refs. Contract No. F33615-78-C-2401; Grant No. NAG3-62.

An axial flow compressor has been tested with water droplet ingestion under a variety of conditions. The results illustrate the manner in which the compressor pressure ratio, efficiency and surging characteristics are affected. A model for estimating the performance of a compressor during water ingestion has been developed and the predictions obtained compare favorably with the test results. It is then shown that with respect to five droplet-associated nonlinearly-interacting processes (namely, droplet-blade interactions, blade performance changes, centrifugal action, heat and mass transfer processes and droplet break-up), the initial water content and centrifugal action play the most dominant roles.

(Author)

A82-34982 * # Blade loss transient dynamic analysis of turbomachinery, M. J. Stallone, V. Gallardo, A. F. Storace, L. J. Bach, G. Black, and E. F. Gaffney (General Electric Co., Cincinnati, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1057, 8 p. Contract No. NAS3-22053.

This paper reports on work completed to develop an analytical method for predicting the transient non-linear response of a complete aircraft engine system due to the loss of a fan blade, and to validate the analysis by comparing the results against actual blade loss test data. The solution, which is based on the

component element method, accounts for rotor-to-casing rubs, high damping and rapid deceleration rates associated with the blade loss event. A comparison of test results and predicted response show good agreement except for an initial overshoot spike not observed in test. The method is effective for analysis of large systems. (Author)

A82-35091 * # A comprehensive method for preliminary design optimization of axial gas turbine stages. R. M. Jenkins (Tuskegee Institute, Tuskegee, AL). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1264, 11 p. 15 refs. Grant No. NsG-3295.

A method is presented that performs a rapid, reasonably accurate preliminary pitchline optimization of axial gas turbine annular flowpath geometry, as well as an initial estimate of blade profile shapes, given only a minimum of theirmodynamic cycle requirements. No geometric parametrirs need be specified. The following preliminary design data are determined; (1) the optimum flowpath geometry, within mechanical stress limits; (2) Initial estimates of cascade blade shapes; (3) predictions of expected turbine performance. The method uses an inverse calculation technique whereby blade profiles are generated by designing channels to yield a specified velocity distribution on the two walls. Velocity distributions are then used to calculate the cascade loss parameters. Calculated blade shapes are used primarily to determine whether the assumed velocity loadings are physically realistic. Model verification is accomplished by comparison of predicted turbine geometry and performance with four existing single stage turbines.

C.D.

A82-35384 * # The influence of Coriolis forces on gyroscopic motion of spinning blades. F. Sisto, A. Chang, and M. Sutcu (Stevens Institute of Technology, Hoboken, NJ). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 88-GT-163. 6 p. 5 refs. Members, \$2.00; nonmembers, \$4.00, Grant No. NAG3-47.

Turbomachine blades on spinning and precessing rotors experience gyroscopically induced instabilities and forcing. With vehicle-mounted turbomachines, either constant or harmonic precession occurs, depending on vehicle or moution. Responses of uniform cantilever beams at arbitrary stagger, subjected to the noted rotor motion, are predicted in both self-excited and forced-excitation modes taking into account Coriolis acceleration. (Author)

A82-35450 * # Progress in the development of energy efficient engine components. R. W. Bucy (General Electric Co., Cincinnati, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-275. 7 p. 8 refs. Members, \$2.00; nonmembers, \$4.00. Contract No, NAS3-20643.

Component test results are presented for the NASA Energy Efficient Engine program, whose design goals relative to the CF6-50C reference engine include a 12% reduction in specific fuel consumption, 5% reduction in direct operating costs, and 50% reduction in specific fuel consumption deterioration rate over the course of commercial service. Emphasis is placed on the engine's high pressure compressor, which has a design pressure ratio of 23:1, and has completed a series of component tests whose resulting configuration is expected to meet all major objectives of the program. Descriptions are given of the core engine and integrated core/low spool tests, and system test benefits are discussed. Attention is given to the design features of the engine's double annular combustor, high and low pressure air turbines, and scale model exhaust mixer.

O.C.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also 14 Ground Support

Systems and Facilities (Space).

N82-(922)*# National Aeronautics and Space Administration. Lewis Reszarch Center, Cleveland, Ohio.
THE AEROSPACE TECHNOLOGY LABORATORY (A

PERSPECTIVE, THEN AND NOW)

James F. Connors and Robert G. Hoffman Feb. 1982 21 p

(NASA-TM-82754; E-1070) Avail: NTIS HC A02/MF A01

CSCL 14B

The physical changes that have taken place in aerospace facilities since the Wright brothers' accomplishment 78 years ago are highlighted. For illustrative purposes some of the technical facilities and operations of the NASA Lewis Research Center are described. These simulation facilities were designed to support research and technology studies in aerospace propulsion. Author

N82-32383*# Pratt and Whitney Aircraft Group, East Hartford, Energy Efficient Engine Component Development and Integration Program.

ENERGY EFFICIENT ENGINE: HIGH PRESSURE TURBINE

UNCOOLED RIG TECHNOLOGY REPORT W. B. Gardner Oct. 1979 242 p refs

(Contract NAS3-20646)

(NASA-CR-165149; NAS 1.26:165149; PWA-5594-92) Avail: NTIS

HC A11/MF A01 CSCL 14B

Results obtained from testing five performance builds (three vane cascades and two rotating rigs of the Energy Efficient Engine uncooled rig have established the uncooled aerodynamic efficiency of the high-pressure turbine at 91,1 percent. This efficiency level was attained by increasing the rim speed and annulus area (AN(2)), and by increasing the turbine reaction level. The increase in AN(2) resulted in a performance improvement of 1.15 percent. At the design point pressure ratio, the increased reaction level rig demonstrated an efficiency of 91.1 percent. The results of this program have verified the aerodynamic design assumptions established for the Energy Efficient Engine high-pressure turbine component.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

Neg.-26336*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

MATERIAL AND PROCESSING NEEDS FOR SILICON SOLAR CELLS IN SPACE

Henry W. Brandhorst, Jr. In NASA. Marshall Space Flight Center Float Zone Workshop Sep. 1981 p 33-41 (For primary document see N82-26330 17-12) Avail: NT(S HC A10/MF A01 CSCL 22A

The technical concerns of NASA in the area of space grade solar cells are summarized. Solar power needs are projected through 1987. The degradation of solar cell performance due to the effects of radiation on impurities and crystal defects and the improved performance of float zone silicon are illustrated. The reduction of oxygen and carbon in float zone silicon allows for much faster low temperature annealing of the defects. The effects of improved crystal purity on cell performance are summarized.

A82-35817 * # A small scale lunar launcher for early lunar material utilization, W. R. Snow, J. A. Kubby, and R. S. Dunbar (Princeton University, Princeton, NJ). In: Space manufacturing 4; Proceedings of the Fifth Conference, Princeton, NJ, May 18-21, 1981. (A82-35601 17-12) New York, American Institute of Aeronautics and Astronautics, 1981, p. 157-171, 12 refs. Grant No. NSG-3176

A system for the launching of lunar derived oxygen or raw materials into low lunar tribit or to L2 for transfer to low earth orbit is presented. The system described is a greatly simplified version of the conventional and sophisticated approach suggested by O'Neill using mass drivers with recirculating buckets. An electromagnetic accelerator is located on the lunar surface which launches 125 kg 'smart' containers of liquid oxygen or raw materials into a transfer orbit. Upon reaching apolune a kick motor is fired to circularize the orbit at 100 km altitude or L2. These containers are collected and their payloads transferred to a tanker OTV. The empty containers then have their kick motors refurbished and then are returned to the launcher site on the lunar surface for reuse. Initial launch capability is designed for about 500T of liquid oxygen delivered to low earth orbit per year with upgrading to higher levels, delivery of lunar soil for shielding, or raw materials for processing given the demand. (Author)

A82-35618 * The supply of lunar oxygen to low earth orbit. D. G. Andrews (Boeing Co., Seattle, WA) and W. R. Snow (Princeton University, Princeton, NJ). In: Space manufacturing 4; Proceedings of the Fifth Conference, Princeton, NJ, May 18-21, 1981. (A82-35601 17-12) New York, American institute of Aeronautics and Astronautics, 1981, p. 173-179, Grant No. NsG-3176.

Since oxygen makes up 86% of the total mass of propellants which would normally have been brought up from the earth to LEO, considerable savings are available if this oxygen can be obtained from the moon for little Delta-V penalty. This paper presents a scenario in which 400 T/yr of LOX is delivered to LEO, with the ability for upgrading to 5000 T/yr. In this scenario, cylindrical tanks of liquid oxygen with a mass of 500 kg are launched from the lunar surface by a mass driver and rendezvous with a collection station in a 100-km lunar orbit. The oxygen is removed from each tank and placed into a tanker QTV which later will transfer from low lunar orbit to LEO with an aerobiaking maneuver. Launch requirements for aerobraked chemical OTVs using earth oxygen are compared to those using lunar oxygen.

ORIGINAL PAGE IS

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also 09 Research Support Facilities (Air).

A82-18310 * # Testing of a spacecraft model in a combined environment simulator, J. V. Staskus and J. C. Roche (NASA, Lewis Research Center, Cleveland, OH). (IEEE, U.S. Defense Nuclear Agency, NASA, and DOE, Annual Conference on Nuclear and Space Radiation Effects, 18th, Seattle, WA, July 21-24, 1981.) IEEE Transactions on Nuclear Science, vol. NS-28, Dec. 1981, p. 4509-4512. 7 refs.

A scale model of a satellite was tested in a large vacuum facility under electron bombardment and vacuum ultraviolet radiation to investigate the charging of dielectric materials on curved surfaces. The model was tested both stationary and rotating relative to the electron sources as well as grounded through one megohm and floating relative to the chamber, Surface potential measurements are presented and compared with the predictions of computer modelling of the stationary tests. Discharge activity observed during the stationary tests is discussed and signals from sensing devices located inside and outside of the model are presented. (Author)

A82-44659 * # Feasibility of an earth-to-space rail launcher system. E. E. Rice, L. A. Miller (Battelle Columbus Laboratories, Columbus, OH), R. A. Marshall (Australian National University, Canberra, Australia), and W. R. Kerslake (NASA, Lewis Research Center, Propulsion Systems Technology Section, Cleveland, OH). International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, Paper 82-46. 9 p. 6 refs. Contract No. NAS3-22882.

The feasibility of earth-to-space electromagnetic (railgun) launchers (ESRL) is considered, in order to determine their technical practicality and economic viability. The potential applications of the launcher include nuclear waste disposal into space, deep space probe launches, and atmospheric research. Examples of performance requirements of the ESRL system are a maximum acceleration of 10,000 g's for nuclear waste disposal in space (NWDS) missions and 2,500 g's for earth orbital missions, a 20 km/sec launch velocity for NWDS missions, and a launch azimuth of 90 degrees E. A brief configuration description is given, and test results indicate that for the 2020-2050 time period, as much as 3.0 MT per day of bulk material could be launched, and about 0.5 MT per day of high-level nuclear waste could be launched. For earth orbital missions, a significant projectile mass was approximately 6.5 MT, and an integral distributed energy store launch system demonstrated a good potential performance. ESRL prove to be economically and environmentally feasible, but an operational ESRL of the proposed size is not considered achievable before the year 2020.

N82-29345*# Battelle Columbus Labs, Ohio.
PRELIMINARY FEASIBILITY ASSESSMENT FOR EARTHTO-SPACE ELECTROMAGNETIC (RAILGUN) LAUNCHERS
Final Technical Report, May 1981 - Jun. 1982

Eric E. Rice, L. A. Miller, and R. W. Earhart. 30 Jun. 1982 403 p. refs.

(Contract NAS3-22882)

(NASA-CR-167886; NAS 1.26.167886) Avail: NTIS

HC A18/MF A01 CSCL 14B

An Earth to space electromagnetic (railgun) launcher (ESRL) for launching material into space was studied Potential ESRL applications were identified and initially assessed to formulate preliminary system requirements. The potential applications included nuclear waste disposal in space, Earth orbital applications, deep space probe launchers, atmospheric research, and boost of chemical rockets. The ESRL system concept consisted of two separate railgun launcher tubes (one at 20 deg from the horizontal for Earth orbital missions, the other vertical for solar system escape disposal missions) powered by a common power plant. Each 2040 m launcher tube is surrounded by 10,200 homopolar generator/inductor units to transmit the power to the walls. Projectile masses are 6500 kg for Earth orbital missions and 2055 kg for nuclear waste disposal missions. For the Earth

orbital missions, the projectile requires a propulsion system, leaving an estimated payload mass of 650 kg. For the nuclear waste disposal in space mission, the high level waste mass was estimated at 250 kg. This preliminary assessment included technical, environmental, and aconomic analyses.

A82-18319 * NASCAP simulation of laboratory charging tests using multiple electron guns. M. J. Mandell, I. Katz, and D. E. Parks (Systems, Science and Software, La Jolla, CA), (IEEE, U.S. Defense Nuclear Agency, NASA, and DOE, Annual Conference on Nuclear and Space Radiation Effects, 18th, Seattle, WA, July 21-24, 1981.) IEEE Transactions on Nuclear Science, vol. NS-28, Dec. 1981, p. 4568-4570. 10 refs. Contracts Nc. NAS3-22536; No. DNA001-79-C-0079.

NASCAP calculations have been performed simulating exposure of a spacecraft-like model to multiple electron guns. The results agree well with experiment. It is found that magnetic field effects are fairly small, but substantial differential charging can result from electron gun placement. Conditions for surface flashover are readily achieved. (Author)

A82-48245 * # Real-time microcomputer simulation for space Shuttle/Centaur evionics. G. P. Szatkowski and H. C. Nelander (General Dynamics Corp., Convair Div., San Diego, CA). Society for Computer Simulation, Conference for Modeling and Simulation on Microcomputer Systems, San Diego, CA, Jan. 28-30, 1982, Paper. 6 p. Contract No. NAS3-22324.

The design of a simulator system for emulating the characteristics of Shuttle/-Centaur avionic support equipment for launching the Solar Polar Mission and the Galileo probe are discussed. The simulators are being constructed on a modular basis for the Centaur control avionics, the Centaur Airborne Support Equipment avionics, the tanking skid ground support equipment, development mechanisms, the tanking skid ground support equipment, development mechanisms, the tanking onboard fluid functions, the star scanner guidance update avionics, the Orbiter command interface avionics, and the Orbiter power system. Each simulator portrays the actual working conditions, including signal delay times and harnessing block diagrams are provided of the interfaces and a flow diagram is presented of the software.

M.S.K.

15 LAUNCH VEHICLES AND SPACE

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

Advanced 30/20 GHz communication satel-A82-12623 * lites, J. N. Sivo (NASA, Lewis Research Center, Cleveland, OH), In: The Space Shuttle - Its current status and future impact; Proceedings of the Aerospace Congress and Exposition, Los Angeles, CA, October 13-16, 1980. (A82-12617 02-16) Warrendale, PA, Society of Automotive Engineers, Inc., 1981, p. 75-81.

increasing demands for satellite communications channels have filled the C-band, have begun to fill the Ku-band, and have resulted in a developmental effort to utilize 2.5 GHz of the 30/20 GHz Ka band, Problems of rain attenuation in the Ku and Ka bands are explored, and solutions are indicated in the use of antenna gain coupled with ground terminal site diversity, and higher satellite power capabilities. Tradeoffs in satellite design are focused on the number of reflectors, increased f/d, gain and sidelobe performance, and total satellite capacity, The NASA 20/3C GHz program is described, including design features of two test systems to be launched in the 1980's to examine the functioning limits of two baseline systems.

NE2-27331*# Systematics General Corp., Sterling, Va. COMMUNICATIONS SATELLITE SYSTEMS CAPACITY **ANALYSIS Final Report**

Larry Browne, Taylor Hines, and Brian Tunstall Jun. 1982 114 p reis

(Contract NAS3-22888)

(NASA-CR-167911; NAS HC A06/MF A01 CSCL 22B 1.26:167911) NTIS

Analog and digital modulation techniques are compared with regard to efficient use of the geostationary orbit by communications satellites, included is the definition of the baseline systems (both space and ground segments), determination of interference susceptibility, calculation of orbit spacing, and evaluation of relative costs. It is assumed that voice or TV is communicated at 14/11 GHz using either FM or QPSK modulation. Both the Fixed-Satellite Service and the Broadcasting-Satellite Service are considered. For most of the cases examined the digital approach requires a satellite spacing less than or equal to that required by the analog approach.

A82-35082 * # Shuttle to GEO propulsion tradeoffs. C. L. Dailey (TRW, Inc., Redondo Beach, CA) and R. M. Lovberg (California, University, La Jolla, CA). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Clayeland, OH, June 21-23, 1982, AIAA Paper 82-1245. 7 p. Contract No. NAS3-22661.

An analysis has been made over a range of thruster, spacecraft and mission parameters to determine optimum electric propulsion requirements for LEO to GEO transfer missions. For this mission solar cell cover thicknesses of four to six mils each side appear to be an optimum compromise between mass and power loss due to radiation damage. The optimum range of thruster specific impulse for this mission is roughly from 1500 to 3000 seconds. Thrusters limited to much lower values of specific impulse and those requiring much higher specific impulse for good efficiency require substantially greater transfer times.

Centaur capabilities for communications satellite launches. W. F. Rector, III (General Dynamics Corp., Convair Div., San Diego, CA), American Institute of Aeronautics and Astronautics, Communications Satellite System Conference, 9th, San Diego, CA, Mar. 8, 1982, Paper 82-0558, 6 p. Contracts No. NAS3-22914; No. NAS3-22901.

The configurations, payload capabilities, and payload envelopes for Centaur in various applications are presented. The Centaur launch record is summarized and the Atlas/Centaur launch schedule is shown, Improvements in capability are reported on, and current and proposed vehicles are depicted. Dual Delta class spacecraft will be flown using a tandem adapter or large direct broadcast satellites in a single launch model. Shuttle/Centaur will permit spacecraft weights of up to 14,000 lb to be put into orbit, including payload lengths up to 40 ft. A new capability to transfer large deployed space systems from the Shuttle to highaltitude orbits at low thrusts will be available. Spacecraft lengths requiring the full, 60-foot cargo bay and weighing 20,000 lb could be placed in geosynchronous orbit with on-orbit rendezvous and assembly of the Centaur and spacecraft in low earth orbit.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and renoue techniques.

For relation information see also 03 Air Transportation and Safety and 85 Urban Technology and Transportation.

A82-10124 * # Design and verification of a multiple fault tolerant control system for STS applications using computer simulation, G, P, Szatkowski and J, C, Karas (General Dynamics Corp., Convair Div., San Diego, CA), In: Computers in Aerospace Conference, 3rd, San Diego, CA, October 26-28, 1981, Collection of Technical Papers. (A82-10076 01-59) New York, American Institute of Aeronautics and Astronautics, 1981, p, 349-357, Contract No. NAS3-22324, (AIAA 81-2173)

General Dynamics/Convair is under NASA contract to integrate the Centaur upper stage into the space transportation system for future planetary missions. This requires that control of all safety critical functions be two-failure tolerant. The control system developed consists of five asynchronous computers, each contributing at their outputs to a 3-out-of-5 voting plane. Subsystem control is based on an end function redundancy management scheme. Analysis of multiple component failures and worst-case time-phase asynchrony among the computers is performed by a real-time computer simulation. The simulation emulates the hardware and subsystem interfaces, wire by wire, providing assessibility to any component for the insertion of preprogrammed failures, Observability is provided via a graphics system and diagnostic software. The simulation provides an engineering tool where the integrity of control system hardware and imbedded software can be demonstrated.

17 SPACECRAFT COMMUNICATIONS, **COMMAND AND TRACKING**

Includes telemetry: space communications networks: astronavigation; and radio blackout.

For related information see also 04 Aircraft Communications and Navigation and 32 Communications.

N82-25290*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SATELLITE-AIDED LAND MOBILE COMMUNICATIONS

Bruce E. LeRoy 1982 10 p refs Presented at the Intern, Commun, Conf., Philadelphia, 16-19 Jun, 1982 (NASA-TM-82861; E-1229; NAS 1,15:82861) Avail: NTIS

HC A02/MF A01 CSCL 09F

It was proposed that a satellite-based land mobile radio system could effectively extend the terrestrial cellular mobile system into rural and remote areas. The market, technical and economic feasibility for such a system is studied. Some of the aspects of implementing an operational mobile-satellite system are discussed. In particular, two key factors in implementation are examined: (1) bandwidth requirements; and (2) frequency sharing. Bandwidth requirements are derived based on the satellite antenna requirements, modulation characteristics and numbers of subscribers. Design trade-offs for the satellite system and potential implementation scenarios are identified. Frequency sharing is examined from a power flux density and modulation viewpoint.

A82 27224 * Open-loop nenosecond-synchronization for wideband satellite communications. W. M. Holmes, Jr. (TRW Defense and Space Systems Group, Space Systems Div., Redondo Beach, CA). In: ITC/USA/'80; Proceedings of the International Telemetering Conference, San Diego, CA, October 14-16, 1980. (A82-2717(12-32) Research Triangle Park, NC, Instrument Society of America, 1980, p. 543-547. Contract No. NAS3-22341.

A synchronization technique for use with an onhoard processing satellite communication system is discussed. The satellite oscillator is used both as the system time reference and as the frequency source for all downlink carriers and data clocks. Downlink timing is established at each system earth terminal through a combination of carrier and data-clock tracking and a downlink timing epoch signal consisting of one bit per TDWA data burst, Uplink timing is established by an open-loop range prediction process using precision ephemerides calculated and distributed by the central control station. Overall timing accuracy of the uplink signal at the satellite receiver of + or - 7 nanoseconds permits unambiguous identification of each data bit position in a 128 Mbps TDMA burst. This is accomplished by means of simple, inexpensive terminal hardware using available crystal oscillators for time/frequency references and digital synthesis techniques that may be implemented in digital LSI chips.

Microwave intersatellite links for communications satellites. G. R. Welti (COMSAT Laboratories, Clarksburg, MD). Institute of Electrical and Electronics Engineers, International Conference on Communications, Philadelphia, PA, June 14-17, 1982, Paper. 5 p. 9 refs. Research sponsored by the international Telecommunications Satellite Organization; Contract No. NAS3-

Applications and interface requirements for intersatellite links (ISLs) between commercial communications satellites are reviewed, ranging from ISLs between widely separated satellites to ISLs between clustered satellites. On-board processing architectures for ISLs employing a variety of modulation schemes are described. These schemes include FM remodulation and QPSK regeneration in combination with switching and buffering. The various architectures are compared in terms of complexity, required performance, antenna size, mass, and

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

includes spacecraft thermal and environmental control: and attitude control.

For life support systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance and 39 Structural Mechan-

N82-11106*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TESTING OF A SPACECRAFT MODEL IN A COMBINED ENVIRONMENT SIMULATOR

J. V. Staskus and J. C. Roche 1981 11 p refs. Presented at the 18th Ann. Conf. on Nucl. and Space Radiation Effects, Seattle, 20-24 Jul. 1981

(NASA-TM-82723; E-1024) Avail: NTIS RC A02/MF A01 CSCL 22B

A scale model of a satellite was tested in a large vacuum facility under electron bombardment and vacuum ultraviolet radiation to investigate the charging of dielectric materials on curved surfaces. The model was tested both stationary and rotating relative to the electron sources as well as grounded through one megohm and floating relative to the chamber. Surface potential measurements are presented and compared with the predictions of computer modelling of the stationary tests. Discharge activity observed during the stationary tests is discussed and signals from sensing devices located inside and outside of the model are presented.

N82-11107*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

VOLTAGE GRADIENTS IN SOLAR ARRAY CAVITIES AS POSSIBLE BREAKDOWN SITES IN SPACECRAFT-CHARGING-INDUCED DISCHARGES

N. John Stevens, Hilton E. Mills, and Lisa Orange 1981 10 p. refs Presented at the Ann. Conf. on Nucl. and Space Radiation Effects, Seattle, 21-24 Jul. 1981

(NASA-TM-82710; E-1003) Avail: NTIS HC A02/MF A01 CSCL 10B

A possible explanation for environmentally-induced discharges on geosynchronous satellites exists in the electric fields formed in the cavities between solar cells - the small gaps formed by the cover slides, colar cells, metallic interconnects and insulating substrate. When exposed to a substorm environment, the cover slides become less negatively charged than the spacecraft ground If the resultant electric field becomes large enough, then the interconnect could emit electrons (probably by field emission) which could be accelerated to space by the positive voltage on the covers. An experimental study was conducted using a small solar array segment in which the interconnect potential was controlled by a power supply while the cover slides were irradiated by monoenergetic electrons, it was found that discharges could be triggered when the interconnect potential became at least 500 volts negative with respect to the cover slides. Analytical modeling of satellites exposed to substorm environments indicates that such gradients are possible. Therefore, it appears that this trigger mechanism for discharges is possible.

N82-14213*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SPACECRAFT CHARGING TECHNOLOGY, 1980 Washington Oct. 1981 1005 p refs Conf. held in Colorado Springs, 12-14 Nov. 1980; sponsored by AFGL and NASA Lewis Research Center

(NASA-CP-2182; AFGL-TR-81-0270) NTIS HC A99/MF A01 CSCL 22B

The third Spacecraft Charging Technology Conference proceedings contain 66 papers on the geosynchronous plasma environment, spacecraft modeling, charged particle environment interactions with spacecraft, spacecraft materials classacterization, and satclife design and testing. The proceedings is a compilation of the state of the art of spacecraft charging and environmental interaction phenomena. For individual titles, see N82-14214 through N82-14275.

ORIGINAL PAGE IS OF POOR QUALITY

1002-14251*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SCATHA SEPM CHARGING RESPONSE: NASCAP PREDICTIONS COMPARED WITH DATA

Carolyn K. Purvis and John Staskus In its Spacecraft Charging Technol., 1980 Oct. 1980 p 592-607 refs (For primary document see NG2-14213 05-18)

Aveil: NTIS HC A99/MF A01 CSCL 22B

Models for the satellite surface potential monitor (SSPM) units constructed in the NASCAP code and the results of comparing predictions to surface voltage and beseplate current data are reported. Several peculiarities in the test data are noted. Preliminary results from space simulations of a SCATHA model with environments representative of the day 87, 1979, eclipse injection event are presented, and their implications for predicting space response are discussed.

N62-14255* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPARISON OF NASCAP MODELLING RESULTS WITH

LUMPED CIRCUIT ANALYSIS
David B. Stang and Carolyn K. Purvis In its Spacecraft Charging
Technol., 1980 Oct. 1980 p 665-683 refs (For primary document see NB2-14213 05-18)

Avail: NTIS HC A99/MF A01 CSCL 22B

Engineering design tools that can be used to predict the development of absolute and differential potentials by realistic spacecraft under geomagnetic substorm conditions are described. Two types of analyses are in use: (1) the NASCAP code, which computes quasistatic charging of geometrically complex objects with multiple surface materials in three dimensions; (2) lumped element equivalent circuit models that are used for analyses of particular spacecraft. The equivalent circuit models require very little computation time, however, they cannot account for effects, such as the formation of potential barriers, that are inherently multidimensional. Steady state potentials of structure and insulation are compared with those resulting from the equivalent circuit model.

N82-14258* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. ANALYTICAL MODELING OF SATELLITES IN GEOSYN-**CHRONOUS ENVIRONMENT**

N. John Stevens In its Space Charging Technol., 1980 Oct. 1980 p 717-729 refs (For primary document see N82-14213

Avail: NTIS HC A99/MF A01 CSCL 22B

Experiences with surface charging of geosynchronous satellites are reviewed and mechanisms leading to discharges on satellite surfaces are considered, it was found that the large differential voltages between the surface and the substrate required to produce massive laboratory discharges do not occur on satellites in space. Analytical modeling predictions supported by dielectric charging data from P78-2, SCATS:: (Spacecraft Charging at High Altitudes) flight results are discussed. Ungrounded insulator areas, buried charge layers (due to mid-energy range particles), and positive differential voltages (where structure voltages are less negative than surrounding dielectric surface voltages) are considered as possible mechanisms producing satellite charge up.

N82-14263*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

USE OF CHARGING CONTROL GUIDELINGS FOR GEO-SYNCHRONOUS SATELLITE DESIGN STUDIES

N. John Steves In its Spacecraft Charging Technol., 1980 Oct. 1980 p 789-801 refs (For primary document see N82-14213 05-18

Avail: NTIS HC A99/MF A01 CSCL 22R

Several of the principle guidelines from the Spacecraft Charging Design Guidelines Handbook are presented with illustrative examples. Use of the geomagnetic substorm specification to qualify satellite designs, the evaluation of satellite designs by using analytical modelling techniques, the use of selected materials and coatings to minimize charging, the tying of all conducting elements to a common ground, and the use of electrical filtering to protect circuits from discharge induced upsets are discussed. Discharge criteria and SCATHA data are excluded.

J.D.H.

N32-14271* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AGREEMENT FOR MASA/JAST - USAF/AFSC SPACE INTERDEPENDENCY ON SPACECRAFT ENVIRONMENT INTERACTION

C. P. Pike (AFGL) and N. John Stevens In its Spacecraft Charging Tites and N. 1980 p. 912-930 refs (For primary document see N82-14213 05-18)

Avail: NTIS HC A99/MF A01 CSCL 22B

A joint AF/NASA comprehensive program on spacecraft environment interactions consists of combined contractual and in house efforts aimed at understanding spacecraft environment ineraction phenomena and relating ground test results to space conditions. Activities include: (1) a concerted effort to identify project related environmental interactions; (2) a materials investigation to measure the basic properties of materials and develop or modify materials as needed; and (3) a ground simulation investigation to evaluate basic plasma interaction phenomena and provide inputs to the analytical modeling investigation. Systems performance is evaluated by both ground tests and analysis. There is an environmental impact investigation to determine the effect of future large spacecraft on the charged particle environment. Space flight investigations are planned to verify the results. The products of this program are test standards and design guidelines which summarize the technology, specify test criteria, and provide techniques to minimize or eliminate system interactions with the charged particle environ-

N82-18311*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGN PRACTICES FOR CONTROLLING SPACECRAFT CHARGING INTERACTIONS

N. John Stevens 1982 21 p refs Presented at the 20th Aerospace Sci. Meeting, Orlando, Fis., 11-14 Jan. 1982; sponsored by AIAA

(NASA-TM-82781; E-1112) Avail: NTIS HC A02/MF A01 CSCL 22B

A design guidelines handbook prepared to provide criteria for assessing and minimizing spacecraft charging interactions is described. An evaluation philosophy of analyzing specific satellite designs in a substorm environment specification with NASCAP is proposed, Criteria for possible discharges are given and a technique for computing the discharge transients is outlined. The charging of a three axis stabilized satellite is examined to illustrate the philosophy. Possible discharge locations are found and transients computed. The effect of changing selected surface coatings is evaluated and found to substantially reduce charging levels.

J.M.S.

N82-23261*# National Aeronautics and Space Administration, Lewis Rosearch Center, Cleveland, Ohio. ENVIRONMENTALLY INDUCED DISCHARGES ON SATEL-

LITES

N. John Stevens 1982 14 p refs Presented at the 2nd EMCSeminar, Noordwijk, Netherlands, 11-13 May 1982; sponsored
by ESTEC

(NASA-TM-82849; E-1219; NAS 1,15:82849) Avail: NTIS HC A02/MF A01 CSCL 228

The problem of asset hazards to geosynchronous satellite systems from geomagnetic and storm encounters is investigated. The available space flight data, coupled with analytical modeling studies, show that only relatively low differential charging is possible from environmental encounters. Using an analytical study discharge event on SCATHA, a discharge process is postulated where a small amount of charge is lost to space. These characteristics could then be used as inputs to a coupling model to determine the hazard to a spacecraft. The procedure is applied to a three axis stabilized satellite design.

A82-17872 * # Validation of the NASCAP model using space-flight data. P. R. Stannard, I. Katz (Systems, Science and Softward, La Jolla, CA), L. Gedeon, J. Roche (NASA, Lewis Research Center, Cleveland, OH), A. G. Rubin, and M. F. Tautz (USAF, Geophysics Laboratory, Bedford, MA). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0269. 13 p. 16 refs. Contract No. NAS3-22536.

The NASA Charging Analyzer Program (NASCAP) has been validated in a space environment. Data epilected by the SCATHA (Spacecraft Charging at High Altitude) spacecraft has been used with NASCAP to simulate the charging response of the spacecraft ground conductor and dielectric surfaces with considerable success. Charging of the spacecraft ground observed in eclipse, during moderate and severe substorm environments, and in sunlight has been reproduced using the code, Close agreement between both the currents and potentials measured by the SSPM's, and the NASCAP simulated response, has been obtained for differential charging. It is concluded that NASCAP is able to predict spacecraft charging behavior in a space environment.

A82-18317 * # Voltage gradients in solar array cavities as possible breakdown sites in spacecraft-charging-induced discharges. N. J. Stevens, H. E. Mills, and L. Orange (NASA, Lewis Research Center, Cleveland, OH). (IEEE, U.S. Defense Nuclear Agency, NASA, and DOE, Annual Conference on Nuclear and Space Radiation, Effects, 18th, Seattle, WA, July 21-24, 1381.) IEEE Transactions on Nuclear Science, vol. NS-28, Dec. 1981, p. 4558-4562, 35 refs.

A possible explanation for environmentally-induced discharges on geosynchronous satellites exists in the electric fields formed in the cavities between solar cells - the small gaps formed by the cover slides, solar cells, metallic interconnects and insulating substrate. When exposed to a substorm environment, the cover slides become less negatively charged than the spacecraft ground. Hence, it is possible for metallic surfaces (usually silver mesh) to be at a negative potential in a cavity that has a 'positive' surface above it. If the resultant electric field becomes large enough, then the interconnect could emit electrons (probably by field emission) which could be accelerated to space by the positive voltage on the covers. At experimental study was connected using a small solar array segment. in which the interconnect potential was controlled by a power supply while the cover slides were irridated by monoenergetic electrons. It was found that discharges could be triggered when the interconnect potential became at least 500 volts negative with respect to the cover slides. Analytical modeling of satellites exposed to substorm environments indicates that such gradients are possible. Therefore, it appears that this trigger mechanism for discharges is possible. Details of the experiment and modeling study are presented.

Na⊋-14224* # TRW Defense and Space Systems Group, Redondo Beach, Calif.

BRUSHFIRE ARC DISCHARGE MODEL

G. T. Lnouye In NASA. Lewis Research Center Spacecraft Charging Technol., 1980 Oct. 1981 p 133-162 refs (For primary document see N82-14213 05-18) (Contract NAS3-21961)

Avail: NTIS HC A99/MF A01 CSCL 22B

A one dimensional arc discharge model incorporating a brushfire-type propagation of a discharge wavefront was investiga@nd. A set of equations, developed and their whitch include electrical, thermal and plasma parameters, were solutions shown to be consistent with a propagating brushfire wavefront. Voltage, current, planma density, temperature, and resistivity profiles were obtains, Mechanical forces, magnetic and electrostatic were considered in evaluating the flashover to blowout current ratio, G', for erc discharges with the brushfire parameters developed in the model. This ratio is an important factor in determining the electromagnetic interference (EMI) impact of arc discharges on spacecraft electrical subsystems. The conclusion of the analysis is that electrostatic forces are much more important than magnetic forces. The magnitude of the G' factor obtained, 58.5 percent, is within the range of those obtained by experimental means. Improvements in the analytical model as well in the experimental approach are recommended. M.D,K.

NS2-14226*# Case Western Reserve Univ., Cleveland, Ohio. SECONDARY ELECTRON EMISSION YIELDS

I. Krainsky, W. Lundin, W. L. Gordon, and R. W. Hoffman In NASA. Lewis Research Center Spacecraft Charging Technol., 1980 Oct. 1981 p 179-197 refs (For primary document see N82-14213 05-18)
(Grant NsG-3197)

Avail: NTIS HC A99/MF A01 CSCL 225

The secondary electron emission (SEE) characteristics for a variety of spacecraft materials were determined under UHV conditions using a commercial double pass CMA which permits sequential Auger electron electron spectroscopic analysis of the surface. The transparent conductive coating indium tin oxido (ITO) was examined on Kapton and borosilicate glass and indium oxide on FED Teflon. The total SEE coefficient ranges from 2.5 to 2.6 on as-received surfaces and from 1.5 to 1.6 on Ar(+) sputtered surfaces with < 5 nm removed. A cylindrical sample carousel provides normal incidence of the primary beam as well as a multiple Faraday cup measurement of the approximately nA beam currents. Total and true secondary yields are obtained from target current measurements with biasing of the carousel. A primary beam pulsed mode to reduce electron beam dosage and minimize charging of insulating coatings was applied to Mg/F2 coated solar cell covers. Electron beam effects on ITO were found quite important at the current densities necessary to do Auger studies.

N82-14227*# Pennsylvania State Univ., University Park. OBLIQUE-INCIDENCE SECONDARY EMISSION FROM CHARGED DIELECTRONICS

James W. Robinson and Paul A. Budd In NASA. Lewis Research Center Spacecraft Charging Technol., 1980 Oct. 1981 p 198-210 refs (For primary document see N82-14213 05-18) (Grant NsG-3166)

Avail: NTIS HC A99/MF A01 CSCL 22B

Experimental measurements and computer simulation of secondary electron emission coefficients for FEP-Teflon, for normal and oblique incidence in the presence of a normal electric field are reported. Knowledge of the electrostatic environment surrounding the specimen calculation of particle trajectories are considered. A simulation using a conformal mapping, a Green's integral, and a trajectory generator provides the necessary mathematical support for the measurements which have been made with normal fields of 1.5 and 2.7 kV/mm. When incidence is normal and energy exceeds the critical energy, the coefficient is given by V.58 and for oblique incidence this expression may be divided by the cosine of the angle. The parameter V sub O is a function of normal field. Measurements for values of V sub f are presented.

N82-14249*# Systems Science and Software, La Jolla, Calif. REPRESENTATION AND MATERIAL CHARGING RE-SPONSE OF GEOPLASMA ENVIRONMENTS

P. R. Stannard, G. W. Schnuelle, I. Katz, and M. J. Mandell 199 NASA. Lewis Research Center Spacecraft Charging Technol., 1980 Oct. 1980 p 560-579 refs (For primary document see N82-14213 05-18)

(Contract NAS3-21762)

Avail: NTIS HC A99/MF A01 CSCL 22B

The sensitivity of the charging response to the representation of the measurest environments and material properties are discussed. Single and double Maxwellian representations are compared with direct numerical integration of the observed spectra. The effect of anisotropic incident flux distribution is modeled. In addition, the effect of the high energy radiation upon bulk conductivity and hence differential charging is

N#2-14272*# Kansas Univ., Lawrence. NUMERICAL SIMULATION OF PLASMA INSULATOR INTERACTIONS IN SPACE, PART 1: THE SELF CONSISTENT CALCULATION

J. H. Nonnast, R. C. Chaky, T. P. Armstrong, J. Enoch, and G. G. Wisemen In NASA. Lewis Research Center Spacecraft Charging Technol., 1980 Oct. 1980 p 932-945 refs (For primary document see N82-14213 05-18) (Grant NsG-3290)

Avail: NTIS HC A99/MF A01 CSCL 22B

A computer program is being developed to simulate the interaction of a plasma with a conducting disk partially covered by an insulator. Initial runs consider only charge sticking to the diele 37 Results indicate that the current density drawn by the hole to be dielectric increases approximately linearly with voltage for conductor voltages between 5 volts and 250 volts. Author

> ORIGINAL PAGE IS OF POOR QUALITY

N82-14273*# Kansas Univ., Lawrence. NUMERICAL SIMULATION OF PLASMA INSULATOR INTERACTIONS IN SPACE. PART 2: DIELECTRIC

R. C. Chaky, J. H. Nonnast, T. P. Armstrong, J. Enoch, and G. Wiseman In NASA. Lewis Research Center Spacecraft Charging Technol., 1980 Oct. 1980 p 946-956 (For primary document nes 132-14213 05-18)

5

(Crant NsG-3290)

Avail: NTIS HC AV9/MF A01 CSCL 22B

Any process which may be modeled statistically for a simple plasma particle may be modeled by the particle in cell technique. The success of the calculation is then dependent on having a large enough number of particles that the statistical treatment is meaningful. Thus it is possible to include the effects of secondary emission, backscattering, charge sticking and possibly dielectric breakdown, photoemission, and spallation. The first plasma dielectric interaction included in the computer code for simulating plasma insulator interactions is againdary electron emission. A calculated current density vs. voltage curve is presented and compared to an experimental curve.

N82-14250*# Systems Science and Software, La Jolla, Calif. SIMULATION OF CHARGING RESPONSE OF SCATHA (P78-2) SATELLITE

G. W. Schnuelle, P. R. Stannard, I. Katz, and M. J. Mandell In NASA. Lewis Research Center Spacecraft Charging Technol., 1980 Oct. 1980 p 580-591 refs (For primary document see N82-14213 05-18) (Contract NAS3-21762)

Avail: NTIS HC A99/MF A01 CSCL 22B

A model of the satellite charging at high altitudes (SCATHA P76-23 satellite was used to simulate the charging response of SCATHA at geosynchronous orbit. The model includes a description of the geometry, currents to exposed surface materials, and electrical connections on the spacecraft. The charging response of the vehicle to that predicted by the NASCAP model for the Day 87, 1979 eclipse charging event, in which the spacecraft charged to several kilovoits negative during a magnetospheric substorm are compared. Double Maxwellian representations of the plasma environment reproduce the charging response observed experimentally.

N82-14275*# Systems Science and Software, San Diego, Calif. CHARGING OF A LARGE OBJECT IN LOW FOLAR EARTH

D. E. Parks and I. Katz In NASA. Lewis Research Center Spacecraft Charging Technol., 1980 Oct. 1980 p 979-989 refs Sponsored in part by AFGL (For primary document see N82-14213 05-18) (Contract NAS3-21762)

Avail: NTIS HC A99/MF A01 CSCL 22B

The charging of a large sphere subject to the environment encountered by the shuttle orbiter as it passes through the auroral regions in its low polar Earth orbit was investigated. The environment consists of a low temperature dense plasma and relatively intense (200 mu A/sq m) field aligned flux of energetic electrons (approximately 5 to 10 keV), The potential on a sphere in eclipse is presented as a function of the ratio kappa of the charging rate produced by precipitating electrons to the discharging rate produced by ram ions. It was found that a 5 meter conducting sphere charges to potentials of order 1 kilovolt for kappa approximately 2, even though a 0.5 meter sphere charges to less than 100 volts. It is concluded that the natural charging environment can induce large potentials (approximately 1 kilovolt) on the shuttle orbiter. A.R.H.

N82-15117*# Martin Marietta Corp., Bethesda, Md. CRYOGENIC FLUID MANAGEMENT EXPERIMENT **Final** Report, Dec. 1978 - Oct. 1981

R. N. Eberhardt, W. J. Bailey, and D. A. Fester Oct. 1981 237 p rets (Contract NAS3-21591) (Contract NAS3-21591) (CONTRACT NAS3-21591)

Avail:

HC A11/MF A01 CSCL 22B

The cryogenic fluid management experiment (CFME), designed to characterize subcritical liquid hydrogen storage and expulsion in the low-q space environment, is discussed. The experiment utilizes a fine mesh screen fluid management device to accomplish

gas-free liquid expulsion and a thermodynamic vent system to intercept heat leak and control tank pressure. The experiment design evolved from a single flight prototype to provision for a multimission (up to 7) capability. A detailed design of the CFME, a dynamic test article, and dedicated ground support equipment were generated. All materials and parts were identified, and components were selected and specifications prepared. Long lead titenium pressurent spheres and the flight tape recorder and ground reproduce unit were procured. Experiment integration with the shuttle orbiter, Spacelab, and KSC ground operations was coordinated with the appropriate NASA centers, and experiment interfaces were defined. Phase 1 ground and flight safety reviews were conducted. Costs were estimated for fabrication and assembly of the CFME, which will become the storage and supply tank for a cryogenic fluid management facility to investigate fluid management in space.

N82-26377*# Systems Science and Software, San Diego, Calif.
ADDITIONAL EXTENSIONS TO THE NASCAP COMPUTER CODE, VOLUME 2 Progress Report, 9 Sep. 1980 - 22 Dec.

P. R. Stannard, I. Katz, and M. J. Mandell Feb. 1982 163 p refs Sponsored in part by AFGL (Contract NAAS3-22536)

(NASA-CR-167856; NAS 1.26:167856; SSS-R-82-5218) Avail:

NTIS HC A08/MF A01 CSCL 22B

Particular attention is given to comparison of the actural response of the SCATHA (Spacecraft Charging AT High Altitudes) P78-2 satellite with theoretical (NASCAP) predictions. Extensive comparisons for a variety of environmental conditions confirm the validity of the NASCAP model. A summary of the capabilities and range of validity of NASCAP is presented, with extensive reference to previously published applications. It is shown that NASCAP is capable of providing quantitatively accurate results when the object and environment are adequately represented and fall within the range of conditions for which NASCAP was intended. Three dimensional electric field affects play an important role in determining the potential of dielectric surfaces and electrically isolated conducting surfaces, particularly in the presence of artificially imposed high voltages. A theory for such phenomena is presented and applied to the active control experiments carried out in SCATHA, as well as other space and laboratory experiments, Finally, some preliminary work toward modeling large spacecraft in polar Earth orbit is presented. An initial physical model is presented including charge emission. A simple code based upon the model is described along with code

N82-26378*# Systems Science and Software, San Diego, Calif. ADDITIONAL EXTENSIONS TO THE NASCAP COMPUTER CODE, VOLUME 3 Contractor Report, 9 Sep. 1980 - 22 Dec.

M. J. Mandell and D. L. Cooke Aug, 1981 90 p refs (Contract NAS3-22536)

(NASA-CR-167857; NAS 1.26:167857; SSS-R-81-5140) Avail: NTIS HC A05/MF A01 CSCL 22B

The ION computer code is designed to calculate charge exchange ion densities, electric potentials, plasma temperatures, and current densities external to a neutralized ion engine in R-Z geometry. The present version assumes the beam ion current and density to be known and specified, and the neutralizing electrons to originate from a hot-wire ring surrounding the beam orifice. The plasma is treated as being resistive, with an electron relaxation time comparable to the plasma frequency. Together with the thermal and electrical boundary conditions described below and other straightforward engine parameters, these assumptions suffice to determine the required quantities, The ION code, written in ASCII FORTRAN for UNIVAC 1100 series computers, is designed to be run interactively, although it can also be run in batch mode. The input is free-format, and the output is mainly graphical, using the machine-independent graphics developed for the NASCAP code. The executive routine calls the code's major subroutines in user-specified order, and the code allows great latitude for restart and parameter change.

A82-13494 * # Real-time computer simulation/emulation for verification of multi-fault-tolerant control of Centaur-in-Shuttle. G. P. Szatkowski (General Dynamics Corp., Convair Div., San Diego, CA). In: Digital Avionics Systems Conference, 4th, St. Louis, MO,

November 17-19, 1981, Collection of Technical Papers. (A82-13451 03-04) New York, American Institute of Aeronautics and Astronautics, 1981, p. 315-325, Contract No. NAS3-22324, (AIAA

NASA has contracted with General Dynamics to design and develop an advanced Centaur liquid upper stage for support of the Galileo and Solar Polar interplanetary missions in 1985-86. The control of the Centaur while it resides in the Shuttle cargo bay must meet the STS safety requirements to be dual failure tolerant in all mission critical functions. The demonstration of the integrity of this control system in the event of multiple component failures and worst-case time-phase asynchroniety among the system's computers is performed by a real-time computer simulation. The simulation emulates the control hardware, subsystem interfaces, and imbedded software processes, wire-by-wire, to provide accessibility for fault insertion. Observability is provided via graphics and diagnostic software, Verification is the product of Monte Carlo simulation analysis, (Author)

A82-15904 * Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma. R. C. Chaky, J. H. Nonnast, and J. Enoch (Kansas, University, Lawrence, KS). Journal of Applied Physics, vol. 52, Dec. 1981, p. 7092-7098. 16 refs. Grant No. NsG-3290.

A computer program is being developed to simulate the interaction of a plasma with a conducting disk. Two configurations are examined: (1) the conductor is a 'button' in the center of a larger dielectric disk, and (2) the conducting disk is covered by a dielectric disk to the same size with a circular hole in the center of the dielectric, exposing a region of conductor. Results of the electrostatic plasma simulation are presented both with and without secondary electron emission from the dielectric; characteristic curves and voltage profiles are included.

A82-16194 * # Modification of spacecraft potentials by thermal electron emission on ATS-5. R. C. Olsen (Alabama, University, Huntsville, AL). Journal of Spacecraft and Rockets, vol. 18, Nov.-Dec. 1981, p. 527-532. 7 refs. Contract No. NASS-23481; Grant No. NsG-3150.

Electron emission experiments on Applied Technology Satellite 5 using a thermal electron emitter are reported and analyzed. Operations in eclipse charging environments showed that electron emission could partially discharge a negatively charged satellite. Typical operations resulted in kilovolt potentials being reduced to hundreds of volts for a few tens of seconds, followed by a gradual recharging over a period of minutes. Equilibrium currents were modeled with a one-dimensional current balance model. Currents on the order of 1 microampere were found, significantly below emitter capabilities. Application of a three-dimensional, time-dependent computer model showed that differential charging on the solar arrays was limiting the emitted current, preventing the complete discharge of the satellite, and allowing it to recharge in spite of the electron emitter. (Author)

A82-17793 * # Space Shuttle Orbiter charging. I. Katz and D. E. Parks (Systems, Science and Software, La Jolla, CA). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0119. 6 p. 8 refs. USAF-supported research; Contract No. NAS3-22536.

This paper considers the charging of the Space Shuttle Orbiter by energetic particles of environmental origin and from emission by accelerators. The results indicate that precipitating electrons quickly induce large voltages. High voltages may also occur when onboard accelerators inject energetic beams into the high altitude plasma. A significant conclusion from electron beam experiments is that the rockets charged to positive potentials much less than anticipated from the theory of probes in a quiescent plasma. Elementary theories predict the large negative potentials observed by firing energetic ions and predict severe differential charging of the Orbiter. (Author)

A82-18312 * Internal breakdown of charged spacecraft dielectrics. B. L. Beers, V. W. Pine, and S. T. Ives (Beers Associates, Inc., Reston, VA). (IEEE, U.S. Defense Nuclear Agency, NASA, and DOE, Annual Conference on Nuclear and Space Radiation Effects, 18th, Seattle, WA, July 21-24, 1981.) IEEE Transactions on Nuclear Science, vol. NS-28, Dec. 1981, p. 4529-4534. 17 refs. Contract No. NAS3-22530.

it is suggested that small energy discharges of low differential voltage that are associated with internal buried charge may be an important mechanism by which sorted electrostatic energy is released from dielectrics on board orbiting spacecraft. The evidence from space given by Stevens (1980) is noted, and the laboratory experimental evidence of Frederickson is cited to demonstrate that discharges occur under circumstances with no external potential drop. Previous calculations indicating that significant internal electric fields can exist in dielectrics charged with multiple-kilovolt electron beams under conditions involving little or no external potential drop are reviewed. Attention is given to the internal discharge mechanism of Meulenberg (1976), and new calculations suggesting that the space environment is conducive to the formation of the conditions required by this mechanism are presented. Experimental procedures for checking the suggestions made are developed.

A82-35547 Differential charging of high-voltage spacecraft - The equilibrium potential of insulated surfaces. I. Katz and M. J. Mandell (Systems, Science, and Software, La Jolla, CA). Journal of Geophysical Research, vol. 87, June 1, 1982, p. 4533-4541, 36 refs. Contract No. NAS3-22536.

A theory is presented for the steady-state potential of insulated surfaces near exposed high voltages. The term 'insulated surfaces' is used to mean either dielectric surfaces or electrically isolated metallic surfaces. The potential sounded below by the zero of the material's I-V curve assuming total suppression of secondary electrons, and above by assuming total extraction of secondaries. Within these bounds, the material's surface potential is determined consistently with the solution to Poisson's equation external to the vehicle. The theory is compared with rocket experiments and with SCATHA satellite data. Also, an explanation is suggested for the observed 'snapover' of solar cell coverslips from near plasma ground potential to near the potential of positively biased interconnects with increasing bias voltage. (Author)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also 07 Aircraft Propulsion, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

N82-20240* # National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GEOMETRY AND STARVATION EFFECTS IN HYDRODY-NAMIC LUBRICATION

David E. Brewe and Bernard J. Hamrock 1982 18 p refs Proposed for presentation at the 59th Meeting of the Propulsion and Energetics Panel Symp. on Problems in Bearings and Lubrication, Ottawa, Canada, 31 May - 3 Jun. 1982; sponsored by AGARD Prepared jointly with Army Aviation Research and

Development Command, St. Louis (NASA-TM-82807; E-1147; NAS 1.15:82807;

AVRADCOM-TR-82-C-17) Avail: NTIS HC A02/MF A01 CSCL 20D

Numerical methods were used to determine the effects of lubricant starvation on the minimum film thickness under conditions of a hydrodynamic point contact, Starvation was effected by varying the fluid inlet level. The Reynolds boundary conditions were applied at the cavitation boundary and zero pressure was stipulated at the meniscus or inlet boundary. A minimum-film-thicknews equation as a function of both the ratio of dimensionless load to dimensionless speed and inlet supply level was determined. By comparing the film generated under the starved inlet condition with the film generated from the fully flooded inlet, an expression for the film reduction factor was obtained. Based on this factor a starvation threshold was defined as well as a critically starved inlet. The changes in the inlet pressure buildup due to changing the available lubricant supply are presented in the form of three dimensional isometric plots and also in the form of contour plots,

N82-24286* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AN INSIGHT INTO AUXILIARY PROPULSION REQUIRE-MENTS OF LARGE SPACE SYSTEMS

James E. Maloy and William W. Smith (Boeing Aerospace Co., Seattle) 1982 21 p refs To be presented at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1981 (NASA-TM-82827; E-1185; NAS 1.15;82827) Ávail: NTIS

HC A02/MF A01 CSCL 21H

Electric and chemical propulsion systems' requirements for Large Space Systems (LSS) launchable by a single Shuttle are considered. Sets of generic LSS classes (ranging in size from 30 m to 250 m) are described and the disturbance force and torque requirements for low Earth orbit (LED), geosynchronous Earth orbit (GEO), and LEO-GEO transfer, are given, Auxiliary propulsion requirements were determined as a function of: specific impulse (250 and 500 sec. for chemical and 1000, 3000, and 10000 sec. for electric); orbit; and angle of orientation, The results were used to size the Auxiliary Propulsion System (thruster size, fuel requirements, power processor, etc).

N82-27358*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

LARGE SPACE SYSTEMS/PROPULSION INTERACTIONS Jun. 1982 253 p refs Workshop held at Cleveland, 22-23 Oct. 1981

(NASA-TM-82904; E-1288; NAS 1.15:82904) Avail: NTIS HC A12/MF A01 CSCL 22A

Material illustrating the presentations on and the conclusions of workshop panels considering the missions, systems requirements and operations, and systems design and integration is presented. For individual titles, see N82-27359 through N82-27379.

> ORIGINAL PAGE IS OF POOR QUALITY

N82-27371*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. SYSTEMS INTEGRATION

James J. Pelouch, Jr. In its Large Space Systems/Propulsion Interactions Jun. 1982 p 123-126 (For primary document sae N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

The workings of systems integration, its accomplishments, the influences of its character changes on the STS, propulsion out of the orbiter and LSS, and technological demands are discussed. The task of systems integration is to define, understand, and account for interactions between the major systems on a space mission. The safety and propulsion systems and their reliability are outlined. E.A.K.

N82-29354*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A NEW STRATEGY FOR EFFICIENT SOLAR ENERGY

CONVERSION: PARALLEL-PROCESSING WITH SURFACE **PLASMONS**

Lynn Marie Anderson 1982 13 p refs Presented at the 17th Intersoc, Energy Conversion Eng. Conf., Los Angeles, 8-13 Aug. 1982; sponsored by IEEE (NASA-TM-82867; E-1236; NAS 1.15:82867) Avail: NTIS

HC A02/MF A01 CSCL 10A

An advanced concept for direct conversion of sunlight electricity, which aims at high efficiency by tailoring the conversion process to separate energy bands within the broad solar spectrum is introduced. The objective is to obtain a high level of spectrumsplitting without sequential losses or unique materials for each frequency band. In this concept, sunlight excites a spectrum of surface plasma waves which are processed in parallel on the came metal film. The surface plasmons transport energy to an array of metal-barrier-semiconductor diodes, where energy is extracted by inelastic tunneling. Diodes are tuned to different frequency bands by selecting the operating voltage and geometry. but all diodes share the same materials.

N82-31443*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECTS OF PROCESSING AND DOPANT ON RADIATION DAMAGE REMOVAL IN SILICON SOLAR CELLS

I. Weinberg, H. W. Brandhorst, Jr., C. K. Swartz, and S. Mehta (Cleveland State Univ., Ohio) 1982 15 p refs Presented at the 3rd European Symp. on Photovoltaic Generators in Space, Bath, England, 4-6 May, 1982; sponsored by RAE, the U.K. Dept. of Industry and ESA

(NASA-TM-82892; F-1270; NAS 1.15.82892)

HC A02/MF A01 CSCL 10A

Gallium and boron doped silicon solar cells, processed by ion-implantation followed by either laser or furnace anneal were irradiated by 1 MeV electrons and their post-irradiation recovery by thermal annealing determined. During the post-irradiation armoal. gallium-doped cells prepared by both processes recovered more rapidly and exhibited none of the severe reverse annealing observed for similarly processed 2 ohm-cm boron doped cells. lon-implanted furnace annealed 0.1 ohm-cm boron doped cells exhibited the lowest post-irradiation annealing temperatures (200 C) after irradiation to 5 x 10 to the 13th e(-)/sq cm. The drastically lowered recovery temperature is attributed to the reduced oxygen and carbon content of the 0.1 ohm-cm cells. Analysis based on defect properties and annealing kinetics indicates that further reduction in annealing temperature should be attainable with further reduction in the silicon's carbon and/or divacancy content after irradiation. **Author**

A82-11706 * # Alkaline regenerative fuel cell systems for energy storage. F. H. Schubert (Life Systems, Inc., Cleveland, OH), M. A. Reid (NASA, Lewis Research Center, Cleveland, OH), and R. E. Martin (United Technologies Corp., South Windsor, CT). In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 1981, Proceedings. Volume 1. (A82-11701 02-44) New York, American Society of Mechanical Engineers, 1981, p. 61-66, 11 refs.

A description is presented of the results of a preliminary design study of a regenerative fuel cell energy storage system for application to future low-earth orbit space missions. The high energy density storage system is based on state-of-the-art alkaline electrolyte cell technology and incorporates dedicated fuel cell and alectrolysis cell modules. In addition to providing energy storage, the system can provide hydrogen and oxygen for attitude control of the satellite and for life support. During the daylight portion of the orbit the electrolysis module uses power provided by the solar array to generate H2 and O2 from the product water produced by the fuel cell module, The fuel cell module supplies electrical power during the dark period of the orbit.

G.R.

A82-11736 * # High power solar array switching regulation. D. K. Decker, J. Cassinelli (TRW Defense and Space Systems Group, Redondo Beach, CA), and M. Valgora (NASA, Lewis Research Center, Cleveland, OH). In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 1981, Proceedings. Volume 1. (A82-11701 02-44) New York, Araberican Society of Mechanical Engineers, 1981, p. 224-231.

It is pointed out that spacecraft utilization projections for the 1980s and beyond show a trend toward extended lifetimes and larger electric power systems. The need for improved power management and energy transfer arising in connection with this trend has resulted in the conduction of a Solar Array Switching Power Management study. A description is presented of initial development work performed in the study, taking into account the characteristics for three mission classes. Attention is given to the manned LEO platform (250-kk, average load), the unmanned GEO platform (50-kW average load), and an ion propulsion orbit transfer vehicle (50- to 250 kW load).

G.R.

A82-11765 * " Gallium arsenide solar cells-status and prospects for use in space. H. W. Brandhorst, D. Flood, and I. Weinberg (NASA, Lewis Research Center, Cleveland, OH), In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 1981, Proceedings, Volume 1. (A82-11701 02-44) New York, American Society of Mechanical Engineers, 1981, p. 409-415. 27 refs.

Gallium Arsenide solar cells now equal or surpass the ubiquitous silicon solar cells in efficiency, radiation resistance, annealability, and in the capability for producing usable power output at elevated temperatures. NASA has developed a long-range research and development program to capitalize on these manifold advantages. In this paper we review the current state and future prospects for R&D in this promising solar cell material, and indicate the progress being made toward development of GaAs cells suitable for a variety of space missions. Results are presented from studies which demonstrate conclusively that GaAs cells can provide a net mission cost and weight savings for certain important mission classes. (Author)

A82-11796 * # Multijunction high voltage concentrator solar cells. G. J. Valco, V. J. Kapoor (Case Western Reserve University, Cleveland, OH), J. C. Evans, and A.-T. Chai (NASA, Lewis Research Center, Cleveland, OH). In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 1981, Proceedings, Volume 2. (A82-11701 02-44) New York, American Society of Mechanical Engineers, 1981, p. 1649-1653, NASA-supported research

search.
The standard integrated circuit technology has been developed to design and fabricate new innovative planar multi-junction solar cell chips for concentrated sunlight appileations. This 1 cm x 1 cm cell consisted of several voltage generating regions called unit cells which were internally connected in series within a single chip resulting in high open circuit voltages. Typical open-circuit voltages of 3.6 V and short-circuit currents of 90 ma were obtained at 80 AM1 suns. A dramatic increase in both short circuit current and open circuit voltage with increased light levels was observed. (Author)

A82-15438 * # Measuring the spacecraft and environmental interactions of the 8-cm mercury ion thrusters on the P80-1 mission.

J. L. Power (NASA, Lewis Research Center, Ion Auxiliary Propulsion Office, Cleveland, OH). In: Electric propulsion and its applications to space missions. (A82-15432 04-12) New York, American Institute of Aeronautics and Astronautics, 1981, p. 813-825, 14 refs.

The subject interface measurements are described for the lon Auxiliary Propulsion System (IAPS) flight test of two 8-cm thrusters. The diagnostic devices and the effects to be measured include: 1) quartz crystal microbalances to detect nonvolatile deposition due to thruster operation; 2) warm and cold solar cell monitors for nonvolatile and volatile (mercury) deposition; 3) retarding potential ion collectors to characterize the low energy thruster lonic efflux; and 4) a probe to measure the spacecraft potential and thruster generated electron currents to blased spacecraft surfaces. The diagnostics will also assess space environmental interactions of the spacecraft and thrusters. The diagnostic data will characterize mercury thruster interfaces and provide data useful for future applications. (Author)

A82-35087 * # A simplified design procedure for life prediction of rocket thrust chambers. J. S. Porowski, W. J. O'Donnell, M. L. Badlani, B. Kasrale (O'Donnell and Associates, Inc., Pittsburgh, PA), and H. J. Kasper (NASA, Lewis Research Center, Cleveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1251. 9 p. 8 refs.

An analytical procedure for predicting thrust chamber life is developed. The hot-gas-wall ligaments separating the coolant and combustion gas are subjected to pressure loading and severe thermal cycling. The resulting stresses interact during plastic straining causing incremental bulging of the ligaments during each tiring cycle. This mechanism of plastic ratcheting is analyzed and a method using a yield surface for combined bending and membrane loading developed for determining the incremental permanent deflection and progressive thinning near the center of the ligaments. Fatigue and tensile instability are analyzed as possible failure modes. Results of the simplified analyses compare favorably with available experimental data and finite element analysis results for OFHC (Oxygen Free High Conductivity) copper. They are also in reasonably good agreement with experimental data for NARloy Z, a copper-zirconium-silver alloy developed by the Rocketdyne Division of Rockwell International. (Author)

A82-39599 * On the cause of the flat-spot phenomenon observed in silicon solar cells at low temperatures and low intensities. V. G. Welzer and J. D. Broder (NASA, Lewis Research Center, Cleveland, OH). *Journal of Applied Physics*, vol. 53, Aug. 1982, p. 5926-5930, 15 refs.

A model is presented that explains the 'flat-spot' power-loss phenomenon observed in silicon solar cells operating under deep space (low temperature, low intensity) conditions. Evidence is presented suggesting that the effect is due to localized metallurgical interactions between the silicon substrate and the contact metallization. These reactions are shown to result in localized regions in which the PN junction is destroyed and replaced with a metal-semiconductor-like interdepth, and metallization are presented along with a method of preventing the effect through the suppression of vacancy formation at the free surface of the contact metallization. Preliminary data indicating the effectiveness of a TiN diffusion barrier in preventing the effect are also given. (Author)

A82-44750 * Component technology for space power systems. R. C. Finke (NASA, Lewis Research Center, Cleveland, OH). International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept. 27-Oct. 2, 1982, Paper 82-408 10 p. 15 rels.

Progress made by NASA toward implementation of equipment for the conversion, management, and distribution of voltage power in space applications are reviewed. Work has been carried forward on components such as bipolar transistors, deep impurity semiconductors, conductors, dielectrics, magnetic devices, and rotary power transfer. Specific programs for the high voltage systems have included research on lightweight, low-cost conductors featuring graphite fibers containing electron donor materials for wires and cables with reduced mass and the conductivity of copper. Attention has also been given p-n juristion technology for high-speed, high-purrent, high-voltage materials and diamond-like dielectric lims which are hard view high dielectric strength, and can operate up to 300 C. A transistor has been fabricated with a voltage of 1200 V at 100 A, with a gain of 10 and a 0.5 microsec rise/fall time. A 25 kW transformer has also been built which performs at 20 kHz with an efficiency of 99.2%.

On the cause of the flat spot phenomenon observed in silicon solar cells at low temperatures and low intensities, V. G. Weizer and J. D. Broder (NASA, Lewis Research Center, Cleveland, OH). In: Photovoltaic Specialists Conference, 15th, Kissimmee, FL, May 12-15, 1981, Conference Record. (A82-44928 23-44) New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 235, 236, 6 refs.

The results of an effort to determine the mechanisms involved in the flat spot (FS) effect are given. It is suggested that the FS effect is due to a resistive metal-semiconductor-like (MSL) interface in parallel with the cell PN junction. Regions responsible for the FS effect lie under the front surface metallization in these cells, where the PN junction has been destroyed and replaced with a metal silicide-semiconductor interface. Such structural changes, which appear to be due to the thermally activated dissolution of the silicon, have been induced in calls as a result of isochronal heat treatments at temperatures between 450 C and 560 C. It has been found that a 650 A layer of Ta2O5 evaporated over the met. "ization is sufficient to prevent the underlying silicon from pitting during the subquent heat treatment, although pitting at the metal silicon ambient interface could still be observed.

N82-11111*# Boeing Aerospace Co., Seattle, Wash.
STUDY OF ELECTRICAL AND CHEMICAL PROPULSION SYSTEMS FOR AUXILIARY PROPULSION OF LARGE SPACE

SYSTEMS, VOLUME 2 Final Report
W. W. Smith Nov. 1981 540 p refs 2 Vol.
(Contract NAS3-21952)

(NASA-CR-165502-Vol-2: D180-2595-4-Vol-2) Avail: NTIS HC A23/MF A01 CSCL 21H

The five major tasks of the program are reported. Task 1 is a literature search followed by selection and definition of seven generic spacecraft classes. Task 2 covers the determination and description of important disturbance effects. Task 3 applies the disturbances to the generic spacecraft and adds maneuver and stationkeeping functions to define total auxiliary propulsion systems requirements for control. The important auxiliary propulsion system characteristics are identified and sensitivities to control functions and large space system characteristics determined. In Task 4, these sensitivities are quantified and the optimum auxiliary propulsion system characteristics determined. Task 5 compares the desired characteristics with those available for both electrical and chemical auxiliary propulsion systems to identify the directions technology advances should take. T.M.

N82-12133*# Hughes Research Labs., Malibu, Calif. Physics Dept. METROFIT AND ACCEPTANCE TEST OF 30-cm ION THRUSTERS Final Report, 12 Apr. 1978 - 1 Apr. 1981 R., L. Poeschel Jun. 1981 324 p (Contract NAS3-21357)

(NASA-CR-165259) Avail: NTIS HC A14/MF A01 CSCL 21C

Six 30 cm mercury thrusters were modified to the J-series design and evaluated using standardized test procedures. The thruster performance meets the design objectives (lifetime objective requires verification), and documentation (drawings, etc.) for the design is completed and upgraded. The etrofit modifications are described and the test data for the modifications are presented and discussed.

N82-16172*# Rocketdyne, Canoga Park, Calif. REUSABLE ROCKET ENGINE MAINTENANCE STUDY Final Report, Sep. 1980 - Oct. 1981 Charles A. MacGregor Jan. 1982 306 p

(Contract NAS3-22652)

(NASA-CR-165569; RI/RD81-226) Avail: NTIS HC A14/MF A01 CSCL 21H Approximately 85,000 liquid rocket engine failure reports, obtained from 30 years of developing and delivering major pump feed engines, were reviewed and screened and reduced to 1771. These were categorized into 16 different failure modes. Failure propagation diagrams were established. The state of the art of engine condition monitoring for in-flight sensors and between flight inspection technology was determined. For the 16 failure modes, the potential measurands and diagnostic requirements were identified, assessed and ranked. Eight areas are identified requiring advanced technology development,

> ORIGINAL PAGE IS OF POOR QUALITY

N82-18315*# Martin Marietta Aerospace, Denver, Colo. PRIMARY PROPULSION/LARGE SPACE SYSTEM INTER-ACTION STUDY Final Report, Sep. 1979 - Dec. 1980 J. V. Coyner, R. H. Dergance, R. I. Robertson, and J. V. Wiggins

Dec. 1981 358 p refs (Contract NAS3-21955)

(NASA-CR-165277; MCR81-504) NTIS

HC A16/MF A01 CSCL 21H

An interaction study was conducted between propulsion systems and large space structures to determine the effect of low thrust primary propulsion system characteristics on the mass, area, and orbit transfer characteristics of large space systems (LSS). The LSS which were considered would be deployed from the space shuttle orbiter bay in low Earth orbit, then transferred to geosynchronous equatorial orbit by their own propulsion systems. The types of structures studied were the expandable box truss, hoop and column, and wrap radial rib each with various surface mesh densities. The impact of the acceleration forces on system sizing was determined and the effects of single point, multipoint, and transient thrust applications were examined. Orbit transfer strategies were analyzed to determine the required velocity increment, burn time, trip time, and payload capability over a range of final acceleration levels. Variables considered were number of perigee burns, delivered specific impulse, and constant thrust and constant acceleration modes of propulsion. Propulsion stages were sized for four propellant combinations; oxygen/hydrogen, oxygen/methane, oxygen/kerosene, and nitrogen tetroxide/monomethylhydrazine, for pump fed and pressure fed engine systems. Two types of tankage configurations were evaluated, minimum length to maximize available payload volume and maximum performance to maximize available payload

N82-21252*# Xerox Electro-Optical Systems, Pasadena, Calif. INERT GAS ION THRUSTER Final Report, Mar. 1978 -Dec. 1980

William D. Ramsey Dec. 1980 90 p refs

(Contract NAS3-21345)

(NASA-CR-165521; NAS 1.26:165521; Rept-2372-5009) Avail: NTIS HC A05/MF A01 CSCL 21C

Inert gas performance with three types of 12 cm diameter magnetoelectrostatic containment (MESC) ion thrusters was tested. The types tested included: (1) a hemispherical shaped discharge chamber with platinum cobalt magnets; (2) three different lengths of the hemispherical chambers with samarium cobalt magnets; and (3) three lengths of the conical shapedchambers with aluminum nickel cobalt magnets. The best argon performance was produced by a 8.0 cm long conical chamber with alnico magnets. The best xenon high mass utilization performance was obtained with the same 8.0 cm long conical thruster. The hemispherical thruster obtained 75 to 87% mass utilization at 185 to 205 eV/ion of singly charged ion equivalent

N82-21253*# O'Donnell and Associates, Inc., Pittsburgh, Pa. DEVELOPMENT OF A SIMPLIFIED PROCEDURE FOR THRUST CHAMBER LIFE PREDICTION Final Report J. S. Porowski, M. Badlani, B. Kasrale, W. J. O Donnell, and D.

Peterson Oct. 1981 85 p refs (Contract NAS3-22649)

(NA SA-CR-165585; NAS 1.26:165585; ODAI-1403-12-81) Avail: NTIS HC A05/MF A01 CSCL 21H

An analytical design procedure for predicting thrust chamber life considering cyclically induced thinning and bulging of the hot gas wall is developed. The hot gas wall, composed of ligaments connecting adjacent cooling channel ribs and separating the coolant flow from the combustion gas, is subjected to pressure loading and severe thermal cycling. Thermal transients during start up and shut down cause plastic straining through the ligaments. The primary bending stress superimposed on the alternate in-plane cyclic straining causes incremental bulging of the ligaments during each firing cycle. This basic mechanism of plastic ratcheting is analyzed and a method developed for determining ligament deformation and strain. The method uses a yield surface for combined bending and membrane loading to determine the incremental permanent deflection and pregressive thinning near the center of the ligaments which cause the geometry of the ligaments to change as the incremental strains accumulate. Fatigue and tensile instability are affected by these local geometry changes. Both are analyzed and a failure criterion developed,

Author

N62-22306* Aerojet Liquid Rocket Co., Sacramento, Calif. LOW-THRUST Isp SENSITIVITY STUDY Final Report L. Schoenman 12 Apr. 1982 265 p refs (Contract NAS3-22665)

(NASA-CR-185621; NAS HC A12/MF A01 CSCL 21H Avail: NTIS 1.26:165621)

A comparison of the cooling requirements and attainable specific impulse performance of engines in the 445 to 4448N thrust class utilizing LOX/RP-1, LOX/Hydrogen and LOX/Methane propellents is presented. The unique design requirements for the regenerative cooling of low-thrust engines operating at high pressures (up to 6894 kPa) were explored analytically by comparing single cooling with the fuel and the oxidizer, and dual cooling with both the fuel and the oxidizer. The effects of coolant channel geometry, chamber length, and contraction ratio on the ability to provide proper cooling were evaluated, as was the resulting specific impulse. The results show that larger contraction ratios and smaller channels are highly desirable for certain propellant combinations,

N82-24285* Colorado State Univ., Fort Collins. Mechanical Engineering.

ELECTRIC THRUSTER RESEARCH

Harold R. Kaufman and Raymond S. Robinson Dec. 1981 151 p refs

(Grant NsG-3011)

(NASA-CR-165603; NAS 1.26:165803) Avail: NTIS

HC A08/MF A01 CSCL 21C

The multipole discharge chamber of an electrostatic ion thruster is discussed. No reductions in discharge losses were obtained, despite repeated demonstration of anode potentials more positive than the bulk of the discharge plasma. The penalty associated with biased anode operation was reduced as the magnetic integral above the biased anodes was increased. The hollow cathode is discussed. The experimental configuration of the Hall current thruster had a uniform field throughout the ion generation and acceleration regions. To obtain reliable ion generation, it was necessary to reduce the magnetic field strength, to the point where excessive electron backflow was required to establish ion acceleration. The theoretical study of ion acceleration with closed electron drift paths resulted in two classes of solutions. One class has the continuous potential variation in the acceleration region that is normally associated with a Hall current accelerator. The other class has an almost discontinuous potential step near the anode end of the acceleration region. This step includes a significant fraction of the total acceleration potential difference.

N82-24287*# General Dynamics/Convair, San Diego, Calif. LOW-THRUST CHEMICAL PROPULSION SYSTEM PRO-PELLANT EXPULSION AND THERMAL CONDITIONING STUDY. EXECUTIVE SUMMARY

F. Merino, I. Wakabayashi, R. L. Pleasant, and M. Hill Apr.

1982 42 p refs (Contract NAS3-22650)

(NASA-CR-165622; GDC-NAS-82-901; NAS 1.26:165622) Avail: NTIS HC A03/MF A01 CSCL 21H

Preferred techniques for providing abort pressurization and engine feed system net positive suction pressure (NPSP) for low thrust chemical propulsion systems (LTPS) were determined. A representative LTPS vehicle configuration is presented. Analysis tasks include: propellant heating analysis; pressurant requirements for abort propellant dump; and comparative analysis of pressurization techniques and thermal subcoolers.

N82-24288*# General Dynamics/Convair, San Diego, Calif. LOW-THRUST CHEMICAL PROPULSION SYSTEM PRO-PELLANT EXPULSION AND THERMAL CONDITIONING STUDY

F. Merino, I. Wakabayashi, R. L. Pleasant, and M. Hill. Apr. 1982 210 p refs (Contract NAS3-22650)

(NASA-CR-167841; GDC-NAS-82-002; NAS 1.26:167841)

Avail: NTIS HC A10/MF A01 CSCL 21H

Thermal conditioning systems for satisfying engine net positive suction pressure (NPSP) requirements, and propellant expulsion systems for achieving propellant dump during a return-to-launch site (RTLS) abort were studied for LH2/LO2 and LCH4/LO2 upper stage propellant combinations. A state-of-the-art thermal

conditioning system employing helium injection beneath the liquid surface shows the lowest weight penalty for LO2 and LCH4. A technology system incorporating a thermal subcooler (heat exchanger) for engine NPSP results in the lowest weight penalty for the LH2 tank. A preliminary design of two state-of-theart and two new technology systems indicates a weight penalty difference too small to warrant development of a LH2 thermal subcooler. Analysis results showed that the LH2/LO2 propellant expulsion system is optimized for maximum dump line diameters, whereas the LCH4/LO2 system is optimized for minimum dump line diameter (LCH4) and maximum dump line diameter (LO2). The primary uncertainty is the accurate determination of two-phase flow rates through the dump system; experimentation is not recommended because this uncertainty is not considered

N82-26381*# Tuskegee Inst., Ala.
CHARACTERIZATION OF ADVANCED ELECTRIC PROPUL-SION SYSTEMS Final Report, 1 Jun. 1980 - 31 Jan. 1982 Pradosh K, Ray May 1982 82 p refs

(Grant NAG3-76)

(NASA-CR-167885; NAS 1,26:167885) HC A05/MF A01 CSCL 21C , Avail: NTIS

Characteristics of several advanced electric propulsion systems are evaluated and compared. The propulsion systems studied are mass driver, rail gun, MPD thruster, hydrogen free radical thruster and mercury electron bombardment ion engine. These are characterized by specific impulse, overall efficiency, input power, average thrust, power to average thrust ratio and average thrust to dry weight ratio. Several important physical characteristics such as dry system mass, accelerator length, bore size and current pulse requirement are also evaluated in appropriate cases. Only the ion engine can operate at a specific impulse beyond 2000 sec, Rail gun, MPD thruster and free radical thruster are currently characterized by low efficiencies. Mass drivers have the best performance characteristics in terms of overall efficiency, power to average thrust ratio and average thrust to dry weight ratio, But, they can only operate at low specific impulses due to large power requirements and are extremely long due to limitations of driving current. Mercury ion engines have the next best performance characteristics while operating at higher specific impulses. It is concluded that, overall, ion engines have somewhat better characteristics as compared to the other electric propulsion ಬ್ರstems. Author

N82-28350*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering

ELECTRIC AND MAGNETIC FIELDS

Harold R. Kaufman, Raymond S. Robinson, and Richard D. Etters Mar. 1982 42 p refs (Grant NsG-3011)

(NASA-CR-165604; NAS 1,26:165604) Avail: NTIS

HC A03/MF A01 CSCL 21C

A number of energy momentum anomalies are described that result from the use of Abraham-Lorentz electromagnetic theory. These anomalies have in common the motion of charged bodies or current carrying conductors relative to the observer. The anomalies can be avoided by using the nonflow approach, based on internal energy of the electromagnetic field. The anomalies can also be avoided by using the flow approach, if all contributions to flow work are included. The general objective of this research is a fundamental physical understanding of electric and magnetic fields which, in turn, might promote the development of new concepts in electric space propulsion. The approach taken is to investigate quantum representations of these fields.

N 2-33424*# TRW Defense and Space Systems Group, Redondo Beach, Calif.

INTEGRATED PROPULSION FOR NEAR-EARTH SPACE MIS-SIONS. VOLUME 1: EXECUTIVE SUMMARY Final Report, 29 Sep. 1980 - 29 Sep. 1981

C. L. Dailey, H. F. Meissinger, R. H. Lovberg, and S. Zafran Oct. 1981 27 p refs

(Contract NAS3-22661)

(NASA-CR-167889-Vol-1; NAS 1.26:167889-Vol-1;

TRW-37255-6001-UT-Vol-1) Avail: NTIS HC A03/MF A01 CSCL

Tradeoffs between electric propulsion system mass ratio and transfer time from LEO to GEO were conducted parametrically for various thruster efficiency, specific impulse, and other propulsion parameters. A computer model was developed for performing orbit transfer calculations which included the effects of aerodynamic drag, radiation degradation, and occultation. The tradeoff results showed that thruster technology areas for integrated propulsion should be directed towards improving primary thrus(er efficiency in the range from 1500 to 2500 seconds, and be continued towards reducing specific mass. Comparison of auxiliary propulsion systems showed large total propellant mass savings with integrated electric auxiliary propulsion. Stationkeeping is the most demanding on orbit propulsion requirement. At area densities above 0.5 sq m/kg, East-West stationkeeping requirements from solar pressure exceed North-South stationkeeping requirements from gravitational forces. A solar array pointing strategy was developed to minimize the effects of atmospheric drag at low altitude, enabling electric propulsion to initiate orbit transfer at Shuttle's maximum cargo carrying altitude. Gravity gradient torques are used during ascent to sustain the spacecraft roll motion required for optimum solar array illumination. A near optimum cover glass thickness of 6 mils was established for LEO to GEO transfer. Author

N82-33425*# TRW Defense and Space Systems Group, Redondo Beach, Calif.

INTEGRATED PROPULSION FOR NEAR-EARTH SPACE MISSIONS. VOLUME 2: TECHNICAL Final Report, 29 Sep. 1980 - 29 Sep. 1981

C. L. Dailey, H. F. Meissinger, R. H. Lovberg, and S. Zafran Oct. 1981 173 p refs

(Contract NAS3-22661)

(NASA-CR-167889-Vol-2; NAS 1.20:167889-Vol-2;

TRW-37255-6002-UT-Vol-2) Avail: NTIS HC A08/MF A01 CSCL

The calculation approach is described for parametric analysis of candidate electric propulsion systems employed in LEO to GEO missions. Occultation relations, atmospheric density effects, and natural radiation effects are presented. A solar cell cover glass tradeoff is performed to determine optimuns glass thickness. Solar array and spacecraft pointing strategies are described for low altitude flight and for optimum array illumination during ascent. Mass ratio tradeoffs versus transfer time provide direction for thruster technology improvements. Integrated electric propulsion analysis is performed for orbit boosting, inclination change, attitude control, stationkeeping, repositioning, and disposal functions as well as power sharing with payload on orbit. Comparison with chemical auxiliary propulsion is made to quantify the advantages of integrated propulsion in terms of weight savings and concomittant launch cost savings.

N82-11110°# Boeing Aerospace Co., Seattle, Wash.
STUDY OF ELECTRICAL AND CHEMICAL PROPULSION
SYSTEMS FOR AUXILIARY PROPULSION OF LARGE SPACE
SYSTEMS. VOLUME 1: EXECUTIVE SUMMARY

W. W. Smith and J. P. Clark Nov. 1981 35 p refs 2 Vol. (Contract NAS3-21952)

(NASA-CR-165502-Vol-1; D180-25956-3-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 21H

The objective was to determine the direction auxiliary propulsion research and development should take to best meet upcoming needs. The approach used was to define the important electrical and chemical propulsion characteristics in terms of the demands that will be imposed by future spacecraft. Comparison of these desired characteristics and capabilities with those

presently available was then used to identify deficiencies.

A82-11762 * # High- and low-resistivity silicon solar cells. A. Meulenberg, Jr. and R. A. Arndt (COMSAT Laboratories, Clarksburg, MD). In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 1981, Proceedings. Volume 1. (A82-11701 02-44) New York, American Society of Mechanical Engineers, 1981, p. 397-399. 13 refs. Research sponsored by the Communications Satellite Corp.; Contracts No. NAS3-21280; No. NAS3-22217.

ORIGINAL PAGE IS OF POOR QUALITY Attention is given to recent work at COMSAT Laboratories on improving silicon solar cell efficiencies and open-circuit voltages for both high (more than 1000 ohm-cm) and low (less than 1 ohm-cm) resistivities, It is noted that open-circuit voltages above 650 mV have been obtained for 0.1 ohm-cm cells and that air mass zero efficiencies of 12.5% have been measured from 4-mil 1,250 ohm-cm.

A82-13434 * # 30-cm mercury ion thruster technology. R. L. Poeschel, J. R. Beattle, P. A. Robinson, and J. W. Ward (Hughes Research Laboratories, Malibu, CA). In: Electric propulation and its applications to space missions. (A82-15432 04-12) New York, American Institute of Aeronautics and Astronautics, 1981, p. 346-361. 21 refs. Contract No. NAS3-21040.

The LeRC/Hughes 30-cm mercury ion thruster has been developed to a state of maturity such that is has become meaningful to formulate models for describing the performance characteristics of the major subassemblies. The thruster hollow cathode and the ion optics subassemblies have been investigated with this objective and conceptual, semiquantitative models have been formulated for relating lifetime and performance capabilities to design and operating parameters. This paper summarizes the investigations, discusses the factors considered for inclusion in the models, and describes the status of the models. (Author)

A82-15435 * # Characteristics of the LeRC/Hughes J-series 30-cm engineering model thruster, C. R. Collett, R. L. Poeschel, and S. Kami (Hughes Research Laboratories, Malibu, CA). In: Electric propulsion and its applications to space missions. (A82-15432 04-12) New York, American Institute of Aeronautics and Astronautics, 1981, p. 376-388, 25 refs. Contracts No. NAS3-21052; No. NAS3-21357.

As a consequence of endurance and structural tests performed on 900-series engineering model thrusters (EMT), several modifications in design were found to be necessary for achieving performance goals. The modified thruster is known as the J-series EMT. The most important of the design modifications affect the accelerator grid, gimbal mount, cathode polepiece, and wiring harness. The paper discusses the design modifications incorporated, the condition(s) they corrected, and the characteristics of the modified thruster.

(Author

A82-18191 * Mass Driver Two - A status report. W. R. Snow, R. S. Dunbar, J. A. Kubby, and G. K. O'Neill (Princeton University, Princeton, NJ). (U.S. Army Armaments Research and Development Command and Defense Advanced Research Projects Agency, Conference on Electromagnetic Guns and Launchers, San Diego, CA, Nov. 4-6, 1980.) IEEE Transactions on Magnetics, vol. AIAG-18, Jan. 1982, p. 127-134. 9 refs. Research supported by the Space Studies Institute; Grant No. NsG-3176.

The current status of Mass Driver Two, a linear synchronous motor for accelerating payloads or reaction mass, is discussed. Mass Driver Two combines all the essential elements of an operational mass driver with the exception of bucket recirculation and payload handling. These essential elements include: magnetic flight, vacuum environment, superconducting bucket coils, high acceleration (nominally 500 g's), optical position sensing and electronic triggering, power circuitry similar to that of a flight article, and regenerative braking. Mass Driver Two is operated on a single shot basis. V.L.

A82-18199 * Mass driver reaction engine characteristics and performance in earth orbital transfer missions. W. R. Snow and R. S. Dunbar (Princeton University, Princeton, NJ). (U.S. Army Armaments Research and Development Command and Defense Advanced Research Projects Agency, Conference on Electromagnetic Guns and Launchers, San Diego, CA, Nov. 4-6, 1980.) IEEE Transactions on Magnetics, vol. MAG-18, Jan. 1982, p. 176-189. 19 refs. Research supported by the Space Studies Institute; Grant No, NsG-3176.

Configurations of a typical mass driver reaction engine (MDRE) are presented and its use for delivery of policies to geosynchronous orbit (GEO) from low earth orbit (LEO) is discussed. Basic rocket equations are developed for LEO to GEO round-trip missions using a

single exhaust velocity, It is shown that exhaust velocities in the 5-10 km/sec range (specific impulse of 500-1000 sec) are well suited for mass drivers, minimizing the overall cost of missions. Payload delivery rate fractions show that there is little to be gained by stretching out LEO to GEO transfer times from 90 to 180 days. It therefore pays to use the shorter trip time, approximately doubling the amount of delivered payload during any fixed time of use of the MDRE.

V.L.

A82-35056 * Propulsion system options for low-acceleration orbit transfer. L. Schoenman (Aerojet Liquid Rocket Co., Sacramento, CA). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1196, 7 p. 6 refs, Contracts No. NAS3-21940; No. NAS3-22665.

The present inventory of developed bipropellant engines suitable for the orbit transfer of large space structures is based on the use of storable propellants (nitrogen tetroxide/monomethyl hydrazine). A range of engine sizes from 22N (5 lbF) to over 26,690N (6000 lbF) is available. These engines are capable of delivering specific impulse values from 2795 to 3089 N-s/kg (285 to 315 lbF-sec/lbm). A comparison is made between the attainable specific impulse of these demonstrated engines and future low-thrust engine designs which can utilize LOX/RP-1, LOX-methane, and LOX/hydrogen propellants. The requirements for cooling these small engines for multi-hour burns as well as the merits of operating at nonoptimum performance mixture ratios to improve cooling margins and reduce tank volumes are addressed in this paper. (Author)

A82-37713 * # Developing a scalable inert gas ion thruster. E. James, W. Ramsey, and G. Steiner (Xerox Electro-Optical Systems, Pasadena, CA). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1275. 9 p. 9 refs. Contracts No. NAS3-22444; No. NAS3-22876.

Analytical studies to identify and then design a high performance scalable lon thruster operating with either argon or xenon for use in large space systems are presented. The magnetoelectrostatic containment concept is selected the ficient ion generation capabilities. The iterative nature of the bounding magnetic fields allows the designer to scale both the diameter and length, so that the thruster can be adapted to spacecraft growth over time. Three different thruster assemblies (conical, hexagonal and hemispherical) are evaluated for a 12 cm diameter thruster and performance mapping of the various thruster configurations shows that conical discharge chambers produce the most efficient discharge operation, achieving argon efficiencies of 50-80% mass utilization at 240-310 eV/ion and xenon efficiencies of 60-97% at 240-280 eV/ion. Preliminary testing of the large 30 cm thruster, using argon propellant, indicates a 35% improvement over the 12 cm thruster in mass utilization efficiency. Since initial performance is found to be better than projected, a larger 50 cm thruster is already in the development stage.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N62-15119* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMODYNAMICS AND KINETICS OF THE SULFATION OF POROUS CALCIUM SILICATE

Robert A. Miller and Fred J. Kohl 1981 18 p refs Presented at the Fall Meeting of the Electrochem. Soc., Inc., Denver, 11-17 Oct. 1981

(NASA-TM-82769; E-1023) Avail: NTIS HC A02/MF A01

CSCL 11G

The sulfation of plasma sprayed calcium silicate in flowing SO2/air mixtures at 900 and 1000 C was investigated thermogravimetrically. Reaction products were analyzed using electron microprobe and X-ray diffraction analysis techniques, and results were compared with thermodynamic predictions. The percentage. by volume, of SO2 in air was varied between 0.036 and 10 percent. At 10 percent SO2 the weight gain curve displays a concave downward shoulder early in the sulfation process. An analytical model was developed which treats the initial process as one which decays exponentially with increasing time and the subsequent process as one which decays exponentially with increasing weight gain. At lower SO2 levels the initial rate is controlled by the reactant flow rate. At 1100 C and 0.036 percent SO2 there is no reaction, in agreement with thermodynamic predictions.

N82-17263*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF PTFE-LINED COMPOSITE JOURNAL REARINGS

Harold E. Sliney and Frank J. Williams (North American Aviation, Inc., Los Angeles) 1982 18 p refs Presented at Ann. Meeting of the Am. Soc, of Lubrication Engr., Cincinnati, 10-13 May 1982

(NASA-TM-82779; E-1110) Avail: NTIS HC A02/MF A01

CSCL 131

Plain: cylindrical journal bearings consisting of aramid fiber reinforced epoxy outer shells and glass fiber reinforced PTFE lubricating liners were evaluated, All materials in these bearings are electrically nonconductive; thus eliminating the problem of galvanic corrosion sometimes encountered with metal bearings installed in dissimilar metal mountings, Friction and wear characteristics were determined for loads, temperatures, and oscillating conditions that are typical of current airframe bearing applications. Friction and wear characteristics were found to be compatible with most airframe bearing requirements from -23 C to 121 C. Contamination with MIL H-5606 hydraulic fluid increased wear of the PTFE liners at 121 C, but did not affect the structural integrity of the aramid/epoxy composite. Author

A82-23779 * Inexpensive cross-linked polymeric separators made from water-soluble polymers, L.-C. Hsu and D. W. Sheibley (NASA, Lewis Research Center, Cleveland, OH). Electrochemical Society, Journal, vol. 129, Feb. 1982, p. 251-254.

Polyvinyl alcohol (PVA), cross-linked chemically with aldehyde reagents, produces membranes which demonstrate oxidation resistance, dimensional stability, low ionic resistivity (less than 0.8 Ohms sq cm), low zincate diffusivity (less than 1 x 10 to the -7th mois/sq cm per min), and low zinc dendrite penetration rate (greater than 350 min) which make them suitable for use as alkaline battery separators. They are intrinsically low in cost, and environmental health and safety problems associated with commercial production appear minimal, Preparation, property measurements, and cell test results in Ni/Zn and Ag/Zn cells are described and discussed.

(Author)

NG2-12135°# Ultrasystems, Inc., Irvine, Calif. THERMAL OXIDATIVE DEGRADATION REACTIONS OF PERFLUOROALKYLETHERS Final Report, Sep. 1860 - Sep. 1981 K. L. Paciorek, T. I. Ito, and R. H. Kratzer Oct. 1981 46 p

refs (Contract NAS3-22517)

lesser degree with M-50.

SN-1020-A1-F) (NASA-CR-165516; SN-10 HC A03/MF A01 CSCL 07C

NTIS Avail:

£.

The mechanisms operative in thermal oxidative degradation of Fomblin Z and hexafluoropropene oxide derived fluids and the effect of alloys and additives upon these processes are investigated. The nature of arrangements responsible for the inherent thermal oxidative instability of the Fomblin Z fluids is not established. It was determined that this behavior is not associated with hydrogen and groups or peroxy linkages. The degradation rate of these fluids at elevated temperatures in oxidizing atmospheres is dependent on the surface/volume ratio. Once a limiting ratio is reached, a steady rate appears to be attained. Based on elemental analysis and oxygen consumption deta, CF2OCF2CF2O2, no. CF2CF2O, is one of the major arrangements present. The action of the M-50 and Ti(4 Al, 4 Mn) allows is much more drestic in the case of Forzblin Z fluids then that observed for the hexafluoropropene derived materials. The effectiveness of antioxidation anticorrosion additives, P-3 and phospha-s-triazine, in the presence of metal alloys is very limited at 316 C; at 288 C the additives arrested almost completely

the fluid degradation. The phospha-s-triazine appears to be at

least twice its effective as the P-3 compound; it also protected the coupon better. The Ti(4 Al, 4 Mn) alloy degraded the fluid

mainly by chain scission processes this takes place to a much

Quantitative separation of tetralin hydroperoxide from its decomposition products by high performence liquid chromatography, J. H. Worstell and S. R. Daniel (Colorado School of Mines, Golden, CO). Journal of Liquid Chromatography, vol. 4, 1981, p. 539-547, 19 refs, Grant No. NsG-3122.

A method for the separation and analysis of tetralin hydroperoxide and its decomposition products by high pressure liquid chromatography has been developed. Elution with a single, mixed solvent from a micron-Porasil column was employed. Constant response factors (internal standard method) over large concentration ranges and reproducible retention parameters are reported,

(Author)

24 COMPOSITE MATERIALS

includes laminates.

N82-11117* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

NOVEL IMPROVED PMR POLYIMIDES

Ruth H. Pater 1981 18 p refs Presented at the 13th Natl. SAMPE Tech. Conf., Mt. Pocono, Pa., 13-15 Oct. 1981 (NASA-TM-82733; E-1045) Avail; NTIS HC A02/MF A01 CSCL 11D

A series of N-phenylnadimide (PN) modifies PMR polyimide composites reinforced with graphite fibers was investigated. The improved flow matrix resins consist of N-phenylnadimide (PN), monomenthyl ester of 5-norbornene-2, 3-dicarboxylic acid (NE), dimethyl ester of 3,3, 4,4-benzophenonatetracarboxylic acide (BTDE), and 4,4 methylenedianiline (MDA). Five modified PMR resin systems were formulated by the addition of 4 to 20 mole percent N-phenylnadimide to the standard PMR-15 composition. These formulations and the control PMR resin were evaluated for rheological characteristics. The initial thermal and mechanical properties of the PN modified PMR and the control PMR/Celion 600C composites were determined. The results show that the addition of N-phenylnadimide to PMR-15 significantly improved the resin flow characteristics without sacrificing the composites properties, Concentrations of 4 and 9 mole percent PN appear to improve the thermoxidative stability of PMR composites.

A.R.H.

N82-14287*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DURABILITY/LIFE OF FIBER COMPOSITES IN HYGRO-THERMOMECHANICAL ENVIRONMENTS

C. C. Chamis and J. H. Sinclair 1981 28 p refs Presented at the Sixth Conf. on Composite Mater.: Testing and Design sponsored by the Am. Soc. for Testing and Apter., Phoenix, Ariz., 12-13 May 1981

(NASA-TM-82749; E-1065) Avail: NTIS HC A03/MF A01 CSCL 11D

Statistical analysis and multiple regression were used to determine and quantify the significant hygrothermomechanical variables which infuence the tensile durability/life (cycle loading, fatigue) of boron-fiber/epoxy-matrix (B/E) and high-modulus-fiber/epoxy-matrix (HMS/E) composites. The use of the multiple regression analysis reduced the variables from fifteen, assumed initially, to six or less with a probability of greater than 0.999. The reduced variables were used to derive predictive models for compression an intralaminar shear durability/life of B/E and HMS/E composites assuming isoparametric fatigue behavior. The predictive models were subsequently generalized to predict the durability/life of graphite-fiber-r generalized model is of simple form, predicts conservative values compared with measured data and should be adequate for use in preliminary designs.

N82-16181*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PREDICTION OF COMPOSITE HYGRAL BEHAVIOR MADE

Christos C. Chamis and J. H. Sinclair 1982 30 p refs Presented at the 37th Ann, Conf. of the Soc. of the Plastics Ind. (SPI), Washington, D.C., 12-15 Jan. 1982.

(NASA-TM-82780; E-1022) Avail: NTIS HC A03/MF A01 CSCL 11D

A convenient procedure is described to determine the hygral behavior (moisture expansion coefficients and moisture stresses) of angleplied fiber composites using a pocket calculator. The procedure consists of equations and appropriate graphs for various (+ or - theta) ply combinations. These graphs present reduced stiffness and moisture expansion coefficients as functions of (+ or - theta) in order to simplify and expedite the use of the equations. The procedure is applicable to all types of balanced. symmetric fiber composites including interply and intraply hybrids, The versatility and generality of the procedure is illustrated using Author several step-by-step numerical examples.

N82-21258*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.
STRENGTH ADVANTAGES OF CHEMICALLY POLISHED BORON FIBERS BEFORE AND AFTER REACTION WITH

James A. DiCarlo and Robert J. Smith 1982 28 p refs Presented at the 6th Ann. Conf. on Composites and Advanced Mater., Cocca Beach, Fla., 18-21 Jan. 1982; sponsored by the American Caramic Society

(NA SA-TM-82806; E-1146; NAS 1.15:82806) Avail: NTIS HC A03/MF A01 CSCL 11D

In order to determine their strength potential, the fracture properties of different types of commercial boron fibers were measured before and after application of secondary strengthening treatments. The principal treatments employed were a slight chemical polish, which removed low strength surface flaws, and a heat treatment in oxygen, which contracted the fibers and thereby compressed intrinsic bulk flaws. Those fiber types most significantly strengthened were 200 to 400 micrometers (8 to 16 mil) diameter boron on tungsten libers produced in a single chemical vapor deposition reactor. The slight polish increased average tensile strenghts from 3.4 to 4.4 CN/m2GN/sq m (500 to 640 ksi) and reduced coefficients of variation from about 15 to 3 percent. The oxygen heat treatment plus slight polish further improved average strengths to 5.5 GN/m2 GN/sq m (800 ksi) with coefficients near 3 percent. To ascertain whether these excellent properties could be retained after fabrication of B/Al composites, as produced and polished 203 micrometers (8 mil) fibers were thinly coated with aluminum, heat treated at B/Al fabrication temperatures, and then tested in tension and flexure at room temperature. The pre-polished fibers were observed to retain their superior strengths to higher temperatures than the as-produced fibers even though both were subjected to the same detrimental reaction with aluminum.

N82-21259*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TUNGSTEN FIBER REINFORCED SUPERALLOY COM-POSITE HIGH TEMPERATURE COMPONENT DESIGN CONSIDERATIONS

Edward A. Winsa 1982 23 p refs Presented at the 111th Ann. Meeting of the Am. Inst. of Mining, Met. and Petrol. Engr., Dallas, 14-18 Feb. 1982 (NASA-TM-82811; E-1152; NAS 1.15:82811) Avail: NTIS

HC A02/MF A01 CSCL 11D

Tungsten fiber reinforced superalloy composites (TFRS) are intended for use in high temperature turbine components. Current turbine component design methodology is based on applying the experience, sometimes semiempirical, gained from over 30 years of superalloy component design. Current composite component design capability is generally limited to the methodology for low temperature resin matrix composites. Often the tendency is to treat TFRS as just another superalloy or low temperature composite. However, TFRS behavior is significantly different than that of superalloys, and the high environment adds consideration not common in low temperature composite component design. The methodology used for preliminary design of TFRS components are described. Considerations unique to TFRS are emphasized. Author

N82-21260*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

THERMAL DEGRADATION OF THE TENSILE PROPERTIES OF UNDIRECTIONALLY REINFORCED FP-AI203/EZ 33 MAGNESIUM COMPOSITES

R. T. Bhatt (AVRADCOM) and H. H. Grimes 1982 9 p refs Presented at the 111th Ann. Meeting of the Am. Inst. of Mining. Met, and Petro. Engr., Dallas, 14-18 Feb. 1982 (NASA-TM-82817; E-1164; NAS 1.15:82817;

AVRADCOM-TR-82-C-2) Avail: NTIS HC A02/MF A01 CSCL

The effects of isothermal and cyclic exposure on the room temperature axial and transverse tensile strength and dynamic flexural modulus of 35 volume percent and 55 volume percent FP-Al2O3/EZ 33 magnesium composites were studied. The composite specimens were continuously heated in a sand bath maintained at 350 C for up to 150 hours or thermally cycled between 50 and 250 C or 50 and 350 C for up to 3000 cycles. Each thermal cycle lasted for a total of six minutes with a hold time of two minutes at the maximum temperature. Results indicate

to significant loss in the room temperature axial tensile strength and dynamic flexural modulus of composites thermally cycled between 50 and 250 C or of composites isothermally heated at 350 C for up to 150 hours from the strength and modulus data for the untreated, as fabricated composites. In contrast, thermal cycling between 50 and 350 C caused considerable loss in both room temperature strength and modulus. Fractographic analysis and measurement of composite transverse strength and matrix hardness of thermally cycled and isothermally heated composites indicated matrix softening and fiber/matrix debonding due to void growth at the interface and matrix cracking at the likely causes of the strength and modulus loss behavior.

N82-22313*# National Agronautics and Space Administration. Lewis Research Center, Clevelzind, Ohio, COMPRESSION BEHAVIOR OF UNIDIRECTIONAL FI-

BROUS COMPOSITE

J. H. Sinclair and C. C. Chamis 1982 20 p refs Presented at Symp, on Compression Testing of Homogeneous Mater, and Composites, Williamsburg, Va., 10-11 Mar. 1982; sponsored by Am. Soc. for Testing and Materials

(NASA-TM-82833; E-1145; NAS 1,15:82833) Avail: NTIS HC A02/MF A01 CSCL 11D

The longitudinal compression behavior of unidirectional fiber composites is investigated using a modified Celanese test method with thick and thin test specimens, The test data obtained are interpreted using the stress/strain curves from back-to-back strain gages, examination of fracture surfaces by scanning electron microscope, and predictive equations for distinct failure modes including fiber compression failure, Euler buckling, delamination, and flexure. The results show that the longitudinal compression fracture is induced by a combination of delamination, flexure, and fiber tier breaks. No distinct fracture surface characteristics can be associated with unique failure modes. An equation is described which can be used to extract the longitudinal compression strength knowing the longitudinal tansile and flexural strengths of the same composite system.

N82-24297*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FACTORS INFLUENCING THE THERMALLY-INDUCED STRENGTH DEGRADATION OF B/AI COMPOSITES

James A. DiCarlo 1982 17 p refs Presented at the Symp, on Fallure Modes in Metal Matrix Composites, Dallas, 15-13 Feb. 1982; sponsored by Am. Inst. of Mining, Met. and Petrol. Engr. (NASA-TM-82823; E-1175; NAS 1.15:82823) Avail: NTIS HC A02/MF A01 CSCL 11D

Literature data related to the thermally-induced strength degradation of B/Al composites were examined in the light of fracture theories based on reaction-controlled fiber weakening. Under the assumption of a parabolic time-dependent growth for the interfacial reaction product, a Griffith-type fracture model was found to yield simple equations whose predictions were in good agreement with data for boron fiber average strength and for B/Al axial fracture strain. The only variables in these equations were the time and temperature of the thermal exposure and an empirical factor related to fiber surface smoothness prior to composite consolidation. Such variables as fiber diameter and aluminum alloy composition were found to have little influence. The basic and practical implications of the fracture model equations are discussed. Author

N82-24300* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGNING WITH FIGER-HEINFORCED PLASTICS (PLAN-AR RANDOM COMPOSITES)

Christos C. Chamis Washington Mar. 1982 26 p refs (NASA-TM-82812; E-1155; NAS 1.15:82812) Avail: NTIS HC A03/MF A01 CSCL 11D

The use of composite mechanics to predict the hygrothermomechanical behavior of planar random composites (PRC) is reviewed and described. These composites are usually made from chopped fiber reinforced resins (thermoplastics or thermosets). The hygrothermomechania i behavior includes mechanical properties, physical properties, thermal properties, fracture toughness, creep and creep rupture. Properties are presented in graphical form with sample calculations to illustrate their use. Concepts such as directional reinforcement and strip hybrids are described. Typical data that can be used for preliminary design for various PRCs are included, Several resins and molding compounds used to make PRCs are described briefly. Pertinent references are cited that cover analysis and design methods, materials, data, fabrication procedures and applications. Author

NB2-26385*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. METHOD AND APPARATUS FOR STRENGTHENING **BORON FIBERS** Patent Application James A. DiCarlo, Inventor (to NASA) Filed 23 Apr. 1982

12 p (NASA-Case-LEW-13826-1; US-Patent-Appl-SN-371354) Avail:

NTIS HC A02/MF A01 CSCL 11D

The tensile strength of commercially available boron fibers produced by the chemical vapor deposition of boron onto tungsten wire substrates is increased by treating the fibers in an oxygen plus inert gas (argon) atmosphere to about 880 C. High temperature oxidation increases the residual compression of each tungsten core by forming a thin boron oxide coating on the fiber surface so that the fiber contracts axially. This increases the intrinsic strength of the fiber by raising the tensile strength level required for core initiated fracture, After cooling to room temperature the fibers are chemically polished to reduce their diameters by 0.2 mils to 0.6 mils. The reduction in diameter removes both original and oxidation induced surface flaws, The strengthened fibers are intended to be utilized as reinforcement. in composite materials. Such materials may be boron/aluminum or boron/epoxy.

N82-26386*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ION BEAM TEXTURED GRAPHITE ELECTRODE PLATES Patent Application

James S. Sevey, Ralph Forman, Arthur N. Curren, and Edwin G. Wintucky, Wentors (to NASA) Filed 31 Mar. 1982 14 p (NASA-Case-LEW-12819-2; US-Patent-Appl-SN-364072) Avail:

NTIS HC A02/MF A01 CSCL 11D A specially textured surface of pyrolytic graphite exhibits extremely low yields of secondary electrons and reduced numbers of reflected primary electrons after impingement of high energy primary electrons. Electrode plates of this material are used in multistage depressed collectors. An ion flux having an energy between 500 eV and 1000 eV and a current density between 1.0 mA/sq cm and 6.0 mA/sq cm produces surface roughening or texturing which is in the form of needles or spires. Such textured surfaces are especially useful as anode collector plates in high efficiency electron tube devices.

N82-30335*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MODULUS, STRENGTH AND THERMAL EXPOSURE STUDIES OF FP-AI203/ALUMINUM AND FP-AI203/MAG-NESIUM COMPOSITES

R. T. Bhatt 1981 18 p refs Presented at the Symp. on Composites and Advanced Mater., Cocoa Beach, Fla., 18-24 Jan.

(NASA-TM-82868; E-1238; NAS 1.15:82868;

AVEADCOM-TR-81-C-1) Avail: NTIS HC A02/MF A01 CSCL

The mechanical properties of FP-AI2O3 fiber reinforced composites prepared by liquid infiltration techniques are improved. A strengthening addition, magnesium, was incorporated with the aluminum-lithium matrix alloy usually selected for these composites because of its good wetting characteristics. This ternary composite, FP-AI2O3/AI-(2-3)Li-(3-5)Mg, showed improved transverse strength compared with FP-Al2O3/Al-(2-3)Li composites. The lower axial strengths found for the FP-AI2O3/AI-(2-3) Li-(3-5)Mg composites viere attributed to fabrication related defects. Another technique was the use of Ti/B coated FP-Al2O3 fibers in the composites. This coating is readily wet by molten aluminum and permitted the use of more conventional aluminum alloys in the composites, However, the anticipated improvements in the axial and transverse strengths were not obtained due to poor bonding between the fiber coating and the matrix. A third approach studied to improve the strengths of FP-AI2O3 reinforced composites was the use of magnesium alloys as matrix materials. While these alloys wet fibers satisfactorily, the result indicated that the magnesium alloy composites used offered no axial strength or modulus advantage over FP-Al2O3/Al-(2-3)Li composites.

N82-30336*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

HIGH TEMPERATURE COMPOSITES. STATUS AND FUTURE DIRECTIONS

Robert A. Signorelli 1982 25 p refs Presented at the 4th Intern. Conf. on Composite Mater. Tokyo, 25-28 Oct 1982 (NASA-TM-82929; E-1280; NAS 1.15:82929) Avail: NTIS HC A02/MF A01 CSCL 11D

A summary of research investigations of manufacturing methods, fabrication methods, and testing of high temperature composites for use in gas turbine engines is presented. Ceramic/ceramic, ceramic/metal, and metal/metal composites are considered. Directional solidification of superalloys and eutectic alloys, fiber reinforced metal and ceramic composites, ceramic fibers and whiskers, refractory coatings, metal fiber/metal composites, matrix metal selection, and the preparation of test specimens are discussed

J.D.

N82-31449*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ENVIRONMENTAL AND HIGH-STRAIN RATE EFFECTS ON COMPOSITES FOR ENGINE APPLICATIONS

C. C. Chamis and G. T. Smith 1982 20 p refs Presented at the 23rd Struct. Dyn. and Mater. Conf., New Orleans, 10-12 May 1982; sponsored by AIAA, ASME, ASCE, and AHS Previously announced in IAA as A82-30119

(NASA-TM-82882; NAS 1,15;82882) Avail: NTIS HC A02/MF A01 CSCL 11D

The Lewis Research Center is conducting a series of programs intended to investigate and develop the application of composite materials to structural components for turbojet engines. A significant part of that effort is directed to establishing resistance, defect growth, and strain rate characteristics of composite materials over the wide range of environmental and load conditions found in commercial turbojet engine operations. Both analytical and experimental efforts are involved.

A82-27440 * Effects of nadic ester concentration and processing on physical and mechanical properties of PMR/Celion 6000 composites. F. I. Hurwitz and J. D. Whittenberger (NASA, Lewis Research Center, Cleveland, OH). In: Technology transfer; Proceedings of the Thirteenth National Technical Conference, Mount Pocono, PA, October 13-15, 1981. (A82-27401 12-24) Azusa, CA, Society for the Advancement of Material and Process Engineering, 1981, p. 477-486. 16 refs.

A82-37101 * # Sensitivity analysis results of the effects of various parameters on composite design. C. C. Chamis (NASA, Lewis Research Center, Structures and Mechanical Technologies Div., Cleveland, OH). In: Reinforced Plastics/Composites Institute, Annual Conference, 37th, Washington, DC, January 11-15, 1982, Preprints. (A82-37081 18-24) New York, Society of the Plastics Industry, Inc., 1982 (Session 20-B). 8 p.

Semitivity analysis results are presented to assess the effects of a multitude of important parameters on fiber composite design and structural response. These results were obtained by using optimum design procedures in conjunction with sensitivity analyses. Sensitivity analyses were performed to assess the effects on composite optimum design and structural response of parameters such fiber transverse and shear properties, in situ matrix elastic and strength properties, correlation coefficients used in composite micromechanics and in combined strength predictions, processing variables, and perturbations of loading conditions. The results show that matrix properties, fiber volume ratio and small perturbations of the loading conditions have significant effects on certain composite structural responses. The remaining parameters have negligible effect.

(Author)

A32-38133 * On determination of fibre fraction in continuous fibre composite materials. J. D. Whittenberger, F. I. Hurwitz (NASA, Lewis Research Center, Cleveland, OH), J. J. Ricca, and R. M. Jurta (U.S. Army, Army Materials and Mechanics Research Center, Watertown, MA). Journal of Materials Science Letters, vol. 1, June 1982, p. 249-252. It is pointed out that the fiber volume fraction is probably the most important

It is pointed out that the fiber volume fraction is probably the most important parameter influencing the properties of fibrous composite materials. The present investigation is concerned with questions regarding the accurate determination of this parameter. It is found that an estimate of the fiber volume fraction based on

determinations from several coupons taken from different regions of a laminate is not accurate. At present fiber volume tractions are not directly measured but rather are calculated from the fiber weight fraction and densities of the composite and fiber, image analysis techniques can and should be applied to determine fiber volume fraction. However, several factors have to be considered in this connection. It is necessary to make many measurements of the local fiber area fractions, and the preparation of representative planar cross sections parallel to the fiber axis may be difficult,

G.R.

A82-40796 * Application of a gripping system to test a untaxial graphite fiber reinforced composite /PMR 15/Celion 6000/ in tension at 316 C. J. D. Whittenberger and F. I. Hurwitz (NASA, Lewis Research Center, Claveland OH). Polymer Composites vol. 3, Apr. 1982, p. 75-92, 5, refs.

Cleveland, OH). Polymer Composites, vol. 3, Apr. 1982, p. 75-82. 5 refs.

A gripping system has been developed to test unlaxial, 0 deg orientation PMR 15/Celion 6000 composites at elevated temperatures. The method involves compression of grit-blasted laminate between grit-blasted metal to give a non-slippin interface for load transfer. Tensile testing at both 316 C and room temperature indicated that deformation was elastic to fracture and that the variation in tensile properties for one laminate is the same as that for several panels. In addition, the tensile properties for unlaxial PMR 15/Celion 6000 are identical at 316 C and room temperature. For nominally 51 volume percent fiber, the elastic modulus is 119.6 GPa, the fracture stress is 1370 MPa, and the strain to fracture is about 1.15 percent. In addition, data are presented which indicate that the gripping system can be used for long term, elevated temperature testing of composite materials.

(Author)

A32-42657 * High-temperature resins. T. T. Serafini (NASA, Lewis Research Center, Cleveland, OH). In: Handbook of composites. (A82-42651 21-24) New York, Van Nostrand Reinhold Co., 1982, p. 89-114. 24 refs.

The basic chemistry, cure processes, properties, and applications of high temperature resins known as polyimides are surveyed. Condensation aromatic polymides are prepared by reacting aromatic diamines with aromatic dianhydrides, aromatic tetracarboxylic acids, or with dialkyl esters of aromatic tetracarboxylic acids, depending on the intended end use. The first is for coatings or films while the latter two are more suitable for polyimide matrix resins. Prepreg solutions are made by dissolving reactants in an aprotic solvent, and advances in the addition of a diamine on the double bond and radical polymerization of the double bond are noted to have yielded a final cure product with void-free characteristics. Attention is given to properties of the Skybond, Pyralin, and NR-150B polyimide prepreg materials and characteristics of aging in the NP-150 polyimides. Finally, features of the NASA-developed PMR polyimides are reviewed.

A82-45630 * Forced torsional properties of PMR composites with varying nadic ester concentrations and processing histories. F. I. Hurwitz (NASA, Lewis Research Center, Cleveland, OH). Polymer Composites, vol. 3, July 1982, p. 152-161. 40 refs.

PMR polyimide resin was prepared from 4,4'-methylenedianiline, the dimethyl ester of 3,3',4,4'-benzophenonetetracarboxylic acid and the monomethyl ester of 5-norbornene-2,3-dicarboxylic acid (NE). The NE group serves as a chair of 5-norbornene-2,3-dicarboxylic acid (NE). The NE group serves as a chair of 5-norbornene-2,3-dicarboxylic acid (NE). The NE group serves as a chair of resins having varying NE concentrations using two molding processes, and the laminates characterized in forced torsion. Glass transition temperatures (T(g)) of 360-390 C were observed in the crosslinked resins, as compared with the literature value of 284 C reported for the uncrosslinked system. T(g) did not decrease with decreasing NE concentrations over the range from 2.0 to 1.25 moles. Stoichiometry, within the range studied, showed little influence on shear properties; however, a 25% variation in matrix shear modulus with processing was observed. The G(12) values determined in forced torsion were in excellent agreement with those reported from tensile tests of + or - 45 deg laminates. A branching and possible secondary crosslink mechanism is proposed based on dynamic mechanical behavior and infrared spectra of the composites. (Author)

N82-12139*# Composites Horizons, Pomona, Calif.
HYBRIDIZED POLYMER MATRIX COMPOSITE Final
Report

Bruce A. Stern and Teunis Visser Sep. 1981 85 p refs (Contract NAS3-21384) (NASA-CR-165340) Avail: NTIS HC A05/MF A01 CSCL 11D

Under certain conditions of combined fire and impact, graphite fibers are released to the atmosphere by graphite fiber composites. The retention of graphite fibers in these situations is investigated, Hybrid combinations of graphite tape and cloth, glass cloth, and resin additives are studied with resin systems. Polyimide resins form the most resistant composites and resins based on simple

novoles epoxies the least resistant of those tested, Graat improvement in the containment of the fibers is obtained in using graphite/glass hybrids, and nearly complete prevention of individual fiber release is made possible by the use of resin.

N82-14288*# Wyoming Univ., Laramie. Composite Materials Research Group.

ANALYSIS OF CRACK PROPAGATION AS AN ENERGY ABSORPTION MECHANISM IN METAL MATRIX COM-POSITES Interim Report, Sep. 1979 - Dec. 1980

Donald F. Adams and Daniel P. Murphy Feb. 1981 159 p.

(Grant NaG-3217)

(NASA-CR-165051; UWME-DR-101-102-1) Avail: NTIS

HC AOB/MF AO1 CSCL 11D

The crack initiation and crack propagation capability was extended to the previously developed generalized plane strain, finite element micromechanics analysis. Also, an axisymmetric analysis was developed, which contains all of the general features of the plane analysis, including elastoplastic material behavior. temperature-dependent material properties, and crack propagation. These analyses were used to generate various example problems demonstrating the inelastic response of, and crack initiation and propagation in, a boron/aluminum composite.

N82-15123* # Purdue Univ., Lafayette, Ind. Composite Materials

INDENTATION LAW FOR COMPOSITE LAMINATES

S. H. Yang 31 Jul. 1981 47 p refs (Grant NsG-3185)

(NASA-CR-165460; CML-81-1) Avail:

NTIS

HC A03/MF A01 CSCL 11D

Static indentation tests are described for glass/epoxy and graphite/epoxy composite laminates with steel balls as the indentor. Beam specimens clamped at various spans were used for the tests. Loading, unloading, and reloading data were obtained and fitted into power laws. Results show that: (1) contact behavior is not appreciably affected by the span; (2) loading and reloading curves seem to follow the 1.5 power law; and (3) unloading curves are described quite well by a 2.5 power law. In addition, values were determined for the critical indentation, alpha sub cr which can be used to predict permanent indentations in unloading. Since alpha sub or only depends on composite material properties, only the loading and an unloading curve are needed to establish the complete loading-unloading-reloading behavior.

N82-16176*# TRW, Inc., Cleveland, Ohio. FABRICATION OF BORON/ALUMINUM FAN BLADES FOR SCR ENGINES Final Report, Jun. 1976 - Jun. 1980 G. S. Doble Mar, 1981 49 p refs (Contract NAS3-20360)

(NASA-CR-165294;

ER-7891-F) HC A03/MF A01 CSCL 11D

NTIS Avail:

The fabrication of boron/aluminum fan blades for the F-404 Supersonic Cruise Research prototype engine by rapid air bonding of fully dense monotapes is described, and the fan blades evaluated. The F-404 configuration is representative of a low aspect ratio advanced design blade with supersonic capability. Dovetail pull tests of this geometry, which substituted boron/ aluminum for titanium, suggested that excessive shear stresses were present in the root. A re-designed blade, incorporating a titanium tang and root, was fabricated by hot isostatic pressing. Blades appeared well bonded but the airfoil contained sizable areas of deformation and identification from the alumina grain used as a pressure transmitting medium. The use of hot isostatic pressing with a formed steel encapsulator should eliminate this problem.

N82-18326*# Wyoming Univ., Laramie. Composite Materials Research Group.

MICROMECHANICAL PREDICTIONS OF CRACK PROPA-GATION AND FRACTURE ENERGY IN A SINGLE FIBER BORON/ALUMINUM MODEL COMPOSITE

Donald F, Adams and Jayant M. Mahishi Feb. 1982 65 p refs

(Grant NsG-3217)

(NASA-CR-168550: UWME-DR-201-101-1) Avail: NTIS HC A04/MF A01 CSCL 11D

The axisymmetric finite element model and associated computer program developed for the analysis of crack propagation in a composite consisting of a single broken fiber in an annular sheath of matrix material was extended to include a constant. displacement boundary condition during an increment of crack propagation. The constant displacement condition permits the growth of a stable crack, as opposed to the catastropic failure in an earlier version. The finite element model was refined to respond more accurately to the high stresses and steep stress gradients near the broken fiber end. The accuracy and effectiveness of the conventional constant strain axisymmetric element for crack problems was established by solving the classical problem of a penny-shaped crack in a thick cylindrical rod under axial tension. The stress intensity factors predicted by the present finite element model are compared with existing continuum results.

N82-20248*# Boeing Military Airplane Development, Seattle, Wash, Advanced Airplane Branch.

ENVIRONMENTAL EFFECTS ON DEFECT GROWTH IN COMPOSITE MATERIALS Final Report

T. R. Porter Jan. 1981 418 p refs

(Contract NAS3-20405)

(NASA-CR-165213; NAS 1.26:165213) HC A18/MF A01 CSCL 11D

Data for evaluating the effects of moisture and temperature on the integrity of fiber composite components was gathered, In particular, the static and cyclic performance of three composite taminates containing flaws was investigated at room temperature and at 422 K (300 F) in wet and dry conditions

NTIS

NTIS

N82-29363*# Hughes Aircraft Co., Torrance, Calif. Dynamics Div.

PYROLYTIC GRAPHITE COLLECTOR DEVELOPMENT

PROGRAM Final Report
William J, Wilkins 25 Feb. 1982 ,23 p refs

(Contract NAS3-22505)

(NASA-CR-167909; NAS 1.26:167909; W-09170) Avail:

NTIS HC A06/MF A01 CSCL 11D

Pyrolytic graphite promises to have significant advantages as a material for multistage depressed collector electrodes. Among these advantages are lighter weight, improved mechanical stiffness under shock and vibration, reduced secondary electron backstreaming for higher efficiency, and reduced outgassing at higher operating temperatures. The essential properties of pyrolytic graphite and the necessary design criteria are discussed, This includes the study of suitable electrode geometries and methods of attachment to other metal and ceramic collector components consistent with typical electrical, thermal, and mechanical requirements. Author

N82-31448*# Douglas Aircraft Co., Inc., Long Beach, Calif. KEVLAR/PMR-15 REDUCED DRAG DC-9 REVERSER STANG FAIRING

R. T. Kawai Aug. 1982 140 p refs (Contract NAS3-21763)

(NASA-CR-165448;

HC A07/MF A01 CSCL 11D

NAS 1.26:165448) Avail:

A reduced drag fairing for the afterbody enclosing the thrust reverser actuators on the DC-9 has been developed with Kevlar-49/ PMR-15 advanced composite material. The improved fairing reduces airplane drag 1% compared to the production baseline. Use of composites reduces weight 40% compared to an equivalent metal fairing. The Kevlar-49/PMR-15 advanced composite is an organic matrix material system that can be used at temperatures up to 500 F. **Author**

A82-13403 * Fatigue of Ni-Al-Mo aligned eutectics at elevated temperatures, J. M. Tartaglia (Climax Molybdenum Company of Michigan, Ann Arbor, MI) and N. S. Stoloff (Rensselaer Polytechnic Institute, Troy, NY). Metallurgical Transactions A - Physical Metal-

URIGINAL PAGE IS

OF POOR QUALITY

lurgy and Materials Science, vol. 12A, Nov. 1981, p. 1891-1898. 18 refs. Grants No. NAG3-22; No. AF-AFOSR-80-0015.

The elevated-temperature mechanical behavior of two aligned eutectics (Ni-8.1 wt % Al-26,4 wt % Mo and Ni-6.3 wt % Al-31.2 wt % Mo) has been investigated utilizing monotonic and cyclic testing in vacuum. Tensile yield strength and fatigue resistance increased from 25 to 725 C, but then were reduced at 825 C. The fatigue lives of specimens tested at 725 C decreased sharply with decreasing frequency. A shift from surface to internal crack initiation was observed upon increasing the test temperature from 725 to 825 C. Stage II crack propagation was observed at both temperatures, in contrast to stage I cracking at 25 C. The test results are compared to those for other nickel and cobalt-base aligned eutectics to show that the frequency effect on fatigue life is not limited to the Ni-Al-Mo system. (Author)

A82-31339 * Work of fracture in aluminum metal-matrix composites. A. Skinner (Revere Research, Inc., Edison, NJ), M. J. Koczak (Drexel University, Philadelphia, PA), and A. Lawley, Metallurgic II Transactions A - Physical Metallurgy and Materials Science, vol. 13A, Feb. 1982, p. 289-297, 13 refs. Grant No. NsG-3128.

Mechanical tests were conducted on B/Al composites and, for comparison, FP-Al2O3/Al composites in the as-fabricated condition and following high-temperature isothermal exposure or thermal colling. In B/Al (1100), isothermal exposure at 773 K for 125 hr reduced toughness, measured by the work of fracture, from 76 to 10 kJ/sq m, and a similar reduction was observed after equivalent thermal cycling. In B/Al (6061), the same isothermal exposure reduced toughness from 44.5 to 8 kJ/sq m, but the effect of thermal cycling was less detrimental. In FP-Al2O3/Al, the work of fracture was insensitive to either type of treatment. Experimental results are interpreted in terms of matrix softening, interface properties, and fiber notch sensitivity.

A82-46220 * Tensile properties of SiC/aluminum filamentary composites - Thermal degradation effects. A. Skinner (Revere Research, Inc., Edison, NJ), M. J. Kockak, and A. Lawley (Drexel University, Philadelphia, PA). Powder Metallurgy International, vol. 14, Aug. 1982, p. 144-147. 18 refs. Grant No. NsG-3128.

Aluminium metal matrix composites with a low cost fiber, e.g. SIC, provide for an attractive combination of high elastic modulus and longitudinal strengths coupled with a low density. SIC (volume fraction 0.55)-aluminum (6061) systems have been studied in order to optimize fiber composite strength and processing parameters. A comparison of two SIC/aluminum composites produced by AVCO and DWA is provided. Fiber properties are shown to alter composite tensile properties and fracture morphology. The room temperature tensile strengths appear to be insensitive to thermal exposures at 500 C up to 150 h. The elastic modulus of the composites also appears to be stable up to 400 C, however variations in the loss modulus are apparent. The fracture morphology reflects the quality of the Interfacial bond, fiber strengths and fiber processing. (Author)

25 INORGANIC AND PHYSICAL **CHEMISTRY**

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermoo namics and

Statistical Physics.

N82-19333*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA REDOX CELL STACK SHUNT CURRENT, PUMPING POWER, AND CELL PERFORMANCE TRADEOFFS Final

Norman Hagedom, Mark A. Hoberecht, and Lawrence H. Thaller Feb. 1982 33 p refs (Contract DE-AI01-80AL-12726)

(NASA-TM-82686: DOE/NASA/12726-11: E-967) Avail: NTIS HC A03/MF A01 CSCL 10C

The NASA Redox energy storage system is under active technology development. The hardware undergoing laboratory testing is either 310 sq. cm. or 929 sq. cm. (0.33 sq. ft. or 1.0 sq. ft, per cell active area with up to 40 individual cells connected to make up a modular cell stack. This size of hardware allows rather accurate projections to be made of the shunt power/pump power tradeoffs. The modeling studies that were completed on the system concept are reviewed along with the approach of mapping the performance of Redox cells over a wide range of flow rates and depths of discharge of the Redox solutions. Methods are outlined for estimating the pumping and shunt current losses for any type of cell and stack combination. These methods are applicable to a variety of pumping options that are present with Redox systems. The results show that a fully developed Redox system has acceptable parasitic losses when using a fixed flow rate adequate to meet the worst conditions of current density and depth of discharge. These losses are reduced by about 65 percent if variable flow schedules are used. The exact value of the overall parasitics will depend on the specific system requirements of current density, voltage limits, charge, discharge time, etc.

N82-21268* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD OF MAKING FORMULATED PLASTIC SEPARA-TORS FOR SOLUBLE ELECTRODE CELLS Patent

Dean W. Sheibley, inventor (to NASA) Issued 5 Jan. 1982
7 p Filed 3 Nov. 1977 Supersedes N78-25149 (16 - 16, p 2085) Continuation of US Patent Appl. SN-776146, US Patent-4,133,941, filed 10 Mar. 1977

(NASA-Case-LEW-12358-2; US-Patent-4,309,372;

US-Patent-Appl-SN-848428; US-Patent-4,133,941;

US-Patent-Appl-SN-776146; US-Patent-Class-264-453; US-Patent-Class-264-53; US-Patent-Class-264-216;

US-Patent-Class-427-115; US-Patent-Class-427-244;

US-Patent-Class-427-246) Avail: US Patent and Trademark

Office CSCL 07D

A method making a membrane comprised of a hydrochloric acid-insoluble sheet of a mixture of a rubber and a powdered ion transport material is disclosed. The sheet can be present as a coating upon a flexible and porous substrate. These membranes can be used in oxidation-reduction electrical accumulator cells wherein the reduction of one member of a couple is accompained by the oxidation of the other member of the couple on the other side of the cell and this must be accompained by a change in chloride ion concentration in both sides. The method comprises preparing a mixture of fine rubber particles, a solvent for the rubber and a powdered ion transport material. The mixture is formed into a sheet and dried to produce a microporous sheet. The ion transport material includes particles ranging from about 0.01 to 10 microns in size and comprises from 20 to 50 volume percent of the microporous sheet.

Official Gazette of the U.S. Patent and Trademark Office

N82-22327* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. CROSS-LINKED POLYVINYL ALCOHOL FILMS AS ALKA-LINE BATTERY SEPARATORS Dean W. Sheibley, Michelle A. Manzo, and Olga D. GonzalezSanabria Mar. 1982 19 p refs Presented at the 158th Meeting of the Electrochim, Soc., Hollywood, Fla., 5-10 Oct. 1980

(NASA-TM-82802; E-1141; NAS 1,15:82802) Avail: NTIS HC A02/MF A01 CSCL 07D

Cross-linking methods were investigated to determine their effect on the performance of polyviriyl alcohol (PVA) films as alkaline battery separators. The following types of cross-linked PVA films are discussed: (1) PVA-dialdehyde blends post-treated with an acid or acid periodate solution (two-step method) and (2) PVA-dialdehyde blends cross-linked during film formation (drying) by using a reagent with both aldehyde and acid functionality (one-step method). Laboratory samples of each cross-linked type of film were prepared and evaluated in standard separator screening sists. The pilot-plant batches of films were prepared and compared to measure differences due to the cross-linking method. The pilot-plant materials were then tested in nickel oxide - zinc cells to compare the two methods with respect to performance characteristics and cycle life. Cell test results are compared with those from tests with Celgard. Author

N82-31450*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PIEZOELECTRIC COMPOSITE MATERIALS Patent Applica-

L. J. Kiraly, inventor (to NASA) Filed 12 Jul. 1982 9 p

(NASA-Case-LEW-12582-1; US-Patent-Appl-SN-397281) Avail:

NTIS HC A02/MF A01 CSCL 11D

A laminated structural device that has the ability to change shape, position and resonant frequency without using discrete motive components is described. The laminate may be a combination of layers of a piezoelectrically active, non-conductive matrix material. A power source selectively places various levels of charge an electrically conductive filaments imbedded in the respective layers to produce various configurations in a predetermined manner. The layers may be electrically conductive, having imbedded piezoelectrically active filaments. A combination of layers of electrically conductive material may be laminated to layers of piezoelectrically active material.

N82-31459*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGN FLEXIBILITY OF REDOX FLOW SYSTEMS

Norman H. Hagedorn and Lawrence H. Thaller 1982 18 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8-13 Aug. 1982

(Contract DE-Al04-80AL-12726)

(NASA-TM-82854; E-1223; NAS 1.15:82854;

DOE/NASA/12726-16) Avail: NTIS HC A02/MF A01 CSCL

The characteristics inherent in Redox flow systems permit considerable latitude in designing systems for specific storage applications. The first of these characteristics is the absence of plating/deplating reactions with their attendant morphology changes at the electrodes. This permits a given Redox system to operate over a wide range of depths of discharge and charge/ discharge rates. The second characteristic is the separation of power generating components (stacks) from the energy storage components (tanks). This results in cost effective system design, ease of system growth via modularization, and freedom from sizing restraints so that the whole spectrum of applications, from utilities down to single residence can be considered. The final characteristic is the commonality of the reactant fluids which assures that all cells at all times are receiving reactants at the same state of charge. Since no cell can be out of balance with respect to any other cell, it is possible for some cells to be charged while others are discharging, in effect creating a DC to DC transformer. It is also possible for various groups of cells to be connected to separate loads, thus supplying a range of output voltages. Also, trim cells can be used to maintain constant bus voltage as the load is changed or as the depth of discharge increases. The commonality of reactant fluids also permits any corrective measures such as rebalancing to occur at the system level instead of at the single cell level.

N82-33463*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CHEMICAL AND ELECTROCHEMICAL BEHAVIOR OF THE Cr(3)/Cr(2) HALF CELL IN THE NASA REDOX ENERGY STOR-AGE SYSTEM

David A. Johnson (Spring Arbor Coil.) and Margaret A. Reid 1982 21 p refs Presented at The 162nd Meeting of the Electrochem. Soc., Detroit, 17-22 Oct. 1982

(Contract DE-AI04-80AL-12726)

(NASA-TM-82913; E-1318; DOE/NASA/12726-17; NAS 1.15:82913) Avail: NTIS HC A02/MF A01 CSCL 10C

The Cr(III) complexes in the NASA Redox Energy Storage System were isolated and identified as Cr(H2O)6(+3) and Cr(H2O)5Cl(+2) by ion exchange chromatography and visible spectrophotometry. The cell reactions during charge-discharge cycles were followed by means of visible spectrophotometry. The spectral bands were resolved into component peaks and concentrations calculated using Beer's Law. During the charge mode Cr(H2O)5Cl(+2) is reduced to Cr(H2O)5Cl(+) and during the discharge mode Cr(H2O)5Cl(+) is oxidized back to Cr(H2O)5Cl (+2). Both electrode reactions occur via a chloride-bridge inner-sphere reaction pathway. Hysteresis effects can be explained by the slow attainment of equilibrium between Cr(H2O)6(+3) and Cr(H2O)5Cl(+2).

A82-43194 * The premixed flame in uniform straining flow, P. A. Durbin (NASA, Lewis Research Center, Cleveland, OH). Journal of Fluid Mechanics, vol. 121, Aug. 1982, p. 141-161, 19 refs.

Characteristics of the premixed flame in uniform straining flow are investigated by the technique of activation-energy asymptotics. An inverse method is used, which avoids some of the restrictions of previous analyses, it is shown that this method recovers known results for adiabatic flames. New results for flames with heat loss are obtained, and it is shown that, in the presence of finite heat loss, straining can extinguish flames. A stability analysis shows that straining can suppress the cellular instability of flames with Lewis number less than unity. Strain can produce instability of flames with Lewis number greater than unity. A comparison shows quite good agreement between theoretical deductions and experimental observations of Ishizuka, Miyasaka & Law (1981). (Author)

N82-22326*# Westinghouse Electric Corp., Concordville, Pa. Combustion Turbine Systems Div.

LOW NO SUB x HEAVY FUEL COMBUSTOR CONCEPT PROGRAM. PHASE 1A: COMBUSTION TECHNOLOGY GENERATION COAL GAS FUELS Final Report

T. P. Sherlock Feb. 1982 57 p refs (Contracts DEN3-146; DE-AlO1-77ET-13111)

(NASA-CR-165614; DOE/NASA/0146-2; NAS 1.26:165614) Avail: NTIS HC A04/MF A01 CSCL 20B

Combustion tests of two scaled burners using actual coal gas from a 25 ton/day fluidized bed coal gasifier are described. The two combustor configurations studied were a ceramic lined. staged rich/lean burner and an integral, all metal multiannual swirl burner (MASB). The tests were conducted over a range of temperature and pressures representative of current industrial combustion turbine inlet conditions. Tests on the rich lean burner were conducted at three levels of product gas heating volues: 104, 197 and 254 btu/scf. Corresponding levels of NOx emissions were 5, 20 and 70 ppmv. Nitrogen was added to the fuel in the form of ammonia, and conversion efficiencies of fuel nitrogen to NOx were on the order of 4 percent to 12 percent, which is somewhat lower than the 14 percent to 18 percent conversion efficiency when src-2 liquid fuel was used. The MASB was tested only on medium btu gas (320 to 270 btu/scf), and produced approximately 80 ppmv NOx at rated engine conditions. Both burners operated similarly on actual coal gas and erbs fuel, and all heating values tested can be successfully burned in current machines.

N82-25337*# General Electric Co., Syracuse, N.Y. Gas Turbine

LOW NO SUB x HEAVY FUEL COMBUSTOR CONCEPT **PROGRAM PHASE 1A GAS TESTS**

M. B. Cutrone, Kenneth W. Beebe, and Martin B. Cutrone Apr. 1982 135 p refs

(Contract DEN3-147)

(NASA-CR-167877: DOE/NASA/0147-2; NAS 1.26:167877)

Avail: NTIS HC A07/MF A01 CSCL 218

The emissions performance of a rich lean combustor (developed for liquid fuels) for combustion of simulated coal gases ranging in heating value from 167 to 244 Btu/scf were assessed. The 244 Btu/scf gas is typical of the product gas from an oxygen blown gasifier, while the 167 Btu/scf gas is similar to that from an air blown gasifier. Although meeting NOx goals for the 167 Btu/scf gas, NOx performance of the rich lean combustor did not meet program goals with the 244 Btu/scf gas because of high thermal NOx, similar to levels expected from conventional lean burning combustors. The NOx emissions are attributed to inadequate fuel air mixing in the rich stage resulting from the design of the large central fuel nozzle delivering 71% of the total gas flow. NOx generation from NH3 was significant at ammonia concentrations significantly less the 0.5%. These levels occur depending on fuel gas cleanup system design, However, NOx yield from ammonia injected into the fuel gas decreased rapidly with increasing ammonia level. and is projected to be less than 10% at NH3 levels of 0,5% or higher.

N82-25338*# Detroit Diesel Allison, Indianapolis, Ind LOW NOX HEAVY FUEL COMBUSTOR CONCEPT PRO-GRAM ADDENDUM: LOW/MID HEATING VALUE GASEOUS FUEL EVALUATION Final Report, Apr. 1981 -Feb. 1982

A. S. Novick and D. L. Troth Apr. 1982 77 p refs (Contract DEN3-148)

(NASA-CR-165615; DOE/NASA/0148-2; NAS 1.26:165615; EDR-10950) Avail; NTIS HC A05/MF A01 CSCL 21B

The combustion performance of a rich/quench/lean (RQL) combustor was evaluated when operated on low and mid heating value gaseous fuels. Two synthesized fuels were prepared having lower heating values of 10.2 MJ/cu m. (274 Btu/scf) and 6.6 MJ/cu m (176 Btu/scf). These fuels were configured to be representative of actual fuels, being composed primarily of nitrogen, hydrogen, carbon monoxide, and carbon dioxide. A liquid fuel air assist fuel nozzle was modified to inject both of the gaseous fuels. The RQL combustor liner was not changed from the configuration used when the liquid fuels were tested. Both gaseous fuels were tested over a range of power levels from 50 percent load to maximum rated power of the DDN Model 570-K industrial gas turbine engine. Exhaust emissions were recorded for four power level at several rich zone equivalence ratios to determine NOx sensitivity to the rich zone operating point. For the mid Btu heating value gas, ammonia was added to the fuel to simulate a fuel bound nitrogen type gaseous fuel. Results at the testing showed that for the low heating value fuel NOx emissions were all below 20 ppmc and smoke was below a 10 smoke number, For the mid heating value fuel, NOx emissions were in the 50 to 70 ppmc range with the smoke below a 10 smoke number.

Moderate temperature Na cells, III - Electro-A82-15732 * chemical and structural studies of Cr0.5V0.5S2 and its Na intercalates. K. M. Abraham and L. Pitts (EIC Laboratories, Inc., Newton, MA). Electrochemical Society, Journal, vol. 128, Dec. 1981, p. 2574-2577. 20 refs. Contract No. NAS3-21726.

Experimental results are reported on the behavior of a rechargeable Na cell incorporating a Cr0.5V0.5S2 cathode. The cell operates at 130 C and uses as electrolyte a 1M solution of NaI in 1,2-bis(2-methoxy-ethoxy)ethane (triglyme). The mechanism of discharge of Cr0.5V0.ES2 involves Na intercalation. It is found that the maximum rechargeable capacity of the Cr0.5V0.5S2 cathode is 0.7 e(overbar)/mol. With an average cell voltage of 1.9 V, the theoretical specific energy of the cathode is 273 W-hr/kg.

A82-15743 * Moderate temperature Na cells. IV - VS2 and NbS2CI2 as rechargeable cathodes in molten NaAICI4. K. M. Abraham, M. W. Rupich, and L. Pitts (EIC Laboratories, Inc., Newton, MA). Electrochemical Society, Journal, vol. 128, Dec. 1981, p. 2700-2702. 10 refs. Contract No. NAS3-21726.

A82-17746 * # Secondary effects in combustion instabilities leading to flashback. L. Vaneveld, K. Hom, and A. K. Oppenheim (Califfornia, University, Berkeley, CA). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0037. 16 p. Grant No. NsG-3227; Contract No. W-7405-eng-48.

The secondary effects in turbulent combustion instabilities leading to flashback are investigated, including those due to buoyancy and contraction at the combustor outlet. Experiments were conducted in an oblong, rectangular cross-section combustion tunnel, where the effects of a bluff-body flames holder were generated by a rear-facing step behind a streamlined inlet nozzle. The results of experiments leading to flashback with the step mounted at the bottom of the combustion chamber were compared to those of experiments in which it was located at the top. Irrespective of the flow obstructions introduced downstream, the critical equivalence ratio for flashback was consistently lower with the step at the bottom, indicating that buoyancy was enhancing the growth of the recirculation zone that pushed the flame upstream and caused flashback. The contraction at the end of the combustion chamber had a promoting influence on the process of vortex pairing, re-enforcing the influence of the trailing vortices over that of the recirculation vortex system, and thereby curbing the tendency to flashback. Provided that the flow velocity was low, however, the characteristic features of combustion instabilities leading to flashback in the absence of contraction could still be established in its

A82-20739 * # High temperature durable catalyst development. G. C. Snow and H. Tong (Acurex Corp., Mountain View, CA). Workshop on Catalytic Combustion, 5th, San Antonio, Ti., Sept. 15, 16, 1981, Paper. 38 p. 14 refs. Research supported by the Acurex Corp.; U.S. Environmental Protection Agency Contract No. 68-02-3122; Contract No. DEN3-83.

A program has been carried out to develop a catalytic reactor capable of operation in environments representative of those anticipated for advanced automotive gas turbine engines. A reactor consisting of a graded cell honeycomb support with a combination of noble metal and metal oxide catalyst coatings was built and successfully operated for 1000 hr. At an air preheat temperature of 740 K and a propane/air ratio of 0.028 by mass, the adiabatic flame temperature was held at about 1700 K. The graded cell monolithic reaction measured 5 cm in diameter by 10.2 cm in length and was operated at a reference velocity of 14.0 m/s at 1 atm. Measured NOx levels remained below 5 ppm, while unburned hydrocarbon concentrations registered near zero and carbon monoxide levels were nominally below 20 ppm.

A82-21431 * Analysis of infrared emission from thin adsorbates. J. L. Lauer and L. E. Keller (Rensselaer Polytechnic Institute, Troy, NY). In: International Conference on Fourier Transform Infrared Spectroscopy, Columbia, SC, June 8-12, 1981, Proceedings. (A82-21426 08-35) Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1981, p. 87-93. Grants No. NsG-3170; No. AF-AFOSR-78-3473; No. DAAG29-79-C-0204; Contract No. N00173-80-M-4575.

Fuel and lubricant deposits on solid surfaces, though often of similar visual appearance, differ in composition, depending on the nature of the deposit formers and the circumstances of deposition. To help establish these relations an infrared Emission Fourier Polarization Microspectrophotometer was constructed to record infrared spectra from the deposits on their original support. By focussing on small aggregates with a reflecting microscope objective and by discriminating against the randomly polarized blackbody radiation with a rotating polarizing filter phase-locked to an amplifier, excellent Fourier emission spectra of polarized bands could be obtained. In many instances, the microscope objective was adequate without the polarizer. The analysis was calibrated against a very thin film of polyethylene terephthalate attached to a highly reflective aluminum mirror on the sample positioner. (Author)

A82-22033 * # Time resolved density measurements in premixed turbulent flames. K. V. Dandekar and F. C. Gouldin (Cornell University, Ithaca, NY). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0036. 6 p. Research supported by the General Motors Corp. and U.S. Navy; Grant No. NsG-3019.

Premixed, turbulent flames are important in connection with investigations of fundamental, turbulent-reacting-flow processes and the study of practical combustion devices, such as spark ignition engines and premixed, prevaporized gas turbine combustors which burn premixed reactants. The considered investigation is concerned with the application of laser induced Rayleigh scattering to measure the gas density in premixed, methane-air flames. A description is provided of the results of density and velocity measurements in an open, lean, premixed methane-air flame stabilized in grid turbulence of low Reynolds number. It is found that where applicable, Rayleigh scattering can be used to good advantage to measure molecular number density. Mean and rms density results show that the mean flame thickens with axial distance but that the maximum in rms does not change appreciably.

G.R.

A82-28651 * Symposium /International/ on Combustion, 18th, University of Waterloo, Waterloo, Ontario, Canada, August 17-22, 1980, Proceedings. Symposium supported by Acurex Corp., U.S. Air Force, NASA, NBS, NSF, U.S. Navy, U.S. Army, U.S. Department of Energy, et al; NSF Grant No. CPE-79-23680; Contracts No. NAS3-22171; No. N00014-80-G-0079; No. DE-FG20-80PC-30197; Grants No. NBS-HA-1008; No. DAAK11-79-M-0010. Pittsburgh, PA, Combustion Institute, 1981, 1998 p. \$76.50. (For individual items see A82-28652 to A82-28738)

Problems related to combustion generated pollution are explored, taking into account the mechanism of NO formation from nitrogen compounds in hydrogen flames studied by laser fluorescence, the structure and similarity of nitric oxide production in turbulent diffusion flames, the effect of steam addition on NO formation, and the formation of NO2 by laminar flames. Other topics considered are concerned with propellant combustion, fluidized bed combustion, the combustion of droplets and sprays, premixed flame studies, fire studies, and flame stabilization. Attention is also given to coal flammability, chemical kinetics, turbulent combustion, soot, coal combustion, the modeling of combustion processes, combustion diagnostics, detonations and explosions, ignition, internal combustion engines, combustion studies, and furnaces.

A82-28694 * Flame structure in a swirl stabilized combustor inferred by radiant emission measurements. C, L, Beyler and F, C, Gouldin (Cornell University, Ithaca, NY). In: Symposium /International/ on Combustion, 18th, Waterloo, Ontario, Canada, August 17-22, 1980, Proceedings. (A82-28661 13-25) Pittsburgh, PA, Combustion Institute, 1981, p. 1011-1019. 25 refs, Grant No. NsG-3019.

Results of measurements of time-averaged chemiluminescent emissions from CH, OH, and CO2 and of Na tracer emissions along lateral lines-of-sight through a cylindrical premixed, swirl-stabilized combustor are reported. Assuming axial symmetry and small optical depth, raw data are inverted to obtain local emission levels from these species as a function of radius. The chemiluminescent emissions are interpreted as signatures of chemical reaction and used in determining the regions of reactions and heat release in the combustor. The data are compared with composition and velocity data obtained in the combustor for identical operating conditions. The results demonstrate that reaction occurs in a relatively narrow, turbulent flame-like combustion zone which begins upstream of the time-averaged location of the swirl-induced recirculation zone and propagates around and laterally away from the recirculation zone into the unburned gas.

C.R.

A82-28708 * Numerical modeling of turbulent combustion in premixed gases. A. F. Ghoniem, A. J. Chorin, and A. K. Oppenheim (California, University, Berkeley, CA). In: Symposium /International/ on Combustion, 18th, Waterloo, Ontario, Canada,

August 17-22, 1980, Proceedings. (A82-28651 13-25) Pittsburgh, PA, Combustion Institute, 1981, p. 1375-1381; Comments, p. 1381-1383. 19 refs. Contract No. W-7405-eng-48; Grant No. NsG-3227.

(Previously announced in STAR as N81-15029)

A82-28709 * Experimental and theoretical studies of the laws governing condensate deposition from combustion gases. D. E. Rosner and K. Seshadri (Yale University, New Haven, CT). In: Symposium /International/ on Combustion, 18th, Waterloo, Ontario, Canada, August 17-22, 1980, Proceedings (A82-28651 13-25) Pittsburgh, PA, Combustion Institute, 1981, p. 1385-1393; Comments, p. 1394. 49 refs. Grants No. NsG-3107; No. NsG-3169; Contract No. F49620-76-C-0020.

A description is presented of the results of a research program directed at an improved understanding of condensate deposition rate phenomena in combustion systems. The conducted experiments make use of real-time optical laser reflectance-interference-polarization techniques in flame environments. The obtained new data and the results of previous gravimetric experiments are employed as a basis for the development of a comprehensive convective diffusion deposition theory, taking into account the assumption of a multicomponent vapor or multisize class particles 'source-free' boundary layer. The theory makes it possible to provide self-consistent salt/ash/soot deposition rate predictions over a wide variety of environmental conditions.

G.R.

A82-28736 Lean-limit extinction of propane/air mixtures in the stagnation-point flow. C. K. Law, S. Ishlzuka, and M. Mizomoto (Northwestern University, Evanston, IL). In: Symposium /International/ on Combustion, 18th, Waterloo, Ontario, Canada, August 17-22, 1980, Proceedings. (A82-28651 13-25) Pittsburgh, PA, Combustion Institute, 1981, p. 1791-1797; Comments, p. 1797, 1798, 25 refs. Grant No. NAG3-53.

The extinction limits of lean propane/air mixtures in the stagnation-point flow of a flat surface were mapped as functions of the surface temperature and the mixture concentration, velocity, and temperature. The maximum flame temperatures and the flame locations were also measured. The results show that the extinction limits are extremely insensitive to the nature of the surface, which can be heated to 1000 C. On the other hand preheating the gas mixture increases the flame temperature by an almost equal amount and therefore significantly extends the extinction limits. It is also found that at extinction the maximum flame temperatures and the flame locations, which when scaled with the velocity gradient, assume almost constant values independent of the other system variables investigated. (Author)

-A82-32877 * Effects of heat loss, preferential diffusion, and flame stretch on flame-front instability and extinction of propane/air mixtures. S. Ishizuka, K. Miyasaka, and C. K. L. w (Northwestern University, Evanston, IL). Combustion and Flame, vol. 45, Mar. 1982, p. 293-308. 13 refs. Grant No. NAG3-53; Contract No. N00014-80-C-0586.

Flame configurations, flame-front cellular instability, and extinction of propane/air mixtures in the stagnation-point flow are experimentally studied for their dependence on downstream heat loss, preferential diffusion, and flame stretch. Boundaries for leanand rich-limit extinction, stabilization of corrugated flames, and local extinction caused by sharp curvatures are mapped for varying propane concentrations and freestream velocities. Flame location and temperature at extinction are determined as functions of stagnation surface temperature, extent of preheating, propane concentration, and freestream velocity. Results substantiate the theoretical predictions of the different extinction modes for lean and rich flames in the absence of downstream heat loss, and yield useful insight on the extinction characteristics when finite downstream heat loss does exist. It is further shown that flame-front instability occurs only for rich mixtures in accordance with preferential diffusion considerations, and that flame stretch has a stabilizing effect such that flame-front instability is completely inhibited before the onset of (Author) extinction.

A82-37570 On the opening of premixed Bunsen flame tips. C. K. Law, S. Ishizuka, and P. Cho (Northwestern University, Evanston, IL). Combustion Science and Technology, vol. 28, no. 3-4, 1982, p. 89-96. 13 refs. Research sponsored by the Ministry of Education of Japan; Contract No. N0014-80-C-0586; Grant No. NAG3-53.

The local extinction of Bunsen flame tip and edges of hydrocarbon/air premixtures has been experimentally investigated using a variety of burners. Results show that, while for both rich propane/air and butane/air mixtures tip opening occurs at a constant fuel equivalence ratio of 1.44 and is therefore independent of the intensity, uniformity, and configuration of the approach flow, for rich methane/air flames burning is intensified at the tip and therefore opening is not possible. These results substantiate the concept and dominance of the diffusional stratification mechanism in causing extinction, and clarify the theoretical predictions on the possible opening of two-dimensional flame wedges. (Author)

A82-37571 * Formation of oxides of nitrogen in monodisperse spray combustion of hydrocarbon fuels. A. A. Nizami, S. Singh, and N. P. Cernansky (Drexel University, Philadelphia, PA). Combustion Science and Technology, vol. 28, no. 3-4, 1982, p. 97-106, 21 refs. Research supported by the Philadelphia Electric Co. and General Motors Corp; NSF Grant No. ENG-76-10232; Grant No. NAG3-1

Experimental results of exit plane NO/NO(x) emissions from atmospheric monodisperse fuel spray combustion are presented. Six different hydrocarbon fuels were studied; Isopropanol, n-propanol, n-octane, Iso-octane, n-heptane and methanol. The results indicate an optimum droplet size for minimizing NO/NO(x) production for all of the test fuels. At the optimum droplet diameter, reductions in NO/NO(x) relative to the NO(x) occurred at droplet diameters of 55 and 48 microns respectively, as compared to a 50-micron droplet size for isopropanol. The occurrence of the minimum NO(x) point at different droplet diameters for the different fuels appears to be governed by the extent of prevaporization of the fuel's physical properties, Estimates are also given for the behavior of heavy finals and of polydisperse fuel sprays in shifting the minimum NO(x) point compared to a monodisperse situation. (Author)

A82-37574 * On stability of premixed flames in stagnation - Point flow. G. I. Sivashinsky (California, University, Berkeley, CA; Tel Aviv University, Tel Aviv, Israel), C. K. Law (California, University, Berkeley, CA; Northwestern University, Evanston, IL), and G. Joulin (Poitiers, Ecole Nationale Supérieure de Mécanique et d'Aérotechnique, Poitiers, France). Combustion Science and Technology, vol. 28, no. 3-4, 1982, p. 155-159. 8 refs. Research supported by the Israel Commission for Basic Research and U.S.-Israel Binational Science Foundation; Grant No. NAG3-53; Contract No. N00014-80-C-0586.

A quantitative description of flame stabilization in stagnation-point flow is proposed. Asymptotic and stability analyses are made for a flame model where the density of the gas is assumed to be constant and the reaction zone is assumed to be narrow and concentrated over the flame front. It is shown that, if blowing is sufficiently strong, the corrugations disappear and a plane flame results. The phenomena cannot be fully described by means of classical linear stability analysis.

C.D.

26 METALLIC MATERIALS

includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-10195*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
CREEP SHEAR BEHAVIOR ON THE OXIDE DISPERSION

Thomas K. Glasgow 1981 39 p refs Presented at 110th Ann. Meeting of the Am. Inst. of Mining, Met. and Petroleum Engr., Chicago, 22-26 Feb. 1981 (NASA-TM-82704; E-985) Avail: NTIS HC A02/MF A01 CSCL

The shear rupture life of the oxide dispersing strengthened (ODS) superalloy MA 6000E was determined at 650 and 760 C was 250 MPa, Comprisons were made at 760 C with the conventional cast superalloy B-1900+Hf, the ODS alloy MA 754, and the directionally solidified eutectic alloy gamma/gamma prime-delta was 170 MPa, and for B-1900+Hf was 360 MPa, The ODS alloy MA 6000E and gamma/gamma prime-delta failed with very little indication of ductile accommodation. Both MA 754 and B-1900+Hf showed some ductile tearing. Fracture surfaces of the ODS alloy M/A 754 showed discontinuities similar size, shape, and roughness to its grain structure, but the fracture surfaces of MA 6000E were much smoother than its grain boundaries.

N82-11182*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRENDS IN HIGH TEMPERATURE GAS TURBINE MATERI-ALS

S, J. Grisaffe and R. L. Dreshfield 1981 18 p refs Presented at the 1981 Aerospace Conf., Anaheim, Calif., 5-8 Oct. (NASA-TM-82715; E-999) Avail: NTIS HC A02/MF A01 CSCL 1.1F

High performance - high technology materials are among the technologies that are required to allow the fruition of such improvements. Materials trends in hot section components are reviewed, and materials for future use are identified. For combustors, airfoils, and disks, a common trend of using multiple material construction to permit advances in technology is identified.

N82-11183*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

UNIVERSAL BINDING ENERGY RELATIONS IN METALLIC ADHESION

J. Ferrante, J. R. Smith (Genera, Motors Research Lab.), and J. H. Rose (Ames Lab.) 1981 16 p refs Presented at the Conf. on Aspects Microscopiques de l'Adhesion et de le Lubrication, Paris, 14-18 Sep. 1981

(NASA-TM-82706; E-993) Avail: NTIS HC A02/MF A01 CSCL

Scaling relations which map metallic adhesive binding energy onto a single universal binding energy curve are discussed in relation to adhesion, friction, and wear in metals. The scaling involved normalizing the energy to the maximum binding energy and normalizing distances by a suitable comination of Thomas-Fermi screening lengths. The universal curve was found to be accurately represented by $E^*(A^*) = -(1 + \text{beta A}) \exp (-\text{Beta A}^*)$ where E^* is the normalized binding energy, A^* is the normalized separation, and beta is the normalized decay constant. The calculated cohesive energies of potassium, barium, copper, molybdenum, and samarium were also found to scale by similar relations, suggesting that the universal relation may be more general than for the simple free electron metals.

N82-11184*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FAILURE AMALYSIS OF A TOOL STEEL TORQUE SHAFT
John R. Reagan 1981 12 p Presented at the Conf. on
Deformation, Fracture, Wear and Nondestructive Evaluation of Mater., New Orleans, 23-24 Nov. 1981; sponsored by Am, Phys, Soc. and Nat. Bureau of Standards

(NASA-TM-82758; E-1077; DOE/NASA/1011-35) Avail:

NTIS HC A02/MF A01 CSCL 11F

A low design load drive shaft used to deliver power from an experimental exhaust heat recovery system to the crankshaft of an experimental diesel truck engine failed during highway testing. An independent testing laboratory analyzed the failure by routine metallography and attributed the failure to fatigue induced by a banded microstructure. Visual examination by NASA of the failed shaft plus the knowledge of the torsional load that it carried pointed to a 100 percent ductile failure with no evidence of fatigue. Scanning electron microscopy confirmed this, Torsional test specimens were produced from pieces of the failed shaft and torsional overload testing produced identical failures to that which had occurred in the truck engine. This pointed to a failure caused by a high overload and although the microstructure was defective it was not the cause of the failure.

N82-12216*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PROGRESS IN PROTECTIVE COATINGS FOR AIRCRAFT GAS TURBINES: A REVIEW OF NASA SPONSORED

John P. Merutka 1981 29 p refs Presented at the 5th Ann, Conf. on Composite and Adv. Mater., Merritt Island, Fla., 19-22 Jan, 1981; sponsored by the Am. Ceramic Soc., Inc. (NASA-TM-82740; E-711) Avail: NTIS HC A03/MF A01 CSCL

Problems associated with protective coatings for advanced aircraft gas turbines are reviewed. Metallic coatings for preventing titanium fires in compressors are identified. Coatings for turbine section are also considered, Ductile aluminide coatings for protecting internal turbine-blade cooling passage surface are also identified. Composite modified external overlay MCrAlY coatings deposited by low-pressure plasma spraying are found to be better deposited by low-pressure plasma splaying are locally to in surface protection capability than vapor deposited MCrAIY costings. Thermal barrier coating (TBC), studies are presented. The design of a turbine airfoil is integrated with a TBC, and computer-aided manufacturing technology is applied.

N82-13281*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ELEVATED TEMPERATURE FATIGUE TESTING OF MET-ALS

Marvin H. Hirschberg In AGARD Fatigue Test Methodology Oct. 1981 18 p refs (For primary document see N82-13274

Avail: NTIS HC A12/MF A01

NB2-17335* ∦ National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

REVIEW OF NASA PROGRESS IN THERMAL BARRIER COATINGS FOR STATIONARY GAS TURBINES

Philip E. Hodge, Robert A. Miller, Michael A. Gedwill, and Isidor Zaplatynsky 1981 16 p refs Presented at the Intern, Gas Turbine Conf., Houston, Tex., 9-12 Mar. 1981 (Contract EF-77-A-01-2593)

(NASA-TM-81716: DOE/NASA/2593-25; E-749) Avail: NTIS HC A02/MF A01 CSCL 11F

Ceramic thermal barrier coatings for industrial/utility gas turbines were investigated. In burner rig tests of a zirconia yttria/nickel chromium aluminum yttrium ZrO2-12w/OY2O3/ NiCrAlY coating system on air cooled superalloy specimens, ceramic coating life (spallation) was sensitive to Na and V concentration in the fuel. The locations of coating spallation correspond to areas where combustion products were predicted to condense. Three new thermal barrier coating systems were identified. These are based on calcium silicate, ZrO2-8w/OY2O3, and a MgO-NiCrAlY cermet. The spall resistance can be increased by reducing the ceramic layer thickness from 0.038 to 0.013 cm and by the use of more oxidation/corrosion resistant bond coats.

N82-20291*#. National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio, FRICTION AND WEAR OF IRON IN CORROSIVE METAL George W. P. Rengstorff, Kazuhisa Miyoshi, and Donald H. Buckley

Mar. 1982 18 p refs

(NASA-TP-1985; NAS 1.60:1985; E-638) Avail: NTIS

HC A02/MF A01 CSCL 11F

Friction and wear experiments were conducted with elemental iron exposed to various corrosive media including two acids, base, and a salt. Studies involved various concentrations of nitric and sulfuric acids, sodium hydroxide, and sodium chloride. Load and reciprocating sliding speed were kept constant. With the base NaOH an increase in normality beyond 0.01 N resulted in a decrease in both friction and wear. X-ray photoelectron spectroscopy (XPS) analysis of the surface showed a decreasing concentration of ferric oxide (Fe2O3) on the iron surface with increasing NaOH concentration. With nitric acid (HNO3) friction decreased in solutions to 0.05 N, beyond which no further change in friction was observed. The concentration of Fe2O3 on the surface continued to increase with increasing normality. XPS analysis revealed the presence of sulfates in addition of Fe2O3 on surfaces exposed to sulfuric acid and iron chlorides but no sodium on surfaces exposed to NaCl.

N82-21298*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF ALUMINUM PHOSPHATE ADDITIONS ON COMPOSITION OF THREE-COMPONENT PLASMA-SPRAYED SOLID LUBRICANT

Thomas P. Jacobson and Stanley G. Young Mar. 1982 19 p.

{NASA-TP-1990; E-713; NAS 1.60:1990} Avail: NTIS HC A02/MF A01 CSCL 11F

Image analysis (IA) and electron microprobe X-ray analysis (EMXA) were used to characterize a plasma-sprayed, selflubricating coating, NASA LUBE PS106, specified by weight percent as 35NiCr-35Ag-30CaF2. To minimize segregation of the powder mixture during the plasma-spraying procedure, monoaluminum phosphate was added to form agglomerate particles. Three concentrations of AIPO4 were added to the mixtures: 1.25, 2.5, and 6.25 percent by weight. Analysis showed that 1.25 wt% AIPO4 yielded a CaF2 deficiency, 2.5 wt% kept the coating closest to specification, and 6.25 wt% yielded excess CaF2 as well as more impurities and voids and a deficiency in silver. Photomicrographs and X-ray maps are presented. The methods of IA and EMXA complement each other, and the reasonable agreement in the results increases the confidence in determining the coating composition.

N82-21300*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRICTION WEAR AND AUGER ANALYSIS OF IRON IMPLANTED WITH 1.5-MeV NITROGEN IONS

John Ferrante and William R. Jones, Jr. Mar. 1982 14 p

(NASA-TP-1989; E-678; NAS 1.60:1989) Avail: NTIS HC A02/MF A01 CSCL 11F

The effect of implantation of 1.5-MeV nitrogen ions on the friction and wear characteristics of pure iron sliding against steel was studied in a pin-on disk apparatus. An implantation dose of 5 x 10 to the 17th power ions/sq cm was used. Small reductions in initial and steady-state wear rates were observed for nitrogen-implanted iron riders as compared with unimplanted controls. Auger electron spectroscopy revealed a subsurface Gaussian nitrogen distribution with a maximum concentration of 15 at, % at a depth of 8 x 10 to the -7th m. A similar analysis within the wear scar of an implanted rider after 20 microns of wear yielded only background nitrogen concentration, thus giving no evidence for diffusion of nitrogen beyond the implanted Author

N82-21301*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRICTION AND SURFACE CHEMISTRY OF SOME FER-**ROUS-BASE METALLIC GLASSES**

Kazuhisa Miyoshi and Donald H. Buckley Mar. 1982 14 p

(NASA-TP-1991; E-919; NAS 1.60:1991) Avail: NTIS HC A02/MF A01 CSCL 11F

The friction properties of some ferrous-base metallic glasses were measured both in argon and in vacuum to a temperature of 350 C. The alloy surfaces were also analyzed with X-ray photoelectron spectroscopy to identify the compounds and

> ORIGINAL PAGE IS OF POOR QUALITY

elements present on the surface. The results of the investigation indicate that even when the surfaces of the amorphous alloys, or metallic glasses, are atomically clean, bulk contaminants such as boric oxide and silicon dioxide diffuse to the surfaces. Friction measurements in both argon and vacuum indicate that the alloys exhibit nigher coefficients of friction in the crystalline Author state than they do in the amorphous state.

NB2-22344*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRIBOLOGICAL PROPERTIES AND XPS STUDIES OF ION PLATED GOLD ON NICKEL AND IRON

Kazuhisa Miyoshi, Talivaldis Spalvins, and Donald H. Buckley 1982 18 p refs Presented at Intern. Conf. on Met. Coatings, San Diego, Calif., 4-9 Apr. 1982; sponsored by American Vacuum

(NASA-TM-82814; E-1161; NAS 1,15:82814) Avail: NTIS

HC A02/MF A01 CSCL 11F

Tribological and X-ray photoelectron spectroscopy analysis were conducted with ion plated gold films on nickel and iron substrates in sliding contact with metals and nonmetals in a vacuum of 3 x 10 nPa and in an argon atmosphere. The results obtained indicated a deeper graded interface when gold was ion plated on nickel than on iron. The deep graded interface between gold and nickel may be due to the solubility of material pairs. The gold and nickel in the graded interface can form an alloy. The gold in the graded interface with iron is atomically dispersed in the iron and thus forms a physically bonded interface. This is believed to be due primarily to implantation effects. The coefficient of friction, wear and transfer of gold in contact with metal or nonmetal were greater in a vacuum of 3 x 10 nPa than in argon, Gold films in contact with metals had a higher coefficient of friction, wear and transfer of gold than gold films in contact with the nonmetals. These observations resulted from the greater adhesion of gold to metals that to nonmetals. Author

N82-22346* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF LASER GLAZED ZrO2 TBCs IN CYCLIC **OXIDATION AND CORROSION BURNER TEST RIGS**

I. Zaplatynsky 1982 21 p refs Presented at the Intern. Conf. on Met. Coatings and Process Technol., San Francisco. 4-8 Apr. 1982; sponsored by the American Vacuum Society (NASA-TM-82830; E-1195; NAS 1,15:82830) Avail: NTIS HC A02/MF A01 CSCL 11F

The performance of laser glazed zirconia thermal barrier coatings (TBCs) was evaluated in cyclic oxidation and cyclic corrosion tests. Plasma sprayed zirconia coatings of two thicknesses were partially melted with a CO2 laser. The power density of the focused laser beam was varied from 35 to 75 W/sq mm, while the scanning speed was about 80 cm per minute. In cyclic oxidation tests, the specimens were heated in a burner rig for 6 minutes and pled for 3 minutes, it is indicated that the laser treated samples have the same life as the untreated ones. However, in corrosion tests, in which the burner rig flame contained 100 PPM sodium, fuel equivalent, the laser treated samples exhibit nearly a fourfold life improvement over that of the reference samples vary. In both tests, the lives of the samples inversely with the thickness of the laser melted layer of zirconia, E.A.K.

N82-22347*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD AND APPARATUS FOR COATING SUBSTRATES USING LASERS Patent Application

Isidor Zaplatynsky, inventor (to NASA) Filed 15 Mar. 1982

(NASA-Case-LEW-13526-1; US-Patent-Appl-SN-358398) Avail: NTIS HC A02/MF A01 CSCL 11F

A method for coating substrates using lasers is described. Metal substrates, preferably of titanium and titanium alloys, were coated by alloying or forming TiN on a substrate surface. In the process a laser beam strikes the surface of a moving substrate in the presence of purified nitrogen gas. A small area of the substrate surface is quickly heated, without melting, and reacts with the nitrogen to form a solid solution. This process of alloying or forming TiN, which occurs by diffusion of nitrogen into the titaninum, is reviewed. NASA

NB2-22349*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SURFACE CHEMISTRY, MICROSTRUCTURE AND FRIC-TION PROPERTIES OF SOME FERROUS-BASE METALLIC GLASSES AT TEMPERATURES TO 750 C

Kazuhisa Miyoshi and Donald H. Buckley Apr. 1982 16 p

(NASA-TP-2008; E-1001; NAS 1.60:2008) Avail: NTIS HC A02/MF A01 CSCL 11B

X-ray photoelectron spectroscopy analysis, transmission electron microscopy, diffraction studies, and sliding friction experiments were conducted with ferrous-base metallic glasses in sliding contact with aluminum oxide at temperatures from room to 750 C in a vacuum of 30 nPs. The results indicate that there is a significant temperature influence on the friction properties, surface chemistry, and microstructure of metallic glasses. The relative concentrations of the various constituents at the surface of the sputtered specimens were very different from the normal bulk compositions. Contaminants can come from the bulk of the material to the surface upon heating and impart boric oxide and silicon oxide at 350 C and boron nitride above 500 C. The coefficient of friction increased with increasing temperature to 350 C. Above 500 C the coefficient of friction decreased rapidly. The segregation of contaminants may be Author responsible for the friction behavior.

N82-24322*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

TRIBOLOGICAL CHARACTERISTICS OF NITROGEN (N+) IMPLANTED IRON

William R. Jones and John Ferrante 1982 24 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct. 1982; sponsored by the American Society of Lubrication Engineers and ASME

(NA SA-TM-82839; E-1207; NAS 1.15:82839) Avail: NTIS HC A02/MF A01 CSCL 11F

The effect of implantation of nitrogen ions (1.5 MeV) on the friction and wear characteristics of pure ion sliding against M-50 steel (unimplanted) was studied in a pin-on-disk sliding friction apparatus. Test conditions included room temperature (25 C), a dry air atmosphere, a load of 1/2 kg (4.9 N), sliding velocities of 0.043 to 0.078 m/sec (15 to 25 rpm), a pure hydrocarbon lubricant (n-hexadecane), or a U.S.P. mineral oil and nitrogen ion implantation doses of 5x10 to the 15th power and 5x10 to the 17th power ions/sq cm. No differences in wear rates were observed in the low dose experiments. In the high dose experiments, small reductions in initial (40 percent) and steady state (20 percent) wear rates were observed for nitrogen implanted iron riders as compared with unimplanted controls. No differences in average friction coefficients were noted for either dose. Auger electron spectroscopy combined with argon ion bombardment revealed a subsurface Gaussian nitrogen distribution with a maximum concentration of 6 atomic percent at a depth of 0.8 microns. Similar analysis within the wear scar of an implanted rider after 20 microns of wear yielded only background nitrogen concentration. No inward migration of nitrogen ions was observed.

N82-24323*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF OXIDE FILMS ON HYDROGEN PERMEABILITY OF CANDIDATE STIRLING ENGINE HEATER HEAD TUBE ALLOYS

Susan R. Schuon and John A. Misencik 1981 32 p refs Presented at the .110th Ann. Meeting of Am. Inst. of Mining, Met. and Petrol. Engrs., Chicago, 22-26 Feb. 1981 (Contract DE-A101-77CS-51040)

(NASA-TM-82824; E-1176; DOE/NASA/51040-38; NAS 1.15:82824) Avail: NTIS HC A03/MF A01 CSCL 11F The effect of oxide films developed in situ from CO/CO2

doped hydrogen on high pressure hydrogen permeability at 820 C was studied on N-155, A-286, IN 800, 19-9DL, Nitronic 40, HS-188, and IN 718 tubing in a Stirling materials simulator. The hydrogen permeability decreased with increasing dopant levels of CO or CO2 and corresponding decreases in oxide porosity. Minor reactive alloying elements strongly influenced permeability. At high levels of CO or CO2, a liquid oxide formed on alloys with greater than 50 percent Fe. This caused increased permeability. The oxides formed on the inside tube walls were analyzed and their effective permeabilities were calculated. T.M.

N82-24325*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CORRELATION OF TENSILE AND SHEAR STRENGTHS OF

METALS WITH THEIR FRICTION PROPERTIES

Kazuhisa Miyoshi and Donald H. Buckley 1982 23 p refs Proposed for presentation at the Joint Lubrication Conf.. Washington, D.C., 5-7 Oct. 1982; sponsored by ASME and the American Society of Lubrication Engineers

(NASA-TM-82828; E-1186; NAS 1.15:82828) Avail: NTIS

HC A02/MF A01 CSCL 11F

The relation between the theoretical tensile and the shear strengths and the friction properties of metals in contact with diamond, boron nitride, silicon carbide, manganese-zinc ferrite, and the metals themselves in vacuum was investigated. The relationship between the actual shear strength and the friction properties of the metal was also investigated. An estimate of the theoretical unlaxial tensile strength was obtained in terms of the equilibrium surface energy, interplanar spacing of the planes perpendicular to the tensile axis, and the Young's modulus of elasticity. An estimate of the theoretical shear strength for metals was obtained from the shear modulus, the repeat distance of atoms in the direction of shear of the metal and the interplanar spacing of the shear planes. The coefficient of friction for metals was found to be related to the theoretical tensile, theoretical shear, and actual shear strengths of metals. The higher the strength of the metal, the lower the coefficient of friction,

N82-24326* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A STATUS REVIEW OF NASA'S COSAM (CONSERVATION OF STRATEGIC AEROSPACE MATERIALS) PROGRAM **Executive Status Report**

Joseph R. Stephens Washington May 1982 46 p refs (NASA-TM-82852; E-1222; NAS 1.15:82852) Avail: NTIS

HC A03/MF A01 CSCL 11F

The use and supply of strategic elements in nickel base superalloys for gas turbine engines are reviewed. Substitution of strategic elements, advanced processing concepts, and the identification of alternate materials are considered. Cobalt, tantalum, columbium, and chromium, the supplies of which are 91-100% imported, are the materials of major concern.

N82-26431*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

IMPROVED THERMAL BARRIER COATING SYSTEM Patent **Application**

Stephan Stecura, inventor (to NASA) Filed 6 May 1982 13 p (NASA-Case-LEW-13324-1; US-Patent-Appl-SN-375784) Avail:

NTIS HC A02/MF A01 CSCL 11F

A high temperature oxidation resistant thermal barrier coating system for a nickel-, cobalt-, or iron-base alloy substrate is described. An inner metal bond coating contacts the substrate, and a thermal barrier coating covers the bond coating. NiCrAIR, and CoCrAIR alloy are satisfactory as bond coating compositions where R = Y or Yb. These alloys contain, by weight, 0-35% chromium, 6-18% aluminum, and 0.05 to 1.55% yttrium or 0.05 to 3.0% ytterbium. The coatings containing ytterbium are preferred over those containing yttrium. An outer thermal barrier coating of partially stabilized zirconium oxide (zirconia) which is between 6% and 8%, by weight, of yttrium oxide (yttria) covers the bond coating. Partial stabilization provides a material with superior durability. Partially stabilized zirconia consists of mixtures of cubic, tetragonal, and monoclinic phases,

N82-29415* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

REFRACTORY COATINGS AND METHOD OF PRODUCING THE SAME Patent

William A. Brainard and Donald R. Wheeler, inventors (to NASA) Issued 22 Jun. 1982 4 p Filed 7 Dec. 1979 Supersedes N80-14232 (18 - 05, p 0583)

(NASA-Case-LEW-13169-1; US-Patent-4,336,117;

US-Patent-Appl-SN-102003; US-Patent-Class-204-192C) Avail;

US Patent and Trademark Office CSCL 11F

The adhesion, friction, and wear properties of sputtered refractory coatings on substrates of materials that form stable nitrides is improved by placing each substrate directly below a titanium carbide target of a commercial radiofrequency diode apparatus in a vacuum chamber. Nitrogen is bled into the system

through a nozzle resulting in a small partial pressure of about 0.5% to 2.5% during the first two minutes of deposition. The flow of nitrogen is then stopped, and the sputtering ambient is reduced to pure argon through a nozzle without interrupting the sputtering process. When nitrogen is deliberately introduced during the crucial interface formation, some of the titanium at the interface reacts to form titanium nitride while the metal of the substrate also forms the nitride. These two nitrides atomically mixed together in the interfecial region act to more strongly bond the growing titanium carbide coating as it forms on the substrate

Official Gazette of the U.S. Patent and Trademark Office

NB2-30371* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

REFRACTORY COATINGS Patent

William A. Brainard and Donald R. Wheeler, inventors (to NASA) Issued 27 Jul, 1982 4 p Filed 29 Sep. 1980 Division of US Patent Appl. SN-102003, filed 7 Dec. 1979

(NASA-Case-LEW-13169-2; US-Patent-4,341,843; US-Patent-Appl-SN-191746; US-Patent-Appl-SN-102003;

US-Patent-Class-428-457; US-Patent-Class-204-1920; US-Patent-Class-428-472) Avail: US Patent and Trademark

Office CSCL 11F

A thin sputtered film is discussed which exhibits improved adherence to a substrate and has improved friction and wear characteristics. Each substrate is placed directly below a titanium carbide target of a commercial radiofrequency diode apparatus in a vacuum chamber. Nitrogen is bled into the system through a nozzle resulting in a small partial pressure of about 0.5% to 2.5% during the first two minutes of deposition. The flow of nitrogen is then stopped, and the sputtering ambient is reduced to pure argon through a nozzle without interrupting the sputtering process.

Official Gazette of the U.S. Patent and Trademark Office

N82-30372* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

EVALUATION OF CANDIDATE STIRLING ENGINE HEATER TUBE ALLOYS AT 820 DEG AND 860 DEG C Final Report

John A. Misencik Jun. 1982 43 p. refs (Contract DE-AI01-77CS-51040) (NASA-TM-82837; E-1204; DOE/NASA/51040-39; NAS 1.15:82837) Avail: NTIS HC A03/MF A01 CSCL 11F

Seven commercial alloys were evaluated in Stirling simulator materials rigs. Five iron base alloys (N-155, A-286, Incoloy 800, 19-9DL, and 316 stainless steel), one nickel base alloy (Inconel 718), and one cobalt base alloy (HS-188) were tested in the form of thin wall tubing in a diesel fuel fired test rig. Tubes filled with hydrogen or helium at gas pressure of 21.6 MPa and temperatures of 820 and 860 C were endurance tested for 1000 and 535 hours, respectively. Results showed that under these conditions hydrogen permeated rapidly through the tube walls, thus requiring refilling during each five hour cycle. Helium was readily contained, exhibiting no measurable loss by permeation. Helium filled tubes tested at 860 C all exhibited creep-rupture failures within the 535 hour endurance test. Subsequent tensile test evaluation after removal from the rig indicated reduced room temperature ductility for some hydrogen-filled tubes compared to helium-filled tubes, suggesting possible hydrogen embrittlement in these alloys.

N82-30373*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF FUEL TO AIR RATIO ON MACH 0.3 BURNER RIG HOT CORROSION OF ZrO2-Y2O3 THERMAL BARRIER COATINGS

Philip E. Hodge Jul. 1982 11 p refs (Contract DE-AI01-77ET-10350)

(NASA-TM-82879; E-1255; DOE/NASA/10350-32; NAS 1.15:82879) Avail: NTIS HC A02/MF A01 CSCL 11F

A Mach 0.3 burner rig test program was conducted to determine how the fuel to air mass ratio affects the durability of ZrO2-Y2O3/Ni-16Cr-6Al-0.31Y thermal barrier coating systems in combustion products containing 5 ppm Na and 2 ppm V. As the fuel to air mass ratio was increased from 0.039 to 0.049, the durability of ZrO2-6Y2O3, ZrO2-8Y2O3 and ZrO2-12Y2O3 coatins decreased. ZrO2-8Y2O3 coatings were approximately 2X and 1.3X more durable than ZrO2-12Y2O3 and ZrO2-6Y2O3 coatings respectively at the fuel to air mass ratio of 0,039. The

number of one hour cycles endured by ZrO2-8Y2O3 coatings varied from averages of 53 to 200 for the fuel to air mass ratios of 0.049 and 0.039, respectively. At the fuel to air mass ratio of 0.049, all ZrO2-Y2O3 coated specimens failed in 40 to 60 one hour cycles

N82-31505* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NICRAL TERNARY ALLOY HAVING IMPROVED CYCLIC OXIDA-**TION RESISTANCE** Patent

Charles A. Barrett (NAS-NRC, Washington, D.C.), Carl E. Lowell (NAS-NRC, Washington, D.C.), and Abdus S. Khan (NAS-NRC, Washington, D.C.) Issued 20 Jul. 1982 3 p Filed 23 Oct. 1980 Supersedes N81-12211 (19 - 03, p 0322) Sponsored by NASA (NASA-Case-LEW-13339-1; US-Patent-4,340,425;

US-Patent-Appl-SN-199769; US-Patent-Class-148-428; US-Patent-Class-4110-445; US-Patent-Class-420-551;

US-Patent-Class-420-508) Avail: US Patent and Trademark Office CSCL 11F

NiCrAl alloys are improved by the addition of zirconium. These alloys are in the Beta or gamma/gamma' + Beta region of the ternary system. Zirconium is added in a very low amount between 0.06 and 0.20 weight percent. There is a narrow optimum zirconium level at the low value of 0.13 weight percent. Maximum resistance to cyclic oxidation is achieved when the zirconium addition is at the optimum value.

Official Gazette of the U.S. Patent and Trademark Office

N82-32461*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FAILURE MECHANISMS OF THERMAL BARRIER COATINGS

EXPOSED TO ELEVATED TEMPERATURES

Robert A. Miller and Carl E. Lowell 1982 14 p refs Presented at the Intern. Conf. on Met. Coatings and Process Technol., San Diego, Calif., 4-9 Apr. 1982

(NASA-TM-82905; E-1289; NAS 1.15:82905) HC A02/MF A01 CSCL 11F Avail: NTIS

The failure of a ZrO2-8%Y2O3/Ni-14% Al-0.1% Zr coating system on Rene 41 in Mach 0.3 burner rig tests was characterized. High flame and metal temperatures were employed in order to accelerate coating failure. Failure by delamination was shown to precede surface cracking or spalling. This type of failure could be duplicated by cooling down the specimen after a single long duration isothermal high temperature cycle in a burner rig or a furnace, but only if the atmosphere was oxidizing. Stresses due to thermal expansion mismatch on cooling coupled with the effects of plastic deformation of the bond coat and oxidation of the irregular bond coat are the probable life limiting factors. Heat up stresses alone could not fail the coating in the burner rig tests. Spalling eventually occurs on heat up but only after the coating has already failed through delamination.

N82-33493*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

A STUDY OF THE NATURE OF SOLID PARTICLE IMPACT AND SHAPE ON THE EROSION MORPHOLOGY OF DUCTILE MET-

P. Veerabhadra Rao (NAS-NRC), Stanley G. Young, and Donald H. Buckley Jul. 1982 19 p refs Presented at Microscopy of the Degradation of Mater. (Wear and Erosion), MICRO 82, Intern. Symp. and Exhibition, London, 12-16 Jul. 1982; sponsored by the Royal Microscopical Society

(NASA-TM-82933; E-1298; NAS 1.15:82933) HC A02/MF A01 CSCL 11F Avail: NTIS

Impulsive versus steady jet impingement of spherical glass bead particles on metal surfaces was studied using a gas gun facility and a commercial sand blasting apparatus. Crushed glass particles were also used in the sand blasting apparatus as well as glass beads. Comparisons of the different types of erosion patterns were made. Scanning electron microscopy, surface profilometry and energy dispersive X-ray spectroscopy analysis were used to characterize erosion patterns. The nature of the wear can be divided into cutting and deformation, each with its own characteristic features. Surface chemistry analysis indicates the possibility of complex chemical and/or mechanical interactions between erodants and target materials.

A82-10674 * Effect of gamma irradiation on the friction and wear of ultrahigh molecular weight polyethylene. W. R. Jones, W. F. Hady (NASA, Lewis Research Center, Cleveland, OH), and A. Crugnola (Lowell, University, Lowell, MA), Wear, vol. 70, July 15, 1981, p. 77-92, 25 refs.

The effect of sterilization gamma irradiation on the friction and wear properties of ultrahigh molecular weight polyethylene (UHMWPE) sliding against stainless steel 316L in dry air at 23 C is investigated, the results to be used in the development of artificial joints which are to surgically replace diseased human joints. A pin-on-disk sliding friction apparatus is used, a constant sliding speed in the range 0,061-0,27 m/s is maintained, a normal load of 1 kgf is applied with dead weight, and the irradiation dose levels are: 0, 2.5, and 5.0 Mrad, Wear and friction data and conditions for each of the ten tests are summarized, and include: (1) wear volume as a function of the sliding distance for the irradiation levels, (2) incremental wear rate, and (3) coefficient of friction as a function of the sliding distance. It is shown that (1) the friction and wear properties of UHMWPE are not significantly changed by the irradiation doses of 2.5 and 5.0 Mrad, (2) the irradiation increases the amount of insoluble gel as well as the amount of low molecular weight material, and (3) after run-in the wear rate is either steady or gradually decreases as a function of the sliding distance.

A82-11399 * Comparative thermal fatigue resistance of several oxide dispersion strengthened alloys. J. D. Whittenberger and P. T. Bizon (NASA, Lewis Research Center, Cleveland, OH). International Journal of Fatigue, vol. 3, Oct. 1981, p. 173-180, 25 refs.

The thermal fatigue resistance of several oxide dispersion strengthened (ODS) alloys has been evaluated through cyclic exposure in fluidized beds. The ODS nickel-base alloy MA 754 and ODS iron-base alloy MA 956 as well as four experimental ODS Ni-16Cr-4.5Al base alloys with and without Ta additions were examined, Both bare and coated alloys were subjected to up to 6000 cycles where each cycle consisted of a 3 minute immersion in a fluidized bed at 1130 C followed by a 3 minute immersion in a bed at 357 C, Testing revealed that the thermal fatigue resistance of the ODS nickel-base alloys was excellent and about equal to that of directionally solidified superalloys. However, the thermal fatigue resistance of MA 956 was found to be poor. Metallographic examination of tested specimens revealed that, in general, the post-test microstructures can be rationalized on the basis of previous diffusion, mechanical property, and oxidation studies. (Author)

A82-37151 * Long-term high-velocity oxidation and hot corrosion testing of several NiCrAl and FeCrAl base oxide dispersion strengthened alloys. C. E. Lowell, D. L. Deadmore, and J. D. Whittenberger (NASA, Lewis Research Center, Materials Div., Cleveland, OH). Oxidation of Metals, vol. 17, Apr. 1982, p. 205-221. 20 refs.

Several oxide dispersion strengthened (ODS) alloys have been tested for cyclic, long-term, high gas-velocity resistance to oxidation at 1100 C and hot corrosion at 900 C. Both nominally Ni-16Cr-4Al and Fe-20Cr-4.5Al ODS alloys were subjected up to about 2500 cycles, where each cycle consisted of 1 hr in a hot, Mach 0.3 combusted gas stream followed by a 3-min quench in an ambient temperature, Mach 0.3 air blast. For comparison to existing technology, a coated superalloy was simultaneously tested. The ODS iron alloy exhibited clearly superior behavior, surviving 3800 oxidation and 2300 hot corrosion cycles essentially unscathed. While the ODS nickel alloys exhibited adequate oxidation resistance, the long-term hot corrosion resistance could be marginal, since the best life for such alloys under these conditions was only about 1100 cycles. However, the hot corrosion resistance of the ODS Ni-base alloys is excellent in comparison to that of traditional superalloys. (Author)

A82-40041 * Crystallographic texture in oxide-dispersion-strengthened alloys, J. D. Whittenberger (NASA, Lewis Research Center, Cleveland, OH). Materials Science and Engineering, vol. 54, June 1982, p. 81-83. 9 refs.

Crystallographic and elastic moduli data are presented which document the degree of texture in several oxide dispersion-strengthened (ODS) nickel-base alloys. The existence of strong crystallographic textures in such multicrystalline alloys is considered important, since the small angle grain boundaries may be

partially responsible for creep threshold stresses. Gleiter (1979) has shown that ideal, low energy boundaries will act as vacancy sources only when the applied stress is greater than a threshold stress, while large angle grain boundaries will emit vacancies at all stress levels. The continued operation of a net vacancy in an ODS alloy must be avoided, since it will lead to a localized disruption of the microstructure.

O.C.

A82-42774 * Structure and creep rupture properties of directionally solidified eutectic gemma/gemma-prime-alpha alloy. J. D. Whittenberger (NASA, Lewis Research Center, Cleveland, OH) and G. Wirth (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Cologne, West Germany). Metal Science, vol. 16, Aug. 1982, p. 383-388, 21 refs. Research supported by the Alexander von Humboldt-Stiftung.

A simple ternary gamma/gamma-prime-alpha alloy of nominal composition (wt-%) Ni-32Mo-6Al has been directionally solidified at 17 mm/h and tested in creep rupture at 1073, 1173, and 1273 K. A uniform microstructure consisting of square-shaped Mo fibers in a gamma + gamma-prime matrix was found despite some variation in the molybdenum and aluminum concentrations along the growth direction. Although the steady-state creep rate is well described by the normal stress temperature equation, the stress exponent (12) and the activation energy (580 kJ/mol) are high. The rupture behavior is best characterized by the Larson-Miller parameter where the constant equals 29. (Author)

A82-47393 * # The influence of gamma prime on the recrystallization of an oxide dispersion strengthened superalloy - MA 6000E. R. K. Hotzler (Queensborough Community College, Bayside, NY) and T. K. Glasgow (NASA, Lewis Research Center, Cleveland, OH). Metallurgical Transactions A - Physical Metallurgy and Materials Science, vol. 13A, Oct. 1982, p. 1665-1674, 15 refs.

The requirement of large, recrystallized, highly elongated grains is of primary importance to the development of suitable high temperature properties in oxide dispersion strengthened-superalloys. In the present study the recrystallization behavior of MA 6000E, a recently developed Y2O3 strengthened superalloy produced by mechanical alloying, was examined using transmission and replication microscopy. Gradient and isothermal annealing treatments were applied to extruded and hot rolled products. It was found that conversion from a very fine (0.2 micron) grain structure to a coarse (approximately 10 mm) grain structure is controlled by the dissolution of the gamma prime phase, while grain shape was controlled primarily by the thermal gradient. The fine uniform oxide dispersion appeared to have only a secondary influence in determining the grain shape as columnar grains could be grown transverse to the working direction by appropriate application of the thermal gradient. (Author)

A82-47397 * The influence of orientation on the stress rupture properties of nickel-base superalloy single crystals. R. A. MacKay (NASA, Lewis Research Center, Cleveland, OH) and R. D. Maler (Chase Brass and Copper Colon, OH). Metallurgical Transactions A - Physical Metallurgy and Materials Science, vol. 13A, Oct. 1982, p. 1747-1754, 13 refs. Grant No. NsG-3246.

Constant load creep rupture tests were performed on MAR-M247 single crystals at 724 MPa and 774 C where the effect of anisotropy is prominent. The initial orientations of the specimens as well as the final orientations of selected crystals after stress rupture testing were determined by the Laue back-reflection X-ray technique. The stress rupture lives of the MAR-M247 single crystals were found to be largely determined by the lattice rotations required to produce intersecting slip, because second-stage creep does not begin until after the onset of intersecting slip. Crystals which required large rotations to become oriented for intersecting slip exhibited the shortest stress rupture lives, whereas crystals requiring little or no rotations exhibited the lowest minimum creep rates, and consequently, the longest stress rupture lives.

A82-47398 * Fatigue and creep-fatigue deformation of several nickel-base superalloys at 650 C. R. V. Miner, J. Gayda (NASA, Lewis Research Center, Cleveland, OH), and R. D. Maier (Chase Brass and Copper Co., Solon, OH). Metallurgical Transactions A - Physical Metallurgy and Materials Science, vol. 13A, Oct. 1982, p. 1755-1765. 36 refs.

Transmission electron microscopy has been used to study the bulk deformation characteristics of seven nickel-base superalloys tested in fatigue and creepfatigue at 650 C, The alloys were Waspalloy, HIP Astroloy, H plus F René 95, IN 100, MERL 76, and NASA IIB-7. The amount of bulk deformation observed in all the alloys was low. In tests with inelastic strain amplitudes less than about 0.003, only some grains exhibited yielding and the majority of those had the 110 line near the tensile axis, Deformation occurred on octahedral systems for all of the alloys except MERL 76 which also showed abundant primary cube slip. Creep-fatigue cycling occasionally produced extended faults between partial dislocations, but otherwise deformation was much the same as for fatigue cycling.

V.L.

A82-47399 * The influence of cohelt on the tensile and stress-rupture properties of the nickel-base superalloy MAR-M247, M. V. Nathal (NASA, Lowis Research Center, Cleveland, OH), R. D. Maier (Chase Brass and Copper Co., Solon, OH), and L. J. Ebert (Case Western Reserve University, Cleveland, OH). Metallurgical Transactions A - Physical Metallurgy and Materials Science, vol. 13A, Oct. 1982, p. 1767-1774. 27 refs.

A82-47400 * The influence of cobalt on the microstructure of the nickei-base superalloy MAR-M247. M. V. Nathal (NASA, Lewis Research Center, Cleveland, OH), R. D. Maler (Chase Brass and Copper Co., Solon, OH), and L. J. Ebert (Case Western Reserve University, Cleveland, OH). Metallurgical Transactions A - Physical Metallurgy and Materials Science, vol. 13A, Oct. 1982, p. 1775-1783, 20 refs. Grant No. NsG-330.

Nickel was substituted for Co to produce 0, 5, and the standard 10% versions of MAR-M247, a cast nickel-base superalloy. The microstructures of the alloys were examined in as-cast, heat treated, aged, and stress-rupture tested conditions using a variety of metallographic techniques and differential thermal analysis. As cobalt concentration was reduced from 10 to 0 wt %, the gamma-prime weight fraction decreased from 59 to 41%; W and Ti concentrations in the gamma-prime phase increased from 5 to 8 and 2 to 3 at.%, respectively; the mean gamma-prime particle size increased from 0.6 to 0.8 micron; Cr and Al concentrations in the gamma matrix decreased from 17 to 13 and 15 to 12 at.%, respectively; and the weight fraction of carbides increased by approximately 1%.

N82-10193*# IIT Research Inst., Chicago, III. Technology Div.

THERMAL FATIGUE AND OXIDATION DATA OF TAZ-8A AND M22 ALLOYS AND VARIATIONS Technical Report, 1 Feb. - 30 Apr. 1980

K. E. Hofer and V. E. Humphreys Sep. 1981 44 p refs (Contract NAS3-17787)

(NASA-CR-165407, IITRI-N HC A03/MF A01 CSCL 11F IITRI-M06001-89) NTIS Avail:

Thermal fatigue and oxidation data were obtained on 36 specimens, representing 18 distinct variations (including the base systems) of TAZ-8A and M22 alloys. Double-edge wedge specimens for these systems were cycled between fluidized beds maintained at 1088 C and 316 C with a 180 s immersion in each bed. The systems included alloys TAZ-8A, M22, and 16 variations of these alloys, Each alloy variation consisted of a unique composition with an alternation in the percentage of carbon (C1 and C2), molydenum (M1 and M2), tungsten (W1 and W2), columbium (CB1, CB2, and CB3), tantalium (T1, T2, and T3), or borgen (B1, B2, and B3) present. All of the alloys showed little whight change due to oxidation compared with other alloys previously tested in fluidized beds. Only both C1 alloy variation specimens survived 3500 cycles without cracking in the small radius, although substantial cracks were present, emanating from the end notches which were used for holding the speciment

N82-13217*# Pittsburg Univ , Pa. Dept. of Metallurgical and Materials Engineering.

INVESTIGATION INTO THE ROLE OF NaCI DEPOSITED ON OXIDE AND METAL SUBSTRATES IN THE INITIATION OF HOT CORROSION Semiannual Report, 1 Apr. - 1 Oct. 1981

N. Birks 1 Oct. 1981 24 p

(Grant NAG3-44)

(NASA-CR-165029; SAR-3) Avail: NTIS HC A02/MF A01

CSCL 11F

Morphological aspects of the conversion to Na2SO4 of NaCl deposits over the temperature range 500-700 C, in air with added SO2 and H2O. Progress of the reaction was observed by withdrawing samples at various times and examining them under the scanning electron microscope using EDAX to assess the extent of chloride to sulfate conversion. These initial results show that the conversion to Na2SO4 proceeds directly on the sodium chloride surface as well as on the surrounding substrate due to evaporation of NaCl from the solid particle. The mechanism of this reaction could involve reaction in the vapor to produce Na2SO4 which then deposits, alternatively Na2SO4 could form directly on the substrate surface duc to direct reaction there between the vapors NaCl, SO2 and O2. A.B.H.

> ORIGINAL PAGE IS OF POOR QUALITY

N\$2-14333*# Avco Lycoming Div., Stratford, Conn. Materials DEVELOPMENT OF IMPROVED HIGH TEMPERATURE COATINGS FOR IN-792 + Hf Final Report D. D. Profant and S. K. Naik Jun, 1981 95 p. refs

(Contract NAS3-22371; DA Proj. 1L1-62209-AH-76) (NASA-CR-165395) Avail: NTIS HC A05/MF A01 CSCL

The development for t-55 1712 engine of high temperature for integral turbine nozzles with improved thermal fatigue resistance without sacrificing oxidation/corrosion protection is discussed. The program evaluated to coating systems which comprised one baseline plasma spray coating (12% Ål-NiCoCrALY). three aluminide coatings including the baseline aluminide (701). two CoNiCrAly (6% Al) + sluminide systems and four NiCoCrY + aluminide coating were evaluated. The two-step coating processes were investigated since it offered the advantage of tailoring the composition as well as properly coating surfaces of an integral or segmented nozzle. Cyclic burner rig thermal fatigue and oxidation/corrosion tests were used to evaluate the candidate coating systems. The plasma sprayed 12% Al-NiCoCrAIY was rated the best coating in thermal fatigue resistance and outperformed all coatings by a factor between 1.4 to 2.5 in cycles to crack initiation. However, this coatings is not applicable to integral or segmented nozzles due to the line of sight limitation of the plasma spray process, The 6% Al-CoNiCrAlY + Mod. 701 aluminide (32 w/o Al) was rated the best coating in oxidation/corrosion resistance and was rated the second best in thermal fatigue resistance.

N82-18368*# Westinghouse Electric Corp., Pittsburgh, Pa. EVALUATION OF PRESENT THERMAL BARRIER COATings for potential service in electric utility gas TURBINES Final Report

R. J. Bratton, S. K. Lau, and S. Y. Lee Jul. 1982 161 p refs Sponsored in part by Electric Power Research Inst.

(Contract NAS3-21377)

(NASA-CR-165545; Rept-81-9D6-NASAC-R3) Avail: NTIS

HC A08/MF A01 CSCL 11F

The resistance of present-day thermal barrier coatings to combustion gases found in electric utility turbines was assessed, The plasma sprayed coatings, both duplex and graded types, were primarily zirconia-based, although a calcium silicate was also evaluated. Both atmospheric burner rig tests and high pressure tests (135 psig) showed that several present-day thermal barrier coatings have a high potential for service in gas turbines burning the relatively clean GT No. 2 fuel, However, coating Improvements are needed for use in turbines burning lower grade fuel such as residual oil. The duplex ZrO2.8Y2O3/NiCrA1Y coating was ranked highest and selected for near-term field testing, with Ca2SiO4/NiCrA1Y ranked second, Graded coatings show potential for corrosive turbine operating conditions and warrant further development. The coating degradation mechanisms for each coating system subjected to the various environmental conditions are also described,

N82-18370* # TRW, Inc., Cleveland, Ohio. Materials Technology

DEVELOPMENT OF MATERIALS AND PROCESS TECHNOL-OGY FOR DUAL ALLOY DISKS Final Report

James M. Marder and Charles S. Kortovich Oct. 1981 188 p

(Contract NAS3-21351)

(NASA-CR-165224; TRW-ER-8001-F) NTIS

HC A09/MF A01 CSCL 11F

Techniques for the preparation of dual alloy disks were developed and evaluated. Four material combinations were evaluated in the form of HIP consolidated and heat treated cylindrical and plate shapes in terms of elevated temperature tensile, stress rupture and low cycle fatigue properties. The process evaluation indicated that the pe-HIP AF-115 rim/loose powder Rene 95 hub combination offered the best overall range of mechanical properties for dual disk applications. The feasibility of this dual alloy concept for the production of more complex components was demonstrated by the scale up fabrication of a prototype CFM-56 disk made from this AF-115/Rene 95 combination. The hub alloy ultimate tensile strength was approximately 92 percent of the program goal of 1520 MPa (220 ksi) at 480 C (900 F) and the rim alloy stress rupture goal of 300 hours at 675 C (1250 F)/925 MPa (134 ksi) was exceeded by 200 hours. The low cycle fatigue properties were equivalent to those exhibited by HIP and heat treated alloys, There was an absence of rupture notch sensitivity in both alloys. The joint tensile properties were approximately 85 percent of the weaker of the two materials (Rene 95) and the stress rupture properties were equivalent to those of the weaker of the two materials (Rene 95).

N82-19360* Pratt and Whitney Aircraft, East Hartford. Conn. TAILORED PLASMA SPRAYED MCIAIY COATINGS FOR AIRCRAFT GAS TURBINE APPLICATIONS

F. J. Pennisi and D. K. Gupta Jan, 1981 132 p refs (NAS3-21730)

(NASA-CR-185234; PWA-5642-21) Avail: NTIS

HC A07/MF A01 CSCL 11F

Eighteen plasma sprayed coating systems, nine based on the NiCoCrAly chemistry and nino based on the CoCrAly composition, were evaluated to identify coating systems which provide equivalent or superior life to that shown by the electron beam physical vapor deposited NiCoCrAly and CoCrAly coatings respectively. NiCoCrAly type coatings were examined on a single crystal alloy and the CoCrAly based coatings were optimized on the B1900+ Hif alloy. Cyclic burner rig oxidation and hot corrosion and tensile ductility tests used to evaluate the various coating candidates. For the single crystal alloy, a low pressure chamber plasma sprayed NiCoCrAly + Si coating exhibited a 2x oxidation life improvement at 1394 K (2050 F) over the vapor deposited NiCoCrAly material while showing equivalent tensile ductility. A silicon modified low pressure chamber plasma sprayed CoCrAly coating was found to be more durable than the baseline vapor deposited CoCrAly coating on the B1900+ Hf alloy.

N82-26436*# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.

HIGH TEMPERATURE LOW CYCLE FATIGUE MECHA-NISMS FOR NICKEL BASE AND A COPPER BASE ALLOY M.S. Thesis Final Report

Chin-I Shih Washington NASA Jun. 1982 110 p refs

(Grant NsG-3263) (NASA-CR-3543:

NAS 1.26:3543) Avail:

HC A06/MF A01 CSCL 11F

Damage mechanisms were studied in Rene' 95 and NARloy Z, using optical, scanning and transmission in microscopy. In necklace Rene' 95, crack initiation was mainly associated with cracking of surface MC carbides, except for hold time tests at higher strain ranges where initiation was associated more with a grain boundary mochanism. A mixed mode of propagation with a faceted fracture morphology was typical for all cycle characters. The dependence of life on maximum tensile stress can be demonstrated by the data falling onto three lines corresponding to the three tensile hold times, in the life against maximum tensile stress plot. In NARloy Z, crack initiation was always at the grain boundaries. The mode of crack propagation depended on the cycle character. The life decreased with decreasing strain rate and with tensile holds. In terms of damage mode, different life prediction laws may be applicable to different A.R.H. cycle characters.

N62-26439*# United Technologies Corp., East Hartford, Conn. Commercial Products Div.

HOT ISOSTATICALLY PRESSED MANUFACTURE OF HIGH STRENGTH MERL 76 DISK AND SEAL SHAPES Final Report

R. D. Eng and D. J. Evans May 1982 139 p refs (Contract NAS3-20072)

(NASA-CR-165549; NAS 1.26:165549; PWA/5574-123) Avail:

NTIS HC A07/MF A01 CSCL 11F

The feasibility of using MERL 76, an advanced high strength direct hot isostatic pressed powder metallurgy superalloy, as a full scale component in a high technology, long life, commercial turbine engine were demonstrated. The component was a JT9D first stage turbine disk, The JT9D disk rim temperature capability was increased by at least 22 C and the weight of JT9D high pressure turbine rotating components was reduced by at least 35 pounds by replacement of forged Superwaspaloy components with hot isostatic pressed (HIP) MERL 76 components. The process control plan and acceptance criteria for manufacture of MERL 76 HIP consolidated components were generated, Disk components were manufactured for spin/burst rig test, experimen-

tal engine tests, and design data generation, which established lower design properties including tensile, stress-rupture, 0.2% creep and notched (Kt = 2.5) low cycle fatigue properties, Sonntag, fatigue crack propagation, and low cycle fatigue crack threshold data, Direct HIP MERL 76, when compared to conventionally forged Superwaspaloy, is demonstrated to be superior in mechanical properties, increased rim temperature capability, reduced component weight, and reduced material cost by at least 30% based on 1980 costs.

J.D.

N82-27462*# Michigan Technological Univ., Houghton. Dept of Metallurgical Engineering.

SOLUTE TRANSPORT DURING THE CYCLIC OXIDATION

OF NI-Cr-Al ALLOYS M,S. Thesis
James A. Nesbitt May 1982 140 p refs (Grant NsG-3215)

(NASA-CR-165544; NAS 1.26:185544)

HC A07/MF A01 CSCL 11F

Important requirements for protective coatings of Ni-Cr-Al alloys for gas turbine superalloys are resistance to oxidation accompanied by thermal cycling, resistance to thermal fatigue cracking. The resistance to oxidation accompanied by thermal cycling is discussed. The resistance to thermal fatigue cracking is also considered.

N82-28409*# Purdue Univ., Lafayette, Ind. Dept. of Material

EFFECTS OF COBALT ON THE MICROSTRUCTURE OF UDIMET 700 M.S. Thesis Final Report

Mayer Abraham Engel Jun. 1982 66 p refs

(Grant NAG3-57) (NASA-CR-165605; NAS 1.26:165605) HC A04/MF A01 CSCL 11F

NTIS Avail:

NTIS

Cobalt, a critical and 'strategic' alloying element in many superalloys, was systematically substituted by nickel in experimental alloys Udimet 700 containing 0.1, 4.3, 8.6, 12.8 and the standard 17.0 wt % cobalt. Electrolytic and chemical extraction techniques, X-ray diffraction, scanning electron and optical microscopy were used for the microstructural studies. The total weight fraction of gamma' was not significantly affected by the cobalt content, although a difference in the size and quantities of the primary and secondary gamma' phases was apparent. The lattice parameters of the gamma' were found to increase with increasing cobalt content while the lattice mismatch between the gamma matrix and gamma' phases decreased. Other significant effects of cobalt on the weight fraction, distribution and formation of the carbide and boride phases as well as the relative stability of the experimental alloys during long-time aging are also discussed.

N82-30374*# Purdue Univ., Lafayette, Ind. CARBIDE STRUCTURES IN M(LC2)AR-M247 M.S. Thosis - Final Report Stanley Walter Wawro Jun. 1982 53 p refs

(Contract NAG3-59) NAS 1.26:167892) Avail:

(NASA-CR-167892; NAS HC A04/MF A01 CSCL 11F

The morphologies and distribution of the MC carbides in Mar-M247 ingot stock and castings were investigated using metallographic, X-ray diffraction and energy-dispersive X-ray analysis techniques. The MC carbides were found to form script structures during solidification. The script structures were composed of three distinct parts. The central cores and elongated arms of the MC carbide script structures had compositions (Ti, Cr, Hf, Ta, W)C and lattice parameters of 4,39 A. The elongated script arms terminated in enlarged, angular 'heads'. The heads had compositions (Ti, Hf, Ta, W)C and lattice parameters of approximately 4,50 A. The heads had a higher Hf content than the cores and arms. The size of the script structures, as well as the relative amount of head-type to core and arm-type MC carbide, was found to be determined by solidification conditions. No carryover of the MC carbides from the ingot stock to the remelted and cast material was observed.

N62-31509*# Colorado State Univ., Fort Collins. Dept. of Physics.

ION BEAM MICROTEXTURING AND ENHANCED SURFACE DIFFUSION Final Report

Raymond S. Robinson Feb, 1982 54 p refs (Grant NAG3-43)

(NASA-CR-167948; NAS 1.26:167948) Avail: NTIS

HC A04/MF A01 CSCL 11F

Ion beam interactions with solid surfaces are discussed with particular emphasis on microtexturing induced by the deliberate deposition of controllable amounts of an impurity material onto a solid surface while simultaneously sputtering the surface with an ion beam. Experimental study of the optical properties of microtextured surfaces is described. Measurements of both absorptance as a function of wavelength and emissivity are presented. A computer code is described that models the sputtering and ion reflection processes involved in microtexture formation.

N62-33494*# Solar Turbines International, San Diego, Calif.
ADVANCED CERAMIC COATING DEVELOPMENT FOR INDUSTRIAL/UTILITY GAS TURBINES Final Report, 11 Mar. 1979 1 Sep. 1981

James W. Vogan and Alvin R. Stetson Jan. 1982 128 p refs (Contracts DEN3-109; DE-Al01-77ET-3111)

(NASA-CR-169852; DOE/NASA/0109-1; NAS 1.26:169852; SR82-R-4792-28) Avail: NTIS HC A07/MF A01 CSCL 11F

A program was conducted with the objective of developing advanced thermal barrier coating (TBC) systems. Coating application was by plasma spray. Duplex, triplex and graded coatings were tested. Coating systems incorporated both NiCrAly and CoCrAly bond coats. Four ceramic overlays were tested: ZrO2. 8203; CaO.TiO2; 2CaO.SiO2; and MgO.Al2O3. The best overall results were obtained with a CaO, TiO2 coating applied to a NiCrAly bond coat. This coating was less sensitive than the ZrO2.8Y2O3 coating to process variables and part geometry. Testing with fuels contaminated with compounds containing sulfur, phosphorus and alkali metals showed the zirconia coatings were destabilized. The calcium titanate coatings were not affected by these contaminants. However, when fuels were used containing 50 ppm of vanadium and 150 ppm of magnesium, heavy deposits were formed on the test specimens and combustor components that required frequent cleaning of the test rig. During the program Mars engine firststage turbine blades were coated and installed for an engine cyclic endurance run with the zirconia, calcium titanate, and calcium silicate coatings. Heavy spalling developed with the calcium silicate system. The zirconia and calcium titanate systems survived the full test duration. It was concluded that these two TBC's showed potential for application in gas turbines.

A82-20742 * # Improved plasma sprayed MCrAIY coatings for aircraft gas turbine applications. F. J. Pennisi and D. K. Gupta (United Technologies Corp., Pratt and Whitney Aircraft Group, East Hartford, CT). American Vacuum Society, International Conference for Metallurgical Coatings, San Francisco, CA, Apr. 6-10, 1981, Paper. 17 p. 11 refs. Contract No. NAS3-21730.

Eighteen plasma sprayed coating systems, nine based on the NiCoCrAIY chemistry and nine based on the CoCrAIY composition, were evaluated to identify coating systems which will provide equivalent or superior life to that shown by the electron beam physical vapor deposited NiCoCrAIY and CoCrAIY coatings respectively. NiCoCrAIY-type coatings were examined on a single crystal alloy and the Co((**)Y based coatings were optimized on the B1900 + Hf alloy. Cyclic burner rig oxidation and hot corrosion and tensile ductility tests were used to evaluate the various coating candidates. For the single crystal alloy, a low pressure chamber plasma sprayed NiCoCrAIY + Si coating exhibited a 2X oxidation life improvement at 1121 C (2050 F) over the vapor deposited NiCoCrAIY material while showing equivalent tensile ductility. A silicon modified low pressure chamber plasma sprayed CoCrAIY coating was found to be more durable than the baseline vapor deposited CoCrAIY coating on the B1900 + Hf alloy. (Author)

A82-34973 * Effects of cobalt on structure, microchemistry and properties of a wrought nickel-base superalloy. R. N. Jarrett and J. K. Tien (Columbia University, New York, NY). Metallurgical Transactions A - Physical Metallurgy and Materials Science, vol. 13A, June 1982, p. 1021-1032, 30 refs. Grant No. NAG3-57.

Tive effect of cobalt on the basic mechanical properties and microstructure of wrought nickel-base superalloys has been investigated experimentally by systematically replacing cobalt by nickel in Udimet 700 (17 wt% Co) commonly used in gas turbine (jet engine) applications. It is shown that the room temperature tensile yield strength and tensile strength only slightly decrease in fine-grained (disk) alloys and are basically unaffected in coarse-grained (blading) alloys as cobalt is removed, Creep and stress rupture resistances at 760 C are found to be unaffected by cobalt level in the blading alloys and decrease sharply only when the cobalt level is reduced below 8 vol% in the disk alloys. The effect of cobalt is explained in terms of gamma prime strengthening kinetics.

A82-40335 * Creep and rupture of an ODS **O*) with high stress rupture ductility. M. E. McAlarney, R. M. Arsons (Celanese Research Center, Summit, NJ), T. E. Howsor, J. K. Tien (Columbia University, New York, NY), and S. Baranow (Special Metals Corp., New Hartford, NY). Metallurgical Transactions A - Physical Metallurgy and Materials Science, vol. 13A, Aug. 1982, p. 1453-1462, 33 refs. Grant No. NsG-3050.

The creep and stress rupture properties of an oxide (Y2O3) dispersion strengthened nickel-base alloy, which also is strengthened by gamma-prime precipitates, was studied at 760 and 1093 C. At both temperatures, the alloy YDNiCrAl exhibits unusually high stress rupture ductility as measured by both elongation and reduction in area. Failure was transgranular, and different modes of failure were observed including crystallographic fracture at intermediate temperatures and tearing or necking almost to a chisel point at higher temperatures. While the rupture ductility was high, the creep strength of the alloy was low relative to conventional gamma prime strengthened superalloys in the intermediate temperature range and to ODS alloys in the higher temperature range. These findings are discussed with respect to the alloy composition; the strengthening oxide phases, which are inhomogeneously dispersed; the grain morphology, which is coarse and elongated and exhibits many included grains; and the second phase inclusion particles occurring at grain boundaries and in the matrix. The creep properties, in particular the high stress dependencies and high creep activation energies measured, are discussed with respect to the resisting stress model of creep in particle strengthened alloys. (Author)

A62-44529 * Recrystallization and grain growth in NIAI. G. R. Haff (ODECO, New Orleans, LA) and E. M. Schulson (Dartmouth College, Hanover, NH). Metallurgical Transactions A - Physical Metallurgy and Materials Science, vol. 13A, Sept. 1982, p. 1563-1566, 8 refs. Grant No. NAG3-13.

Aluminide intermetallics, because of their strength, microstructural stability, and oxidation resistance at elevated temperatures, represent potential structural materials for use in advanced energy conversion systems. This inherent potential of the intermetallics can currently not be realized in connection with the general brittleness of the materials under ambient conditions. It is pointed out, however, that brittleness is not an inherent characteristic. Single crystals are ductile and polycrystals may be, too, if their grains are fine enough. The present investigation is concerned with an approach for reducing material brittleness, taking into account thermal-mechanically induced grain refinement in NiAl, a B2 aluminide which melts at 1638 C and which retains complete order to its melting point. Attention is given to the kinetics of recrystallization and grain growth of warmworked, nickel-rich material.

A82-48244 * # Applications 6. ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small gas turbings | ** temperature powder metal alumirum alloys to small g

A program aimed at the development of advanced powder-metallurgy (PM) aluminum alloys for high-temperature applications up to 650 F using the concepts of rapid solidification and mechanical alloying is discussed. In particular, application of rapidly solidified PM aluminum alloys to centrifugal compressor impellers, currently used in auxiliary power units for both military and commercial aircraft and potentially for advanced automotive gas turbine engines, is examined. It is shown that substitution of high-temperature aluminum for titanium alloy impellers operating in the 360-650 F range provides significant savings in material and machining costs and results in reduced component weight, and consequently, reduced rotating group inertia requirements.

27 NONMETALLIC MATERIALS

includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textlies, adhesives, and ceramic materials.

N82-15210 # Sational Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CASTABLE HIGH TEMPERATURE FRACTORY MATERIALS Patent Application

Isidor Zaplatynsky, inventor (to NASA) Filed 13 Oct. 1981

(NASA-Casu-LEW-13080-2; US-Patent-Appl-SN-310713) Avail;

NTIS HC A02/MF A01 CSCL 11B

The fabrication of chemically inert ceramic bodies that are both high refractory and porous is disclosed. A paste is formed by mixing alumina grain having a uniform particle size with colloidal silics that is stabilized with ammonia. This paste is then cast without forming a compact and dried without pressing. After drying, the cast body was sufficient green strength to be handled, and it is transferred to a furnance for curing, A green body prepared in accordance with the invention does not undergo shrinkage during either curing or prolonged subsequent heating.

N82-11211*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FABRICATION AND WEAR TEST OF A CONTINUOUS

FIBER/PARTICULATE COMPOSITE TOTAL SURFACE HIP REPLACEMENT

Jack C. Roberts (Rensselaer Polytechnic Inst., Troy, NY.), Frederick F. Ling (Rensselaer Polytechnic Inst., Troy, N.Y.), and William R. Jones, Jr. 1981 29 p refs Presented at the Joint Lubrication Conf. New Orleans, 5-7 Oct. 1981; cosponsored by ASME and the Am. Soc, of Lubrication Engr.

(Grant DAAG29-79-C-0204) (NASA-TM-31746; E-709) Avail: NTIS HC A03/MF A01 CSCL

Continuous fiber woven E-glass composite femoral shells having the ame elastic properties as lione were fabricated. The shells were then encrusted with filled epoxy wear resistant coatings and run dry against ultrahigh molecular weight polyeth-

ylene acetabular cups in 42,000 and 250,000 cycle were tests on a total hip simulator. The tribological characteristics of these shells atriculating with the acetabular cups are comparable to a vitallium bal articulating with an ultrahigh molecular weight polyethylene cup.

N82-14359*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
ULTRASONIC VELOCITY FOR ESTIMATING DENSITY OF

STRUCTURAL CERAMICS

S. J. Klima, G. K. Watson, T. P. Herbell, and T. J. Moore 1981 12 p refs Presented at the Automotive Technol. Develop. Contractor Coord, Meeting, Dearborn, Mich., 26-29 Oct. 1981 (Contract DE-AI01-77CS-51040)

(NASA-TM-82765; DOE/NASA/51040-35; E-1026-5) Avail: NTIS HC A02/MF A01 CSCL 11B

The feasibility of using ultrasonic velocity as a measure of bulk density of sintered alpha silicon carbide was investigated. The material studied was either in the as-six ered condition or hot isostatic(ly pressed in the temperature range from 1850 to 2050 C. Densities varied from approximately 2.8 to 3.2 g cu cm. Results show that the bulk, nominal density of structural grade silicon carbide articles can be estimated from ultrasonic velocity measurements to within 1 percent using 20 MHz longitudinal waves and a commercially available ultrasonic time intervalometer. The ultrasonic velocity measurement technique shows promise for screening out material with unacceptably low Author density levels.

N82-15197*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. NITRIDATION OF SILICON M.S. Thesis Reserve Univ.

Nancy J. Shaw Oct. 1981 113 p refs

(NASA-TM-82722; E-921) Avail: NTIS HC A06/MF A01 CSCL

Silicon powders with three levels of impurities, principally Fe, were sintered in He or H2. Non-densifying mechanisms of material transport were dominant in all cases. High purity Si showed coarsening in He while particle growth was suppressed in H2, Lower purity powder coarsened in both He and H2. The same three Si powders and Si /111/ single crystal wafers were nitrided in both N2 and N2/H2 atmospheres. Hydrogen increased the degree of nitridation of all three powders and the alpha/bets ratio of the lower purity powder. Some Si3N4 whiskers and open channels through the surface nitride layer were observed in the presence of Fe, correlating with the nitridation-enhancing effects of Fe. Thermodynamic calculations showed that when SiO2 is present on the Si, addition of H2 to the nitriding atmosphere decreases the amount of SiO2 and increases the partial pressure of Si-containing vapor species, that is, Si and SiO, Large amounts of NH3 and SiH4 were also predicted to

N82-15198*# National Aeronauties and Space Administration. Lewis Research Center, Cleveland, Ohio.

GEOMETRICAL ASPECTS OF THE TRIBOLOGICAL PRO-PERTIES OF GRAPHITE FIBER NEINFORCED POLYMIDE COMPOSITES

Robert L. Fusaro 1982 36 p refs Presented at the Ann. Meeting of the Am. Soc. of Lubrication Engrs., Cincinnati, 10-13 May 1982

(NASA-TM-82757; E-1076) Avail; NTIS HC A03/MF A01 CSCL 11D

A latin square statistical experimental test design was used to evaluate the effect of temperature, load and sliding speed on the tribological properties of graphics fiber reinforced polymide (GFRPI) composite specimens. Hemispherically tipped composite riders were slid against 440 C HT stainless steel disks, comparisons were made to previous studies in which hemispherically tipped 440 C HT stainless steel riders were slid aggettst GFRPI composite disks and to studies in which GFRPI was used as a liner in plain spherical bearings. The results indicate that sliding surface geometry is especially important, in that different geometries can give completely different friction and wear results. Load, temperature, and sliding distance were found to influence the friction and wear results but sliding speed was found to have little effect, Experiments on GFRPI riders with 10 weight percent additions of graphite fluoride showed that this addition has no effect on friction and wear.

N82-15199*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

ELUCIDATION OF WEAR MECHANISMS BY FERRO-

GRAPHIC ANALYSIS

William R. Jones, Jr. 1981 18 p refs Presented at the Tech. Symp. on Water Glycol Hydraulic Fluids at BASF Wyandotte Corp., Wyandotte, Mich., 8 Oct. 1981 (NASA-TM-82737; #-1050) Avail: NTIS HC A02/MF A01 CSCL 20K

The use of ferrographic analysis in conjunction with light and scanning electron microscopy is described for the elucidation of wear mechanisms taking place in operating equipment. Example of adhesive wear, abrasive wear, corrosive wear, rolling element fatigue, lubricant breakdown, and other wear modes are illustrated, In addition, the use of magnetic solutions to precipitate nonmagnetic debris from aqueous and nonaqueous fluids is described.

N82-16239*# National Aeronautics and Space Administration. Lewis Research Center, Cieveland, Ohio.

TRIBOLOGICAL CHARACTERISTICS OF A COMPOSITE TOTAL-SURFACE HIP REPLACEMENT Final Report

William R. Jones, Jr., Jack C. Roberts (Rensselaer Polytechnic Inst.), and Frederick F. Ling (Rensselaer Polytechnic Inst.) Washington NASA Jan. 1982 17 p. refs. Presented at the ASME-ASLE Joint Lubrication Conf., New Orleans, 5-7 Oct. 1981

(NASA-TP-1853; E-709) Avail: NTIS HC A02/MF A01 CSCL

Continuous fiber, woven E glass composite femoral shells having the same elastic properties as bone were fabricated. The shells were then encrusted with filled epoxy wear resistant coatings and run dry against ultrahigh molecular weight polyethylene acetabular cups in 42,000 and 25C,000 cycle wear tests on a total hip simulator. The tribological characteristics of these continuous fiber particulate composite femoral shells articulating with ultrahigh molecular weight polyethylene acetabular cups were comparable to those of a vitallium ball articulating with an ultrahigh molecular weight polyethylene acetabular cup.

N82-19373*# National Aeronautics and Space Administration. Lewis Research Centur, Cleveland, Ohio. TRIBOLOGICAL PROPERTIES AT 25 C OF SEVEN POLYI-MIDE FILMS BONDED TO 440 C HIGH-TEMPERATURE STAINLESS STEEL

Robert L. Fusaro Feb. 1982 23 p refs (NASA-TP-1944; E-758) Avail: NTIS HC A02/MF A01 CSCL

The tribological properties of seven polyimide films applied to 440 C high temperature stainless steel substrates were studied at 25 C with a pin-on-disk type of friction and were apparatus. The polyimides fell into two groups according to friction and wear properties. Group I polyimides had slightly lower friction but much higher wear than group II polyimides. The wear mechanism was predominately adhesion, but the wear particles were larger for group I polyimides. For most of the polyimides the transfer films consisted of clumps of compacted wear particles. One polyimide composition produced a very thin transfer film that sheared plastically in the contact area.

N82-19374*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SURFACE CHEMISTRY AND WEAR BEHAVIOR OF SINGLE-CRYSTAL SILICON CARBIDE SLIDING AGAINST IRON AT TEMPERATURES TO 1500 C IN VACUUM Kazuhisa Miyoshi and Donald H. Buckley Feb. 1982

(NASA-TP-1947; E-654) Avail: NTIS HC A02/MF A01 CSCL

X-ray photoelectron and Auger electron spectroscopy analyses and morphological studies of wear and metal transfer were conducted with a single-crystal silicon carbide 0001 surface in contact with iron at various temperatures to 1500 C in a vacuum of 10 to the minus 8th power pascal. The results indicate that below 800 C, carbide-carbon and silicon are primarily seen on the silicon carbide surface. Above 800 C the graphite increases rapidly with increase in temperature. The outermost surficial layer, which consists mostly of graphite and little silicon at temperatures above 1200 C is about 2 nm thick. A thicker layer, which consists of a mixture of graphite, carbide, and silicon is approximately 100 nm thick. The closer the surface sliding temperature is to 800 C, the more the metal transfer produced. Above 800 C, there was a transfer of rough, discontinuous, and thin iron debris instead of smooth, continuous and thin iron film which was observed to transfer below 800 C. Two kinds of fracture pits were observed on the silicon carbide surface: (1) a pit with a spherical asperity; and (2) multiangular shaped pits.

N82-20313*# National Aeronautics at a Space Administration. Lewis Research Center, Cleveland, Ohio. IMPROVED BOUNDARY LUBRICATION WITH FORMU-LATED C-ETHERS

William R. Loomis 1982 25 p refs Proposed for presentation at the 37th Ann. Meeting of the Am. Soc. of Lubrication Engr., Cincinnati, 10-13 May 1982

(NASA-TM-82808; E-1149; NAS 1.15;82808) Avail: NTIS HC A02/MF A01 CSCL 07C

A comparison of five recently developed C-ether-formulated fluids with an advanced formulated MIL-L-27502 candidate ester is described. Steady state wear and friction measurements were made with a sliding pin on disk friction apparatus. Conditions included disk tempe atures up to 260 C, dry air test atmosphere, kilogram load, 50 rpm disk speed, and test times to 130 minutes, Based on wear rates and coefficients of friction, three of the C-ether formulations as well as the C-ether base fluid gave better boundary lubrication than the ester fluid under a: test conditions. The susceptibility of C-ethers to selective additive treatment (phosphinic esters or acids and other antiwear additives) was demonstrated when two of the formulations gave somewhat improved lubrication over the base fluid. The increased operating potential for this fluid was shown in relationship to bulk oil temperature limits for MIL-L-23699 and MIL-L-27502 type esters.

NB2-20314*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SPUTTERED SILICON NITRIDE COATINGS FOR WEAR **PROTECTION**

Alfred Grill (Ben Gurion Univ.) and Paul R. Aron 1982 10 p refs Presented at the Intern. Conf. on Met. Coatings and Process Technol., San Diego, Calif., 4-9 Apr. 1982 (NASA-TM-82819; E-1143; NAS 1.15:82819) Avail: NTIS

HC A02/MF A01 CSCL 07D Silicon nitride films were deposited by RF sputtering on 304 stainless steel substrates in a planar RF sputtering apparatus. The sputtering was performed from a Si3N4 target in a sputtering atmosphere of argon and nitrogen. The rate of deposition, the composition of the coatings, the surface microhardness and the adhesion of the coatings to the substrates were investigated as a function of the process parameters, such as: substrate target distance, fraction nitrogen in the sputtering atmosphere and sputtering pressure. Silicon rich coating was obtained for fraction nitrogen below 0.2. The rate of deposition decreases continuously with increasing fraction nitrogen and decreasing sputtering pressure. It was found that the adherence of the coatings improves with decreasing sputtering pressure, almost independently of their composition.

N82-20316*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

INFLUENCE OF MINERAL OIL AND ADDITIVES ON MICROHARDNESS AND SURFACE CHEMISTRY OF MAGNESIUM OXIDE (001) SURFACE

Kazuhisa Miyoshi, Hiroyuki Shigaki, and Donald H. Buckley Mar. 1982 11 p refs (NASA-TP-1986; E-975; NAS 1.60:1986) Avail: NTIS

HC A02/MF A01 CSCL 11H

X-ray photoelectron spectroscopy analyses and hardness experiments were conducted with cleaved magnesium oxide /001/ surfaces. The magnesium oxide bulk crystals were cleaved into specimens along the /001/ surface, and indentations were made on the cleaved surface in laboratory air, in nitrogen gas, or in degassed mineral oil with and without an additive while not exposing specimen surface to any other environment. The various additives examined contained suffur, phosphorus, chlorine, or oleic acid. The sulfur-containing additive exhibited the highest hardness and smallest dislocation patterns evidencing plastic deformation; the chlorine-containing additive exhibited the lowest hardness and largest dislocation patterns evidencing plastic deformation. Hydrocarbon and chloride (MgCl2) films formed on the magnesium oxide surface. A chloride film was responsible for the lowest measured hardness.

N82-21331*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

SOME PROPERTIES OF RF SPUTTERED HAFNIUM NITRIDE COATINGS

Paul R. Aron and Alfred Grill (Ben Gurion Univ. of the Negev) 1982 12 p refs Presented at the Intern. Conf. on Met. Coating and Process Technol., San Diego, Calif., 5-8 Apr. 1981 (NASA-TM-82826; E-1182; NAS 1,15:82826) Avail: NTIS HC A02/MF A01 CSCL 11F

Hafnium nitride coatings were deposited by reactive RF sputtering from a hafnium target in nitrogen and argon gas mixtures. The rate of deposition, composition, electrical resistivity and complex index of refraction were investigated as a function of target substrate distance and the fraction nitrogen, (fN2) in the sputtering atmosphere. The relative composition of the coatings is independent on fN2 for values above 0.1. The electric resistivity of the hafnium nitride films changes over 8 orders of magnitude when fN2 changes from 0.10 to 0.85. The index of refraction is almost constant at 2.8(1-0.3i) up to fN2 = 0.40 then decreases to 2.1(1 - 0.01i) for higher values of fN2.

> Original page is OF POOR QUALITY

N82-21332*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMAL AND OXIDATIVE DEGRADATION STUDIES OF FORMULATED C-ETHERS BY GEL-PERMEATION CHROMA-TOGRAPHY

William R. Jones, Jr. and Wilfredo Morales Mar. 1982 14 p.

(NASA-TP-1994; NAS 1.60:1994; E-978) Avail: NTIS HC A02/MF A01 CSCL 07D

Gel-permeation chromatography was used to analyze C-ether lubricant formulations from high-temperature bearing tests and from micro-oxidation tests. Three mu-styragel columns (one 500 and two 100 A) and a tetrahydrofuran mobile phase were found to adequately separate the C-ether degradation products. The micro-oxidation tests yielded degradation results qualitatively similar to those observed from the bearing tests. Microoxidation tests conducted in air yielded more degradation than did tests in nitrogen. No great differences were observed between the thermal-oxidative stabilities of the two C-ether formulations or between the catalytic degradation activities of silver and steel. C-ether formulation I did yield more degradation than did formulation II in 111- and 25-hour bearing tests, respectively.

N82-22366* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECTS OF ENVIRONMENT ON MICROHARDNESS OF MAGNESIUM OXIDE

Hiroyuki Ishigaki (Osaka Univ.) and Donald H. Buckley Apr.

1982 11 p refs (NASA-TP-2002; E-916; NAS 1.60:2002) Avail: NTIS HC A02/MF A01 CSCL 11B

Micro-Vickers hardness measurements of magnesium oxide single crystals were conducted in various environments. These environments included air, nitrogen gas, water, mineral oil with or without various additives, and aqueous solutions with various pH values. Indentations were made on the (100) plane with the diagonals of the indentation in the (100) direction. The results indicate that a sulfur containing additive in mineral oil increased hardness, a chlorine containing additive in mineral oil decreased hardness, and aqueous solutions of hydrogen chloride decreased hardness. Other environments were found to have little effect on hardness. Mechanically polished surfaces showed larger Author indentation creep than did as-cleaved surfaces.

NB2-24342* National Apronautics and Space Administration. Lewis Research Center, Cieveland, Ohio.

PMR POLYIMIDES-REVIEW AND UPDATE

Tito T, Serafini, Peter Delvigs, and William B, Alston 1982 19 p refs Presented at the 27th Natl. S&MPE Symp. and Exhibition, San Diego, Calif., 4-6 May 1982

(NASA-TM-82821; E-1111; NAS 1.15:82821;

AVRADCOM-TR-82-C-3) Avail: NTIS HC A02/MF A01 CSCL

Fiber reinforced PMR polyimides are finding increased acceptance as engineering materials for high performance structural applications. Prepreg materials based on this novel class of highly processable, high temperature resistant polyimides are commercially available and the PMR concept is used by other investigators. The current status of first and second generation PMR polyimides were reviewed. Emphasis is given to the chemistry, processing and applications of the first generation material known as PMR-15.

N82-24343*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

TRIBOLOGICAL PROPERTIES OF SINTERED POLYCRYS-TALLINE AND SINGLE CRYSTAL SILICON CARBIDE

Kazuhisa Miyoshi, Donald H. Buckley, and M. Srinivasan (Carborundum) 1982 28 p refs Presented at the 84th Ann. Meeting of the Am. Ceram, Soc., Cincinnati, 2-5 May 1982 (NASA-TM-82829; E-1194; NAS 1.15:82829) Avail: NTIS HC A03/MF A01 CSCL 11G

Tribological studies and X-ray photoelectron spectroscopy analyses were conducted with sintered polycrystalline and single crystal silicon carbide surfaces in sliding contact with iron at various temperatures to 1500 C in a vacuum of 30 nPa. The results indicate that there is a significant temperature influence on both the friction properties and the surface chemistry of

silicon carbide. The main contaminants on the as received sintered polycrystalline silicon carbide surfaces are adsorbed carixoxygen, graphite, and silicon dioxide. The surface :evus low coefficient of friction. This is due to the presence of the graphite on the surface. At temperatures of 400 to 600 C graphite and copious amount of silicon dioxide were observed on the polycrystalline silica whide surface in addition to silicon carbide. At 800 C, the an sales of the silicon dioxide decreased rapidly and the silicon carbina spin silicon and carbon peaks were at a maximum intensity in the እና 5 spectra. The coefficients of friction were high in the temperature range 400 to 800 C. Small amounts of carbon and oxygen contaminants were observed on the as received single crystal silicon carbide surface below 250 C. Silicon carbide type silicon and carbon peaks were seen on the silicon carbide in addition to very small amount of graphite and silicon dioxide at temperatures of 450 to 800 C.

N82-26468*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMAL OXIDATIVE DEGRADATION REACTIONS OF LINEAR PERFLUOROALKY LETHERS

William R. Jones, Jr., K. J. L. Paciorek (Ultrasystems, Inc., Irvine, Calif.), T. I. Ito (Ultrasystems, Inc., Irvine, Calif.), end R. H. Kratzer (Ultrasystems, Inc., Irvine, Calif.) 1982 24 p refs Presented at the Am. Fluoropolymers Symp., Las Vegas, Nevade, 29 Mar. - 2 Apr. 1982; sponsored by the Am. Chem. Soc. (NASA-TM-82834; E-1200; NAS 1.15:82834) Avail: NTIS HC A02/MF A01 CSCL 07C

Thermal and thermal oxidative stability studies were performed on linear perfluoro alkyl ether fluids. The effect on degradation by metal catalysts and degradation inhibitors are reported. The liner perfluoro alkylethers are inherently unstable at 316 C in an oxidizing atmosphere. The metal catalysts greatly increased the rate of degradation in oxidizing atmospheres. In the presence of these metals in an oxidizing atmosphere, the degradation inhibitors were highly effective in arresting degradation at 288 C. However, the inhibitors had only limited effectiveness at 316 C. The metals promote degradation by chain scission, Based on elemental analysis and oxygen consumption data, the linear perfluoro alkylether fluids have a structural arrangement based on diffueroformyl and tetrafluoroethylene oxide units, with the former predominating.

N82-28440* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TEXTURING POLYMER SURFACES BY TRANSFER CAST-ING Patent

Bruce A. Banks, Albert J. Weigand, and James S. Sovey, inventors (to NASA) Issued 11 May 1982 4 p Filed 19 Dec. 1980 Supersedes N81-16327 (19 - 07, p 899)

(NASA-Case-LEW-13120-1; US-Patent-4,329,385;

US-Patent-Appl-SN-218587; US-Patent-Class-428-141; US-Patent-Class-204-192E; US-Patent-Class-204-192EC; US-Patent-Class-264-22; US-Patent-Class-264-220) Avail: US

Patent and Trademark Office CSCL 11G

A technique for fabricating textured surfaces on polymers without altering their surface chemistries is described. A surface of a fluorocarbon polymer is exposed to a beam of ions to texture it. The polymer which is to be surface-roughened is then cast over the textured surface of the fluorocarbon polymer. After curing, the cast polymer is peeled off the textured fluorocarbon polymer, and the peeled off surface has negative replica of the textured surface. The microscopic surface texture provides large surface areas for adhesive bonding. In cardiovascular prosthesis applications the surfaces are relied on for the development of a thin adherent well nourished thrombus.

Official Gazette of the U.S. Patent and Trademark Office

N82-28441* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD OF PROTECTING A SURFACE WITH A SILICON-SLURRY/ALUMINIDE COATING Patent
Daniel L. Deadmore and Stanley G. Young, inventors (to NASA)

Issued 12 Jan. 1982 6 p Filed 20 Jun. 1980 Supersedes N80-26389 (18 - 17, p 2237)

(NASA-Case-LEW-13343-1; US-Patent-4,310,574; US-Patent-Appl-SN-161254; US-Patent-Class-427-405; US-Patent-Class-427-205; US-Patent-Class-427-253;

US-Patent-Class-428-938; US-Patent-Class-428-941) Avail: US Patent and Trademark Office CSCL 11G

A low cost coating for protecting metallic base system substrates from high temperatures, high gas velocity oxidation, thermal fatigue and hot corrosion is described. The coating is particularly useful for protecting vanes and blades in aircraft and land based gas turbine engines. A lacquer slurry comprising cellulose nitrate containing high purity silicon powder is sprayed onto the superalloy substrates. The silicon layer is then aluminized to complete the coating. The Si-Al coating is less costly to produce than advanced aluminides and protects the substrate from oxidation and thermal fatigue for a much longer period of time than the conventional aluminide coatings. While more expensive Pt-Al coatings #/d physical vapor deposited MCrAIY coatings may last longer to provide equal protection on certain substrates, the Si-Al coating exceeded the performance of both types of coatings on certain superalloys in high gas velocity oxidation and thermal fatigue, Also, the Si-Ai coating increased the resistance of certain superalloys to hot corrosion.
Official Gazette of the U.% Patent and Trademark Office

N82-28445*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ION BEAM SPUTTER DEPOSITED DIAMOND LIKE FILMS

Bruce A. Banks and Sharon K. Rutledge 1982 18 p refs Presented at Meeting of the Greater New York Chapter of the Am, Vacuum Soc., Yorktown Heights, N.Y., 2 Jun. 1982 Avail: NTIS (NASA-TM-82873; E-1249; NAS 1.15;82873) HC A02/MF A01 CSCL 11G

A single argon ion beam source was used to sputter deposit carbon films on fused silica, copper, and tantalum substrates under conditions of sputter deposition alone and sputter deposition combined with simultaneous argon ion bombardment. Simultaneously deposited and ion bombarded carbon films were prepared under conditions of carbon atom removal to arival ratios of O, 0.036, and 0.71. Deposition and etch rates were measured for films on fused silica substrates. Resulting characteristics of the deposited films are: electrical resistivity of densities of 2.1 gm/cu cm for sputter deposited films and 2.2 gm/cu cm for simultaneously sputter deposited and Ar ion bombarded films. For films approximately 1700 A thick deposited by either process and at 5550 A wavelength light the reflectance was 0.2, the absorptance was 0.7, the absorption coefficient was 67,000 cm to the -1 and the transmittance was 0.1

N82-29453* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FULLY PLASMA-SPRAYED COMPLIANT BACKED CERAM-IC TURBINE SEAL Patent

Robert C. Bill and Donald W. Wisander, inventors (to NASA) Issued 22 Jun. 1982 4 p Filed 30 Mar. 1980 Supersedes N80-24619 (18 - 15, p 1985)

(NASA-Case-LEW-13268-1; US-Patent-4,336,276; US-Patent-Appl-SN-145209; US-Patent-Class-427-34;

US-Patent-Class-415-174; US-Patent-Class-427-423) Avail: US

Patent and Trademark Office CSCL 11A

A seal having a high temperature abradable lining material encircling the tips of turbine blades in turbomachinery is discussed. The minimum operating clearances between the blade tips and the lining of a high pressure turbine are maintained. A low temperature easily decomposable material, such as a polymer, in powder form is blended with a high temperature oxidation resistant metal powder. The two materials are simultaneously deposited on a substrate formed by the turbine casing. Alternately, the polymer powder may be added to the metal powder during plasma spraying. A ceramic layer is then deposited directly onto the metal polymer composite. The polymer additive mixed with the metr is then completely volatilized to provide a porous layer between the ceramic layer and the substrate.

Official Gazette of the U.S. Patent and Trademark Office

N82-29458*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

BOUNDARY LUBRICATION: REVISITED

William R. Jones, Jr. 1982 33 p refs Presented at Meeting of the Am. Soc. of Lubrication Engr., Independence, Ohio, 9 Mar.

(NASA-TM-82858; E-1181; NAS 1.15:82858) Avail: NTIS HC A03/MF A01 CSCL 11G

A review of the various lubrication regimes, with particular, emphasis on boundary lubrication, is presented. The types of wear debris and extent of surface damage is illustrated for each regime. The role of boundary surface films along with their modes of formation and important physical properties are discussed. In addition, the effects of various operating parameters on friction and wear in the boundary lubrication regime are considered.

N82-29459*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRIBOLOGICAL EVALUATION OF COMPOSITE MATERIALS MADE FROM A PARTIALLY FLUORINATED POLYIMIDE Robert L. Fusaro Apr. 1982 40 p refs (NASA-TM-82832; E-1199; NAS 1.15:82832) Avail: NTIS HC A03/MF A01 CSCL 11G

Preliminary tribological studies on a new polyimide formulated from the diamine 2,2-bis [4-(4-aminophenoxy) phenyl] hexafluoropane (4-BDAF) indicates polyimides made from this diamine have excellent potential for high temperature applications. Two different polyimides were formulated from the diamine, and five different composites were formulated using one of the polyimides. Composites were made using 10 weight percent (w/o) graphite fluoride powder, 20 w/o PTFE powder, 30 w/o silver powder, or 50 w/o carbon fibers, both graphitic and nongraphitic types. The powder additions did not improve the tribological properties as much as the carbon fibers, and the graphitic fibers produced better results than did the nongraphitic fibers. Results also indicated that improved high temperature stability and tribological properties may be obtained with a polyimide made from the dianhydride pyromellitic acid (PMDA) rather than the dianhydride benzophenonatetracarboxylic acid (BTDA).

N82-30401*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEPOSITION OF REACTIVELY ION BEAM SPUTTERED SILICON NITRIDE COATINGS

A. Grill (Ben Gurion Univ. of the Negev) Aug. 1982 11 p (NASA-TM-82942; E-1310; NAS 1.15:82942) Avail: NTIS

HC A02/MF A01 CSCL 11D

An ion beam source was used to deposit silicon nitride films by reactively sputtering a silicon target with beams of Ar + N2 mixtures. The nitrogen fraction in the sputtering gas was 0.05 to 0.80 at a total pressure of 6 to 2 millionth torr. The ion beam current was 50 mA at 500 V. The composition of the deposited films was investigated by auger electron spectroscopy and the rate of deposition was determined by interferometry. A relatively low rate of deposition of about 2 nm. one-tenth min. was found. AES spectra of films obtained with nitrogen fractions higher than 0.50 were consistent with a silicon to nitrogen ratio corresponding to Si3N4. However the AES spectra also indicated that the sputtered silicon nitride films were contaminated with oxygen and carbon and contained significant amounts of iron, nickel, and chromium, most probably sputtered from the holder of the substrate and target.

N82-32491*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OCCURRENCE OF SPHERICAL CERAMIC DEBRIS IN INDENTA-**TION AND SLIDING CONTACT**

Kazuhisa Miyoshi and Donald H. Buckley Aug. 1982 21 p refs (NASA-TP-2048; E-1072; NAS 1.60:2048) Avail: NTIS HC A02/MF A01 CSCL 11G

Indenting experiments were conducted with the silicon carbide (0001) surface in contact with a spherical diamond indenter in air. Sliding friction experiments were also conducted with silicon carbide in contact with iron and iron-based binary alloys at room temperature and 800 C. Fracture pits with a spherical particle and spherical wear debris were observed as a result of indenting and sliding, Spherical debris may be produced by a mechanism that involves a spherical-shaped fracture along the circular or spherical stress trajectories under the inelestic deformation zone.

OF POOR QUALITY

N82-33521* National Aeronautics and Space Administration. Lewis

Research Center, Cleveland, Ohio.
SURFACE TEXTURING OF FLUOROPOLYMERS Patent

Bruce A. Banks, Michael J. Mirtich, and James S. Sovey, inventors (to NASA) Issued 17 Aug. 1982 5 p Filed 19 Dec. 1980 (NASA-Case-LEW-13028-1; US-Patent-4,344,996;

US-Patent-Appl-SN-218588; US-Patent-Class-428-141;

US-Patent-Class-204-38B; US-Patent-Class-204-192E;

US-Patent-Class-204-192EC) Avail: US Patent and Trademark

Office CSCL 11G

A method is disclosed for improving surface texture for adhesive bonding, metal bonding, substrate plating, decal substrate preparation, and biomedical implant applications. The surface to be bonded is dusted in a controlled fashion to produce a disbursed layer of fine mesh particles which serve as masks. The surface texture is produced by impinging gas ions on the masked surface. The textured surface takes the form of pillars or cones. The bonding material, such as a liquid epoxy, flows between the pillars which results in a bond having increased strength, For bonding metals a thin film of metal is vapor or sputter deposited onto the textured surface. Electroplating or electroless plating is then used to increase the metal thickness in the desired amount.

Official Gazotte of the U.S. Patent and Trademark Office

N82-33522*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OVERLAY METALLIC-CERMET ALLOY COATING SYSTEMS

Patent Application

Michael A. Gedwill, Stanley R. Levine, and Thomas K. Glasgow, inventors (to NASA) Filed 30 Jul. 1982 11 p

(NASA-Case-LEW-13639-1; US-Patent-Appl-SN-403378) Avail: NTIS HC A02/MF A01 CSCL 11G

A substrate, such as as a turbine blade, vane, or the like, which is subjected to high temperature use is coated with a base coating of an oxide dispersed, metallic alloy (cermet). A top coating of an oxidation, hot corrosion, erosion resistant alloy of nickel, cobalt, or iron is then deposited on the base coating. A heat treatment is used to improve the bonding. The base coating serves as an inhibitor to interdiffusion between the protective 10 top coating and the substrate. Otherwise, the protective top coating would rapidly interact detrimentally with the substrate and degrade by spalling of the protective oxides formed on the outer surface at elevated temperatures. NASA

A82-21699 * The effect of oxygen concentration on the boundary-lubricating characteristics of a C ether and a polyphenyl ether to 300 C. W. R. Jones, Jr. (NASA, Lewis Research Center, Cleveland, OH). Wear, vol. 73, Nov. 16, 1981, p. 123-136. 26 refs.

Ball-on-disk sliding friction experiments were carried out at 17 m/min (100 rev/min) to investigate the effect of oxygen concentration varying from 20% (air) to 0.001% (nitrogen) on the boundarylubricating characteristics of an unformulated C ether in the temperature range 20-300 C. Results were then compared with those obtained for a five-ring polyphenylether in air and in nitrogen. The C ether yielded lower wear and lower friction coefficients than a five-ring polyphenylether in both air and nitrogen over most of the temperature range. Friction polymer was observed around the wear scars of most test specimens, with much greater quantities of friction polymer produced in a low-oxygen environment. Thus, with respect to friction polymer production, the C ether behaved very much like the polyphenylether.

Dynamics of solid dispersions in oil during the A82-30021 * lubrication of point contacts. II - Molybdenum disulfide. C. Cusano (Illinois, University, Urbana, IL) and H. E. Sliney (NASA, Lewis Research Center, Cleveland, OH). (American Society of Lubrication Engineers, Annual Meeting, 36th, Pittsburgh, PA, May 11-14, 1981.) ASLE Transactions, vol. 25, Apr. 1982, p. 190-197. 18 refs. (Previously announced in STAR as N81-20275)

A82-41552 * Phase stability in plasma-sprayed, partially stabilized zirconia-yttria, R. A. Miller, J. L. Smlalek, and R. G. Garlick (NASA, Lewis Research Center, Cleveland, OH). In: Science and technology of zirconia. Columbus, OH, American Ceramic Society, Inc., (Advances in Ceramics. Volume 3) 1981, p. 241-253, 13 refs.

A82-42366 * Effects of heating rate on density, microstructure, and strength of Si3N4-6 wt.% Y2O3 and a beta-prime sialon. S. S. Campbell and S. Dutta (NASA, Lewis Research Center, Materials Div., Cleveland, OH). [American Ceramic Society, Annual Meeting, 83rd, Washington, DC, May 3, 1981, Paper 42-B-81.) American Ceramic Society Bulletin, vol. 61, Aug. 1982, p. 854-856, 7

The effects of the heating rate during sintering/firing on the final density, microstructure, and strength of Si3N4-6 wt% Y2O3 and beta-prime sialon, sintered for four hours at 1750 C, are examined. In Si3N4-6 wt% Y2O3 increasing the heating rate from 7 C/min to 25 C/min to 90 C/min results in a corresponding decrease in the final density from 3.01 g/cu cm to 2.92 g/cu cm to 2.76 g/cu cm. In the beta-prime sialon composition all three heating rates produce an equivalent final density of 3.13 g/cu cm. All heating rates in both compositions produce nonhomogeneous microstructures. The room-temperature strength of Si3N4-6 wt% Y2O3 increases from 372 to 510 MPa with increased density, while the corresponding strengths for the betaprime slalon at equivalent densities are 345 to 445 MPa. N.B.

A82-42924 * The combined effects of Fe and H2 on the nitridation of silicon. N. J. Shaw (NASA, Lewis Research Center, Cleveland, OH). Journal of Materials Science Letters, vol. 1, Aug. 1982, p. 337-340. 13 refs.

In view of the support offered by previous work for the suggestion that Fe may affect alpha-SI3N4 formation and microstructural development, a two-part study was conducted to differentiate the effects of H2 and Fe in, first, the nitridation of pure and of Fe-containing powder in N2 and N2-4% H2, and then the nitridation of (1 1 1) Si single crystal wafers with and without Fe powder on the surface. The degree of nitridation is most strongly affected by H2 at 1200 C, but by Fe at 1375 C, where Fe-containing samples in either atmosphere were almost completely nitrided. While neither H2 nor Fe alone changed the ratio of alpha-Si3N4 to beta-Si3N4, the combination of H2 and Fe increased it at both temperatures

N82-17367*# TRW Defense and Space Systems Group, Redondo Beach, Calif.

IMPROVED TACK PMR

R. A. Buyny Oct. 1981 108 p refs (Contract NAS3-22026)

(NASA-CR-165432; TRW-36805-6016-UT-00) Avail: NTIS HC A06/MF A01 CSCL 07C

One reactive diluent and several high boiling solvents were investigated for providing long shelf life tack and drape to PMR polyimide prepreg materials. The most promising approach was to introduce dimethoxy ethyl ether (diglyme) to the normal methanol solvent, Compression and autoclave molding cycles were developed for the improved tack prepreg which provided up to 15% higher thermomechanical properties than conventional PMR-15 composites. Near the conclusion of this investigation, it was discovered that diglyme constituted a potential hazard because its auto ignition temperature is 464 K. Consequently, i. was recommended that diglyme should not be used as a tackifier for PMR prepregs.

A82-18432 * # Some observations in high pressure rheology of lubricants. S. Bair and W. O. Winer (Georgia Institute of Technology, Atlanta, GA). American Society of Mechanical Engineers and American Society of Lubrication Engineers, Joint Lubrication Conference, New Orleans, LA, Oct. 5-7, 1981, ASME Paper 81-Lub-17. 8 p. 15 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3106.

Experimental data are presented on viscosity, elastic shear modulus, and limiting shear stress of 12 liquid lubricants. It is shown that transition histories do affect the limiting shear stress of the materials in the form of isothermal compression resulting in a lower density and lower limiting stress than isobaric cooling. The measured limiting shear stress agrees with EHD traction data at slide-to-roll ratios of 0.1 or more. In pressure viscosity measurements of the polymer solutions, it is found that for some temperatures, the pressure viscosity coefficient of the blend is slightly less than that of the base, which results in the crossing of the viscosity-pressure isotherms at high pressures.

A82-20143 * Strength distributions of SiC ceramics after oxidation and oxidation under load. T. E. Easler, R. C. Bradt, and R. E. Tressler (Pennsylvania State University, University Park, PA), (American Ceramic Society, Annual Conference, 4th, Cocoa Beach, FL, Jan. 20, 1980, Paper 9-C-80C.) American Ceramic Society, Journal, vol. 64, Dec. 1981, p. 731-734, 22 refs. Army-supported research; Grant No. NsG-3016.

The room-temperature strength distributions of a sintered and a hot-pressed SiC were examined as-machined, after oxidation at 1370 C, and after oxidation under load at 1370 C. The strengths were observed to be dependent on both the duration of oxidation and the magnitude of the applied load. Processes resulting in both strengthening and weakening behavior were observed to occur, at times simultaneously within the same strength distribution. This dynamic situation indicates that the strength-controlling flaw populations are highly transient in nature. (Author)

A82-20741 * # Analytical and experimental evaluation of biaxial contact stress. D. W. Richerson, D. G. Finger, and J. M. Wimmer (Garrett Turbine Engine Co., Phoenix, AZ). International Symposium on Fracture Mechanics of Geranics, Pennsylvania State University, University Park, PA, July 15-17, 1981, Paper. 22 p. 25 refs. Research supported by the U.S. Department of Energy; Contracts No, N00014-78-C-0547; No. DEN3-167.

Contact stress analysis was conducted for ceramic-metal and ceramic-ceramic interfaces using a finite element model. Ceramics investigated included NC-132 hot-pressed silicon nitride, NC-350 reaction-bonded silicon nitride, Hexaloy SA SiC, and RBN104 reaction-bonded silicon nitride. The results are shown to be well correlated with closed-form solution both for normal and normal-tangential loading. The latter load condition is found to be especially critical for ceramic materials due to the presence of a high tensile stress at the trailing edge of the ceramic surface contact zone. It is shown that during sliding contact or biaxial loading, the magnitude of this tensile stress increases with the coefficient of friction. V.L.

A82-35064 * # Progress in ceramic component fabrication technology. R. S. Storm and R. W. Lashway (Carborundum Resistant Materials Co., Niagara Falls, NY). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1211. 6 p. Contracts No. DEN3-17; No. DEN3-168; No. DEN3-167.

Net shape techniques have been used in the production of rotating and static vehicular engine high-temperature components composed of sintered Alpha-SiC (SASC). Injection-molded rotors have been cold spin tested, as well as a slip-cast combustor assembly hot rig. SASC pistons and cylinder liners have also been constructed for an opposed piston, two-cycle diesel test rig while test results are presented. An uncooled, minimum-friction internal combustion engine with multifuel capability due to its elevated combustion tem peratures appears to be achievable in the near term by means of SASC techniques. The flexural strength of SASC at 1500 C is 446 MPa, identical to that at room temperature, and excellent strength retention has been demonstrated after 3500 hours of cyclic exposure,

A82-35083 * # Characterization of advanced electric propulsion systems. P. K. Ray (Tuskegee Institute, Tuskegee, AL). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1246. 11 p. 7 refs. Grant No. NAG3-76.

Characteristic parameters of several advanced electric propulsion systems are evaluated and compared. The propulsion systems studied are mass driver, rall gun, argon MPD thruster, hydrogen free radical thruster and mercury electron bombardment ion engine. Overall, ion engines have somewhat better characteristics as compared to the other electric propulsion systems. (Author)

A82-35403 * # Net shape fabrication of Alpha Silicon Carbide turbine components. R. S. Storm (Carborundum Co., Niagara Falls, NY). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr., 18-22, 1982, Paper 82-GT-216. 16 p. 5 refs. Members, \$2.00; nonmembers, \$4.00. Research supported by the U.S. Department of Energy; Contracts No. DEN3-17; No. DEN3-167; No. DEN3-168,

Development of Alpha Silicon Carbide components by net shape fabrication techniques has continued in conjunction with several turbine engine programs, Progress in injection molding of simple parts has been extended to much larger components. Turbine rotors fabricated by a one piece molding have been successfully spin tested above design speeds. Static components weighing up to 4.5

kg and 33 cc in diameter have also been produced using this techfique, Use of sintering fixtures significantly improves dimensional control. A new Si-SiC composite material has also been developed with average strengths up to 1000 MPa (150 ksi) at 1200 C. (Author)

A82-35431 * # Fabrication of turbine components and properties of sintered silicon nitride. J. T. Neil, K. W. French, C. L. Quackenbush, and J. T. Smith (GTE Laboratories, Waltham, MA). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-252. 6 p. Members, \$2.00; nonmembers, \$4.00. Research supported by the U.S. Department of Energy and General Motors Corp.; Contract No. DEN3-17.

This paper presents a status report on the injection molding of sinterable silicon nitride at GTE Laboratories. The effort involves fabrication of single axial turbine blades and monclithic radial turbine rotors. The injection molding process is reviewed and the fabrication of the turbine components discussed. Oxidation resistance and strength results of current injection molded sintered silicon nitride as well as dimensional checks on sintered turbine blades demonstrate that this material is a viable candidate for high temperature structural applications.

(Author

A82-35441 * # Ceramic thermal barrier coatings for gas turbine engines. R. J. Bratton, S. K. Lau, C. A. Andersson, and S. Y. Lee (Westinghouse Research and Development Center, Pittsburgh, PA). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-265. 4 p. 15 revs. Members, \$2.00; nonmembers, \$4.00. Research supported by the Electric Power Research Institute and U.S. Department of Energy; Contracts No. NAS3-21377; No. DEN3-110.

The results of studies concerning the high temperature corrosion resistance of ZrO2-Y2O3, ZrO2-MgO, and Ca2SiO4 plasma-sprayed coatings, which may be used as gas turbine engine thermal barriers, are reported. The coatings were evaluated in atmospheric burner rig and pressurized passage tests, using GT No. 2 fuel in pure form and with sodium, sulfur and vanadium corrosive impurities doping. It is found that, while the coatings performed well in both pressurized passage and burner rig tests with pure fuel chemical reactions between the ceramic coatings and combustion gases/condensates resulted in coating degradation with impure fuels. Chemical reactions between the ceramic coatings and vanadium compounds played a critical role in coating degradation.

O.C.

A82-35871 * Effects of oxidation and oxidation under load on strength distributions of \$i3N4. T. E. Easler, R. C. Bradt, and R. E. Tressler (Pennsylvania State University, University Park, PA). (American Ceramic Society, Annual Meeting, 82nd, Chicago, IL, Apr. 29, 1980, Paper 69-B-80.) American Ceramic Society, Journal, vol. 65, June 1982, p. 317-320. 18 refs. Army-supported research; Grant No. NsG-3016.

The room-temperature strength distributions of a sintered and a hot-pressed Si3N4 were examined in the as-machined condition, after oxidation at 1370 C and after oxidation under load at 1370 C. The strength-controlling flaw populations were highly transient in nature. Both the duration of oxidation and the magnitude of the applied load were observed to effect changes in strength. This dynamic situation is related to both strengthening and weakening processes, which at times may occur simultaneously in the same strength distribution. (Author)

A82-37015 * Fabrication of sinterable silicon nitride by injection molding. C. L. Quackenbush, K. French, and J. T. Neil (GTE Laboratories, Inc., Waltham, IMA). (American Ceramic Society, Topical Meeting on Nonoxide Ceramics, Bass River, MA, Oct. 5, 6, 1981.) Ceramic Engineering and Science Proceedings, vol. 3, Jan.-Feb. 1982, p. 20-34. 8 refs. Research supported by the U.S. Department of Energy; Contract No. DEN3-17.

Transformation of structural ceramics from the laboratory to production requires development of near net shape fabrication techniques which minimize finish grinding. One potential technique for producing large quantities of complex shaped parts at a low cost, and microstructure of sintered silicon nitride fabricated by injection molding is discussed and compared to data generated from isostatically dry-pressed material. Binder selection methodology, compounding of ceramic and binder components, injection molding techniques, and problems in binder removal are discussed. Strength, oxidation resistance, and microstructure of sintered silicon nitride fabricated by injection molding is discussed and compared to data generated from isostatically dry-pressed material. (Author)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

N82-21415*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

RESONANCE TUBE HAZARDS IN OXYGEN SYSTEMS

Ph.D. Thesis - Toledo Univ., 1975
Bert R. Phillips 1982 25 p refs Presented at Symp. on Flammability and Sensitivity of Mater. in Oxygen Enriched Atmosphere, Phoenix Ariz., 31 Mar. - 1 Apr. 1982; sponsored by the Am. Soc. for Testing and Mater.

(NA SA-TM-82801: E-1140; NAS 1.15:82801) Avail: NTIS HC A02/MF A01 CSCL 21D

An experimental and analytical program was carried out to determine whether fluid dynamic oscillations could create a hazard in gaseous oxygen flow systems. The particular fluid dynamic oscillation studied was the resonance tube phenomena as it was excited in a tee-shaped configuration characteristic of configurations found in many industrial high pressure gas flow systems. The types of hazards that could be caused by the oscillations were direct heating and ignition of the piping system by the gas, the greatly augmented heating that could occur if inert contaminants were present, and the ignition of metallic contaminants. Asbestos was used as the inert contaminant; titanium, aluminum, magnesium and steel were chosen as ignitable metallic contaminants. The oscillations in the tee-shaped configuration were compared to oscillations driven by choked convergent nozzles and were found to differ markedly. Temperature generated at the end or base of the resonance tube exceeded 1089 K for both gaseous oxygen and nitrogen and reached 1645 K when asbestos was added. Aluminum in both powder and fiber form was readily ignited within the resonance tube when the supply pressures were less than 8270 kPa whereas at higher supply pressures the mixture exploded with enough violence to destory the apparatus in less than 10 sec. In addition to aluminum, magnesium, and titanium, samples of 400 series states steels were also ignited within the resonance tube. The ignition occurred within a few seconds after the oxygen flow began.

N82-26483*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTS ON FUEL HEATING FOR COMMERCIAL **AIRCRAFT**

R. Friedman and F. J. Stockemer (Lockheed-California Co., Burbank, Calif.) 1982 15 p refs Presented at 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; Sponsored by AIAA, SAE and ASME

(NASA-TM-82878; E-1254; NAS 1.15:82878) Avail: NTIS

HC A02/MF A01 CSCL 21D

An experimental jet fuel with a -30 C freezing point was chilled in a wing tank simulator with superimposed fuel heating to improve low temperature flowability. Heating consisted of circulating a portion of the fuel to an external heat exchanger and returning the heated fuel to the tank. Flowability was determined by the mass percent of unpumpable fuel (holdup) left in the simulator upon withdrawal of fuel at the conclusion of testing. The study demonstrated that fuel heating is feasible and improves flowability as compared to that of baseline, unheated tests. Delayed heating with initiation when the fuel reaches a prescribed low temperature limit, showed promise of being more efficient than continuous heating. Regardless of the mode or rate of heating, complete flowability (zero holdup) could not be restored by fuel heating. The severe, extreme-day environment imposed by the test caused a very small amount of subfreezing fuel to be retained near the tank surfaces even at high rates of heating. Correlations of flowability established for unheated fuel tests also could be applied to the heated test results if based or, boundary-layer temperature or a solid index (subfreezing point) characteristic of the fuel.

N82-27519* # National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

EFFECT OF SOME NITROGEN COMPOUNDS THERMAL STABILITY OF JET A

Albert C, Antoling Jun. 1982 20 p refs (NASA-TM-82908: NAS 1.15:82908) HC A02/MF A01 CSCL 21D

Avail:

The effect of known concentrations of some nitrogen containing compounds on the thermal stability of a conventional fuel, namely, Jet A was investigated. The concentration range from 0.01 to 0.1 wt% nitrogen was examined. Solutions were made containing, individually, pyrrole, indole, quinoline, pyridine, and 4 ethylpyridine at 0.01, 0.03, 0.06, and 0.4 wt% nitrogen concentrations in Jet A. The measurements were all made by using a standard ASTM test for evaluating fuel thermal oxidation behavior, namely, ASTM D3241, 'thermal oxidation stability of turbine fuels (JFTOT procedure).' Measurements were made at two temperature settings, and 'breakpoint temperatures' were determined. The results show that the pyrrole and indole solutions have breakpoint temperatures substantially lower than those of the Jet A used.

N82-28460*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF HYDROCARBON FUEL TYPE ON FUEL

Edgar L. Wong and David A. Bittker Jun. 1982 13 p refs (NASA-TM-82916; E-1073; NAS 1.15:82916) Avail: NT\S HC A02/MF A01 CSCL 21D

A modified let fuel thermal oxidation tester (JFTOT) procedure was used to evaluate deposit and sediment formation for four pure hydrocarbon fuels over the temperature range 150 to 450 C in 316-stainless-steel heater tubes, Fuel types were a normal alkane, an alkene, a naphthene, and an aromatic. Each fuel exhibited certain distinctive deposit and sediment formation characteristics. The affect of aluminum and 316-stainless-steel heater tube surfaces on deposit formation for the fuel n-decane over the same temperature range was investigated. Results showed that an aluminum surface had lower deposit formation rates at all temperatures investigated. By using a modified JFTOT procedure the thermal stability of four pure hydrocarbon fuels and two practical fuels (Jet A and home heating oil no. 2) was rated on the basis of their breakpoint emperatures. Results indicate that this method could be used to rate thermal stability for a series of fuels.

N82-32504*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

CHARACTERIZATION OF AN EXPERIMENTAL REFEREE
BROADSNED SPECIFICATION (ERBS) AVIATION TURBINE FUEL AND ERBS FUEL BLENDS

Gary T. Seng Aug. 1982 25 p refs (NASA-TM-82883; E-1260; NAS 1.15:82883) HC A02/MF A01 CSCL 21D Avail: NTIS

Characterization data and comparisons of these data are presented for three individual lots of a research test fuel designated as an Experimental Referee Broadened Specification (ERBS) aviation turbine fuel. This research fuel, which is a blend of kerosene and hydrotreated catalytic gas oil, is a representation of a kerojet fuel with broadened properties. To lower the hydrogen content of the ERBS fuel, a blending stock, composed of xylene bottoms and hydrotreated catalytic gas oil, was developed and employed to produce two different ERBS fuel blends. The ERBS fuel blends and the blending stock were also characterized and the results for the blends are compared to those of the original ERBS fuel. The characterization results indicate that with the exception of the freezing point for ERBS !ot 2, which was slightly high, the three lots, produced over a 2 year period, met all general fuel requirements. However, although the properties of the fuels were found to be fairly consistent, there were differences in composition. Similarly, all major requirements for the ERBS fuel blends were met or closely approached, and the properties of the blended fuels were found to generally reflect those expected for the proportions of ERBS fuel and blending stock used in their production. Author

N82-10245*# Aerojet Liquid Rocket Co., Sacramento, Calif. FUEL/OXIDIZER-RICH HIGH-PRESSURE PREBURNERS **Finel Report**

L. Schoenman Oct. 1981 254 p refs (Contract NAS3-21753)

(NASA-CR-165404) Avail: NTIS HC A12/MF A01 CSCL

The analyses, designs, fabrication, and cold-flow acceptance testing of LOX/RP-1 preburner components required for a high-pressure staged-combustion rocket engine are discussed. Separate designs of injectors, combustion chambers, turbine simulators, and hot-gas mixing devices are provided for fuel-rich and oxidizer-rich operation. The fuel-rich design addiesses the problem of non-equilibrium LOX/RP-1 combustion. The development and use of a pseudo-kinetic combustion model for predicting operaing efficiency, physical properties of the combustion products, and the potential for generating solid car on is presented. The oxygen-rich design addresses the design criteria for the prevention of metal ignition. This is accomplished by the selection of materials and the generation of well-mixed gases. The combining of unique propellant injector element designs with secondary mixing devices is predicted to be the best approach. M.G.

N82-11224*# Lockheed-California Co., Burbank. EXPERIMENTAL STUDY OF FUEL HEATING AT LOW TEMPERATURES IN A WING TANK MODEL, VOLUME 1 Final Report

Francis J. Stockemer Aug. 1981 75 p refs (Contract NAS3-21977)

(NASA-CR-165397; LR-299 HC A04/MF A01 CSCL 21D LR-29935-Vol-1)

NTIS

Scale model fuel heating systems for use with aviation hydrocarbon fuel at low temperatures were investigated. The effectiveness of the heating systems in providing flowability and pumpability at extreme low temperature when some freezing of the fuel would otherwise occur is evaluated. The test tank simulated a section of an outer wing tank, and was chilled on the upper and lower surfaces. Turbine engine lubricating oil was heated, and recirculating fuel transferred the heat. Fuels included: a commercial Jet A; an intermediate freeze point distillate; a higher freeze point distillate blended according to Experimental Referee Broadened Specification guidelines; and a higher freeze point paraffinic distillate used in a preceding investigation. Each fuel was chilled to selected temperature to evaluate unpumpable solid formation (holdup), Tests simulating extreme cold weather flight, without heating, provided baseline fuel holdup data. Heating and recirculating fuel increased bulk temperature significantly; it had a relativley small effect on temperature near the bottom of the tank. Methods which increased penetration of heated fuel into the lower boundary layer improved the capability for reducing holdup.

N82-11230* Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

AN ASSESSMENT OF THE USE OF ANTIMISTING FUEL

IN TURBOFAN ENGINES Final Report, Sep. 1979 - Nov. 1980

A. Fiorentino, R. DeSaro, and T. Franz Jun. 1981 53 p refs (Contract NAS3-22045)

(NASA-CR-165258; AD-A104673; PWA-5697-29;

FAA-CT-81-58) Avail: NTIS HC A04/MF A01 CSCL 21/4 An evaluation was made on the effects of using antimisting kerosene (AMK) on the performane of the components from the fuel system and the combustor of a current in-vervice JT8D aircraft engine. The objectives were to identify problems associated with using antimisting kerosene and to determine the extent of shearing or degradation required to allow the engine components to achieve satisfactory operation. The program consisted of a literature survey and a test program which evaluated the antimisting kerosene fuel in laboratory and bench component testing, and assessed the performance of the combustor in a high pressure facility and in an atitude relight/cold ignition facility. Performance of the fuel pump and control system was evaluated in an open loop simulation. Thus far, results of the program would not preclude the use of antimisting kerosene in a jet engine application.

N82-13243*# Engineering Societies Commission on Energy,

Inc., Washington, D. C.

BARRIERS TO THE UTILIZATION OF SYNTHETIC FUELS FOR TRANSPORTATION Final Report

Harry W. Parker and Matthew J. Reilly Oct. 1981 25 p (NASA Order C-57307-D; Contract DE-AI01-81CS-50006) (NASA-CR-185517; DQE/NASA-7307/1) Avail: HC A02/MF A01 CSCL 21D

The principal types of engines for transportation uses are reviewed and the specifications for conventional fuels are compared with specifications for synthetic fuels. Synfuel processes nearing the commercialization phase are reviewed. The barriers to using synfuels can be classified into four groups: technical, such as the uncertainty that a new engine design can satisfy the desired performance criteria; environmental, such as the risk that the engine emissions cannot meet the applicable environmental standards; economic, including the cost of using a synfuel relative to conventional transportation fuels; and market. involving market penetration by offering new engines, establishing new distribution systems and/or changing user expectations.

NTIS

N82-14371*# United Technologies Research Center, East Hartford, Conn.

EXTERNAL FUEL VAPORIZATION STUDY Final Report E. J. Szetela and J. A. TeVelde Nov. 1981 92 p refs (NASA-CR-165513; UTRC-81-915326-15) HC A05/MF A01 CSCL 21D

The feasibility of external fuel vaporization in advanced aircraft gas turbine engines is addressed. Experiments were run to determine key fuel properties including boiling points, dew points, critical temperature, critical pressure, heat transfer coefficients, deposit formation rates, and deposit removal in a flowing system. Of particular concern were the heat transfer rate in the heat exchanger and the performance of the orifice used in the throttling process. Three fuels were utilized in the experiments including Jet-A. Experimental referee broad specification fuel, and a premium No. 2 diesel fuel. Engine conditions representing the NASA Energy Efficient Engine at sea level takenff, cruise, and idle were simulated in the vaporization system and it was found that single phase flow was maintained in the heat exchanger and downstream of the throttle. Deposits encountered in the heat exchanger represented a thermal resistance as high as .0013 sq M K/watt and a deposit formation rate as high as 800 micro-gC/sq cm hr. These values are equivalent to a buildup of 0.055 cm of thickness in 36 hours resulting in a more severe fouling condition than originally anticipated, it was found that the deposit can be removed by cleaning with air at a temperature of 720 K for 10 minutes.

NS2-18402*# SRI International Corp., Menlo Park, Calif. OXIDATION AND FORMATION OF DEPOSIT PRECURSORS IN HYDROCARBON FUELS Final Report

S, E. Buttrill, Jr., Frank R. Mayo, Bosco Lan, G. A, St.John, and David Dulin Jan. 1982 26 p refs

(Contract NAS3-22510)

PYU-2115) (NASA-CR-185534; Avail

HC A03/MF A01 CSCL 21D

A practical fuel, home heating oil no. 2 (Fuel C), and the pure hydrocarbon, n-dodecane, were subjected to mild oxidation at 130 C and the resulting oxygenated reaction products, deposit precursors, were analyzed using field ionization mass spectrometry. Results for fuel C indicated that, as oxidation was initially extended. certain exygenated reaction products of increasing molecular weights in the form of monomers, dimers and some trimers were produced. Further oxidation time increase resulted in further increase in monomers but a marked decrease in dimers and trimers. This suggests that these larger molecular weight products have proceeded to form deposit and separated from the fuel mixture. Results for a dodecane indicated that yields for dimers and trimers were very low. Dimers were produced as a result of interaction between oxygenated products with each other rather than with another fuel molecule. This occurred even though fuel molecule concentration was 50 times, or more greater than that for these oxygenated reaction products.

N82-24353*# Aerojet Liquid Rocket Co., Sacramento, Calif. TESTING OF FUEL/OXIDIZER-RICH, HIGH-PRESSURE PRESURNERS Final Report

B. R. Lawver May 1982 253 p refs (Contract NAS3-22647)

(NASA-CR-165609; NAS 1,26:165609) HC A12/MF A01 CSCL 211 NTIS Avail:

Results of an evaluation of high pressure combustion of fuel rich and oxidizer rich LOX/RP-1 propellants using 4,0 inch diameter prototype preburner injectors and chambers are presented. Testing covered a pressure range from 8.9 to 17,5 MN/square meters (1292 to 2540 psia). Fuel rich mixture ratios ranged from 0.238 to 0.367; oxidizer rich mixture ratios ranged from 27.2 to 47.5. Performance, gas temperature uniformity, and stability data for two fuel rich and two ozidizer rich preburner injectors are presented for a conventional like-on-like (LOL) design and a platelet design injector. Kinetically limited combustion is shown by the excellent agreement of measured fuel rich gas composition and C performance data with kinetic mudel predictions. The oxidizer rich test results support previous equilibrium combustion predictions.

N82-26482*# Solar Turbines International, San Diego, Calif. LOW NOX HEAVY FUEL COMBUSTOR CONCEPT PRO-GRAM

D. J. White and Alan J. Kubasco May 1982 50 p refs (Contract DEN3-145)

(NASA-CR-167876; NAS 1.26:167876; DOE/NASA/0145-2; SR82-R-4994-08) Avail: NTIS HC A03/MF A01 CSCL 21D

Three simulated coal gas fuels based on hydrogen and carbon monoxide were tested during an experimental evaluation with a rich lean can combustor: these were a simulated Winkler gas, Lurgi gas and Blue Water gas, All three were simulated by mixing together the necessary pure component species, to levels typical of fuel gases produced from coal, The Lurgi gas was also evaluated with ammonia addition. Fuel burning in a rich lean mode was emphasized. Only the Blue Water gas, however, could be operated in such fashion. This showed that the expected NOx signature form could be obtained, although the absolute values of NOx were above the 75 ppm goals for most operating conditions. Lean combustion produced very low NOx well below 75 ppm with the Winkler and Lurgi gases. In addition, these low levels were not significantly impacted by changes in operating conditions.

N82-31546*# Lockheed-California Co., Burbank. ADDITIONAL EXPERIMENTS ON FLOWABILITY IMPROVE-MENTS OF AVIATION FUELS AT LOW TEMPERATURES, **VOLUME 2** Final Report

Francis J. Stockemer and Ronald L. Deane Aug. 1982 56 p.

(Contract NAS3-21977)

(NASA-CR-167912; NAS 1.26:167912) Avail: NTIS

HC A04/MF A01 CSCL 21D

An investigation was performed to study flow improver additives and scale-model fuel heating systems for use with aviation hydrocarbon fuel at low temperatures. Test were performed in a facility that simulated the heat transfer and temperature profiles anticipated in wing fuel tanks during flight of long-range commercial aircraft. The results are presented of experiments conducted in a test tank simulating a section of an outer wing integral fuel tank approximately full-scale in height, chilled through heat exchange panels bonded to the upper and lower horizontal surfaces. A separate system heated lubricating oil externally by a controllable electric heater, to transfer heat to fuel pumped from the test tank through an oil-to-fuel heat exchanger, and to recirculate the heated fuel back to the test tank.

An experiment to evaluate liquid hydrogen storage in space. R. N. Eberhardt, D. A. Fester, W. A. Johns, and J. S. Marino (Martin Marietta Aerospace, Denver, CO). National Bureau of Standards, Cryogenic Engineering Conference, San Diego, CA, Aug. 10-14, 1981, Paper. 9 p. Contract No. NAS3-21591.

The design and verification of a Cryogenic Fluid Management Experiment for orbital operation on the Shuttle is described. The experiment will furnish engineering data to establish design criteria

for storage and supply of cryogenic fluids, mainly hydrogen, for use In low gravity environments. The apparatus comprises an LAD (liquid acquisition device) and a TVS (thermodynamic vent system). The hydrogen will be either vented or forced out by injected helium and the flow rates will be monitored. The data will be compared with ground-based simulations to determine optimal flow rates for the pressurizing gas and the release of the cryogenic fluid. It is noted that tests on a one-g, one-third size LAD system are under way.

Deposit formation in liquid fuels. II - The A82-22240 * effect of selected compounds on the storage stability of Jet A turbine fuel, J. H. Worstell and S. R. Daniel (Colorado School of Mines, Golden, CO). Fuel, vol. 60, June 1981, p. 481-484, 30 refs. Grant No. NsG-3122.

The influence of substituted pyridines, pyrroles, indoles, and quinolines on the storage stability of conventional Jet A turbine fuel is evaluated. Significant increases in the amount of deposit formed in accelerated storage tests are found upon addition of these compounds at levels as low as one ppm nitrogen. While the effect is correlated with basicity of the nitrogen compound within a given compound class, the correlation does not hold between classes (pyridines, quinolines, etc.). Steric hindrance at the nitrogen atom greatly inhibits deposit promotion. The characteristics, but not the elemental composition, of deposits vary with the identity of the added nitrogen compound and with deposition temperature,

(Author)

A82-22241 * Deposit formation in liquid fuels. I - Effect of coal-derived Lewis bases on storage stability of Jet A turbine fuel. K. E. Dahlin, S. R. Daniel, and J. H. Worstell (Colorado School of Mines, Golden, CO). Fuel, vol. 60, June 1981, p. 477-480. 24 refs. Grant No. NsG-3122.

The development of reasonably precise techniques for the measurement of storage stability of jet aviation fuel is described. Lewis bases, extracted by ligand-exchange from a coal-derived liquid, are shown to adversely affect storage stability (as determined by an accelerated storage test) when added to Jet A turbine fuel. JFTOT results suggesting slight decreases in thermal stability of fuel 'spiked' (i.e., contaminated with a measured quantity of reagent) with extract are reported. Addition to Jet A turbine fuel of individual heterocyclic nitrogen compounds is shown to produce comparable decreases in storage stability. (Author)

A82-23238 * Deposit formation in liquid fuels. III - The effect of selected nitrogen compounds on diesel fuel. J. H. Worstell, S. R. Daniel, and G. Frauenhoff (Colorado School of Mines, Golden, CO). Fuel, vol. 60, June 1981, p. 485-487. 11 refs. Grant No. NsG-3122.

The influence of substituted quinolines, pyrroles, indoles, and pyridines on deposit formation in a diesel fuel is evaluated. Significant increases in deposition rate are found which are dependent upon the basicity of the nitrogen compound within a given compound class. These effects correspond closely with those produced in a Jet A fuel. Removal of highly polar fuel components renders the nitrogen compound influence inoperative. These components are therefore participants in deposit-forming reactions.

(Author)

A82-33030 * Oxidation stability of advanced reactionbonded Si3N4 materials. L. J. Lindberg, D. W. Richerson, W. D. Carruthers (Garrett Turbine Engine Co., Phoenix, AZ), and H. M. Gersch (Ai Research Casting Co., Torrance, CA). (American Ceramic Society, Fall Meeting, San Francisco, CA, Oct. 28, 1980, Paper 52-B-80P.) American Ceramic Society Bulletin, vol. 61, May 1982, p. 574-578. 11 refs. Contracts No. N00024-76-C-5352; No. F33615-77-C-5171; No. DEN3-167.

Four slip-cast, injection-molded and isostatically-pressed specimens of reaction-bonded silicon nitride (RBSN) were subjected to static oxidation tests at 900 C for 10 hours. Specimens containing 8-10% interconnected open porosity of size greater than one micron exhibited a 20-30% decrease in average room temperature four-point flexure strength, while those with 10% open porosity of magnitudes much smaller than one micron as well as those with 2-4% interconnected open porosity of about one micron did not decrease in strength after 900 C exposure. It was determined that preoxidation treatment at 1350 C prevents the 20-30% strength degradation due to internal oxidation, and evidence is presented which suggests that surface pit formation in some RBSN may result from contamination by the furnace environment rather than any intrinsic material properties.

O.C.

A82-33031 * Acoustic microscopy of silicon carbide materials. P. K. Khandelwal, P. W. Heitman (General Motors Corp., Detroit Diesel Allison Div., Indianapolis, IN), D. Yuhas, and C. L. Vorres (Sonoscan, Inc., Bensenville, IL). American Ceramic Society Bulletin, vol. 61, May 1982, p. 586, 587. Research supported by the U.S. Department of Energy; Contract No. DEN3-17.

It is shown that scanning laser acoustic microscopy (SLAM) is able to detect such fracture-controlling flaws in dense silicon carbide materials as surface voids, whose diameter-by-depth size is a minimum of 75 by 17 microns in reaction-bonded SiC and 68 by 25 microns in alpha-SiC. Surface conditions such as pitting, which have been found to limit the discernibility of drilled holes, become important when pit and drilled hole sizes become comparable. O.C.

A82-35307 * # Deposit formation in hydrocarbon fuels. R. Roback, E. J. Szetela, and L. J. Spadaccini (United Technologies Research Center, East Hartford, CT). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-49, 9 p. 9 refs. Members, \$2.00; nonmembers, \$4.00. Contract No. NAS3-22277.

The hydrocarbon fuels RP-1, commercial-grade propane, JP-7 and chemically pure propane were subjected to tests in a high pressure fuel coking apparatus in order to evaluate their thermal decomposition limits and carbon deposition rates in heated copper tubes. A fuel thermal stability parametric evaluation was conducted at 136-340 atmospheres, bulk fuel velocities of 6-30 m/sec, and tube wall temperatures of 422-811 K, and the effect of inside wall material on deposit formation was evaluated in tests using nickel-plated tubes. Results show RP-1 deposit formation at wall temperatures between 600 and 800 K, with peak deposit formation near 700 K. Substitution of deoxygenated JP-7 for RP-1 showed no improvement, and the carbon deposition rates for propane fuels were found to be higher than those of either of the kerosene fuels. Nickel plating of the tube walls significantly reduced RP-1 carbon deposition rates.

A82-35312 * # Experimental study of external fuel vaporization. E. J. Szetela and J. A. TaVelde (United Technologies Research Center, East Hartford, CT). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-59 8 p. 9 refs. Members, \$2.00; nonmembers, \$4.00. Contract No. NAS3-21971.

The fuel properties used in the design of a flash vaporization system for aircraft gas turbine engines were evaluated in experiments using a flowing system to determine critical temperature and pressure, boiling points, dew points, heat transfer coefficients, deposit formation rates, and deposit removal. Three fuels were included in the experiments: Jet-A, an experimental referree broad specification fuel, and a premium No. 2 diesel fuel. Engine conditions representing a NASA Energy Efficient Engine at sea-level take-off, cruise, and idle were simulated in the vaporization system and it was found that single phase flow was maintained in the heat exchanger and downstream of the throttle. Deposits encountered in the heat exchanger represented a thermal resistance as high as 1300 sq M K/watt and a deposit formation rate over 1000 gC/sq cm hr. C.D.

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-13281*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ELEVATED TEMPERATURE FATIGUE TESTING OF METc26

Marvin H. Hirschberg In AGARD Fatigue Test Methodology Oct. 1981 18 p refs (For primary document see N82-13274

Avail: NTIS HC A12/MF A01

Material characterization and evaluation conducted for the purpose of calculating fatigue crack initiation lives of components operating at elevated temperatures are discussed. The major technology areas needed to perform a life prediction of an aircraft turbine engine hot section component and the steps required for life prediction are outlined. These include: the determination of the operating environment, the calculation of the thermal and mechanical loading of the component, the cyclic stress strain and creep behavior of the material required for structural analysis. the structural analysis to determine the local stress strain temperature time response of the material at the critical location in the component, and from a knowledge of the fatigue, creep, and failure resistance of the material, a prediction of the life of the component.

N82-20339*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

IDENTIFICATION OF MULTIVARIABLE HIGH PERFOR-MANCE TURBOFAN ENGINE DYNAMICS FROM CLOSED

Walter Merrill 1982 16 p refs Presented at the 6th IFAC p. on Identification and System Parameter Estimation, Vväshington, D.C., 7-11 Jun. 1982

(NASA-TM-82785; E-1120; NAS 1.15:82785) Avail: NTIS HC A02/MF A01 CSCL 21E

The multivariable instrumental variable/approximate maximum likelihood (IV/AML) method or recursive time-series analysis is used to identify the multivariable (four inputs-three outputs) dynamics of the Pratt and Whitney F100 engine. A detailed nonlinear engine simulation is used to determine linear engine model structures and parameters at an operating point using open loop data. Also, the IV/AML method is used in a direct identification mode to identify models from actual closed loop engine test data. Models identified from simulated and test data are compared to determine a final model structure and parameterization that can predict engine response for a wide class of inputs. The ability of the IV/AML algorithm to identify useful dynamic models from engine test data is assessed.

N82-22386* # National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ULTRASONIC SCANNING SYSTEM FOR IMAGING FLAW GROWTH IN COMPOSITES

Louis J. Kiraly and Erwin H. Meyn 1982 18 p Presented at 28th Intern. Instrumentation Symp., Las Vegas, Nev., 3-6 May 1982; sponsored by Instrument Soc. of Am. (NASA-TM-82799; E-1138; NAS 1.15:22799) Avail: NTIS HC A02/MF A01 CSCL 11D

A system for measuring and visually representing damage in composite specimens while they are being loaded was demonstrated. It uses a hobbiest grade microcomputer system to control data taking and image processing. The system scans operator selected regions of the specimen while it is under load in a tensile test machine and measures internal damage by the attenuation of a 2.5 MHz ultrasonic beam paces shrough the specimen. The microcomputer dynamically contain the position of ultrasonic transducers mounted on a two axis motor driven carriage. As many as 65,536 samples can be taken and filed on a floppy disk system in less than four minutes,

N82-22387*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MORPHOLOGICAL AND FRICTIONAL BEHAVIOR OF SPUTTERED MoS2 FILMS

T. Spalvins 1982 18 p refs Presented at Intern, Conf. on Met. Coatings, San Diego, Calif., 4-9 Apr. 1982; sponsored by Am. Vacuum Soc.

(NASA-TM-82809; E-1150; NAS 1.15:82809) Avail: NTIS

HC A02/MF A01 CSCL 11F

From the texture and growth patterns of sputtered MoS2 films deposited on substrates, three regions are distinguished: (1) a ridge formation region; (2) an equiaxed transition zone; and (3) a columnar-fiber-like structure. The lubricating properties of sputtered MoS2 films are visually identified with respect to optical changes before and after rubbing. The orientation of the surface microcrystallites is identified, and the change in optical properties is explained. In sliding contact the sputtered film tends to break up at the base of the columnar region, Effective lubrication occurs with the film remaining on the substrate. This film is 0,18 to 0,22 microns thick.

N82-22388*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A HIGH SPEED IMPLEMENTATION OF THE RANDOM

DECREMENT ALGORITHM
Louis J. Kiraly 1982 13 p refs Presented at 1982
Aerospace/Test Measurement Symp., Las Vegas, Nev., 2-6 May 1392; sporsored by Instrument Soc. of Am.

(NASA-TM-82853; E-1192, NAS 1.15:82853) Avail: NTIS

HC A02/MF A01 CSCL 093

The algorithm is useful for measuring net system damping levels in stochastic processes and for the development of equivelent linearized system response models. The algorithm works by summing together all subrecords which occur after predefined threshold level is crossed. The random decrement signature is normally developed by examing stored data and adding subrecords together. The high speed implementation of the random decrement algorithm exploits the digital character of sampled data and uses fixed record lengths of 2(n) samples to greatly speed up the process. The contributions to the random decrement signature of each data point was calculated only once and in the same sequence as the data were taken. A hardware implementation of the algorithm using random logic is diagrammed and the process is shown to be limited only by the record size and the threshold crossing frequency of the sampled data. With a hardware cycle time of 200 ns and 1024 point signature, a threshold crossing frequency of 5000 Hertz can be processed and a stably averaged signature presented in real time.

N82-24361*# Ohio State Univ., Columbus. THE ORTHOGONAL IN-SITU MACHINING OF SINGLE AND POLYCRYSTALLINE ALUMINUM COPPER, AND VOLUME 1 Ph.D. Thesis Final Report Paul H, Cohen May 1982 203 p refs

(Grant NsG-3164)

(NASA-CR-168929; NAS 1.26:168929) HC A10/MF A01 CSCL 13H NTIS Avail:

Metal cutting is a unique deformation process characterised by large strains, exceptionally high strain rates and few constraints to the deformation. These factors, along with the difficulty of directly measuring the shear angle, make chip formation difficult to model and understand. One technique for skirting the difficulty of post mortem chip measurement is to perform a cutting experiment dynamically in a scanning electron microscope. The performance of the in-situ experiment with full instrumentation allows for component force measurement, orientation measurement (on a round single crystal disk) and a timing device, all superimposed below the deformation on the TV monitor and recorded for future viewing. This allows the sher angle to be directly measured for the screen along with the other needed information,

A82-46430 * Pressure pulsations above turbomolecular pumps. S. Danziger, B. R. F. Kendall, and J. Dormer (Pennsylvania State University, University Park, PA). Journal of Vacuum Science and Technology, vol. 21, Sept.-Oct. 1982, p. 893-895. 6 refs. Grant No. NsG-3301,

Lange and Singleton (1978) have observed pressure pulses above a turbomolecular pump. They reported that the mean pulse frequency increased with .

the temperature of the pump cooling water and that the evolved gas was mainly hydrogen. The present investigation takes into account tests conducted with a similar pumping system. The pumping system was equipped with additional pressure-monitoring equipment in order to study these pulsations in more detail. It was found that at least two distinct types of pressure pulsations may be present in a turbomolecular-pumped ultrahigh vacuum system. The random hydrogen pulses are easily eliminated for period of days by changing the cooling water temperature. The cyclic pulses consisting mainly of water vapor are not likely to be a problem in normal experiments.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical /communications.

For related information see also 04 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking.

N82-31585°# Case Western Reserve Univ., Cleveland, Ohio. Inst. of Technology

COAXIAL PRIME FOCUS FEEDS FOR PARABOLOIDAL RE-FLECTORS

R. E. Collin, H. Schilling, and L. Hebert Jul. 1982 138 p refs (Contract NAS3-22342)

(NASA-CR-167934; NAS 1.26:167934) Avail: NTIS HC A07/MF A01 CSCL 20N

A TE11 - TM11 dual mode coaxial feed for use in prime focus paraboloidal antenna systems is investigated. The scattering matrix parameters of the internal bifurcation junction was determined by the residue calculus technique. The scattering parameters and radiation fields of the aperture were found from the Weinstein solution. The optimum modeling ratio for minimum cross-polarization was determined along with the corresponding optimum feed dimensions. A peak cross-polarization level of -58 dB is predicted. The frequency characteristics were also investigated and a bandwidth of 5% is predicted over which the cross-polarization remains below -30 dB, the input VSWR is below 1.15, and the phase error is less than 10 deg. Theoretical radiation patterns and efficiency curves for a paraboloidal reflector illuminated by this feed were computed. The predicted sidelobe level is below -30 dB and aperture efficiencies greater than 70% are possible. Experimental results are also presented that substantiates the theoretical results. In addition, experimental results for a 'short-cup' coaxial feed are given. The report includes extensive design data for the dual-mode feed along with performance curves showing cross-polarization as a function of feed parameters. The feed is useful for low-cost ground based receiving antennas for use in direct television satellite broadcasting service. Author

N82-13302*# Arinc Research Corp., Annapolis, Md.
THE 30/20 GHz COMMUNICATIONS SATELLITE TRUNKING NETWORK STUDY

William Kolb Oct. 1981 65 p. (Contract NAS3-22496)

(NASA-CR-165467) Avail: NTIS HC A04/MF A01 CSCL 17B

Alternative transmission media for a CONSTRICT de trunking network in the years 1990 and 2000 are examined. The alternative technologies comprised fiber optic cable, conventional C- and Ku-band satellites, and 30/20 GHz satellites. Three levels of implementation were considered - a 10-city network, a 20-city network, and a 40-city network. The cities selected were the major metropolitan areas with the greatest communications demand. All intercity voice, data, and video traffic carried more than 40 miles was included in the analysis. In the optimized network, traffic transmitted less than 500 milec was found to be better served by fiber optic cable in 1990. By the year 2000, the crossover point would be down to 200 miles, assuming availability of 30/20 GHz satellites.

N82-17420*# Future Systems, Inc., Gaitherstrurg, Md.
CROSS-IMPACT STUDY OF FOREIGN SATELLITE COMMUNICATIONS ON NASA'S 30/20 GHz PROGRAM

Aug. 1980 244 p refs (Contract NAS3-21500)

(NASA-CR-165154; FSI-251) Avail: NTIS HC A11/MF A01 CSCL 17B

A comprehensive traffic demand forecast and a scenario for the transition process from current satellite systems to more advanced systems of the 1990's are presented. Systems configurations with and without the use of 30/20 GHz are described and these two alternatives are compared. It is concluded that: (1) the use of 30/20 GHz will result in increased satellite capacity, which will be needed to satisfy demand; (2) the

use of 30/20 GHz will decrease the transmission cost, especially for broadband communications; (3) in some areas, particularly Europe and Japan but also the U.S., 30/20 GHz is the only available frequency band for customer premise Earth stations because of the dense terrestrial microwave networks; and (4) the development of 30/20 GHz technology will improve U.S. markets for equipment and satellites in many world regions.

A.R.H.

N82-20362*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PHASE 2. VOLUME 1: EXECUTIVE SUMMARY Final Report, Apr. 1980 - Mer. 1981

L. Bronstein, Y. Kawamoto, J. J. Ribarich, J. R. Scope, B. J. Forman, S. G. Bergman, and S. Reisenfeld Jul. 1981 122 p 4 Vol.

(Contract NAS3-22340)

(NASA-CR-165409-Vol-1; NAS 1,26:165409-Vol-1;

SCG-810338R) Avail: NTIS HC A08/MF A01 CSCL 179 Summary information on the final communication system design, communication payload, space vehicle, and development plan for the 30/20 GHz flight experiment will be installed on the LEASAT spacecraft which will be placed into orbit from the space shuttle cargo bay. The communication concept has two parts: a truck service and a customer premise service (CPS). The trucking system serves four spot beams which are interconnected in a satellite switched time division multiple access mode by an IF switch matrix. The CPS covers two large areas of the eastern United States with a pair of scanning beams.

M.G

₹82-20363*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PMASE 2.

THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PHASE 2. VOLUME 2: EXPERIMENT SYSTEM DESCRIPTION Final Report, Apr. 1980 - Mar. 1981

L. Bronstein, Y. Kawamoto, J. J. Ribarich, J. R. Scope, B. J. Forman, S. G. Bergman, and S. Reisenfeld Jul. 1981 469 p 4 Vol.

(Contract NAS3-22340)

(NASA-CR-165409-Vol-2; NAS 1,26:165409-Vol-2; SCG-810339R) Avail: NTIS HC A20/MF A01 CSCL 17B

A detailed technical description of the 30/20 GHz flight experiment system is presented. The overall communication system is described with performance analyses, communication operations, and experiment plans. Hardware descriptions of the payload are given with the tradeoff studies that led to the final design. The spacecraft bus which carries the payload is discussed and its interface with the launch vehicle system is described. Finally, the hardwares and the operations of the terrestrial segment are presented.

N82-20364*# Hughes Aircraft Co., El Segundo, Calif. Sparand Communications Group.

THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PHASE 2. VOLUME 3: EXPERIMENT SYSTEM REQUIREMENT DOCUMENT Final Report Apr. 1980 - Mar. 1981

L. Bronstein, Y. Kawamoto, J. J. Ribarich, J. R. Scope, B. J. Forman, S. G. Berman, and S. Reisenfeld Jul. 1981 25 p 4 Vol.

(Contract NAS3-22340)

(NASA-CR-165409-Vol-3; NAS 1.26:165409-Vol-3; SCG-810340R) Avail: NTIS HC A02/MF A01 CSCL 17B

An approach to the requirements document to be used to procure the system by NASA is presented. The basic approach is similar to the requirements document used in the commercial communication satellite. Enough detail requirements are given to define the system without tight constraints.

N82-20365*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PHASE 2. VOLUME 4: EXPERIMENT SYSTEM DEVELOPMENT PLAN Final Report, ppr. 1980 - Mar, 1981

L. Bronstein, Y. Kawamoto, J. J. Riberich, J. R. Scope, B. J. Forman, S. G. Bergman, and S. Reisenfeld Jul, 1981 40 p

4 Vol. (Contract NAS3-22340) (NASA-CR-165409-Vol-4; SCG-8103411R; NAS 1,26;165409-Vol-4; SCG-810341R) Avail: NTIS HC A03/MF A01 CSCL 17B

The development plan for the 30/20 GHz flight experiment system is presented. A master program schedule with detailed development plans for each subsystem is planned with careful attention given to how technology items to ensure a minimal risk. The work breakdown structure shows the organization of the program management with detailed task definitions. The ROM costs based on the development plan are also given.

N82-25423*# Western Union Telegraph Co., McLean, Va. Government Systems Div.

WORLDWIDE SATELLITE MARKET DEMAND FOREGAST Final Report

J. M. Bowyer, M. Frankfort, and K. M. Steinnagel 19 Jun. 1981 124 p refs (Contract NAS3-22461)

(NASA-CR-167918; NASA-1-4-W-1-T11; NAS 1.26:167918)

Avail: NTIS HC A06/MF A01 CSCL 17B

The forecast is for the years 1981 - 2000 with benchmark years at 1985, 1990 and 2000. Two types of merkets are considered for this study: Hardware (worldwide total) - satellites. earth stations and control facilities (includes replacements and spares); and non-hardware (addressable by U.S. industry) planning, launch, turnkey systems and operations. These markets were examined for the INTELSAT System (international systems and domestic and regional systems using leased transponders) and domestic and regional systems. Forecasts were determined for six worldwide regions encompassing 185 countries using actual costs for existing equipment and engineering estimates of costs for advanced systems. Most likely (conservative growth rate estimates) and optimistic (mid range growth rate estimates) scenarios were employed for arriving at the forecasts which are precented in constant 1980 U.S. dollars. The worldwide satellite market demand forecast predicts that the market between 181 and 2000 will range from \$35 to \$50 billion, Approximately one-half of the world market, \$16 to \$20 billion, will be generated in the United States.

N:32-26526*# Ohio State Univ., Columbus,
THE TRANSMISSION OR SCATTERING OF ELASTIC
WAVES BY AN INHOMOGENEITY OF SIMPLE GEOMETRY:

A COMPARISON OF THEORIES
Y. C. Sheu and L. S. Fu May 1982 96 p refs

Y. C. Sheu and L. S. Fu May 1982 96 p refs (Grant NsG-3269)

(NASA-CR-169034; NAS 1,26;169034; TR-104) Avail: NTIS HC A05/MF A01 CSCL 20N

The extended method of equivalent inclusion developed is applied to study the specific wave problems of the transmission of elastic waves in an infinite medium containing a layer of inhomogeneity, and of the scattering of elastic waves in an infinite medium containing a perfect spherical inhomogeneity. The eigenstrains and expanded as a geometric series and the method of integration for the inhomogeneous Helmholtz operator given by Fu and Mura is adopted. The results obtained by using a limited number of terms in the eigenstrain expansion are compared with exact solutions for the layer problem and for a perfect sphere. Two parameters are singled out for this comparison; the ratio of elastic moduli, and the ratio of the mass densities. General trends for three different situations are shown.

N82-28503*# Illinois Univ., Urbana-Champaign. Electromagnetics Lab

NASA ADAPTIVE MULTIBEAM PHASED ARRAY (AMPA): AN APPLICATION STUDY Final Report, 15 Jan. - 30 Apr. 1982

R. Mittra, S. W. Lee, and W. Gee May 1982 78 p refs (Grant NAG3-149)

(NASA-CR-169125; NAS 1.26:169125) Avail: NTIS HC A05/MF A01 CSCL 20N

The proposed orbital generatry for the adaptive multibeam phased array (AMPA) communication system is reviewed and some of the system's capabilities and preliminary specifications

ORIGINAL PAGE IS

are highlighted Typical AMPA user link models and calculations are presented, the principal AMPA features are described, and the implementation of the system is demonstrated. System tradeoffs and requirements are discussed Recommendations are included.

AR.H.

N82-31584*# NTL, Inc., Colmmack, N.Y.
A NEW ANTENNA CONCEPT FOR SATELLITE COMMUNICATIONS

NTIS

G. Skahill and D. Ciccolella Jun. 1982 111 p refs (Contract NAS3-22887)

(NASA-CR-167924; NAS 1.26:167924) Ava!!:

HC A06/MF A01 CSCL 20N

A novel antenna configuration of two reflecting surfaces and a phased array is examined for application to satellite communications and shown to be superior in every respect to earlier designs for service to the continental United States from synchronous orbit. The vignetting that afflicts other two reflector optical systems is eliminated by use of a reflecting field element. The remaining aberrations, predominantly coma, are isolated in the time delay distribution at the surface of the array and can be compensated by ordinary array techniques. The optics exhibits infinite bandwidth and the frequency range is limited only by the design of the array.

Author

AB2-10679 * A review of transhorizon propagation phenomena. R. K. Crane (Environmental Research and Technology, Inc., Concord, MA). (International Union of Radio Science, Symposium on the Effects of the Lower Atmosphere on Radio Propagation at Frequencies above 1 GHz, Lennoxville, Quebec, Canada, May 26-30, 1980.) Radio Science, vol. 16, Sept.-Oct. 1981, p. 649-669. 40 refs. Contract No. NASw-3336.

Interference problems underlie the current interest in transhorizon propagation. In 'cular, statistics of the rare, high-level fields are of interest. This paper reviews the propagation mechanisms which produce the high-level fields and summarizes recent work in the modeling of the transhorizon propagation. (Author)

A82-23486 * # 30/20 GHz communications satellite multibeam antenna. W. G. Scott, H. S. Luh, A. E. Smoll, and E. W. Matthews (Ford Aerospace and Communications Corp., Palo Alto, CA). In: Communications Satellite Systems Conference, 9th, San Diego, CA, March 7-11, 1982, Collection of Technical Papers. (A82-23476 09-32) New York, American Institute of Aeronautics and Astronautics, 1982, p. 78-86. Contract No. NAS3-22498. (AIAA 82-0449)

A 20 GHz downlink satellite antenna design is described. The aperture simultaneously radiates 18 fixed, 0.3 deg width pencil beams directed at 18 cities distributed over CONUS for Trunking Service. All beams use the same trunk frequency allocation for 18 reuses of the band. The same aperture also radiates six additional 0.3 deg spot beams for Customer Premises Service (CPS) for TDMA beam hopping operation to small terminals anywhere in CONUS. Each CPS beam scans one sector of CONUS and all six beams are frequency reused in a CPS band, Offset dual reflector optics are used with a feed array and multiport beam forming network (BFN). For so many frequency reuses, sidelobes per beam must be 30 to 40 dB down over CONUS. Novel dual reflector optics were devised with shaped surfaces providing low aberrations for all beam positions over CONUS (+ or - 12 BW by + or - 5 BW). Scan loss under 1 dB is calculated with nearly constant sidelobes. For each beam position, a 7-element cluster of feeds is activated in the feed array with coefficients adjusted by the BFN to maintain low sidelobes and thus high beam isolation for frequency reuse.

A82-23508 * # Baseband-processed SS-TDMA communication system architecture and design concepts. S. Attwood and D. Sabourin (Motorola, Inc., Government Electronics Div., Scottsdale, AZ). In: Communications Satellite Systems Conference, 9th, San Diego, CA, March 7-11, 1982, Collection of Technical Papers. (A82-23476 09-32) New York, American Institute of Aeronautics and Astronautics, 1982, p. 234-242. Contract No. NAS3-22502.

(AIAA 82-0482)

The architecture and system design for a commercial satellite communications system planned for the 1990's was developed by Motorola for NASA's Lewis Research Center. The system provides data communications between individual users via trunking and customer premises service terminals utilizing a central switching satellite operating in a time-division multiple-access (TDMA) mode. The major elements of the design incorporating baseband processing include: demand-assigned multiple access reservation protocol, spectral utilization, system synchronization, modulation technique and forward error control implementation. Motorola's baseband processor design, which is being proven in a proof-of-concept advanced technology development, will perform data regeneration and message routing for individual users on-board the spacecraft. (Author)

A82-23538 * # Planning satellite communication services and spectrum-orbit utilization. P. H. Sawitz (ORI, Inc., Silver Spring, MD). In: Communications Satellite Systems Conference, 9th, San Diego, CA, March 7-11, 1982, Collection of Technical Papers. (A82-23476 09-32) New York, American Institute of Aeronautics and Astronautics, 1982, p. 489-494. Contract No. NAS3-22885. (AIAA 82-0526)

The relationship between approaches to planning satellite communication services and spectrum-orbit utilization is considered, with emphasis on the fixed-satellite and the broadcasting-satellite services. It is noted that there are several possible approaches to planning space services, differing principally in the rigidity with which technical parameters are prescribed, in the time for which a plan remains in force, and in the procedures adopted for implementation and modifications. With some planning approaches, spectrum-orbit utilization is fixed at the time the plan is made. Citiers provide for greater flexibility by making it possible to postpone some decisions on technical parameters. In addition, the two political questions of what is equitable access and how it can be guaranteed in practice play an important role.

A82-26713 * Conversion and matched filter approximations for serial minimum-shift keyed modulation. R. E. Ziemer (Missouri-Rolla, University, Rolla, MO), C. R. Ryar, and J. H. Stilwell (Motorola, Inc., Government Electronics Div., Gilbert, AZ). *IEEE Transactions on Communications*, vol. COM-30, Mar. 1982, p. 495-509. 9 refs. Contract No. NAS3-22502.

Serial minimum-shift keyed (MSK) modulation, a technique for generating and detecting MSK using series filtering, is ideally suited for high data rate applications provided the required conversion and matched filters can be closely approximated. Low-pass implementations of these filters as parallel inphase- and quadrature-mixer structures are characterized in this paper in terms of signal-to-noise ratio (SNR) degradation from ideal and envelope deviation. Several hardware implementation techniques utilizing microwave devices or lungand elements are presented. Optimization of parameter values results in realizations whose SNR degradation is less than 0.5 dB at error probabilities of .000001. (Author)

A82-27178 * Adaptive rain fade compensation. J. C. Rautio (General Electric Co., Space Div., Philadelphia, PA). In: ITC/USA/'80; Proceedings of the International Telemetering Conference, San Diego, CÅ, October 14-16, 1980. (A82-27176 12-32) Research Triangle Park, NC, Instrument Society of America, 1980, p. 35-46. Contract No. NAS3-21745.

A large available margin must be provided for satellite communications systems operating near 20 GHz, which occasionally experience fades due to rain attenuation. It is proposed that this margin may be achieved in high-capacity FDMA satellites by dynamically providing a large margin to those links which are experiencing deep fades, while maintaining a small fade margin on all others. Single-beam SCPC operation and multiple-beam, satellite-switched FDMA systems are described, and the optimization of the dynamic FDMA links in a severely fading environment is investigated. A solution is derived which takes into account: (1) transponder intermodulation distortion, (2) cochannel and cross-polarization antenna interference, and (3) rain fade characteristics. The sample system configuration presented shows that such systems reach availability levels approaching 0.9999 at Ka-Band.

O.C.

A62-27189 * 30/20 GHz demonstration system for improving orbit utilization. W. M. Holmes, Jr. (TRW Defense and Space Systems Group, Space Systems Div., Redondo Beach, CA). In: ITC/USA/'80; Proceedings of the International Telemetering Conference, San Diego, CA, October 14-16, 1980. (A82-27176 12-32) Research Triangle Park, NC, Instrument Society of America, 1980, p. 189-198. Contract No, NAS3-21933.

To guard against severe rain losses at 30 and 20 GHz, techniques are being developed which provide the high antenna gain needed to increase communications margins and frequency reuse capability through beam isolation, while providing complete coverage of the U.S. Effective bandwidths from a single satellite location may then reach tens of gigshertz, with capacity tailored to match nonuniform geographic demand patterns. Satellite onboard processing which includes forward-error-correction and the routing of channels to terminals will reduce scanning antenna requirements and increase rain margins, through the adaptive use of system margins to support those terminals experiencing rain. These antenna and onboard processing techniques are adaptable to C-band and Ku-band, in addition to Ka-band.

A82-36265 * Focal surfaces of offset dual-reflector antennas. C. J. Sletten and R. A. Shore (Solar Energy Technology, Inc., Bedford, MA). IEE Proceedings, Part H - Microwaves, Optics and Antennas, vol. 129, pt. H, no. 3, June 1982, p. 109-115. 9 refs. Contract No, NAS3-22343.

An analytical technique is described for finding the best focal surfaces for diffset-fed dual-reflector antennas. A ray tracing procedure traces the loci of rays incident on the main reflector onto a plane or 'screen' situated perpendicular to a central ray of the antenna system. Given, then, by computer graphics, the best feed locations for azimuth and elevation plane patterns, an aperture diffraction method is used which can compute the sidelobe levels and beamwidths register, from aperture phase errors on scanned or multibeam patterns. High-mag, tion Cassegrain or Gregorian antennas, with tilt angles optimised according to

33 ELECTRONICS AND ELECTRICAL **ENGINEERING**

Includes test equipment and maintainability; components. e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also 60 Computer Operations

and Hardware and /6 Solid-State Physics.

N82-15311*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PROCEEDINGS OF THE CONFERENCE ON HIGH-TEMPERATURE ELECTRONICS

1981 134 p refs Conf. held in Tucson, Ariz., 25-27 Mar. 1981 Sponsored by IEEE Industrial Electronics and Control Instrumentation Group, IEEE Solid State Circuits Council, DOE, NSC, NSF, LASL, and Arizona Univ.

(NASA-T6)-84039; DE81-025058; CONF-810316) Avail;

NTIS HC A07/MF A01 CSCL 09C

The development of electronic devices for use in high temperature environments is addressed. The instrumentational needs of planetary exploration, fossil and nuclear power reactors, turbine engine monitoring, and well logging are defined. Emphasis is place on the fabrication and performance of materials and semiconductor devices, circuits and systems and packaging. For individual titles, see N82-15312 through N82-15337.

N82-15313*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH TEMPERATURE ELECTRONIC REQUIREMENTS IN AEROPHOPULSION SYSTEMS

William C. Nieberding and J. Anthony Powell In its Proc. of The Conf. on High-Temp, Electron. 1981 p 13-16 refs (For primary document see N82-15311 06-33)

(E-708) Avail: NTIS HC A07/MF A01 CSCL 09C

The needs for high temperature electronic and electro-optic devices as they would be used on aircraft engines in either research and development applications, or operational applications are discussed. The conclusion reached is that the temperature at which the devices must be able to function is in the neighborhood of 500 to 600 C either for R&D or for operational applications. In R&D applications the devices must function in this temperature range when in the engine but only for a moderate period of time. On an operational engine, the reliability requirements dictate that the devices be able to be burned-in at temperatures significantly higher than those at which they will function on the engine. The major point made is that semiconductor technology must be pushed well beyond the level at which silicon will be able to function.

N82-22439*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.
THREE-DIMENSIONAL RELATIVISTIC FIELD-ELECTRON INTERACTION IN A MULTICAVITY HIGH-POWER KLYSTRON. 1: BASIC THEORY

Henry G. Kosmahl Apr. 1982 33 p refs Presented at the Intern. Electron Devices Meeting, Washington, D.C., 11 Oct. 1971; sponsored by IEEE; and the Solar Power Space System Workshop. Harrison, Tex., 15-18 Jan. 1979; sponsored by NASA (NASA-TP-1992; E-1017; NAS 1.60;1992) Avail: NTIS HC A03/MF A01 CSCL 09A

A theoretical investigation of three dimensional relativistic klystron action is described. The relativistic axisymmetric equations of motion are derived from the time-dependent Lagrangian function for a charged particle in electroms metic fields. An analytical expression of the fringing RF electric and magnetic fields within and in the vicinity of the interaction gap and the space-charge forces between axially and radially elastic deformable rings of charges are both included in the formulation. This makes an accurate computation of electron motion through the tunnel of the cavities and the drift tube spaces possible. Method of analysis is based on Lagrangian formulation. Bunching is computed using a disk model of electron stream in which the electron stream is divided into axisymmetric disks of equal charge and each disk

> ORIGINAL PAGE IS OF POOR QUALITY

is assumed to consist of a number of concentric rings of equal charges. The Individual representative groups of electrons are followed through the interaction gaps and drift tube spaces. Induced currents and voltages in interacting cavities are calculated by invoking the Shockley-Ramo theorem.

N82-23397*# National Aeronautics and Space Administration.

Lewis Research Cattler, Cleveland, Ohio. THREE-DIMENSIONAL RELATIVISTIC FIELD-ELECTRON INTERACTION IN A MULTICAVITY HIGH-POWER KLYSTRON. PART 2: WORKING EQUATIONS

Henry G. Kosmahl Apr. 1982 45 p refs Presented at the Intern. Electrons Devices Meeting, Washington, D.C., 11 Oct.
1971: sponsored by IEEE Also presented at the Solar Power Space System Workshop, Houston, Tex., 15-18 Jan. 1979; sponse d by NASA. Lyndon B. Johnson Space Center (NASA-iP-2008; E-1018; NAS 1.60:2008) Avail: NTIS

A high power multicavity klystron amplifier was designed and a computation package containing all equations and procedures needed is presented. The rigorously derived three dimensional relativistic axisymmetric equations of motion are used to compute the bunched current and the induced RF gap voltage for all interaction cavities except the input and second cavities, where the linear space charge wave theory data are employed in order to reduce the computation time. Both distance step and time step integration methods are used to compute the Fourier coefficients of both the beam current and induced current.

N82-24415* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

MULTISTAGE DEPRESSED COLLECTOR FOR DUAL MODE **OPERATION** Patent

Henry C. Kosmahl, inventor (to NASA) Issued 7 Jul. 1981 Filed 7 Sep. 1979 Supersedes N79-32463 (17 - 23, p 3080)

(NASA-Case-LEW-13282-1; US-Patent-4,277,721;

US-Patent-Appl-SN-073579; US-Patent-Class-315-5.38; US-Patent-Class-315-3.6) Avail: US Patent and Trademark

Office CSCL 09A

A depressed collector which captures the spent electrons of a microwave transmitting tube at high efficiency in both high and low power modes of operation is described. The collector comprises entrance and end electrodes, the end electrode having a spike extending toward entrance electrode, Intermediate electrodes and the entrance electrode each have a central aperture and, together, these electrodes capture most high power mode spent electrons. The apertures of the electrodes increase in size in a downstream direction. To capture low power mode spent electrons a low power mode electrode is positioned between the last intermediate electrode and the end electrode. This electrode has a central aperture preferably smaller but no larger than that of the last intermediate electrode, An auxiliary low power mode electrode may be added having a central aperture larger than that of the low power mode electrode, All of the electrodes are at voltages provided by a voltage divider connected between a potential.

Official Gazette of the U.S. Patent and Trademark Office

N82-24431* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

FIRST RESULTS OF MATERIAL CHARGING IN THE SPACE **ENVIRONMENT Interim Report**

N. J. Stevens, F. Berkopec, J. Staskus, P. F. Mizera, H. C. Koons, E. R. Schnauss, D. R. Croley, Jr., H. K. Kan (Aerospace Corp.), M. S. Leung (Aerospace Corp.), W. L. Lehn (AFML) et al. 15 Mar. 1981 20 p refs Prepared in cooperation with SRI International, Menic Park, Calif.

(Contract F04701-80-C-0081)

(NASA-1M-84743; NAS 1.15:84743; TOR-0081(6506-1)-1) Avail: NTIS HC A02/MF A01 CSCL 09C

A satellite experiment, designed to measure potential charging of typical thermal control materials at near geosynchronous altitude, was flown as part of the SCATHA program, Direct observations of charging of typical satellite materials in a natural charging event (> 5 keV) are presented. The results show some features which differ significantly from previous laboratory simulations of the environment

N82-24432*# National Aaronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SIMPLIFIED dc TO dc CONVERTER Patent Application Robert P. Gruber, inventor (to NASA) Filed 14 Apr. 1982

(NASA-Case-LEW-13495-1; US-Potent-Appl-SN-368188) Avail: NTIS HC A02/MF A01 CSCL 09A

A de to de converter is disclosed which has a minimum number of components, output voltage regulation, and output current limiting without any circuits converting the output to any other circuits of the converter. The converter is comprised of a transformer having a primary winding through which current is directed in alternate directions by metal oxide semiconductor transistors connected between the primary winding and a dc source or battery. A secondary winding of the transformer is connected to a rectifying and filter circuit to provide unidirectional output current. Both windings of the transformer are carried on the respective outer legs of an E-core with the center leg of the core proving a leakage reactance. This leakage reactance has the same effect as placing an inductor in series with the rectifiers in output circuit.

N82-25441*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,
COMPUTER MODELING OF MULTIPLE-CHANNEL INPUT

SIGNALS AND INTERMODULATION LOSSES CAUSED BY **NONLINEAR TRAVELING WAVE TUBE AMPLIFIERS**

N. Stankiewicz May 1982 26 p (NASA-TP-1999; E-722; NAS 1.60:1999) Avail: NTIS

HC A03/MF A01 CSCL 09A

The multiple channel input signal to a soft limiter amplifier as a traveling wave tube is represented as a finite, linear sum of Gaussian functions in the frequency domain. Linear regression is used to fit the channel shapes to a least squares residual error. Distortions in output signal, namely intermodulation products, are produced by the nonlinear gain characteristic of the amplifier and constitute the principal noise analyzed in this study. The signal to noise ratios are calculated for various input powers from saturation to 10 dB below saturation for two specific distributions of channels. A criterion for the truncation of the series expansion of the nonlinear transfer characteristic is given. It is found that he signal to noise ratios are very sensitive to the coefficients used in this expansion. Improper or incorrect truncation of the series leads to ambiguous results in the signal to noise ratios.

N82-26568* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COUPLED CAVITY TRAVELING WAVE TUBE WITH VELOCITY TAPERING Patent

Denis J. Connolly, inventor (to NASA) Issued 9 Feb, 1982 7 p Filed 20 Feb, 1980

(NASA-Case-LEW-12296-1; US-Patent-4,315,194;

US-Patent-Appl-SN-122966; US-Patent-Class-315-3.6;

US-Patent-Class-315-3.5; US-Patent-Class-330-43) Avail: US

Patent and Trademark Office CSCL 09A

A coupled cavity traveling wave tube with a velocity taper, which affords beam wave resynchronization and thereby enhances is described. The wave velocity reduction is achieved by reducing the resonant frequencies of the individual resonant cavities as a function of the distance from the electron gun, through changes in internal cavity dimensions. The required changes in cavity dimensions can be accomplished by gradually increasing the cavity radius decreasing the gap length from cavity to cavity. The velocity reduction is carried out without an increase in circuit resistive losses and the upper and lower cut off frequencies are reduced in approximately the same manner.

> ORIGINAL PAGE IS OF POOR QUALITY

N82-30474*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio. COMPONENT TECHNOLOGY FOR SPACE POWER SYS-

Robert C, Finke 1982 13 p refs Presented at the 33rd Intern, Astronautical Federation Congr., Paris, 26 Sep. - 2 Oct.

(NASA-TM-82928; E-1322; NAS 1.15:82928) Avail: NTIS

HC A02/MF A01 CSCL 09C

The Lewis/OAST program for the development of Component Technology for Space Power Systems is described. The program is divided into five generic areas: semiconductor devices transistors, thyristors, and diodes); conductors (materials and transmission lines); dielectrics; magnetic devices; and thermal control devices. Examples of progress in each of the five areas is discusped, Bipolar power transistors up to 1000 V at 100 A with a gain of 10 and a 0.5 mu sec rise and fall time are presented. A new class of semiconductor devices with a possibility of switching 1000 000 V is described. Several 100 kW rotary power transformer designs and a 25 kW, 20 kHz transformer weighting 3.2 kg have been developed. Progress on the creation of diamond-like films for thermal devices and intercalated carbon fibers with the strength of steel and the conductivity of copper at one third the mass of copper is presented.

N82-33636*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SUMMARY OF ELECTRIC VEHICLE de MOTOR-CONTROLLER **TESTS** Final Report

E. F. McBrien and H. B. Tryon Sep. 1982 30 p refs (Contract DE-Al01-77CS-51044)

(NASA-TM-82863; E-1232; DOE/NASA/51044-28; NAS 1.15:82863) Avail: N'l'IS HC A03/MF A01 CSCL 13F

The differences in the performance of dc motors are evaluated when operating with chopper type controllers, and when operating on direct current. The interactions between the motor and the controller which cause these differences are investigated. Motorcontrolled tests provided some of the data the quantified motor efficiency variations for both ripple free and chopper modes of operation.

A82-16128 * # Experimental verification of a computational procedure for the design of TWT-refocuser-MDC systems. J. A. Dayton, Jr., H. G. Kosmahl, P. Ramins, and N. Stankiewicz (NASA, Lewis Researc: Center, Cleveland, OH). IEEE Transactions on Electron Devices, vol. ED-28, Dec. 1981, p. 1480-1489, 10 refs.

A comparison of analytical and experimental results is presented for a high performance dual-mode helix TWT, equipped with multistage depressed collectors (MDC), and operated over conditions ranging from saturation to the linear regime. The computations are carried out with advanced multidimensional computer programs which model the electron beam as a series of disks or rings of charge and follow their trajectories from the RF input of the TWT, through the slow-wave structure, through the refocusing system, to their points of impact in the depressed collector. TWT performance, collector efficiency, and collector current distribution are computed and compared with measurements. Very good agreement is obtained between computed and measured TWT performance and collector efficiencies. The analytical techniques were subsequently applied to the design of a smaller MDC of nearly equal efficiency.

A82-16831 * # A new approach to the minimum weight/loss design of switching power converters. F. C. Lee, S. Rahman, C. J. Wu (Virginia Polytechnic Institute and State University, Blacksburg, VA), and J. Kolacki (NASA, Lewis Research Center, Cleveland, OH). International Power Conversion Conference, Dallas, TX, Apr. 28-30, 1981, Paper. 11 p. 10 refs. Contract No. NAS3-21051.

A new technique using the mathematical nonlinear programming ALAG is proposed to facilitate design optimizations of switching power converters. This computer-aided approach provides a minimum weight (or loss) design down to the details of component level and concurrently satisfies all related power-circuit performance requirements. It also provides such design insights as tradeoffs between power loss and system weight as the switching frequency is increased. (Author)

A82-20745 * # Hard permanent magnet development trends and their application to A.C. machines, H. F. Mildrum (NASA, Lewis Research Center, Cleveland, OH). Institute of Electrical and Electronics Engineers, Annual Meeting, Philadelphia, PA, Oct. 5-9, 1981, Paper. 8 p. 27 refs. Research supported by the U.S. Department of Energy; Contract No. DEN3-189.

The physical and magnetic properties of Mn-Al-C, Fe-Cr-Co, and RE-TM (rare earth-transition metal intermetallics) in polymer and soft metal bonded or sintered form are considered for ac circuit machine usage. The mr ufacturing processes for the magnetic materials are reviewed, and the mechanical and electrical properties of the magnetic materials are compared, with consideration given to the reference Alnico magnet. The Mn-Al-C magnets have the same magnetic properties and costs as Alnico units, operate well at low temperatures, but have poor high temperature performance. Fe-Cr-Co magnets also have comparable cost to Alnico magnets, and operate at high or low temperature, but are brittle, expensive, and contain Co. RE-Co magnets possess a high energy density, operate well in a wide temperature range, and are expensive. Recommendation for exploring the rare-earth alternatives are offered,

A remote millivolt multiplexer and amplifier module for wind tunnel data acquisition. D. B. Juanarena (Pressure Systems, Inc., Hampton, VA) and P. Z. Blumenthal (NASA, Lewis Research Center, Cleveland, OH). In: International Instrumentation Symposium, 28th, Las Vegas, NV, May 3-6, 1982, Proceedings. Part 1. (A82-41819 21-35) Research Triangle Park, NC, Instrument Society of America, 1982, p. 445-456. Contract No. NAS3-22950.

A 30-channel remotely located multiplexer and amplifier module is developed for the measurement of wind tunnel models, which substantially reduces the amount of wiring necessary and thus provides higher accuracy. The module provides for a wide variety of transducer voltage cutputs to be multiplexed and amplified within the model, and all signals are able to exit the module on two wires. The module is self-calibrating, and when coupled with the electronically scanned pressure instrumentation widely used in wind tunnels, it allows the modular wind tunnel models to be fabricated and checked before installation into the wind tunnel.

Analysis and design of a standardized control module for switching regulators. F. C. Lee, M. F. Mahmoud (Virginia Polytechnic Institute and State University, Blacksburg, VA), Y. Yu (Xerox Corp., El Segundo, CA), and J. C. Kolecki (NASA, Lewis Research Center, Cleveland, OH). IEEE Transactions on Aerospace and Electronic Systems, vol. AES-18, July 1982, p. 478-496, 10 refs, Contract No. NAS3-20102.

Three basic switching regulators: buck, boost, and buck/boost, employing a multiloop standardized control module (SCM) were characterized by a common small signal block diagram. Employing the unified model, regulator purformances such as stability, audiosusceptibility, output impedance, and step load transient are analyzed and key performance indexes are expressed in simple analytical forms. More importantly, the performance characteristics of all three regulators are shown to enjoy common properties due to the unique SCM control scheme which nullifies the positive zero and provides adaptive compensation to the moving poles of the boost and buck/boost converters. This allows a simple unified design procedure to be devised for selecting the key SCM control parameters for an arbitrarily given power stage configuration and parameter values, such that all regulator performance specifications can be met and optimized concurrently in a single design attempt.

N82-12347*# Duke Univ., Durham, N. C. Dept of Electrical

HIGH-FREQUENCY HIGH-VOLTAGE HIGH-POWER DC-TO-DC CONVERTERS

Thomas G, Wilson, Harry A. Owen, Jr., and Paul M. Wilson 1981 11 p refs Presented at the U.S-Japan Sci. Seminar en Analysis and Design in Power Electron., Kobe, Japan, 25-28 Nov. 1981

(Grant NaG-3157)

Avail: NTIS HE A02/MF A01 CSCL 09C

The current and voltage waveshapes associated with the power transitor and the power diode in an example current-orvoltage step-up (buck-boost) converter were analyzed to highlight the problems and possible tradeoffs involved in the design of high voltage high power converters operating at switching frequencies in the range of 100 Khz. Although the fast switching speeds of currently available power diodes and transistors permit converter operation at high switching frequencles, the resulting time rates of changes of current coupled with parasitic inductances in series with the semiconductor switches, produce large repetitive voltage transients across the semiconductor switches, potentially far in excess of the device voltage ratings. The need is established for semiconductor switch protection circuitry to control the peak voltages appearing across the semiconductor swtiches, as well as to provide the waveshaping action require for a given semiconductor device. The possible tradeoffs, as well as the factors affecting the tradeoffs that must be considered in order to maximize the efficiency of the converters are enumerated.

N82-13357*# Westinghouse Electric Corp., Lima, Ohio. Electrical Systems Div.

HIGH VOLTAGE DC SWITCHGEAR DEVELOPMENT FOR MULTI-KW SPACE POWER SYSTEM: AEROSPACE TECHNOLOGY DEVELOPMENT OF THREE TYPES OF SOLID STATE POWER CONTROLLERS FOR 200-1100VDC WITH CURRENT RATINGS OF 25, 50, AND 80 AMPERES WITH ONE TYPE UTILIZING AN ELECTROMECHANICAL DEVICE Final Report

W. W. Billings Nov. 1981 187 p (Contract NAS3-21755)

WAED 81-05E (NASA-CR-165413; Avail: NTIS HC A09/MF A01 CSCL 09C

Three types of solid state power controllers (SSPC's) for high voltage, high power I/C system applications were developed. The first type utilizes a SCR power switch. The second type employes an electromechanical power switch element with solid state commutation. The third type utilizes a transistor power switch. Significant accomplishments include high operating efficiencies, fault clearing, high/low temperature performance and vacuum operation.

N82-14447*# Virginia Polytechnic Inst. and State Univ.,

MODELING AND ANALYSIS OF POWER PROCESSING SYSTEMS (MAPPS). VOLUME 1: TECHNICAL REPORT Final Technical Report, Oct. 1977 - Aug. 1980 F. C. Lee, S. Rahman, R. A. Carter, C. H. Wu, Yuang Yu (TRW

Defense and Space Systems Group, Redondo Beach, Calif.), and R. Chang (TRW Defense and Space Systems Group, Redondo Beach, Calif.) Dec. 1980 335 p refs (Contract NAS3-21051)

(NASA-CR-165538; TRW-32660-6001-RU-01) Avail: NTIS HC A15/MF A01 CSCL 09C

Computer aided design and analysis techniques were applied power processing equipment. Topics covered include: (1) discrete time domain analysis of switching regulators for performance analysis: (2) design optimization of power converters using augmented Lagrangian penalty function technique; (3) investigation of current-injected multiloop controlled switching regulators; and (4) application of optimization for Navy VSTOL energy power system. The generation of the mathematical models and the development and application of computer aided design techniques to solve the different mathematical models are discussed, Recommendations are made for future work that would enhance the application of the computer aided design techniques for power processing systems.

N82-15315*# Panelvision Corp., Pittsburgh, Pa. DEVELOPMENT OF AN 1100 DEG & CAPACITOR

Robert E, Stapleton In NASA. Lewis Research Center Proc. of the Conf. on High-Temp. Electron. 1981 p 25-28 ref Prepared in cooperation with Westinghouse Electric Corp., Pittsburgh, Pa. (For primary document see N82-15311 06-33) (Contracts NAS3-6465; NAS3-10941)

Avail: NTIS HC A07/MF A01 CSCL 09C

The feasibility of cleveloping a high temperature capacitor for 1100 F operation which is as small and light as conventional capacitors for normal operating temperatures is discussed. Pyrolyic boron nitride (PBN) was selected for the dielectric. The PBN capacitors were made by slicing and lapping material from thick blocks and then sputtering thin film electrodes. These capacitors had breakdown strengths of 7,000 voits per mil and a dissipation factor of less than 0.001 at 1100 F. Additional processing improvements were made after testing a multi-layer or stacked PBN capacitor for 1,000 hours at 1100 F. Sputter etching the

wafers before depositing electrodes resulted in a reduction in dissipation factor, A sputtered boron nitride film applied to the outer electrode surfaces produced a more stable capacitor. A design for a 0.1 mu F capacitor and a summary of PBN wafer fabrication costs are given.

N82-17439*# Hughes Research Labs., Malibu, Calif. A 10KW SERIES RESONANT CONVERTER DESIGN, TRANSISTOR CHARACTERIZATION, AND BASE-DRIVE OPTIMIZATION Final Report, 6 May 1980 - 15 Sep. 1981 R. Robson and D. Hancock Nov. 1981 152 p (Contract NAS3-22471)

(NASA-CR-165546) Avail: NTIS HC A08/MF A01 CSCL 09A

Transistors are characterized for use as switches in resonant circuit applications. A base drive circuit to provide the optimal base drive to these transistors under resonant circuit conditions is developed and then used in the design, fabrication and testing of a breadboard, spaceborne type 10 kW series resonant

N82-18506*# Westinghouse Electric Corp., Pittsburgh, Pa.
HIGH VOLTAGE POWER TRANSISTOR DEVELOPMENT Final Report, Nov. 1979 - Sep. 1981

P. L. Hower 30 Oct. 1981 54 p refs

(Contract NAS3-21949)

(NASA-CR-165547; Rept-81-9F5-HTRAN-R5) Avail; NTIS

HC A04/MF A01 CSCL 09A

Design considerations, fabrication procedures, and methods of evaluation for high-voltage power-transistor development are discussed. Technique improvements such as controlling the electric field at the surface and preserving lifetimes in the collector region which have advanced the state of the art in high-voltage transistors are discussed. These improvements can be applied directly to the development of 1200 volt, 200 ampere transistors. M.D.K.

N82-18507*# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.

SECONDARY ELECTRON EMISSION FROM A CHARGED DIELECTRIC IN THE PRESENCE OF NORMAL AND OBLIQUE ELECTRIC FIELDS M.S. Thesis

Bahram Javidi Feb. 1982 110 p refs

(Grant NsG-3166)

(NASA-CR-168558) Avail: NTIS HC A06/MF AC1 CSCL 09C

The secondary electron emission coefficient was obtained for a FEP-Teflon dielectric charged with monoenergetic electrons normally incident upon the surface of the specimen. Measurements of secondary emission coefficient were done for normal and oblique incidence with different primary beam energies in the presence of normal and oblique electric fields. A collimated probing beam was directed to different points on the surface of the specimen and the released or accumulated charge was monitored using an electrometer. The measured data for different probing beam energies, different impact points and different angles of incidence were plotted vs. impact energy and impact point. Data analyzed by computer simulations to find the potential distribution on the surface of the specimen and the electric field around it, is presented and discussaನೆ.

N82-18508*# Pennsylvania State Univ., University Park, Dept. of Electrical Engineering.

MAPPING OF ELECTRICAL POTENTIAL DISTRIBUTIONS WITH CHARGED PARTICLE BEAMS Final Report, Nov. 1977 - Feb. 1982

James W, Robinson Feb. 1982 61 p refs

(Grant NsG-3166)

(NASA-CR-168556) Avail: NTIS HC A04/MF A01 CSCL

09C

Methods for measuring electrostatic potentials on and near dielectric surfaces charged to several kilovolts are studied. Secondary emission from those charged dielectrics is measured. Candidates for potential measurement include the induced charge. from which potential is calculated; the trajectory endpoints of either high or low energy particles traversing the region near the surface; trajectory impact on the surface; and creating ions at points of interest near the surface. Some of the methods require computer simulations and iterative calculation if potential maps are to be generated. Several approaches are described and compared. A method using a half-cylinder as a test chamber and low-energy probing beams is adapted for the measurement of seconary emission.

N82-22438*# Duke Univ., Durham, N. C. Dept, of Electrical Engineering.

ANALYSIS OF TRANSISTOR AND SNUBBER TURN-OFF DYNAMICS IN HIGH-FREQUENCY HIGH-VOLTAGE HIGH-POWER CONVERTERS

Paul M. Wilson, Thomas G. Wilson, and Harry A. Owen, Jr. [1982] 3 p refs (Grant NsG-3157)

(NASA-CR-168769; NAS 1.26:168760) HC A02/MF A01 CSCL 09C Avail: NTIS

Do to do converters which operate reliably and efficiently at switching frequencies high enough to effect substantial reductions in the size and weight of converter energy storage elements are studied. A two winding current or voltage stepup (buck boost) dc-to-dc converter power stage submodule designed to operate in the 2.5-kW range, with an input voltage range of 110 to 180 V dc, and an output voltage of 250 V dc is emphasized. In order to assess the limitations of present day component and circuit technologies, a design goal switching frequency of 10 kHz was maintained. The converter design requirements represent a unique combination of high frequency, high voltage, and high power operation. The turn off dynamics of the primary circuit power switching transistor and its associated turn off snubber circuitry are investigated.

N82-23395*# General Electric Co., Philadelphia, Pa. Div.

PRELIMINARY DESIGN DEVELOPMENT OF 100 KW ROTARY POWER TRANSFER DEVICE

S. M. Weinberger Mar, 1981 165 p refs

(Contract NAS3-22266) (NASA-CR-165431; NAS 1.26:165431; GE-81SDS4215) Avail:

NTIS HC A08/MF A01 CSCL 09C

Contactless power transfer devices for transferring electrical power across a rotating spacecraft interface were studied. A power level of 100 KW was of primary interest and the study was limited to alternating current devices. Rotary transformers and rotary capacitors together with the required dc to ac power conditioning electronics were examined. Microwave devices were addressed. The rotary transformer with resonant circuit power conditioning was selected as the most feasible approach. The rotary capacitor would be larger while microwave devices would be less efficient. A design analysis was made of a 100 KW, 20 kHz power transfer device consisting of a rotary transformer, power conditioning electronics, drive mechanism and heat rejection system. The size, weight and efficiency of the device were determined. The characteristics of a baseline slip ring were presented. Aspects of testing the 100 KW power transfer device were examined. The power transfer device is a feasible concept which can be implemented using presently available technclogies. Author

N82-24424°# Department of Energy, Washington, D. C. DEVELOPMENT OF A DUAL-FIELD HETEROPOP!.AR **POWER CONVERTER**

David B. Eisenhaure, Bruce Johnson, Tim E. Bliamptis, and Emery StGeorge Aug. 1981 68 p refs (Contract NAS3-20817: DE-AI01-77CS-1044)

(NASA-CR-165168; NAS 1,26:165168; R-1489) Avail: NTIS

HC A04/MF A01 CSCL 108

The design and testing of a 400 watt, dual phase, dual rotor, field modulated inductor alternator is described. The system is designed for use as a flywheel to ac utility line or flywheel to dc bus (electric vehicle) power converter. The machine is unique in that it uses dual rotors and separately controlled fields to produce output current and voltage which are in phase with each other. Having the voltage and current in phase allows the power electronics to be made of simple low cost components. Based on analytical predictions and experimental results, development of a complete 22 kilowatt (30 Hp) power conversion, system is recommended. This system would include power electronics and controls and would replace the inductor alternator with an improved electromagnetic conversion system. Author

STRAIGHT AND CHOPPED DC PERFORMANCE DATA FOR A GENERAL ELECTRIC 5BY435A1 DC SHUNT MOTOR WITH A GENERAL ELECTRIC EV-1 CONTROLLER Final Report

Paul C. Edie Oct. 1981 58 p

(Contract DEN3-123; DE-AI01-77CS-51044)

(NASA-CR-165507: DOE/NASA/0123-4; NAS 1.26:165507; ERC-TR-8186) Avail: NTIS HC A04/MF A01 CSCL 09C

Both straight and chopped do motor performance data for a General Electric 5BY436A1 motor with a General Electric EV-1 controller is presented in tabular and graphical formats. Effects of motor temperature and operating voltage are also shown. The maximum motor efficiency is approximately 85% at low operating temperatures in the straight do mode. Chopp of efficiency can be assumed to be 95% under all operating conditions. For equal speeds, the motor operated in the chopped mode develops slightly more torque and draws more current than it does in the straight mode.

N82-25442*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.

INPUT FILTER COMPENSATION FOR SWITCHING REGULATORS Final Report

Fred C, Lae and S, S, Kelkar 1C May 1982 56 p refs (Grant NAG3-81)

(NASA-CR-169005; NAS 1.26:169005) Avail: NTIS

HC A04/MF A01 CSCL 09C

The problems caused by the interaction between the input filter, output filter, and the control loop are discussed. The input filter design is made more complicated because of the need to avoid performance degradation and also stay within the weight and loss limitations. Conventional input filter design techniques are then dicussed. The concept of pole zero cancellation is reviewed; this concept is the basis for an approach to control the peaking of the output impedance of the input filter and thus mitigate some of the problems caused by the input filter. The proposed approach for control of the peaking of the output impedance of the input filter, to use a feedforward loop working in conjunction with revenance to possible forming a total state control schame. The design of the feedforward loop for a buck regulator is described. A possible implementation of the feedforward loop design is suggested.

A82-13312*

'Bootstrap' charging of surfaces composed of multiple materials. P. R. Stannard, I. Katz, and D. E. Parks (Systems, Science and Software, La Jolla, CA). (IEEE, U.S. Defense Nuclear Agency, NASA, and DOE, Annual Conference on Nuclear and Space Radiation Effects, 18th, Seattle, WA, July 21-24, 1981.) IEEE Transactions on Nuclear Science, vol. NS-28, Dec. 1981, p. 4563-4567. 5 refs. USAF-supported research; Contract No. NAS3-22536.

The paper examines the charging of a checkerboard array of two materials, only one of which tends to acquire a negative potential alone, using the NASA Charging Analyzer Program (NASCAP). The influence of the charging material's field causes the otherwise 'non-charging' material to acquire a negative potential due to the suppression of its secondary emission ('bootstrap' charging). The NASCAP predictions for the equilibrium potential difference between the two materials are compared to results based on an analytical model. (Author)

A82-20505 * Permanent magnet properties of Mn-Al-C between 50 C and +150 C. Z. A. Abdelnour, H. F. Mildrum, and K. J. Strnat (Dayton, University, Dayton, OH). *IEEE Transactions on Magnetics*, vol. MAG-17, Nov. 1981, p. 2651-2653. 9 refs. Contract No. DEN3-189

Anisotropic Mn-Al-C (Ni) magnets are potential substitutes for Alnico 5 and 8. The limited machinability of the alloy and the fact that it is cobalt-free made it particularly interesting. The low Curie point and the costly warm extrusion process needed for grain orientation are drawbacks. The objective of this study was a detailed magnetic characterization of the material for possible use in electric machinery. The principal society of the study were the largest

extruded bars presently available, of 31 mm diameter. Easy and hard axis magnetization curves and second-quadrant recoil loop fields were measured at various temperatures ranging from -50 C to +150 C. Property variations over the cross section of a bar were also studied. (Author)

A82-20743 * # Power system design optimization using Lagrange multiplier techniques. Y. Yu (Xerox Corp., El Segundo, CA) and F. C. Lee (Virginia Polytechnic Institute and State University, Blacksburg, VA). Power Conversion International Conference, Munich, West Germany, Sept. 14, 1981, Paper. 18 p. 8 refs. Contract No. NAS3-21051.

An optimization technique using the Lagrange Multiplier Method is proposed to facilitate design of switching power converter systems. The essence of the optimization is to identify the optimal battery voltage level and switching frequency along with the detailed converter design so that the total system weight including the battery and the packaged converter is minimized, and concurrently all specified power circuit performances are satisfied. (Author)

A82-20744 * A PWM transistor inverter for an ac electric vehicle drive. J. M. Slicker (Eaton Engineering and Research Center, Southfield, MI). Institute of Electrical and Electronics Engineers, Annual Meeting, Philadelphia, PA, Oct. 5-9, 1981, Paper. 8 p. 8 refs. Research supported by the U.S. Department of Energy; Contract No. DEN3-125.

A prototype system consisting of closely integrated motor, inverter, and transaxle has been built in order to demonstrate the feasibility of a three-phase ac transistorized inverter for electric vehicle applications. The microprocessor-controlled inverter employs monolithle power transistors to drive an oil-cooled, three-phase induction traction motor at a peak output power of 30 kW from a 144 V battery pack. Transistor safe switching requirements are discussed, and a circuit is presented for recovering trapped snubber inductor energy at transistor turn-off.

V.L.

N82-23394*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

PRELIMINARY STUDY, ANALYSIS AND DESIGN FOR A POWER SWITCH FOR DIGITAL ENGINE ACTUATORS
E. C. Beattie and H. C. Zickwolf, Jr. Sep. 1979 79 p refs (Contract NAS3-21809)

(NASA-CR-159559; NAS 1.26:159559; PWA-5643-6) Avail: NTIS HC A05/MF A01 CSCL 09A

Innovative control configurations using high temperature switches to operate actuator driving solenoids were studied. The impact on engine control system life cycle costs and reliability of electronic control and (ECU) heat dissipation due to power conditioning and interface drivers were addressed. Various power supply and actuation schemes were investigated, including optical signal transmission and electronics on the actuator, engine driven alternator, and inside the ECU. The use of a switching shunt power conditioner results in the most significant decrease in heat dissipation within the ECU. No overall control system reliability improvement is projected by the use of remote high temperature switches for solenoid drivers.

A82-23494 * # Dynamic switch matrix for the TDMA satellife switching system. P. T. Ho, J. H. Wisniewski, J. R. Pelose, and H. M. Perasso (Ford Aerospace and Communications Corp., Western Development Laboratories Div., Palo Alto, CA). In: Communications Satellite Systems Conference, 9th, San Diego, CA, March 7-11, 1982, Collection of Technical Papers. (A82-23476 09-32) New York, American Institute of Aeronautics and Astronautics, 1982, p. 135-141. 11 refs. Contract No. NAS3-22501. (AIAA 82-0458)

Future high capacity satellite communication systems require signal processing on board satellites. The on-board signal processing includes switching of RF signals between multiple antennas to provide interconnection between the uplink and downlink beams. This paper describes the development of a dynamic switch matrix for a TDMA satellite switching system to be used in the next generation communications satellites. In this paper, a dynamic switch matrix,

which includes the microwave switch matrix, the distribution control unit and the timing source, will be described. Several different microwave switch matrix architectures and switching devices were evaluated and compared. A unique coupler crossbar switch matrix architecture with dual-gate field effect transistor as switching element was developed. Experimental results of both microwave switch matrix (MSM) and distribution control unit (DCU) are presented. These test results verify the MSM with coupler crossbar architecture and dual-gate FET as switching element will meet the future SS-TDMA system requirements. Finally, the reliability of the dynamic switch matrix is addressed. The analysis shows reliability of 0.9981 for 7 year space operation can be achieved for the designed dynamic switch matrix.

A82-23566 * # IMPATT power building blocks for 20 GHz spaceborne transmit amplifier. J. Asmus, Y. Cho, J. deGruyl, E. Ng, A. Giannakopoulos, and H. C. Okean (LNR Communications, Inc., Hauppauge, NY). In: Communications Satellite Systems Conference, 9th, San Diego, CA, March 7-11, 1982, Collection of Technical Papers. (A82-23476 09-32) New York, American Institute of Aeronautics and Astronautics, 1982, p. 715-720. Contracts No. NAS3-22491; No. F33615-80-C-1182. (AIAA 82-0498)

Single-stage circulator coupled IMPATT building block constituents of a 20-GHz solid state power amplifier (SSPA) currently under development for spaceborne downlink transmitter usage have been demonstrated as providing 1.5 to 2.0W RF power output at 4 to 5 dB operating gain over a 1 GHz bandwidth. Using either commercially available or recently developed in-house GaAs Schottky Read-profile IMPATT diodes, DC/RF power added efficiencies of 14 to 15% were achieved in these amplifier stages. A two stage IMPATT driver amplifier with similar RF output power capability exhibited 13 + or - 0.5 dB operating gain over a 1 GHz bandwidth. (Author)

A82-36926 * # Fast recovery, high voltage silicon diodes for AC motor controllers. V. Balodis, A. H. Berman, and C. Gaugh (Power Transistor Co., Torrance, CA). PCI/Motorcon '82, Conference, San Francisco, CA, Mar. 29, 1982, Paper. 9 p. 5 refs. Contract No. NAS3-22539.

The fabrication and characterization of a high voltage, high current, fast recovery silicon diode for use in AC motor controllers, originally developed for NASA for use in avionics power supplies, is presented. The diode utilizes a positive bevel PIN mesa structure with glass passivation and has the following characteristics: peak inverse voitage - 1200 volts, forward voltage at 50 amperes - 1.5 volts, reverse recovery time of 200 nanoseconds. Characterization data for the diode, included in a table, show agreement with design concepts developed for power diodes. Circuit diagrams of the diode are also given.

A82-36927 * # A 10-kW series resonant converter design, transistor characterization, and base-drive optimization. R. R. Robson and D. J. Hancock (Hughes Research Laboratories, Malibu, CA). Institute of Electrical and Electronics Engineers, Annual Power Electronics Specialists Conference, 13th, Massachusetts Institute of Technology, Cambridge, MA, June 14-17, 1982, Paper, 12 p. Contract No. NAS3-22471.

The development, components, and performance of a transistor-based 10 kW series resonant converter for use in resonant circuits in space applications is described. The transistors serve to switch on the converter current, which has a half-sinusoid waveform when the transistor is in saturation. The goal of the program was to handle an input-output voltage range of 230-270 Vdc, an output voltage range of 200-500 Vdc, and a current limit range of 0-20 A. Testing procedures for the D60T and D7ST transistors are outlined and base drive waveforms are presented. The total device dissipation was minimized and found to be independent of the regenerative feedback ratio at lower current levels. Dissipation was set at within 10% and rise times were found to be acceptable. This finished unit displayed a 91% efficiency at full power levels of 500 V and 20 A and 93,7% at 500 V and 10 A.

A82-40403 * Compensation mechanism in liquid encapsulated Czochralski GaAs - Importance of melt stoichlometry, D. E. Holmes, R. T. Chen, K. R. Elliott, C. G. Kirkpatrick (Rockwe!! International Corp., Microelectronics Research and Development Center Thousand Oaks, CA), and P. W. Yu (Wright State University, Dayton, OH). (Institute of Electrical and Electronics Engineers, GaAs Integrated Circuits Symposium, San Diego, CA, Oct. 27-29, 1981.) IEEE Transactions on Electron Devices, vol. ED-29, July 1982, p. 1045-1051. 25 refs. Contracts No. NAS3-22224; No. F33615-81-C-1406.

It is shown that the key to reproducible growth of undoped semi-insulating GaAs by the liquid encapsulated Czochraleki (LEC) technique is the control over the melt stoichiometry. Twelve crystals were grown from stoichiometric and nonstoichiometric melts. The material was characterized by secondary ion mass spectrometry, localized vibrational mode far infrared spectroscopy, Hall-effect measurements, optical absorption, and photoluminescence. A quantitative model for the compensation mechanism in the semi-insulating material was develoded based on these measurements. The free carrier concentration is controlled by the balance between EL2 deep donors and carbon acceptors; furthermore, the incorporation of EL2 is controlled by the melt steichiometry, increasing as the As atom fraction in the molt increases. As a result, semi-insulating material can be grown only from melts above a critical As composition. The practical significance of these results is discussed in terms of achieving high yield and reproducibility in the crystal growth process. (Author)

A82-43784 * Wideband, high speed switch matrix development for SS-TDMA applications. W. H. Prather, B. J., Cory, R. F. Wade, W. J. Taft, and R. E. Buzinski (General Electric Co., Fairfield, CT), In: ICC '81; International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record, Volume 1. (A82-43778 22-32) New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 5.3.1-5.3.5. Contract No. NAS3-22500, The paper describes the design of an SS-TDMA microwave switch matrix being developed as part of the NAS 20208 11.

The paper describes the design of an SS-TDMA microwave switch matrix being developed as part of the NASA 30/20 GHz Communications Satellite Program, A critical element in the systems development is the high-speed wideband switching capability necessary for 30/20 GHz SS-TDMA trunking service intercontions. A proof-of-concept model of a 20-by-20 microwave switch matrix with a 2.5 GHz bandwidth and 10-nanosecond switching speeds is being developed to realize this capability.

B.J.

A82-43867 Near optimum delay-line detection filters for serial detection of MSK signals. R. E. Ziemer and C. R. Ryan (Motorola, Inc., Government Electronics Div., Scottsdale, AZ). In: ICC '81; International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record. Volume 3. (A82-43776 22-32) New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 56.2.1-56.2.5. 6 refs. Contract No. NAS3-22502.

A method for designing transversal delay-line filter approximations to the matched filter for the serial detection of minimum-shift keyed (MSK) modulated signals is given. Two configurations are characterized in terms of signal-to-noise ratio degradation at a bit error rate (BER) of 10 to the -6th. One is shown to depart less than 0.3 dB from the ideal matched filter performance when its parameter values are optimized. A lumped-element equivalent is also given and shown to provide a degradation of less than 0.4 dB at a BER of 10 to the -6th. (Author)

A82-46385 * Modeling the full-bridge series-resonant power converter. R. J. King and T. A. Stuart (Toledo, University, Toledo, OH). *IEEE Transactions on Aerospace and Electronic Systems*, vol. AES-18, July 1982, p. 449-459, 8 refs. Grant No. NsG-3281.

A steady state model is derived for the full-bridge series-resonant power converter. Normalized parametric curves for various currents and voltages are then plotted versus the triggering angle of the switching devices. The calculations are compared with experimental measurements made on a 50 kHz converter and a discussion of certain operating problems is presented. (Author)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

N82-11397*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LEWIS RESEARCH CENTER'S COAL-FIRED, PRESSURIZED, FLUIDIZED-BED REACTOR TEST FACILITY

John A. Kobak and R. James Rollbuhler Oct. 1981 35 p refs

(NASA-TM-81616; E-621) Avail: NTIS HC A03/MF A01 CSCL 20D

A 200-kilowatt-thermai, pressurized, fluidized-bed (PFB) reactor, research test facility was designed, constructed, and operated as part of a NASA-funded-project to assess and evaluate the effect of PFB hot-gas effluent on aircraft turbine engine materials that might have applications in stationary-power-plant turbogenerators. Some of the techniques and components developed for this PFB system are described. One of the more important items was the development of a two-in-one, gas-solids separator that removed 95+ percent of the solids in 1600 F to 1300 F gases. Another was a coal and sorbent feed and mixing system for injecting the fuel into the pressurized combustor. Also important were the controls and data-acquisition systems that enablad one person to operate the entire facility. The solid, liquid, and gas sub-systems all had problems that were solved over the 2-year operating time of the facility, which culminated in a 400-hour, hot-gas, turbine test.

N82-11399*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

HIGH THERMAL POWER DENSITY HEAT TRANSFER Patent Application

James F. Morris, inventor (to NASA) Filed 30 Oct, 1980

(NASA-Case-LEW-12950-1; US-Patent-Appl-SN-202228) Avail: NTIS HC A02/MF A01 CSCL 20D

Heat from a high temperature heat pipe is transferred through a vacuum or a gap filled with electrically nonconducting gas to a cooler heat pipe. The heat pipe is used to cool the nuclear reactor while the heat pipe is connected thermally and electrically to a thermionic converter If the receiver requires greater thermal power density, geometries are used with larger heat pipe areas for transmitting and receiving energy than the area for conducting the heat to the thermionic converter. In this way the heat pipe capability for increasing thermal power densities compensates for the comparatively low thermal power densities through the electrically non-conducting gap between the two heat pipes.

NASA

N82-17453*# National Aeronautics and Space Administration, Lewis Research Center, Claveland, Ohio.

EFFECTS OF ARC CURRENT ON THE LIFE IN BURNER RIG THERMAL CYCLING OF PLASMA SPRAYED Zrosub2-YSUB2OSUB3

R. C. Hendricks and G. McDonald 1982 9 p refs Presented at the 6th Ann. Conf. on Composites, Cocoa Beach, Fla., 17-21 Jan. 1982; sponsored by the American Ceramic Society (NASA-TM-82795; E-1129) Avail: NTIS HC A02/MF A01 CSCL 20D

An analysis of thermal cycle life data for four sets of eight thermal barrier coated specimens representing arc currents (plasma gun power) of 525, 600, 800, or 950 amps is presented. The ZrO2-8Y203/NiCrAlY plasma spray coated Rene 41 rods were thermal cycled to 1040 C in a Mach 0.3-Jet A/air burner flame. The experimental results indicate the existance of a minimum or threshold power level which coating life expectancy is less than 500 cycles. Above the threshold power level, coating life expectancy more than doubles and increases with arc current.

ORIGINAL PAGE IS OF POOR QUALITY N82-19493*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. EFFECT OF LOCATION IN AN ARRAY ON HEAT TRANSFER TO A CYLINDER IN CROSSFLOW

Robert J. Simoneau and G. James VanFossen, Jr. 1982 15 p refs Proposed for presentation at the 3rd Joint Thermophy. Fluids, Plasma and Heat Transfer Conf., St. Louis, 7-11 Jun. 1982

(NASA-TM-82797; E-1131) Avail: NTIS HC A02/MF A01 CSCL 20D

An experiment was conducted to measure the heat transfer from a heated cylinder in crossflow in an array of circular cylinders, All cylinders had a length-to-dir neter ratio of 3.0. Both in-line and staggered array patterns were studied. The cylinders were spaced 2.67 diameters apart center-to-center in both the axial and transverse directions to the flow. The row containing the heated cylinder remained in a fixed position in the channel and the relative locution of this row within the array was changed by adding up to five upstream rows. The working fluid was nitrogen gas at pressures from 100 to 600 kPa. The Reynolds number ranged based on cylinder diameter and average unobstructed channel velocity was from 5,000 to 125,000. Turbulence intensity: profiles were measured for each case at a point one half space upstream of the row containing the heated cylinder. The basis of comparison for all the heat transfer data was the single row with the heated cylinder. For the in-line cases the addition of a single row of cylinders upstream of the row containing the heated cylinder increased the heat transfer by an average of 50 percent above the base case. Adding up to five more rows caused no increase or decrease in heat transfer. Adding rows in the staggered array cases resulted in average increases in heat transfer of 21, 64, 58, 46, and 46 percent for one to five upstream rows, respectively.

N82-19494*# National Aeronsutics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HYDRODYNAMIC AND AERODYNAMIC BREAKUP OF LIQUID SHEETS

R. Ingebo 1982 5 p refs Proposed for presentation at the 2nd Intern. Conf. on Liquid Atomization and Spray Systems, Madison, Wisc., 20-24 Jun. 1982

(NASA-TM-82800; E1139) Avail: NTIS HC A02/MF A01 CSCL 20D

The effect of hydrodynamic, aerodynamic and liquid surface forces on the mean drop diameter of water sprays that are produced by the breakup of nonswirling and swirling water sheets in quiescent air and in airflows similar to those encountered in gas turbine combustors is investigated. The mean drop diameter is used to cnaracterize fuel sprays and it is a very important factor in determining the performance and exhaust emissions of gas turbine combustors.

S.L.

N82-20467*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLOW THROUGH ALIGNED SEQUENTIAL ORIFICE TYPE INLETS

Robert C. Hendricks and T. Trent Stetz Mar. 1982 53 p refs (NASA-TP-1967; E-682; NAS 1,60:1967) Avail: NTIS HC A04/MF A01 CSCL 20D

Chocked flow rate and pressure profile data were taken and studied for configurations consisting of four axially aligned, sequential orifice inlets of 0.5 length diameter ratio with separation distances of 0.66 and 32 diameters. A flow coefficient - reduced temperature plot represents the flow rate data for the two cases. At a separation distance of 32 diameters the pressure profiles dropped sharply at the entrance and partially recovered within each orifice - the exception being at low temperatures, where fluid jetting through the last orifice occurred. At a separation distance of 0.66 diameter fluid jetting was prevalent at the lower inlet temperatures. These results are in qualitative agreement with data for four axially aligned, sequential Borda inlets and for tubes with single sharp edge orifice or Borda inlets to L/D's of 105 and with a water flow visualization study.

N82-22453*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
GENERATION OF INSTABILITY WAVES AT A LEADING
EDGE

Marvin E. Goldstein 1982 12 p refs Proposed for presentation

at the 3rd Joint Thermophys. Fluids, Plasma and Heat Transfer Conf., St. Louis, 7-11 Jun. 1982; sponsored by AIAA and ASME

(NASA-TM-82835: E-1201: CAS 1,15:82835) Avail: NTIS

HC A02/MF A01 CSCL 20D

Two cases are considered. The first is concerned with mean floyes of the Blasius type wherein the instabilities are represented by Tollmien-Schlichting waves. It is shown that the latter are menerated fairly far downstream of the edge and are the result of a wave length reduction process that tunes the free stream disturbances to the Tollmien-Schlichting wave length. The other case is concerned with inflectional, uni-directional, transversely sheared mean flows. Such idealized flows provide a fairly good local representation to the nearly parallel flows in jets. They can support inviscid instabilities of the Kelvin-Helmholtz type. The various mathematically permissible mechanisms that can couple these instabilities to the upstream disturbances are discussed.

N82-24449*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MAGNETIC HEAT PUMPING Patent Application

Gerald V. Brown, inventor (to NASA) Filed 19 Feb. 1981 20 p

(NASA-Case-LEW-12508-3; US-Patent-Appl-SN-235868) Avail: NTIS HC A02/MF A01 CSCL 20D

The method of the invention employs ferromagnetic or ferrimagnetic elements, preferably of rare-earth based material, for example gadolinium, and preferably employs a regenerator. The steps of the method comprise controlling the temperature and applied magnetic field of the element to cause the state of the element as represented on a temperature-magnetic entropy diagram repeatedly to traverse a loop. The loop may have a first portion of concurrent substantially isothermal or constant temperature and increasing applied magnetic field, a second portion of lowering temperature and constant applied magnetic field, a third portion of isothermal and decreasing applied magnetic field, and a fourth portion of increasing temperature and constant applied magnetic field. Other loops may be four-sided, with, for example, two isotherms and two adiabats (constant entropy portions). Preferably, a regenerator may be employed to enhance desired cooling or heating effects, with varied magnetic fields or varying temperatures including three-sided figures traversed by the representative point.

N8z-24455*# National Aeronautics and Space \dministration. Lewis Research Centur, Cleveland, Ohio.

FLOWS THROUGH SEQUENTIAL ORIFICES WITH HEATED SPACER RESERVOIRS

R. C. Hendricks and T. Tront Stetz (Miami Univ., Oxford, Ohio) 1982 13 p refs Presented at the 9th Intern. Cryogenics Eng. Conf./Intern. Cryogenic Mater. Conf., Kobe, Japan, 11-14 May 1982

(NASA-TM-82855; E-1224; NAS 1.15:82855) Avail: NTIS

HC A02/MF A01 CSCL 20D

Flow rates and pressure thermal profiles for two phase choked flows of fluid nitrogen were studied theoretically and experimentally in a four sequential orifice configuration. Both theory and experimental evidence demonstrate that heat addition in the first spacer-reservoir adjacent to the inlet orifice is most effective in reducing the flow rate and that heat addition in the last spacer-reservoir is least effective. The flows are choked at the exit orifice for large spacings and at the inlet orifice for small spacings. The moderate addition of heat available for this experiment did not materially alter this result for large spacings; however, significant heat addition for the small spacings tended to shift the choke point to the exit orifice. Nitrogen is used as the working fluid over a range of states from liquid to gas with a reduced inlet stagnation pressure range to P sub r, o = 2.

Author

N82-25463*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COVERING SOLID, FILM COOLED SURFACES WITH A DUPLEX THERMAL BARRIER COATING Patent Applica-

C. H. Liebert, inventor (to NASA) Filed 8 Dec. 1981 9 p (NASA-Case-LEW-13450-1; US-Patent-Appl-SN-328760) Avail: NTIS HC A02/MF A01 CSCL 20D

A thermal barrier coating is applied to solid film cooled hardware. Also, thermal barrier coating systems are used to provide corrosion resistance and thermal protection to these base metal surfaces. An inert gas, such as argon, is discharged through the apertures during the application of the thermal barrier coating system by plasma spraying. This flow of inert gas reduces both blocking of the holes and base metal oxidation during the coating operation.

N82-26611*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEPOSIT FORMATION IN HYDROCARBON ROCKET FUELS WITH AN EVALUATION OF A PROPANE HEAT TRANSFER CORRELATION

Philip A. Masters and Carl A. Aukerman 1982 16 p refs Presented at 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; sponsored by AIAA, SAE and ASME (NA SA-TM-82911; E-1245; NAS 1.15;82911) Avail: NTIS HC A02/MF A01 CSCL 20D

A high pressure fuel coking testing apparatus was designed and developed and was used to evaluate thermal decomposition limits and carbon decomposition rates in heated copper tubes for hydrocarbon fuels. A commercial propane (90% grade) and chemically pure (CP) propane were tested. Heat transfer to supercritical propane was evaluated at 136 atm, bulk fluid velocities of 6 to 30 m/s, and tube wall temperatures in the range of 422 to 811 K. A forced convection heat transfer correlation developed in a previous test effort verified a prediction of most of the experimental data within a + cr - 30% range, with good agreement for the CP propane data. No significant differences were apparent in the predictions derived from the correlation when the carbon resistance was included with the film resistance. A post-test scanning electron microprobe analysis indicated occurrences of migration and interdiffusion of copper into the carbon denosit. Author

N82-28574*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. THE DRYOUT REGION IN FRICTIONALLY HEATED SLIDING CONTACTS

R. C. Hendricks, J. Braun (Akron Univ., Ohio), V Arp, and P. J. Giarratano (NBS, Boulder, Colo.) 1982 20 p refs Proposed for presentation at the Intern. Heat Transfer Conf., Munich, 6-10 Sep. 1982; sponsored by the Am. Soc. of Mech. Engr. (NASA-TM-82796) Avail: NTIS HC A02/MF A01 CSCL 13I

Some conditions under which boiling and two-phase flow can occur in or near a wet sliding contact are determined and illustrated. The experimental apparatus consisted of a tool pressed against an instrumented slider plate and motion picture sequences at 4000 frames/sec. The temperature and photographic data demonstrated surface conditions of boiling, drying, trapped gas evolution (solutions), and volatility of fluid mixture components. The theoretical modeling and analysis are in reasonable agreement with experimental data.

N82-30498*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW VISUALIZATION STUDY OF THE HORSESHOE

VORTEX IN A TURBINE STATOR CASCADE

Raymond E. Gaugler and Louis M. Russell Jun, 1982 33 p

refs (NASA-TP-1884; E-915; NAS 1,60,1884) Avail: NTIS

HC A03/MF A01 CSCL 20D

Flow visualization techniques were used to show the behavior of the horseshoe vortex in a large scale turbine stator cascade. Oil drops on the end wall surface flowed in response to local shear stresses, indicating the limiting flow streamlines at the surface. Smoke injected into the flow and photographed showed time averaged flow behavior. Neutrally bouyant helium filled soap bubbles followed the flow and showed up on photographs as streaks, indicating the paths followed by individual fluid particles. Preliminary attempts to control the vortex were made by injecting air through control jets drilled in the end wall near the vane leading edge. Seventeen different hole locations were tested, one at a time, and the effect of the control jets on the path follwed by smoke in the boundary layer was recorded photographically.

Ne2-32633*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.
USE OF FIBER LIKE MATERIALS TO AUGMENT THE CYCLE LIFE OF THICK THERMOPROTECTIVE SEAL COATINGS

R. C. Hendricks and G. McDonald Aug. 1982 14 p refs Presented at Intern. Conf. on Met. Coatings and Process Technol., San Diego, Calif., 4-9 Apr. 1982; sponsored by American Vacuum Society (NASA-TM-82901; E-1284; NAS 1.15:82901) HC A02/MF A01 CSCL 20D

Some experimental and analytical studies of plasma sprayed ZrO2-Y2O3 thick seal thermoprotective materials over NiCrAlY bond coats with testing to 1040 deg C in a Mach 0.3 burner flame are reviewed. These results indicate the need for material to have both compliance and sufficient strength to function successfully as a thick thermoprotective seal material. Fibrous materials may satisfy many of these requirements. A preliminary analysis simulating the simplified behavior of a 25 mm cylindrical SiO2-fiber material indicated significant radial temperature gradients, a relatively cool interace and generally acceptable stresses over the initial portion of the thermal cycle, Subsequent testing of these fiberlike materials in a Mach 0.3 Jet A/air burner flame confirmed these results.

N82-32634*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TURBULENT SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR UNIFORM SHEAR FLOW

R. G. Deissler 1981 31 p refs Presented at the Fluid Dyn. Meeting of the Am. Phys. Soc., Monterey, Calif., 23-24 Nov. 1981 (NASA-TM-82925; E-1202; NAS 1.15:82925) HC A03/MF A01 CSCL 20D

To study the nonlinear physics of uniform turbulent shear flow, the unaveraged Navier-Stokes equations are solved numerically. This extends our previous work in which mean gradients were absent. For initial conditions, modified three-dimensional-cosine velocity fluctuations are used. The boundary conditions are modified periodic conditions on a stationary three-dimensional numerical grid. A uniform mean shear is superimposed on the initial and boundary conditions. The three components of the mean-square velocity fluctuations are initially equal for the conditions chosen. As in the case of no shear the initially nonrandom flow develops into an apparently random turbulence at higher Reynolds number. Thus, randomness or turbulence can apparently arise as a consequence of the structure of the Navier-Stokes equations. Except for an initial period of adjustment, all fluctuating components grow with time. The initial equality of the three intensity components is destroyed by the shear, the transverse components becoming smaller than the longitudinal one, in agreement with experiment. Also, the shear creates a small-scale structure in the turbulence. The nonlinear solutions are compared with linearized Author ones.

A82-10964 * # Flow through axially aligned sequential apertures of the crifice and Borda types, R. C. Hendricks and T. T. Stetz (NASA, Lewis Research Center, Cleveland, OH). American Society of Mechanical Engineers and American Institute of Chemical Engineers, National Heat Transfer Conference, 20th, Milwaukee, WI, Aug. 2-5, 1981, ASM Paper 81-HT-79, 9 p. 17 refs, Members, \$2.00; nonmembers, \$4.00.

Choked flow rate and pressure profile data were taken and studied for two axially aligned sequential configurations consisting of: (1) Four Borda type inlets of 1.9 1/D with two separation distances of 0.8 and 30 diameters. (2) Four orifice type inlets of 0.5 1/D with two separation distances of 0.66 and 32 diameters. A flow-coefficient reduced-temperature plot can be used to represent the flow rate data for each geometry. At the larger separation distances, the pressure profiles dropped sharply at the entrance and partially recovered within each of the Borda and orifice inlet configurations; the exception being the last inlet where at low entrance temperatures, fluid jetting could occur. For the smaller

> ORIGINAL PAGE IS OF POOR QUALITY

spacings fluid jetting was prevalent throughout each of the inlet configurations at lower inlet temperatures. These results are in qualitative agreement with data of tubes with single Borda or sharp-edge orifice type injets to 105 1/D and water flow visualization

A82-14848 * # Heat transfer in cooled porous region with curved boundary. R. Siegel and A. Snyder (NASA, Lewis Research Center, Cleveland, OH), ASME, Transactions, Journal of Heat Transfer, vol. 103, Nov. 1981, p. 765-771, 7 refs.

Heat transfer characteristics are analyzed for a cooled twodimensional porous medium having a curved boundary. A general analytical procedure is given in combination with a numerical conformal mapping method used to transform the porous region into an upper half plane. To illustrate the method, results are evaluated for a cosine shaped boundary subjected to uniform external heating. The results show the effects of coolant starvation in the thick regions of the medium, and the extent that internal heat conduction causes the heated surface to have a more uniform temperature.

A82-16071 * Distorted turbulence in axisymmetric flow, P. A. Durbin (NASA, Lewis Research Center, Cleveland, OH). Quarterly Journal of Mechanics and Applied Mathematics, vol. 34, Nov. 1981, p. 489-500, 6 refs.

A solution to the rapid-distortion theory for small-scale turbulence in flow round an axisymmetric obstacle is derived. General formulae for velocity covariances and Eulerian time scales are obtained and are evaluated for the particular case of flow round a sphere. The large-scale limit for this flow is also discussed. (Author)

A82-16570 * # Toward the use of similarity theory in twophase choked flows. R. C. Hendricks, R. J. Simoneau (NASA, Lewis Research Center, Cleveland, OH), and J. V. Sengers (Maryland, University, College Park, MD). In: Scaling in two-phase flows; Proceedings of the Winter Annual Meeting, Chicago, IL, November 16-21, 1980. Meeting sponsored by the American Society of Mechanical Engineers. New York, American Society of Mechanical Engineers (Heat Transfer Symposia Series, HTD Volume 14), 1980,

Comparison of two-phase choked flows in normalized coordinates were made between pure components and available data using a reference fluid to compute the thermophysical properties. The results are favorable. Solution of the governing equations for two LNG mixtures show some possible similarities between the normalized choked flows of the two mixtures, but the departures from the pure component locil are significant.

A82-39899 * Cauchy integral method for two-dimensional solidification interface shapes. R. Siegel and D. J. Sosoka (NASA, Lewis Research Center, Cleveland, OH). International Journal of Heat and Mass Transfer, vol. 25, July 1982, p. 975-984. 10 refs.

A method is developed to determine the shape of steady state solidification interfaces formed when liquid above its freezing point circulates over a cold surface. The solidification interface, which is at uniform temperature, will form in a shape such that the non-uniform energy convected to it is locally balanced by conduction into the solid. The interface shape is of interest relative to the crystal structure formed during solidification; regulating the crystal structure has application in casting naturally strengthened metallic composites. The results also pertain to phase-change energy storage devices, where the solidified configuration and overall heat transfer are needed. The analysis uses a conformal mapping technique to relate the desired interface coordinates to the components of the temperature gradient at the interface. These components are unknown because the interface shape is unknown, A Cauchy integral formulation provides a second relation involving the components, and a simultaneous solution yields the interface shape.

A82-40781 * Analysis of the decay of temperature fluctuations in isotropic turbulence. P. A. Durbín (NASA, Lewis Research Center, Cleveland, OH). Physics of Fluids, vol. 25, Aug. 1982, p. 1328-1332, 10 refs.

The Lagrangian dispersion theory of Durbin (1980) is used to analyze experiments by Warhaft and Lumley (1978) and by Sreenivasan et al. (1980) on temperature fluctuations in grid-generated turbulence. Both theory and experiment show that the decay exponent m depends on the ratio of the initial length scales of velocity and temperature, although when this ratio is greater than 2.5 such dependence is negligible. The theory shows that m is not truly constant, but within the range covered by the experiments it is nearly so. The agreement between theory and experiment lends credence to the idea that the decay of fluctuations is controlled largely by turbulent relative dispersion.

measurements and by flow visualization; (2) Turbulence measurements by a variety of single- and multi-wire hot-wire probe techniques; and (3) Flowfield computations using the computer code developed during the previous year's research program.

N82-15360*# Oklahoma State Univ., Stillwater, School of Mechanical and Aerospace Engineering. INVESTIGATIONS OF FLOWFIELDS FOUND IN TYPICAL COMBUSTOR GEOMETRIES Semiannual Status Report, 1 Jan. - 31 Jul. 1981

D. G. Lilley and D. K. McLaughlin (Dynamics Technology, Inc., Torrance, Calif.) 31 Jul. 1981 243 p refs (Grant NAG3-74)

(NASA-CR-165031; SASR-2) Avail: NTIS HC A11/MF A01

The flowfields of gas turbine combustion chambers were investigated. Six flowfield configurations with sidewall angles alpha = 90 and 45 deg. and swirt vane angles phi = 0, 45 and 70 deg. are characterized. Photography of neutrally-buoyant helium-filled soap bubbles, tufts, and injected smoke helps to characterize the time-mean streamlines, recirculation zones and regions of highly turbulent flow. Five-hole pitot probe pressure measurements allow the determination of time-mean velocities u, v and w. An advanced computer code equipped with a standard two-equation kappa-epsilon turbulence model was used to predict corresponding flow situations and to compare results with the experimental data.

N82-17456*# Stanford Univ., Calif. Dept. of Mechanical Engineering.

TURBULENT BOUNDARY LAYER HEAT TRANSFER EXPERIMENTS: CONVEX CURVATURE EFFECTS INCLUD-ING INTRODUCTION AND RECOVERY Final Report

T. W. Simon, R. J. Moffat, J. P. Johnston, and W. M. Kays Washington NASA Feb. 1982 217 p refs (Grants NsG-3124; NAG3-3)

(NASA-CR-3510; HMT-32) Avail: NTIS HC A10/MF A01 CSCL 20D

Measurements were made of the heat transfer rate through turbulent and transitional boundary layers on an isothermal, convexly curved wall and downstream flat plate. The effect of convex curvature on the fully turbulent boundary layer was a reduction of the local Stanton numbers 20% to 50% below those predicted for a flat wall under the same circumstances. The recovery of the heat fransfer rates on the downstream flat wall was extremely slow. After 60 cm of recovery length, the Stanton number was still typically 15% to 20% below the flat wall predicted value. Various effects important in the modeling of surved flows were studied separately. These are: the effect of initial boundary layer thickness, the effect of freestream velocity, the effect of freestream acceleration, the effect of unheated starting length, and the effect of the maturity of the boundary layer. An existing curvature pedde an model was tested against this broad heat transfer dasa base to determine where it could appropriately be used for heat transfer predictions.

M82-19495*# Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.

INVESTIGATIONS OF FLOWFIELDS FOUND IN TYPICAL COMBUSTOR GEOMETRIES Semiannual Status Report,

1 Aug. 1981 - 31 Jan. 1982 D. G. Lilley 31 Jan. 1982 138 p refs

(Grant NAG3-74)

(NASA-CR-168585; SASR-3) Avail: NTIS HC A07/MF A01

CSCL 20D

.

Measurements and computations are being applied to an axisymmetric swirling flow, emerging from swirl vanes at angle phi, entering a large chamber test section via a sudden expansion of various side-wall angles alpha. New features are: the turbulence measurements are being performed on swirling as well as nonswirling flow; and all measurements and computations are also being performed on a confined jet flowfield with realistic downstream blockage. Recent activity falls into three categories: (1) Time-mean flowfield characterization by five-hole pitot probe N82-19496*# United Technologies Research Center, East Hartford, Conn.

MASS AND MOMENTUM TURBULENT TRANSPORT EXPERIMENTS WITH CONFINED COAXIAL JETS Interim Report, 18 Feb. - 18 Oct. 1981

B. V. Johnson and J. C. Bennett Nov. 1981 157 p refs (Contract NAS3-22771)

(NASA-CR-165574; R81-915540-97 HC A08/MF A01 CSCL 20D NTIS

Downstream mixing of coaxial jets discharging in an expanded duct was studied to obtain data for the evaluation and improvement of turbulent transport models currently used in a variety of computational procedures throughout the propulsion community for combustor flow modeling. Flow visualization studies showed four major shear regions occurring; a wake region immediately downstream of the innet jet inlet duct; a shear region further downstream between the inner and annular jets; a recirculation zone; and a reattachment zone. A combination of turbulent momentum transport rate and two velocity component data were obtained from simultaneous measurements with a two color laser velocimeter (LV) system, Axial, radial and azimuthal velocities and turbulent momentum transport rate measurements in the r-z and r-theta planes were used to determine the mean value. second central moment (or rms fluctuation from mean), skewness and kurtosis for each data set probability density function (p.d.f.). A combination of turbulent mass transport rate, concentration and velocity data were obtained system. Velocity and mass transport in all three directions as well as concentration distributions were used to obtain the mean, second central moments, skewness and kurtosis for each p.d.f. These LV/LIF measurements also exposed the existence of a large region of countergradient turbulent axial mass transport in the region where the annular jet fluid was accelerating the inner jet fluid.

N82-22455*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.

A NEW NUMERICAL APPROACH FOR COMPRESSIBLE

VISCOUS FLOWS Final Report J. C. Wu and S. G. Lekoudis Mar. 1982 105 p refs (Grant NsG-3307)

(NASA-CR-168842; NAS 1.26:168842) HC A06/MF A01 CSCL 20D Avail:

A numerical approach for computing unsteady compressible viscous flows was developed. This approach offers the capability of confining the region of computation to the viscous region of the flow. The viscous region is defined as the region where the vorticity is nonnegligible and the difference in dilatation between the potential flow and the real flow around the same geometis also nonnegligible. The method was developed and testr Also, an application of the procedure to the solution of the steady Navier-Stokes equations for incompressible internal flows is presented.

N82-22458*# United Technologies Research Center, East

TURBOFAN FORCED MIXER-NOZZLE INTERNAL FLOW-FIELD. VOLUME 1: A BENCHMARK EXPERIMENTAL STUDY Final Report

Robert W. Paterson Washington NASA Apr. 1982 131 p refs 3 Vol.

(Contract NAS3-20951)

(NASA-CR-3492; NAS 1.26:3492) HC A07/MF A01 CSCL 20D

An experimental investigation of the flow field within a model turbofan forced mixer nozzle is described. Velocity and thermodynamic state variable data for use in assessing the accuracy and assisting the further development of computational procedures for predicting the flow field within mixer nozzles are provided. Velocity and temperature data suggested that the nozzle mixing

process was dominated by circulations (secondary flows) of a length scale on the order the lobe dimensions which were associated with strong radial velocities observed near the lobe exit plane. The 'benchmark' model mixer experiment conducted for code assessment purposes is discussed,

N82-22459* United Technologies Research Center, East Hartford, Conn.

TURBOFAN FORCED MIXER-NOZZLE INTERNAL FLOW-FIELD. VOLUME 2: COMPUTATIONAL FLUID DYNAMIC PREDICTIONS Final Report

M. J. Werle and V. N. Vasta Washington NASA Apr. 1982 90 p refs 3 Vol.

(Contract NAS3-20951)

(NASA-CR-3493;NAS 1,26,3483) Avail; NTIS HC A05/MF A01

CSCL 20D

A general program was conducted to develop and assess a computational method for predicting the flow properties in a turbofan forced mixed duct. The detail assessment of the resulting computer code is presented. It was found that the code provided excellent predictions of the kinematics of the mixing process throughout the entire length of the mixer nozzle. The thermal mixing process between the hot core and cold fan flows was found to be well represented in the low speed portion of the flowfield.

N92-22460*# United Technologies Research Center. East Hartford, Conn

TURBOFAN FORCED MIXER-NOZZLE INTERNAL FLOW-FIELD. VOLUME 3: A COMPUTER CODE FOR 3-D MIXING IN AXISYMMETRIC NOZZLES Final Report

J. P. Kreskovsky, W. R. Briley, and H. McDonald Washington NASA Apr. 1982 129 p refs Prepared in cooperation with Scientific Research Associated, Inc., Glastonbury, Conn. 3 Vol. (Contract NAS3-20951)

(NASA-CR-3494; NAS 1.26:3494; R81-912929) Avail: NTIS HC A07/MF A01 CSCL 20D

A finite difference method is developed for making detailed predictions of three dimensional subronic turbulent flow in turbofan lobe mixers. The governing equations are solved by a forwardmarching solution procedure which corrects an inviscid potential flow solution for viscous and thermal effects, secondary flows, total pressure distortion and losses, internal flow blockage and pressure drop. Test calculations for a turbulent coaxial jet flow verify that the turbulence model performs satisfactorily for this relatively simple flow. Lobe mixer flows are presented for two geometries typical of current mixer design. These calculations included both hot and cold flow conditions, and both matched and mismatched Mach number and total pressure in the fan and turbine streams.

NB2-24452*# Southwest Research Inst., San Antonio, Tex. STUDY OF VAPOR FLOW INTO A CAPILLARY ACQUISI-TION DEVICE Final Report

Franklin T. Dodge and Edgar B. Bowles Apr. 1982 64 p reis (Contract NAS3-22664)

(NASA-CR-167883; NAS 1,26;167883; SuRIO2-6369) Avail:

NTIS HC A04/MF A01 CSCL 20D

An analytical model was developed that prescribes the conditions for vapor flow through the window screen of a start basket. Several original submodels were developed as part of this model. The submodels interrelate such phenomena as the effect of internal evaporation of the liquid, the bubble point change of a screen in the presence of wicking, the conditions for drying out of a screen through a combination of avaporation and pressure difference, the vapor inflow fifte across a wet screen as a function of pressure difference, and the effect on wicking of a difference between the static pressure of the liquid reservoir and the surrounding vapor. Most of these interrelations were verified by a series of separate effects tests, which were also used to determine certain empirical constants in the models. The equations of the model were solved numerically for typical start basket designs, and a simplified start basket was constructed to verify the predictions, using both volatile and nonvolatile test liquids. The test results verified the trends predicted by the model.

> ORIGINAL PAGE IS OF POOR QUALITY

NB2-27686*# Pannsylvania State Univ., University Park. Turbomachinery Lab

THREE DIMENSIONAL FLOW FIELD INSIDE COMPRESSOR MOTOR, INCLUDING BLADE BOUNDARY LAYERS Semientnual Progress Report

J. M. Galmes, M. Pousgere, and B. Lakahminarayana Jun, 1982. 78 p refs

(Grant NsG-3266)

(NASA-CR-169120; NAS 1.26; 169120; PSU/Tuibo/82:4) Avail:

NTIS HC A03/MF A01 CSCL 200

The Reynolds stress equation, pressure strain correlation, and dissipative terms and diffusion are discussed in relation to turbulence modelling using the Reynolds stress model. Algebraic modeling of Reynolds stresses and calculation of the boundary layer over an axial cylinder are examined with regards to the kinetic energy model for turbulence modelling. The numerical analysis of blade and hub wall boundary layers, and an experimental study of rotor blade boundary layer in an axial flow compressor rotor are discussed. The Patankar-Spalding numerical method for two dimensional boundary layers is included.

N82-31638*# Connecticut Univ., Storrs. Dept. of Mechanical Engineering.

TURBINE ENDWALL SINGLE CYLINDER PROGRAM Semiannual Status Report, 1 Jan. - 1 Jul. 1982

Lee S. Langston 1 Jul. 1982 50 p refs

(Grant NsG-3238)

NAS (NASA-CR-169278; 1.26:169278) Avail: NTIS

HC A03/MF A01 CSCL 20D

Detailed measurement of the flow field in front of a large-scale single cylinder, mounted in a wind tunnel is discussed. A better understanding of the three dimensional separation occuring in front of the cylinder on the endwall, and of the vortex system that is formed is sought. A data base with which to check analytical and numerical computer models of three dimensional flows is also anticipated.

N82-31639*# City Coll. Research Foundation, New York. Turbomachinery Lab.

EXPERIMENTAL STUDY OF TURBULENCE IN BLADE END **WALL CORNER REGION**

R. Raj Aug. 1982 110 p refs

(Grant NAG3-122)

(NASA-CR-169283; NAS 1.26:169283; RF-05438) Avail: NTIS

HC A06/MF A01 CSCL 20D

Corner flows and wall pressure fluctuations, design and fabrication of the test model, preliminary results on boundary layer, flow visualization, turbulence intensity and spectra measurements are presented. The design consideration and fabrication report on the newly built wind tunnel to be used for subsequent continuation of the research effort is also presented.

N62-31641*# Cornell Univ., Ithaca, N. Y. Energy Program. EXHAUST GAS MEASUREMENTS IN A PROPANE FUELED SWIRL STABILIZED COMBUSTOR

M. S. Aanad Aug. 1982 177 p refs

(Grant NsG-3019)

(NASA-CR-169293; NAS 1.26:169293; E-82-4) Avail: NTIS

HC A09/MF A01 CSCL 20D

Exhaust gas temperature, velocity, and composition are measured and combustor efficiencies are calculated in a lean. premixed swirl stabilized laboratory combustor. The radial profiles of the data between the co- and the counter swirl cases show significant differences. Co-swirl cases show evidence of poor turbulent mixing across the combustor in comparison to the counter-swirl cases. NO sub x levels are low in the combustor but substantial amounts of CO are present. Combustion efficiencies are low and surprisingly constant with varying outer swirl in contradiction to previous results under a slightly different inner swirl condition. This difference in the efficiency trends is expected

to be a result of the high sensitivity of the combustor to changes in the inner swirl. Combustor operation is found to be the same for propane and methane fuels. A mechanism is proposed to explain the combustor operation and a few important characteristics determining combustor efficiency are identified.

J.D.

N62-31642*# Cornell Univ., Ithaca, N. Y. FLOW PROCESS IN COMBUSTORS
F. C. Gouldin Jun, 1982 16 p refs (Grant NsG-3019)

(NASA-CR-169294; NAS 1.26:169294) Avail:

HC A02/MF A01 CSCL 20D

Fluid mechanical effects on combustion processes in steady flow combustors, especially gas turbine combustors were investigated. Flow features of most interest were vorticity, especially swirl, and turbulence. Theoretical analyses, numerical calculations, and experiments were performed. The theoretical and numerical work focused on noncombusting flows, while the experimental work consisted of both reacting and nonreacting flow studies. An experimental data set, e.g., velocity, temperature and composition, was developed for a swirl flow combustor for use by combustion modelers for development and validation work.

J.D.

Ne2-31643*# Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.

INVESTIGATIONS OF FLOWFIELDS FOUND IN TYPICAL COM-BUSTOR GEOMETRIES Semiannual Status Report, 1 Feb. -31 Jul. 1982

David G. Lilley 31 Jul. 1982 252 p refs

(Grant NAG3-74)

(NASA-CR-169295; NAS 1.26:169295; SASR-4) Avail: NTIS

HC A12/MF A01 CSCL 20D

Experimental and theoretical research undertaken on 2-D axisymmetric geometries under low speed, nonreacting, turbulent, swirling flow conditions is reported. The flow enters the test section and proceeds into a larger chamber (the expansion ratio D/d = 2) via a sudden or gradual expansion (sidewall angle alpha = 90 and 45 degrees). Inlet swirl vanes are adjustable to a variety of vane angles with values of phi = 0, 38, 45, 60 and 70 degrees being emphasized.

A82-10961 * # A hast exchanger computational procedure for temperature-dependent fouling. L. M. Chiappetta and E. J. Szetela (United Technologies Research Center, East Hartford, CT). American Society of Mechanical Engineers and American Institute of Chemical Engineers, National Heat Transfer Conference, 20th, Milwaukee, WI, Aug. 2-5, 1981, ASME Paper 81-HT-7\$, 8 p. 14 refs, Members, \$2.00; nonmembers, \$4,00. Contract No. NAS3-21971.

A novel heat exchanger computational procedure is described which provides a means of rapidly calculating the distributions of fluid and wall temperatures, deposit formation, and pressure loss at various points in a heat exchanger. The procedure is unique in that it is capable of treating wide variations in heat exchanger geometry without recourse to restrictive assumptions concerning heat exchanger type (e.g., co-flow, counterflow, cross flow devices, etc.). The analysis has been used extensively to predict the performance of cross-counterflow heat exchangers in which ore fluid behaves as a perfect gas (e.g., air) while the other fluid is assumed to be a distillate fuel. The model has been extended to include the effects on heat exchanger performance of time varying inflow conditions. Heat exchanger performance degradation due to deposit formation with time can be simulated, making this procedure useful in predicting the effects of temperature-dependent fouling. (Author)

AP?: A separate effects study on a convexly-curved wall. T. W. Simon (Minnesota, University, Minneapolis, MN) and R. J. Moffat (Stanford University, Stanford, CA). American Society of Mechanical Engineers and American Institute of Chemical Engineers, National Heat Transfer Conference, 20th, Milwaukee, WI. Aug. 2-5, 1981,

ASME Paper 81-HT-78, 10 p. 30 rafs. Members, \$2,00; nonmembers, \$4,00. Grants No. NsG-3124; No. NAG3-3.

Surface heat transfer rates have been measured for several different flows on an isothermal, convexly curved surface. The freestream velocity, boundary layer thickness, acceleration parameter, and unheated starting length were varied systematically, and both turbulent and transitional boundary layers were studied. The effect of convex curvature on heat transfer rates is significant with Stanton numbers reduced 20-25% below flat wall values for the same enthalpy thickness Reynolds number. Heat transfer rates recovered slowly on a flat wall downstream of the curved wall, and after 60 cm, the Stanton numbers were still 15-20% below flat wall values. The behavior of the boundary layer suggests the existence of an asymptotic condition. Boundary layer thickness, freestream velocity, and boundary layer maturity affect the initial response to the introduction of curvature and the rate at which the asymptotic state is approached. Convex curvature appears to increase the boundary layer's sensitivity to acceleration; it also delays and retards transition, Near-laminar or early-transitional boundary layers recover from curvature rapidly, whereas late-transitional and mature boundary layers recover slowly.

NB2-11390*# SHD Associates, Inc., Evanston, III.
SURFACE-TENSION INDUCED INSTABILITIES: EFFECTS
OF LATERAL BOUNDARIES Final Report
S. Rosenblat, S. H. Davis, and G. M. Hornsy Jun. 1981 130 p

(Contract NAS3-22274)

NTIS

(NASA-CR-165530) Avail: NTIS HC A07/MF A01 CSCL 20D

Convention in circular and rectangular cylinders is analyzed. The governing equations and boundary conditions are formulated, when and equilinear stability theory are considered, and the physical implications of the theory are discussed.

J.D.H.

AB2-13396 Eigenvalues of the Rayleigh-Bénard and Maren and problems. S. Rosenblat, G. M. Homsy, and S. H. Davis (SHD Associates, Inc., Evanston, IL). *Physics of Fluids*, vol. 24, Nov. 1981, p. 2115-2117. Contract No. NAS3-22274.

The eigenvalues of the linear Bénard-Marangoni stability problem are discussed. Pearson and Nield boundary conditions, which correspond to a rigid, isothermal lower boundary and a stress-free conducting upper boundary are considered, it is shown that although a critical value of the Marangoni number can be determined; the number is not, strictly speaking, an eigenvalue and cannot be used as an eigenvalue parameter for the determination of an eigenvector set.

A82-17824 * # Mean flowfields in axisymmetric combustor geometries with swirl. D. L. Rhode, D. G. Lilley Oklahoma State University, Stillwater, OK), and D. K. McLaughlin (Dynamics Technology, Inc., Torrance, CA). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0177. 14 p. 31 refs. Grant No. NAG3-74.

Six flowfield configurations are investigated with sidewall angles of 90 and 45 deg, and swirl vane angles of 0, 45, and 70 deg. It is found that central recirculation zones occur for the swirling flow cases investigated, which extend from the inlet to x/D = 1.7, where x is the axial polar coordinate, and D is the test section diameter. Five-hole pitot probe pressure measurements are used to determine time-mean velocities, and corresponding flow situations are predicted and compared to results of experimental data. Excellent agreement is found for the nonswirling flow, aithough poor agreement is found for swirling flow cases, especially near the inlet. The discrepancy is attributed to the lack of realism in the turbulence model, and/or to inaccurate specification of time-mean velocity and turbulence energy distributions at the inlet.

A82-17880 * # Atomization and combustion properties of flashing injectors. A. S. P. Solomon, S. D. Rupprecht (Pennsylvania State University, University Park; Westinghouse Research Laboratories, Monroeville, PA), L.-D. Chen, and G. M. Faeth (Pennsylvania

State University, University Park, PAI. American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan, 11-14, 1982, Paper 82-0300. 11 p. 29 refs. Grant No. NsG-3306.

Flashing injection involves expanding a fluid through an injector until a supersaturated state is reached, causing a portion of the fluid to flash to a vapor. This investigation considered the flow, atomization and spreading properties of flashing injectors flowing liquids containing dissolved gases (Jut A/air) as well as superheated liquids (Freon 1f). The use of a two stage expansion process, separated by an expansion chamber, was found to be beneficial for good atomization properties of flashing injection - particularly for dissolved gas systems. Both locally homogeneous and separated flow models provided good predictions of injector flow properties, Conventional correlations for drop sizes from pressure atomized and airblast injectors were successfully modified, using the separated flow model to prescribe injector exit conditions, to correlate drop size measurements. Additional experimental results are provided for spray angle and combustion properties of sprays from flashing (Author) injectors.

A82-23832 * # Solutions of the compressible Navier-Stokes equations using the integral method, M. M. ElRefaee, J. C. Wu, and S. G. Lekoudis (Georgia Institute of Technology, Atlanta, GA). (American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 19th. St. Louis, MO, Jan. 12-15, 1981, Paper 81-0046.) AIAA Journal, vol. 20, Mar. 1982, p. 356-362. 16 refs. Grant No, NsG-3307.

The integral representation method was used to obtain numerical solutions of the compressible, unsteady, two-dimensional Navier-Stokes equations for subsonic flows. The equations were written with the vorticity, the dilatation, the density, and the enthalpy as the dependent variables. The method was tested by solving the following problems: the flow over a flat plate, around a circular cylinder, and around a Joukowski airfoil. The last two problems involved massive flow separation. The approach offers the capability of confining the domain of computations to the region where two quantities, the vorticity and the difference in dilatation between the real flow and the potential flow around the body, are non-negligible. (Author)

A82-24748 * Numerical analysis of confined turbulent flow.
A. Lin (Cincinnati, University, Cincinnati, OH) and H. Weinstein (City College, New York, NY). Computers and Fluids, vol. 10, no. 1, 1982, p. 27-50. 25 refs. Grant No. NsG-3174.

The considered investigation is concerned with the development of an efficient computational method for obtaining a physical understanding of an internal turbulent field. The employed approach makes use of a 'two equation' type model for the turbulence to obtain the numerical solution of a two-dimensional confined turbulent flow. The mean flow governing equations are considered along with the governing equation of the mean temperature and concentrations, and the boundary conditions. The numerical procedure for solving the turbulent flow is discussed, taking into procure an approximation to the nonlinear terms, and the inner and other coupling. Attention is given to a stability convergence analysis, the stability characteristics, and computational examples.

G.R.

A82-27000 Numerical modelling of turbulent flow in a combustion tunnel. A. F. Ghoniem, A. J. Chorin, and A. K. Oppenheim (California, University, Lawrence Berkeley Laboratory, Berkeley, CA). Royal Society (London), Philosophical Transactions, Series A, vol. 304, no. 1484, Mar. 9, 1982, p. 303-325. 21 refs. Contract No. W-7405-eng-48; Grant No. NsG-3227.

A numerical technique is presented for the analysis of turbulent flow associated with combustion. The technique uses Chorin's random vortex method (rvm), an algorithm capable of tracing the action of elementary turbulent eddies and their cumulative effects without imposing any restriction upon their motion. In the past, the rvm has been used with success to treat nonreacting turbulent flows, revealing in particular the mechanics of large-scale flow patterns, the so-called coherent structures. Introduced here is a flame propagation algorithm, also developed by Chorin, in conjunction with volume sources modelling the mechanical effects of the exothermic process of combustion. As an illustration of its use, the technique is applied

to flow in a combustion tunnel where the flame is stabilized by a back-facing step. Solutions for both nonreacting and reacting flow fields are obtained which satisfactorily describe the essential features of turbulent combustion in a lean propane-air mixture that were observed in the laboratory by means of high speed Schlieren photography.

(Author)

A82-31445 * Natural convection with combined driving forces. S. Ostrach (Cass Western Reserve University, Cleveland, OH). PCH/PhysicoChemical Hydrodynamics, vol. 1, no. 4, 1980, p. 233-247, 29 refs. Grant No. NsG-3221.

The problem of free and natural convection with combined driving forces is considered in general and all possible configurations are identified. Dimensionless parameters are discussed in order to help categorize the various problems, and existing work is critically evaluated. Four distinct cases are considered for conventional convection and for the situation when the body force and the density gradient are parallel but opposed. Considerable emphasis is given to unstable convection in horizontal layers.

C.D.

A82-31908 * # Tube entrance heat transfer with deposit formation. E. J. Szetela and D. R. Sobel (United Technologies Research Center, East Hartford, CT). Amarican Institute of Aeronautics and Astronautics and American Society of Mechanical Engineers, Joint Thermophysics, Fluids, Plasma and Heat Transfer Conference, 3rd, St. Louis, MO, June 7-11, 1982, AIAA Paper 82-0918, 7 p. 21 refs. Contract No. NAS3-21971.

A two-peak wall temperature profile was observed while flowing a kerosene-type gas turbine fuel through a direct-resistance heated tubo at an engrance Reynolds number of about 1500. The downstream peak gradually diminished as deposits formed inside the tube, and only one peak remained after seven hours. The observation is explained qualitatively on the basis of analytical and experimental results reported in the literature. It is shown that the temperature profile can be divided into five regions: development of the thermal boundary layer, appearance of the secondary flows, fully developed thermal boundary layer, transition to turbulent flow, and turbulent flow. Deposits increase the tube roughness and reduce the length required for laminar-turbulent transition.

A82-32225 * Effects of internal heat transfer on the structure of self-similar blast waves. A. F. Ghoniem, S. A. Berger, A. K. Oppenheim (California, University, Berkeley, CA), and M. M. Kamel (Cairo University, Caîro, Egypt). Journal of Fluid Mechanics, vol. 117, Apr. 1982, p. 473-491. 19 refs. NSF Grant No. ENG-78-12372; Content No. W. 7405-ENG-48; Grant No. NAG3-131.

An analysis of the problem of salf-similar, nonadiabatic blast waves, where both sonduction and radiation are allowed to take clace, show the problem is be reducible to the integration of a system of six coupled nonlinear ordinary differential equations. Consideration of these equations shows that although radiation tends to produce uniform fields through temperature gradient attenuation, all the energy carried by radiation is deposited on the front and the bounding shock becomes increasingly overdriven. When conduction is taken into account, the distribution of gasdynamic parameters in blast waves in the case of Rosseland diffusion radiation is more uniform than in the case of the Planck emission radiation, O.C.

A82-35043 * # Bluff-body flameholder wakes - A simple numerical solution. G, H. Vatistas, S. Lin, C. K. Kwok (Concordia University, Montreal, Canada), and D. G. Lilley (Oklahoma State University, Stillwater, OK). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1177. 7 p. 22 refs. National Research Council Grant No. A-7435; Grant No. NAG3-74.

Numerical finite difference predictions are made of recirculation zones behind bluff-body flame stabilizers, showing quantitatively the effects of forebody geometry, blockage ratio, lateral position of the blockage and inlet swirl on the central recirculation zone. A simple transient Navier-Stokes solution algorithm and laminar flow simulation are used with 'free slip' and 'no slip' wall boundary conditions, thus illustrating how a basic approach may be used to solve a sophisticated fluid dynamic problem. (Author)

A82-37710 * # Turbulence measurements in a confined jet using a sixorientation hot-wire probe technique. S. I. Janjua, D. K. McLaughlin (Dynamics Technology, Inc., Torrance, CA), D. G. Lilley (Oklahoma State University, Stillwater, OK), and T. Jackson. AIAA, SAE, and ASME, Joint Propulsion Conferance, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1262. 13 p. 22 refs. Chiract No. NAG3-74.

The six-orientation hot-wire technique is applied to nonreacting axisymmetric cowfields, obtaining measurements of time-mean and rms voltages at six difinformation to determine the time-mean elocities, turbulence intensities, and shear stresses. At each location in the flow, there are six different values of each of the above quantities that can be obtained using six sets of measurements of three adjacent orientations. Flowfield surveys of both swirling and nonswirling confined jets are used to calculate estimates of the mean velocity components and the normal and shear turbulent stresses, and comparisons with independent data are made. A sonsitivity analysis of the data reduction technique demonstrates that the largest uncertainties are to be expected in the turbulent shear force estimates.

A82-39501 * Nonlinear Marangoni convection in bounded layers. I -Circular cylindrical containers. II - Rectangular cylindrical containers. S. Rosenblat, S. H. Davis, and G. M. Homsy (SHD Associates Inc., Evanston, IL). Journal of Fluid Mechanics, vol. 120, July 1982, p. 91-138, 25 refs. Contract No.

Liquid undergoing nonlinear Marangoni instability in a circular cylinder is examined, with attention given to roll-cell development and interaction. Surface deflections are neglected and the side want are considered as adiabatic and impenetrable, allowing the liquid to freely slip. The nonlinear convective states are calculated and their stability is defined, he behavior and amplitude of cells forming in the liquid, heated from below, and modeled in order to derive all the transport properties. A new small paramete. I formulated which is related to the critical Marangoni number of the infinite matrix expressing the eigenvalue expansion of the problem. The observed roll cell amplitudes and transport properties are shown to be available from simple eigenvalues, with double eigenvalues, indicating the existence of two roll-states as predicted by linear theory, nonlinear theory indicates transitions from one steady convective state to another,

A82-41203 * # Buoyancy effects on the temperature field in downward spreading flames. R. A. Altenkirch, D. C. Winchester, and R. Eichhorn (Kentucky, University, Lexington, KY). ASME, Transactions, Journal of Heat Transfer, vol. 104, Aug. 1982, p. 560-563, 8 refs, Grant No. NsG-3114,

It is shown that flames which spread vertically down thermally thin fuels at the same Damköhler number, and therefore have the same dimensionless spread rate, also have the same dimensionless temperature fields irrespective of differences in physical size. The Frey and Tien (1976) effects of pressure on flame size are due to the effects of pressure on the character of the induced buoyant flow.

Flow aerodynamics modeling of an MHD swirt combus-A82-44782 * # tor - Calculations and experimental verification. A. K. Gupta, J. M. Beer, J. F. Louis (MIT, Cambridge, MA), A. A. Busnaina, and D. G. Lilley (Oklahoma State University, Stillwater, OK). ASME, Transactions, Journal of Fluids Engineering, vol. 104, Sept. 1982, p. 385-391; Discussion, p. 391, 392, 18 refs. Contract No. DE-AC01-79ET-15518; Grant No. NAG3-74.

This paper describes a computer code for calculating the flow dynamics of constant density flow in the second stage trumpet shaped nozzle section of a two stage MHD swirl combustor for application to a disk generator. The primitive pressure-velocity variable, finite difference computer code has been developed to allow the computation of inert nonreacting turbulent swirling flows in an axisymmetric MHD model swirl combustor. The method and program involve a staggered grid system for exial and radial velocities, and a line relaxation technique for efficient solution of the equations. Turbulence simulation is by way of a twoequation Kappa-epsilon model. The code produces as output the flowfield map of the nondimensional stream function, axial, and swiri velocity. Good agreen that was obtained between the theoretical predictions and the qualitative experimental results. The best seed injector location for uniform seed distribution at combustor exit is with injector located centrally on the combustor axis at entrance to the second stage combustor. (Author)

A82-45157 * Self-adaptive closed constrained solution algorithms for nonlinear conduction. J. Padovan and S. Tovichakchaikul (Akron, University, Akron, OH). Numerical Heat Transfer, vol. 5, July-Sept. 1982, p. 253-274. 10 refs. Grant No. NAG3-54.

Self-adaptive solution algorithms are developed for nonlinear heat conduction problems encountered in analyzing materials for use in high temperature or cryogenic conditions. The nonlinear effects are noted to occur due to convection and radiation effects, as well as temperature-dependent properties of the materials, incremental successive substitution (ISS) and Newton-Raphson (NR) procedures are treated as extrapolation schemes which have solution projections bounded by a hyperline with an externally applied thermal load vector arising from internal heat generation and boundary conditions. Closed constraints are formulated which improve the efficiency and stability of the procedures by employing closed ellipsoidal curfaces to control the size of successive iterations. Governing equations are defined for nonlinear finite element models, and comparisons are made of results using the the new method and the ISS and NR schemes for epoxy, PVC, and CuGe.

35 INSTRUMENTATION AND **PHOTOGRAPHY**

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aeriel photography see 43 Earth Resources. For related information see also 06 Aircraft Instrumentation, and

19 Spacecraft Instrumentation.

N82-14494* | National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AN EXPERIMENTAL INVESTIGATION INTO THE FEASIBIL-ITY OF A THERMOELECTRIC HEAT FLUX GAGE

Jan C. Jones (Tri State Univ.) and G. James VanFossen, Jr. Dec. 1981 17 p refs (NASA-TM-82755; E-1071) Avail: NTIS HC A02/MF A01

CSCL 14B

An experiment was conducted to determine the feasibility of using a commercially available thermoelectric device as a heat flux gage. In certain research applications, the thermoelectric heat flux gage can provide a relatively simple means to model a warm fluid-cold wall. The experiment showed that heat flux through the gage could be correlated within two percent to the applied thermoelectric current through the device and the hot and cold side temperature with a simple algebraic equation.

Author

N82-19521*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH-SPEED LASER ANEMOMETER SYSTEM FOR INTRA-ROTOR FLOW MAPPING IN TURBOMACHINERY

J. Anthony Powell, Anthony J. Strazisar, and Richard G. Seasholtz Feb. 1982 22 p refs

(NASA-TP-1663; E-276) Avail: NTIS HC A02/MF A01 CSCL

A fringe-type laser anemometer with innovative features is described. The innovative features include: (1) rapid, efficient data acquisition processes, (2) detailed graphic display of data being accumulated, and (3) input laser-beam positioning that allows greater optical access to the intrarotor region. Results are presented that demonstrate the anemometer's capability in flow mapping within a transonic axial-flow compressor rotor.

M.D.K.

N82-22481*# National Aeronatics and Space Administration. Lewis Research Center, Clevelanc, Ohio.

FRINGE LOCALIZATION REQUIREMENTS FOR THREE-DIMENSIONAL FLOW VISUALIZATION OF SHOCK WAVES IN DIFFUSE-ILLUMINATION DOUBLE PULSE HOLO-**GRAPHIC INTERFEROMETRY**

Arthur J, Decker Apr. 1982 45 p refs (NASA-TP-1868; NAS 1.60:1868; E-757) Avail: NTIS HC A03/MF A01 CSCL 14E

A theory of fringe localization in rapid-double-exposure. diffuse-illumination holographic interferometry was developed. The theory was then applied to compare holographic measurements with laser anemometer measurements of shock locations in a transonic axial-flow compressor rotor. The computed fringe localization error was found to agree well with the measured localization error. It is shown how the view orientation and the curvature and positional variation of the strength of a shock wave are used to determine the localization error and to minimize it. In particular, it is suggested that the view direction not deviate from tangency at the shock surface by more than 30 degrees.

N82-23515*# National Aeronautics and Space Administration. Lewis Research Center, Cleverand, Ohio. POCKELS-EFFECT CELL FOR GAS-FLOW SIMULATION David Weimer May 1982 13 p refs (NASA-TP-2007; E-1028; NAS 1.60:2007) Avail: NTIS HC A02/MF A01 CSCL 14B

> ORIGINAL PAGE IS OF POOR QUALITY

A Pockels effect cell using a 75 cu cm DK*P crystal was developed and used as a gas flow simulator, index of refraction gradients were produced in the cell by the fringing fields of parallel plate electrodes, Calibration curves for the device were obtained for index of refraction gradients in excess of 00025 m

N82-28605*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LASER ANEMOMETER USING A FABRY-PEROT INTERFER-OMETER FOR MEASURING MEAN VELOCITY AND TURBULENCE INTENSITY ALONG THE OPTICAL AXIS IN TURBOMACHINERY'

Richard G. Seasholtz and Louis J. Goldman 1982 11 p refs Proposed for presentation at the Winter Ann. Meeting of the Am. Soc. of Mech. Engr., Phoenix, Ariz., 14-19 Nov. 1982 (NASA-TM-82841; E-1211; NAS 1 15:82841) Avail: NTIS HC A02/MF A01 CSCL 14B

A technique for measuring a small optical axis velocity component in a flow with a large transverse velocity component is presented. Experimental results are given for a subsonic free jet operating in a laboratory environment, and for a 0.508 meter diameter turbine stator cascade. Satisfactory operation of the instrument was demonstrated in the stator cascade facility with an ambient acoustic noise level during operation of about 105 dB. In addition, the turbulence intensity measured with the interferometer was consistent with previous measurements taken with a fringe type laser anemometer.

N82-31663*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEVELOPMENT AND UTILIZATION OF A LASER VELOCIME-TER SYSTEM FOR A LARGE TRANSONIC WIND TUNNEL

Robert J. Freedman and John P. Greissing Jun. 1982 17 p

(NASA-TM-82886; E-1264; NAS 1.15:82886) HC A02/MF A01 CSCL 148 Avail: NTIS

The need for measurements of the velocity flow field about spinner propeller nacelle configurations at Mach numbers to 0.8 was met by a specially developed laser velocimeter system. This system, which uses an argon ion laser and 4 beam 2 color optics, was required to operate in the hostile environment associated with the operation of a large transonic wind tunnel. To overcome the conditions present in locating the sensitive optics in close proximity to the wind tunnel, an isolation system was developed. The system protects the velocimeter from the high vibrations, elevated temperatures, destructive acoustic pressures and low atmospheric pressures attendant with the operation of the wind tunnel. The system was utilized to map the flow field in front of, behind and in between the rotating blades of an advanced swept blade propeller model at a Mach number of 0.8. The data collected by the system will be used to correlate and verify computer analyses of propeller nacelle flow fields and propeller performance. R.J.F.

N82-31664*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A DIGITAL OPTICAL TORQUEMETER FOR HIGH ROTATIONAL SPEED APPLICATIONS

Daniel J. Lesco, Donald R. Buchele, and Lawrence G. Oberle Aug. 1982 17 p refs

(NASA-TM-82914; E-1189; NAS 1.15:82914) HC A02/MF A01 CSCL 14B Avail: NTIS

A digital optical torquemeter system designed for applications at high rotational speeds was fabricated and tested for zero stability at speeds up to 20,000 rpm. Data obtained in a spin rig and with simulated inputs demonstrate that the system is capable of measuring torque bar twist to within 0.03 degrees at speeds of 30,000 rpm. The optical system uses fiber optic bundles to transmit light to the torque bar and to silicon avalanche detectors. The system is microcomputer based and provides measurements of

average torque and torque as a function of angular shaft position. The torquemeter requires no bearings or other contact between the rotating torque bar and the nonrotating optics, and tolerates movement of the torque bar as large as 1 mm relative to the optics.

R.J.F.

N82-32662*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXTENDING THE FREQUENCY OF RESPONSE OF LIGHTLY DAMPED SECOND ORDER SYSTEMS: APPLICATION TO THE DRAG FORCE ANEMOMETER

Gustave C. Fralick Aug. 1982 26 p refs (NASA-TM-82927; E-1178; NAS 1.15:82927) Avail: NTIS HC A03/MF A01 CSCL 14B

It is shown that a conventional electronic frequency compensator does not provide adequate compensation near the resonant frequency of a lightly damped second order system, such as the drag force anemometer. The reason for this is discussed, and a simple circuit modification is presented which overcomes the difficulty. The improvement is shown in theoretical frequency response curves as well as in the experimental results from some typical drag force anemometers.

N62-32670*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NEW VERSIONS OF OLD FLOW VISUALIZATION SYSTEMS
Walton L. Howes In NASA. Langley Research Center Flow
Visualization and Laser Velocimetry for Wind Tunnels, Sep. 1982
p 59-64 (For pri/mary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

A small, modified Mach-Zehnder interferometer placed in series with a much larger schlieren optical system spanning the test section is examined. In one arm of the interferometer, light from the schlieren is focused through a pinhole and recollimating lens to produce a reference beam which interferes with the remaining object beam from the other arm. The object and reference beams are separated only over a small interval following the test section, and differential vibrations are greatly reduced. Color schlieren has technical, as well as aesthetic, advantages over black-and-white schlieren. Since each color is associated with a specific amount of refraction, quantitative evaluation of certain refractive-index fields becomes possible using very simple equations derived from ray trace theory. Rainbow schlieren of an acetylene flame, and the evaluated refractive index distribution are shown. Floot-meansquare refractive index fluctuations in homogeneous, isotropic turbulence were determined using the rainbow schlieren, since these fluctuations determine the root-mean-square refraction, which is indicated by the overall color of the image. E.A.K.

N82-32672*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PROPELLER FLOW, VISUALIZATION TECHNIQUES

George L. Stefko, F. J. Paulovich, J. P. Greissing, and E. D. Walker In NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 75-89 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

Propeller flow visualization techniques were tested. The actual operating blade shape as it determines the actual propeller performance and noise was established. The ability to photographically determine the advanced propeller blade tip deflections, local flow field conditions, and gain insight into aeroelastic instability is demonstrated. The analytical prediction methods which are being developed can be compared with experimental data. These comparisons contribute to the verification of these improved methods and give improved capability for designing future advanced propyllers with enhanced performance and noise characteristics.

E.A.K.

N82-32675*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLOW VISUALIZATION OF SHOCK-BOUNDARY LAYER INTER-ACTION

Warren R. Hingst and Mark Jurkovich *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 101-108 (For primary document see N82-32663 23-35)

AVAIL: NTIS HC A16/MF A01 CSCL 14B

Two and three-dimensional shock-boundary layer interaction data were obtained from supersonic wind tunnel tests. These interactions are studied both with and without boundary layer bleed. The data verify computational fluid dynamic codes. Surface static pressure, pitot pressure, flow angularity, and bleed rates, are studied by flow visualization techniques. Surface oil flow using fluorescent dye and laser sheet using water droplets as the scattering material are used for flow visualization.

N82-32686*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STATUS OF LASER ANEMOMÉTRY IN TURBOMACHINERY RISEARCH AT THE LEWIS RESEARCH CENTER

Richard G. Seasholtz In NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 227-234 refs (5cr primary document see N82-32663 23-35) Avail: NTIS HC A16/MF A01 CSCL 14B

Laser anemometer systems were developed for a full-annular turbine stator cascade facility and for a compressor rotor facility; both are ambient temperature axial flow facilities with a 20-inch tip ciameter. The optical configurations of the two anemometers are similar single-component fringe-type backscatter systems with a probe volume diameter of 125 microns and length of about 2 mm. Laser anemometer measurements are compared with numerical solutions for a transonic axial flow compressor rotor and a turbine stator cascade.

N82-32688*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEVELOPMENT OF A LASER VELOCIMETE/R FOR A LARGE TRANSONIC WIND TUNNEL

John P. Greissing and Daniel L. Whipple In NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 243-247 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

On a 8 x 6 Foot Supersonic Wind Tunnel a laser velocimeter was utilized in the testing of advanced high speed turbopropellers. The system, using a 15-W argon-ion laser, a 3-beam 2-axis transmitting-receiving optics package, a zoom lens with 1- to 4-m focal lengths, and a 0.4-m corner mirror was initially assembled and tested in the checkout room. During the time the system was located in the checkout area, experience was acquired in the alignment and operation of the system and the data equisition system and software were developed. By using air jet/ simulate tunnel air flow, the system worked quite well. Howers oblems with beam alignment arose because of reduced succeptable pressure. Mounting the laser into a vessel maintained at atmospheric pressure with deflectors mounted to the external walls improved operation for about 2 hours before misalignment reoccured. The system was remounted to the positioning platform in an enclosure that provides both thermal and acoustic isolation.

R.J.F

N82-32689*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SEEDING CONSIDERATIONS FOR AN LV SYSTEM IN A LARGE TRANSONIC WIND TUNNEL

Robert J. Freedman *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 249-252 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

When it was decided to use a laser velocimeter to measure the properties of propellers, seeding was a great concern since large particles fail to flow and small ones are too small to be seen. Many methods were tried and weeded out by using a Malvern particle sizer. The most promising ones were tested in the tunnel and the laser velocimeter (LV) measurements compared to theoretical values of veocity as the particle approached a blunt nose body along a stagnation streamline. Data obtained from the LV system were compared with the one dimensional particle lag calculation. This figure showed the theoretical velocity over the blunt nose and a velocity profile for 5 um particles. This indicated the particles were approximately 5 um. The seeding method is shown. The seed was atomized by 2 seeders run with all 12 available atomizer jets on. The atomizer seed traveled from these two seeds through four 1 inch tubes 20 feet long to the plenum champer where this cluster of tubes injected the seed into the air stream. The tubes were located 60 feet from the model and could be moved only by shutting the tunnel down. Future seeding plans are shown.

N82-32690*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LV MEASUREMENTS WITH AN ADVANCED TURBOPROP

Harvey E. Neumann and J. S. Serafini In NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 253-256 (For primary document see №82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

Nonintrusive measurements of velocity about a spinnerpropeller-nacelle configuration were made at a Mach number of 0.8. A laser velocimater (LV) specifically developed for these measurements was used to determine the flow field of the advanced swept S/3-3 propeller. The data will be used to study the flow and to verify computer prediction codes. The usefulness of the LV data in detecting flow anomalies and to substantiate the data quality was demonstrated. Some typical results are given. Mach number profiles at the entrance of the propeller are compared with theoretical predictions. The LV data is in excellent agreement with the axisymmetric, compressible, inviscid theory (without blades) ahead of the propeller except near the hub. The data indicate blade blockage near the spinner. Blade to blade variations in axial velocity for four radial positions at the propeller exist are also given. The large apparent wake near the hub is associated with the hub choking. The blade to blade variation of axial velocity ahead of a shock within the blade passage is given.

A82-40132 * Miniature drag-force anemometer. L. N. Krause and G. C. Fralick (NASA, Lewis Research Center, Cleveland, OH). In: Flow: Its measurement and control in science and industry; Proceedings of the Second Symposium, St. Louis, MO, March 23-26, 1981. Volume 2. (A82-40126 20-35) Research Triangle Park, NC, Instrument Society of America, 1981, p. 117-130. 8 refs.

A miniature drag-force anemometer is described which is capable of measuring unsteady as well as steady-state velocity head and flow direction. It consists of a cantilevered beam with strain gages located at the base of the beam as the force measuring element. The dynamics of the beam are like those of a lightly damped second-order system with a natural frequency as high as 40 kilohertz depending on beam geometry and material. The amemorater can be used in both forward and reversed flow. Anemometer characteristics and several designs are presented along with discussions of several applications. (Author)

N82-22479*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

THIN FILM TEMPERATURE SENSORS, PHASE 3

H. P. Grant, J. S. Przybyszewski, R. G. Claing, and W. L. Anderson 11 Jan. 1982 83 p refs (Contract NAS3-22002)

(NASA-CR-165476; NAS 1.26:165476; PWA-5708-26) Avail: NTIS HC A05/MF A01 CSCL 14B

A thin film Thermocouple system installation for engine test evaluation was designed, and an engine test plan was prepared. Film adherence, durability, accuracy, and drift characteristics were improved. Film thickness was increased to 14 microns, and drift was reduced to less than 0.02 percent of Fahrenheit temperature per hour on actual turbine blades at 1255 K. S.L.

A82-30300 * Three sensor hot wire/film technique for three dimensional mean and turbulence flow field measurement. B. Lakshminarayana (Pennsylvania State University, University Park, PA), TSI Quarterly, vol. 8, Jan.-Mar. 1982, p. 3-13. 49 refs. Grants No. NGL-39-009-007; No. NsG-3012; No. NsG-3032.

- Andrew

Methods of measuring the three dimensional flow field using a three-sensor, hot-wire probe is described in this paper, with emphasis on the techniques developed by the author's group at The Pennsylvania State University. The hot wire equations, data processing procedure, calibration techniques, and a discussion of various errors in the measurement are included. Some typical data acquired by this probe is also included. (Author)

A82-34231 * Digital imaging techniques in experimental atress analysis. W. H. Peters and W. F. Ranson (South Ca/ca: a, University, Columbia, SC).

75. Digital imaging techniques in experimental atress analysis. W. H. Peters and W. F. Ranson (South Ca/ca: A, University, Columbia, SC).

75. Digital imaging techniques in experimental atress analysis. W. H. Peters and W. F. Ranson (South Ca/ca: A, University, Columbia, SC).

Digital imaging techniques are utilized as a measure of surface displacement components in laser speckle metrology. An image scanner which is interfaced to a computer records and stores in memory the laser speckle patterns of an object in a reference and deformed configuration. Subsets of the deformed images are numerically correlated with the references as a measure of surface displacements. Discrete values are determined around a closed contour for plane problems which then become input into a boundary integral equation method in order to calculate surface traction in the contour. Stresses are then calculated within this boundary. The solution procedure is illustrated by a numerical example of a case of uniform tension. (Author)

A82-36987 * # Experimental boundary integral equation applications in speckle interferometry. J. E. Fraley, M. A. Hamed, W. H. Peters, and W. F. Ransor. (South Carolina, University, Columbia, SC), In: Society for Experimental Stress Analysis, Spring Meeting, Dearborn, Mi, May 31-June 4, 1931, Proceedings (A82-36977 18-39) Brookfield Center, CT, Society for Experimental Stress Analysis, 1982, p. 68-72, Grant No. NAG3-75.

A complete data analysis system utilizing laser speckle interferometry and Experimental Integral Equation Method (EBIE) is described. A host computer provides the optical data analysis and serves as an input device to a PDP11/VAX computer for numerical analysis. The basic theory of pointwise filtering and digital correlation is described as experimental data input to the BIE method. (Author)

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-26499* KMS Fusion, Inc., Ann Arbor, Mich.
FREE ELECTRON LASERS FOR TRANSMISSION OF
ENERGY IN SPACE Final Report
S. B. Segall, H. R. Hiddleston, and G. C. Catolla Oct, 1981
40 p refs
(Contract NAS3-22659)
(NASA-CR-165520; NAS 1.26:165520; KMSF-U-1185) Avail:
NTIS HC A03/MF A01 CSCL 20E

A one-dimensional resonant-particle model of a free electron laser (FEL) is used to calculate laser gain and conversion efficiency of electron energy to photon energy. The optical beam profile for a resonant optical cavity is included in the model as an axial variation of laser intensity. The electron beam profile is matched to the optical beam profile and modeled as an axial variation of current density. Effective energy spread due to beam emittance is included. Accelerators appropriate for a space-based FEL oscillator are reviewed. Constraints on the concentric optical resonator and on systems required for space operation are described. An example is given of a space-based FEL that would produce 1.7 MW of average output power at 0.5 micrometer wavelength with over 50% conversion efficiency of electrical energy to laser energy, it would utilize a 10 m-long amplifier centered in a 200 m-long optical cavity. A 3-amp, 65 meV electrostatic accelerator would provide the electron beam and recover the beam after it passes through the amplifier. Three to five shuttle flights would be needed to place the laser in orbit.

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

NB2-12442* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MODIFIED FACE SEAL FOR POSITIVE FILM STIFFNESS

Izhak Etsion (Technion - Israel Inst. of Tech.) and Abraham Lipshitz, inventors (to NASA) (Technion - Israel Inst. of Tech.) Issued 29 Sep. 1981 4 p Filed 7 Nov. 1979 Supersedes N80-12414 (18 - 03, p 0334) Sponsored by NASA (NASA-Case-LEW-12989-1; US-Patent-4,291,887;

US-Patent-Appl-SN-092145; US-Patent-Class-277-27;

US-Patent Class-277-40; US-Patent-Class-277-93R) Avail: US Patent and Trademark Office CSCL 11A

The film stiffness of a face seal is improved without increasing the sealing and dam area by using an apparatus which includes a primary seal ring in the form of a nose piece. A spring forces a sealing surface on the seal ring into sealing contact with a seat to form a face seal. A circumferential clearance seal is formed in series with this face seal by a lip on the piece. The width of the surface of the lip is subsntially the same as the width of the sealing surface on the face seal and the clearance between the surface on the lip and the shaft is substantially the same as the spacing between the face sealing surfaces on the face seal when the shaft is rotating. The circumferential clearance seal restricts the flow of fluid from a main cavity to an intermediate cavity with a resulting pressure drop. The hydrostatic opening face is strongly dependent on the face seal clearance, and the desired axial stiffness is achieved.

Official Gazette of the U.S. Patent and Trademark Office

N82-12446*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (2TF) 200 MW POWER PLANT. DESIGN REQUIREMENTS DOCUMENT (DRD) Final Report

H. S. Rigo, R. W. Berczw, J. A. Burkhart, T. S. Mroz, D. J. Bents, and A. M. Hatch (MIT) Sep. 1981 88 p refs Revised (Contract DE-AI01-77ET-10769) (NASA-TM-82705; DOE/NASA/10769-20-Rev-3) Avail: NTIS

HC A05/MF A01 CSCL 10B

A description and the design requirements for the 200 MWe (nominal) net output MHD Engineering Test Facility (ETF) Conceptual Design, are presented. Performance requirements for the plant are identified and process conditions are indicated at interface stations between the major systems comprising the plant. Also included are the description, functions, interfaces and requirements for each of these major systems. The lastest information (1980-1981) from the MHD technology program are integrated with elements of a conventional steam electric power generating plant.

N82-14519*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPLICATION OF SURFACE ANALYSIS TO SOLVE PROBLEMS OF WEAR

Donald H, Buckley 1981 35 p refs Presented at the Ideele Traeger der SURTEC Berlin '81, West Germany, 29 Jun. - 3 Jul.

(NASA-TM-82753; E-1069) Avail: NTIS HC A03/MF A01 CSCL 20K

Results are presented for the use of surface analytical tools including field ion microscopy, Auger emission spectroscopy analysis (AES), cylindrical mirror Auger analysis and X-ray photoelectron spectroscopy (XPS), Data from the field ion microscope reveal adhesive transfer (wear) at the atomic level with the formation of surface compounds not found in the bulk, and AES reveals that this transfer will occur even in the presence of surface oxides. Both AES and XPS reveal that in abrasive wear with silicon carbide and diamond contacting the transition metals, the surface and the abrasive undergo a chemical or structural change which effects wear. With silicon carbide, silicon volatilizes leaving behind a pseudo-graphitic surface and the surface of diamond is observed to graphitize.

> ORIGINAL PAGE IS OF POOR QUALITY

N82-16411*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

David P. Fleming 1982 18 p refs Presented at the 52nd Shock and Vibration Symp., New Orleans 27-29 Oct. 1983; sponsored by NRL and the Machinery Vibration Monitoring and Anal, Meeting, Oak Brook, Ill., 30 Mar. + 1 Apr. 1982; sponsored by the Vibration Inst.

(NASA-TM-82786; E-1121) Avail: NTIS HC A02/MF A01 CSCL 11A

Seals can exert large forces on rotors. As an example, in turbopump ring seals film stiffness as high as 90 MN/m (500,000 lb/in) have been calculated. This stiffness is comparable to the stiffness of rotor support bearings; thus seals can play an important part in supporting and stabilizing rotor systems. The work done to determine forces generated in ring seals is reviewed. Working formulas are presented for seal stiffness and damping, and geometries to maximize stiffness are discussed, An example is described where a change in seal design stabilized a previously unstable rotor.

N82-16412*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECTS OF ARTIFICIALLY PRODUCED DEFECTS ON FILM THICKNESS DISTRIBUTION IN SLIDING EHD POINT CONTACTS

C, Cusano (Illinois Univ. at Urbana-Champaign) and L. D. Wedeven 1981 31 p refs Presented at the Joint Lubrication Conf., New Orleans, 5-7 Oct. 1981; sponsored by the Am. Soc. of Lubrication Engr. and ASME (NASA-TM-82732; E-1042)

Avail, NTIS HC A03/MF A01 CSCL 20K

The effects of artificially produced dents and grooves on the elastohydrodynamic (EHD) film thickness profile in a sliding point contact were investigated by means of optical interferometry. The defects, formed on the surface of a highly polished ball. were held stationary at various locations within and in the vicinity of the contact region while the disk was rotating. It is shown that the defects, having a geometry similar to what can be expected in practice, can dramatically change the film thickness which exists when no defects are present in or near the contact, This change in film thickness is mainly a function of the position of the defects in the inlet region, the geometry of the defects, the orientation of the defects in the case of grooves, and the depth of the defect relative to the central film thickness. Author

N82-16413*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

BASIC LUBRICATION EQUATIONS

Bernard J. Hamrock and Duncan Dowson (Leeds Univ.) Dec. 1981 87 p refs Repr. from Ball Bearing Lubrication, chapter 5, Sep. 1981 (NASA-TM-81693; E-209) Avail. NTIS HC A05/MF A01 CSCL

Lubricants, usually Newtonian fluids, are assumed to experience laminar flow. The basic equations used to describe the flow are the Navier-Stokes equation of motion. The study of hydrodynamic lubrication is, from a mathematical standpoint, the application of a reduced form of these Navier-Stokes equations in association with the continuity equation, The Reynolds equation can also be derived from first principles, provided of course that the same basic assumptions are adopted in each case. Both methods are used in deriving the Reynolds equation, and the assumptions inherent in reducing the Navier-Stokes equations are specified. Because the Reynolds equation contains viscosity and density terms and these properties depend on temperature and pressure, it is often necessary to couple the Reynolds with energy equation. The lubricant properties and the energy equation are presented. Film thickness, a parameter of the Reynolds equation, is a function of the elastic behavior of the bearing surface. The governing elasticity equation is therefore presented. A,R.H.

N82-19540* National Ae/onautics and Space Administration. Lewis Research Center, Clr veland, Ohio, COMPOSITE SEAL FOR TURBOMACHINERY Patent Robert C. Bill and Lawrence P. Ludwig, inventors (to NASA) Issued 20 Oct. 1981 5 p Filed 20 Nov. 1979 Division of US Patent Appl. SN-931090, filed 8 Aug. 1978, US Patent-4,207, 024 which is a division of US Patent Appl. SN-810290, filed 27 Mar. 1977, US Patent-4,135,851 (NASA-Casa-LEW-12131-3; US-Patent-4,295,786; US-Patent-4,207,024; US-Patent-4,135,851; US-Patent-Appl-SN-096255; US-Patent-Appl-SN-931090; US-Patent-Appl-SN-801290; US-Patent-Class-415-174; US-Patent-Class-415-196) Avail: US Patent and Trademark

Office CSCL 11A A gas path seal suitable for use with a turbine engine or compressor is provided. A shroud wearable or abradable by the abrasion of the rotor blades of the turbine or commessor shrouds the rotor blades. A compliant backing surrounds the shroud, The backing is a yieldingly deformable porous material covered with a thin ductile layer. A mounting fixture surrounds tha backing.
Official Gazette of the U.S. Patent and Trademark Office

N82-20543*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. HIGH-SPEED MOTION PICTURE CAMERA EXPERIMENTS OF CAVITATION IN DYNAMICALLY LOADED JOURNAL

Bo O. Jacobson and Bernard J. Hamrock 1982 22 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct. 1982; sponsored by ASME and American Society of Lubrication Engineers (MASA-TM-82798; E-1137; NAS 1.15:82798) HR A02/MF A01 CSCL 131

A high-speed camera was used to investigate cavitation in dynamically loaded journal bearings. The length-diameter ratio of the bearing, the speeds of the shaft and bearing, the surface material of the shaft, and the static and dynamic eccentricity of the bearing were varied. The results reveal not only the appearance of gas cavitation, but also the development of previously unsuspected vapor cavitation. It was found that gas cavitation increases with time until, after many hundreds of pressure cycles, there is a constant amount of gas kept in the cavitation zone of the bearing. The gas can have pressure of many times the atmospheric pressure. Vapor cavitation bubbles, on the other hand, collapse at pressures lower than the cimospheric pressure and cannot be transported through a high)ressure zone, nor does the amount of vapor cavitation in a bearing increase with time. Analysis is given to support the experimental findings for J.D.H. both gas and vapor cavitation.

N82-24497* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEVELOPMENT OF HIGH-SPEED ROLLING-ELEMENT BEARINGS. A HISTORICAL AND TECHNICAL PERSPEC-TIVE

Erwin V. Zaretsky 1982 28 p refs Presented at the SKF Seventy-Fifth Anniv, Celebration Meeting, Nieuwegin, Netherlands, 9 Jun. 1982; sponsored by SKF Research and Development Center

(NASA-TM-82884; E-1198: NAS 1.15;82884) Avail: NTIS HC A03/MF A01 CSCL 131

Research on large-bore ball and roller bearings for aircraft engines is described. Tapered roller bearings and small-bore bearings are discussed. Temperature capabilities of rolling element bearings for aircraft engines have moved from 450 to 589 K (350 to 600 F) with increased reliability. High bearing speeds to 3 million DN can be achieved with a reliability exceeding that which was common in commercial aircraft. Capabilities of available bearing steels and lubricants were defined and established. Consuter programs for the analysis and design of rolling element bearings were developed and experimentally verified. The reported work is a summary of NASA contributions to high performance engine and transmission bearing capabilities.

N82-25514*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRICTIONAL HEATING DUE TO ASPERITY INTERACTION OF ELASTOHYDRODYNAMIC LINE-CONTACT SURFACES Bankim C, Majumdar and Bernard J. Hamrock May 1982 23 p refs Presented at the ASME-ASLE Joint Lubrication Conf., New Orleans, 5-7 Oct. 1981

(NASA-TP-1882; E-897; NAS 1.60:1882) Avail: NTIS

HC A02/MF A01 CSCL 20K

A numerical solution of an elastohydrodynamically lubricated (EHL) line contact between two long, rough-surface cylinders that considers the frictional heating of asperitias was obtained. Pressure distribution, temperature distribution, film thickness and EHL load for given speeds, lubricant properties, material properties of surfaces, and surface roughness parameters were theoretically solved by simultaneous solution of the elasticity equation and the Reynolds equation for two partially lubricated rough surfaces. The pressure due to experity contact was calculated by assuming a Gaussian distribution of surface irregularities. The elastic deformation used for film thickness computation was found from the two kinds of pressure by mane strain analysis. The temperature rise in the contact zone was calculated by using the Blok-Jaeger flesh temperature model. The effects of surface roughness on EHL load for various slide-role ratios, surface roughness parameters, surface patterns, and temperature parameters was studied. It was found that the maximum temperature rise in most cases occurred in the injet zone, and that the minimum film thickness decreased and the maximum temperature increased as the surface roughness was increased.

N82-25518*# National Aeronautics and Space Administration. Lew/s Research Center, Cleveland, Ohio.

LUBRICATION OF RIGID ELLIPSIDA SOLIDS

Bernard J. Hamrock and Duncan Dowson (Leeds Univ., Engl.) May 1982 55 p refs

(NASA-TM-81694; E-209; NAS 1.15:81694) Avail: NTIS HC A04/MF A01 CSCL 131

The influence of geometry on the isothermal hydrodynamic film separating two rigid solids was investigated. The minimum film thickness is derived for fully flooded conjunctions by using the Reynolds boundary conditions. It was found that the minimum film thickness had the same speed, viscosity, and load dependence as Kapitza' classical solution. However, the incorporation of Reynolds boundary conditions resulted in an additional geometry effect. Solutions using the parabolic film approximation are compared by using the exact expression for the film in the analysis, Cantour plots are known that indicate in detail the pressure de solids, Author

N82-28519*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. FILM SHAPE CALCULATIONS ON SUPERCOMPUTERS

Bernard J. Hamrock 1982 10 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, 4-6 Oct. 1982 (NA SA-TM-82856; E-1225; NAS 1.15:82856) Avail: NTIS HC A02/MF A01 CSCL 09B

Both scalar and vector operations are described to demonstrate usefulness of supercomputers (computers with peak computing speeds exceeding 100 million operative per second) in solving tribological problems. A simple kernel of the film shape calculations in an elastohydrodynamic lubricated rectangular contact is presented and the relevant equations are described. Both scalar and vector versions of the film shape code are presented. The run times of the two types of code indicate that over a 50-to-1 speedup of scalar to vector computational time for vector lengths typically used in elastohydrodynamic lubrication analysis is obtained.

NB2-25520*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LUBRICANT EFFECTS ON EFFICIENCY OF A HELICOPTER TRANSMISSION

Andrew M. Mitchell and John J. Cop. 1982 16 p refs Presented at the AGARD Symp, on Probl. in Bearings and Lubrication, Ottawa, Canada, 31 May - 4 Jun. 1982

(NASA-TM-82857; E-1226; NAS 1.15:82857; AVRADCOM-TR-82-C-9) Avail: NTIS HC A02/MF A01 CSCL

Eleven different lubricants were used in efficiency tests conducted on the OH-58A helicopter main transmission using the NASA Lewis Research Center's 500 hp torque regenerative helicopter transmission test stand. Tests were run at oil-in temperatures of 355 K and 372 K. The efficiency was calculated from a heat balance on the water running through an oil to water heat exchanger which the transmission was spavily insulated. Results show an efficientcy range from 98,3% to 38.8% which is a 50% variation relative to the losses associated with the maximum efficiency measured. For a given lubricant, the efficiency increased as temperature increased and viscosity decreased. There were two exceptions which could not be explained. Between lubricants, afficiancy was not correlated with viscosity. There were relatively large variations in efficiency with the different lubricants whose viscosity generally fell in the 5 to 7 centistoke range. The lubricants had no significant effect on the vibration signature of the transmission,

N82-26674* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FULLY PLASMA-SPRAYED COMPLIANT BACKED CERAM-

IC TURBINE SEAL Patent Application
Robert C. Bill and Donald W. Wisander, inventors (to NASA) Filed 30 Nov. 1981 8 p

(NASA-Case-LEW-13268-2; US-Patent-Appl-SN-325931) Avail:

NASA-CESS-LEVY-1320-2, SCL 11A

A S2al with a high temperature abradable lining material which envircles the tips of turbine blades in turbomachinery was designed. The seal is directed to maintaining the minimum operating clearances between the blade tips and the lining of a high pressure turbine. A low temperature easily decomposable material in powder form is blended with a high temperature oxidation resistant metal powder. The two materials are simultaneously deposited on a substrate formed by the turbine casing. Alternately, the polymer powder may be added to the metal powder during plasma spraying. A ceramic layer is then deposited directly onto the metal-polymer composite. The polymer additive mixed with the metal is then completely volatilized to provide a porous layer between the ceramic layer and the substrate. Thermal stresses are reduced by the porous structure which gives a cushion effect. No brazing is required by using only plasma spraying for depositing both the powders of the metal and polymer material as well as the ceramic powder.

N82-26678* # National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

MULTIROLLER TRACTION DRIVE SPEED REDUCER: EVALUATION FOR AUTOMOTIVE GAS TURBINE ENGINE Douglas A. Rohn, Neil E. Anderson, and Stuart H. Loewenthal Jun. 1982 24 p refs Prepared in cooperation with Army Aviation Research and Development Command, Cleveland, Ohio (NASA-TP-2027; E-1002; NAS 1.60:2027;

AVRADCOM-TR-81-C-11) Avail: NTIS HC A02/MF A01 CSCL

Tests were conducted on a nominal 14:1 fixed-ratio Nasvytis multiroller traction drive retrofitted as the speed reducer in an automotive gas turbine engine. Power turbine speeds of 45,000 rpm and a drive output power of 102 kW (137 hp) were reached. The drive operated under both variable roller loading (proportional to torque) and fixed roller loading (automatic loading mechanism locked). The drive operated smoothly and efficiently as the engine speed reducer. Engine specific fuel consumption with the traction speed reducer was comparable to that with the original helical gearset.

N82-26681* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TOOTH PROFILE ANALYSIIS OF CIRCULAR-CUT, SPIRAL-BEVEL GEARS

Ronald L. Huston (Cincinnati Univ.), Yael Lin (Technion - Israel Inst, of Technology), and John J. Coy 1982 20 p refs Presented at the Design Engr. Tech. Conf., Washington, D.C., 12-15 Sep. 1982; sponsored by ASME Prepared in cooperation with Army Aviation Research and Development Command, Cleveland, Ohio (NASA-TM-82840; E-1209; NAS 1.15 82840;

AVRADCOM-TR-82-C-05) Avail: NTIS HC A02/MF A01 CSCL

An analysis of tooth profile changes in the transverse plane of circular-cut, spiral-bevel crown gears is presented. The analysis assumes a straight-line profile in the mid-transverse plane. The profile variation along the centerline is determined by using expressions for the variation of the spiral angle along the tooth centerline, together with the profile description at the mid-transverse plane. It is shown that the tooth surface is a hyperboloid and that significant variations in the pressure angle are possible. Author

> ORIGINAL PAGE IS OF POOR QUALITY

N82-28643*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

RELIABILITY MODEL FOR PLANETARY GEAR

Michael Savage (Akron Univ.), Charles A. Paridon (Hewlett Packard Co., Sunnyvale, California), and John J. Coy (Army Aviation Research and Development Command, Cleveland, Ohio) 1982 22 p reis Proposed for Presentation at Design Engr. Tech. Conf., Washington, D.C., 12-15 Sep. 1982, sponsored by ASME Prepared in cooperation with Army Aviation Research and **Development Command**

(NASA-TM-82859; NAS 1 15 82859; AVRADCOM-TR-82-C-6)

Avail NTIS HC A02/MF A01 CSCL 131

A reliability model is presented for planetary gear trains in which the ring gear is fixed, the Sun gear is the input, and the planet arm is the output. The input and output shafts are coaxial and the input and output torques are assumed to be coaxial with these shafts. Thrust and side loading are neglected. This type of gear train is commonly used in main rotor transmissions for helicopters and in other applications which require high reductions in speed. The reliability model is based on the Weibull distribution of the individual reliabilities of the transmission components. The transmission's basic dynamic capacity is defined as the input torque which may be applied for one million input rotations of the Sun gear Load and life are related by a power law. The load life exponent and basic dynamic capacity are developed as functions of the component capacities.

NB2-28644*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

ADVANCES IN HIGH-SPEED ROLLING-ELEMENT BEAR-INGS

Erwin V Zaretsky 1982 29 p refs Presented at the 16th Ann Israel Conf. on Mechan Engr. Haifa. Israel, 12-14 Jul. 1987, sponsored by Technion - Israel Inst. of Tech. (NASA-TM-82910, E-1295, NAS 1.15/82910) Avail: NTIS HC A03/MF A01 CSCL 131

Aircraft engine and transmission rolling-element bearing state-of-the-art is summarized.

NS2-28645*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. THE OPTIMAL DESIGN OF INVOLUTE GEAR TEETH WITH

UNEQUAL ADDENDA

Michael Savage (Akron Univ.), John J. Coy (Army Aviation Research and Development Command, Cleveland, Ohio), and Dennis P Townsend 1982 8 p refs Presented at Tenth World Congr. on System Simulation and Sci. Computation, Montreal, 8-13 Aug 1982; sponsored by Intern Assoc for Mathematics and Computers in Simulation (NASA-TM-82866; E-1235; NAS 1 15:82866;

AVRADCOM-TR-82-C-7) Avail NTIS HC A02/MF A01 CSCL

The design of a gear mesh is treated with the objective of minimizing the gear size for a given gear ratio, pinion torque, pressure angle, and allowable tooth lengths. Tacth strengths considered include scoring, pitting fatigue, and bending fatigue. Kinematic involute interference is avoided. The design variation on standard spur gear teeth called the long and short addendum system, is considered in this system the mesh center distance and pressure angle are maintained as is the ability to manufacture the teeth with standard tooling. However, the pinion and gear tooth proportions are altered in order to obtain fewer teeth numbers for the same ratio as standard gears without kinematic involute interference. The effect of this nonstandard gearing geometry with on tooth strengths and gear mesh size are studied. For a 2.1 gearing ratio, the optimal nonstandard gear design is compared with the optimal standard gear design.

N82-28646*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

A FINITE ELEMENT STRESS ANALYSIS OF SPUR GEARS INCLUDING FILLET RADII AND RIM THICKNESS EF-

S. H. Chang (Cincinnati Univ.), R. L. Huston (Cincinnati Univ.), and J. J. Coy. 1982 12 p. refs. Proposed for presentation at Ann. Meeting of ASME, Phoenix, Ariz... 14-19 Nov. 1982 Prepared in cooperation with Army Aviation Research and Development Command, Cleveland, Ohio (NASA-TM-82865; E-1234; NAS 1.15.82865,

AVRADCOM-TR-82-C-8) Avail: NTIS HC A02/MF A01 CSCL

Spur gear stress analysis results are presented for a variety of loading conditions, support conditions, fillet radii, and rim thickness. These results are obtained using the SAP IV finiteelement code. The maximum stresses, occurring at the root surface, substantially increase with decreasing rim thickness for partially supported rims (that is, with loose-fitting hubs). For fully supported rims (that is, with tight-fitting hubs), the root surface stresses slightly decrease with decreasing rim thickness. The fillet radius is found to have a significant effect upon the maximum stresses at the root surface. These stresses increase with increasing fillet radius. The fillet radius has little effect upon the internal root section stresses.

N82-30552*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. PRECISION OF SPIRAL-BEVEL GEARS

. L. Litviri (Univ. of Chicago at Chicago Circle), R. N. Goldrich (Univ. of Chicago at Chicago Circle), J. J. Coy, and E. V. Zaretsky 1982 26 p refs Presented at the Winter Ann. Meeting of the Am, Soc. of Mech. Engr., Phoenix, Ariz., 15-19 Nov. 1982 Sponsored in part by AVRADCOM Research and Technology

(NASA-TM-82888; E-1996; NAS 1,15;82888; AVRADCOM-TR-82-C-11) Avail: NTIS HC A03/MF A01 CSCL 13

The kinematic errors in spiral bevel gear trains caused by the generation of nonconjugate surfaces, by axial displacements of the gears during assembly, and by eccentricity of the assembled gears were determined. One mathematical model corresponds the motion of the contact ellipse across the tooth surface, (geometry I) and the other along the tooth surface (geometry II). The following results were obtained: (1) kinematic errors induced by errors of manufacture may be minimized by applying special machine settings, the original error may be reduced by order of magnitude, the procedure is most effective for geometry 2 gears, (2) when trying to adjust the bearing contact pattern between the gear teeth for geometry 1 gears, it is more desirable to shim the gear axially; for geometry II gears, shim the opinion axially: (3) the kinematic accuracy of spiral bevel drives are most sensitive to eccentricities of the gear and less sensitive to eccentricities of the pinion. The precision of mounting accuracy and manufacture are most crucial for the gear, and less so for the pinion.

M82-31691*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

INFLUENCE OF CORROSIVE SOLUTIONS ON MICROHARD-NESS AND CHEMISTRY OF MAGNESIUM OXIDE /001/ SUR-**FACES**

Hiroyuki Ishigaki (Osaka Univ.), Kazuhisa Miyoshi, and Donald H. Buckley Aug. 1982 11 p refs (NASA-TP-2040; E-1035; NAS 1.60:2040)

Avail: NTIS HC A02/MF A01 CSCL 20K

X-ray photoelectron spectroscopy analyses and hardness experiments were conducted on cleaved magnesium oxide /001/ surfaces. The magnesium oxide bulk crystals were cleaved to specimen size along the /001/ surface, and indentations were made on the cleaved surface in corrosive solutions containing HCI, NaOH, or HNO3 and in water without exposing the specimen to any other environment. The results indicated that chloride (such as MgCl2) and sodium films are formed on the magnesium oxide surface as a result of interactions between an HCI-containing solution and a cleaved magnesium oxide surface. The chloride films soften the magnesium oxide surface. In this case microhardness is strongly influenced by the pH value of the solution. The lower the pH, the lower the microhardness. Sodium films, which are formed on the magnesium oxide surface exposed to an NaOH containing solution, do not soften the magnesium oxide surface.

N82-32733*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. KINEMATIC PRECISION OF GEAR TRAINS

F. L. Litvin (Illinois Univ. at Chicago Circle), R. N. Goldrich (Illinois

Univ. at Chicago Circle), John J. Coy (AVRADCOM Research and Technology Lab., Cleveland, Ohio), and E. V. Zaretsky 1982 40 p. refs Proposed for presentation at the Winter Ann. Meeting of the ASME, Phoenix, 15-19 Nov. 1982

(NASA-TM-82887; E-1191; NAS 1.15:82887;

AVRADCOM-TR-82-C-10) Avail: NTIS HC A03/MF A01 CSCL 131

Kinematic precision is affected by errors which are the result of either intentional adjustments or accidental defects in manufacturing and assembly of gear trains. A method for the determination of kinematic precision of gear trains is described. The method is based on the exact kinematic relations for the contact point motions of the gear tooth surfaces under the influence of errors. An approximate method is also explained. Example applications of the general approximate methods are demonstrated for gear trains consisting of involute (spur and helical) gears, circular arc (Wildhaber-Novikov) gears, and spiral bevel gears. Gear noise measurements from a helicopter transmission are presented and discussed with relation to the kinematic precision theory.

N82-32734*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE INFLUENCE SE SURFACE DENTS AND GROOVES ON TRACTION IN SLIDING EHD POINT CONTACTS

C. Cusano (Illinois Univ., Urbana-Champaign) and L. D. Wedeven 1982 14 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct., 1982; sponsored by AMSE and Am. Soc. of Lubrication Engr.

(NASA-TM-82943; E-1345; NAS 1.15:32943)

HC A02/MF A01 CSCL 20K

Changes in traction, caused by dents and grooves on a highly polished ball, are investigated as these defects approach and go through sliding elastohydrodynamic point contacts. The contacts are formed with the ball loading against a transparent disk. The ball and thus the topographical features are held stationary at various locations in the vicinity and within the contact while the disk is rotating. These topographical features can cause substantial changes in the traction when compared to traction obtained with smooth surfaces.

N82-32735*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PLASTIC DEFORMATION AND WEAR PROCESS AT A SUR-FACE DURING UNLUBRICATED SLIDING

Takashi Yamamoto (Tokyo Univ. of Agriculture and Technology, Japan) and Donald H. Buckley 1982 36 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 4-6 Oct. 1982; sponsored by ASME and the Am. Soc. of Lubrication Engr.

(NASA-TM-82820; E-1168; NAS 1.15:82820) Avail: NTIS

HC A03/MF A01 CSCL 20K

The plastic deformation and wear of a 304 stainless stepl surface sliding against an aluminum oxide rider with a spherical surface (the radius of curvature: 1.3 cm) were observed by using scanning electron and optical microscopes, Experiments were conducted in a vacuum of one million Pa and in an environment of fifty thousandth Pa of chlorine gas at 25 C. The load was 500 grams and the sliding velocity was 0.5 centimeter per second. The deformed surface layer which accumulates and develops successively is left behind the rider, and step shaped proturbances are developed even after single pass sliding under both environmental conditions. A fully developed surface layer is gradually torn off leaving a characteristic pattern. The mechanism for tearing away of the surface layer from the contact area and sliding track contour is explained assuming the simplified process of material removal based on the adhesion theory for the wear of materials.

N82-32736*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF SHOT PEENING ON SURFACE FATIGUE LIFE OF CARBURIZED AND HARDENED AISI 9310 SPUR GEARS

Dennis P. Townsend and Erwin V. Zaretsky Aug. 1982 14 p refs (NASA-TP-2047; E-936; NAS 1,60;2047) Avail: NTIS HC A02/MF A01 CSCL 13I

Surface fatigue tests were conducted on two groups of AISI 9310 spur gears. Both groups were manufactured with standard ground tooth surfaces, with the second group subjected to an additional shot peening process on the gear tooth flanks. The gear pitch diameter was 8.89 cm (3.5 in.). Test conditions were a gear temperature of 350 K (170 F), a maximum Hertz stress of 1.71 billion N/sq m (248,000 psi), and a speed of 10,000 rpm. The shot peened gears exhibited pitting fatigue lives 1.6 times the life of standard gears without shot peening. Residual stress measurements and analysis indicate that the longer fatigue life is the result of the higher compressive stress produced by the shot peening. The life for the shot peened gear was calculated to be 1.5 times that for the plain gear by using the measured residual stress difference for the standard and shot peened gears. The measured residual stress for the shot peened gears was much higher than that for the standard gears.

N82-32737*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

WEAR MECHANISM BASED ON ADHESION

Takashi Yamamoto and Donald H. Buckley Aug. 1982 13 p refs

(NASA-TP-2037; E-1118; NAS 1.60:2037) Avail: NTIS HC A02/MF A01 CSCL 11A

Various concepts concerning wear mechanisms and deformation behavior observed in the sliding wear track are surveyed. The mechanisms for wear fragment formation is discussed on the basis of adhesion. The wear process under unlubricated sliding conditions is explained in relation to the concept of adhesion at the interface during the sliding process. The mechanism for tearing away the surface layer from the contact area and forming the sliding track contour is explained by assuming the simplified process of material removal based on the adhesion theory. S.L.

A82-18434 " Effect of surface roughness on elastohydrodynamic line contact. B. C. Majumdar and B. J. Hamrock (NASA, Lewis Research Center, Cleveland, OH). American Society of Mechanical Engineers and American Society of Lubrication Engineers, Joint Lubrication Conference, New Orleans, LA, Oct. 5-7, 1981, ASME Paper 81-Lub-23. 7 p. 17 refs, Members, \$2.00; nonmembers, \$4.00.

A numerical solution of an elastohydrodynamic lubrication (EHL) contact between two long rough surface cylinders is obtained. A simultaneous solution of an elasticity equation and the Reynolds equation for two partially lubricated rough surfaces is used to obtain a theoretical solution of pressure distribution, elastohydrodynamic load and film thicknesses for given speeds. A theoretical solution is also found for lubricants with pressure dependent viscosity, material properties of cylinders, and surface roughness parameters, Elastic deformation is found from hydrodynamic and contact pressure using plane strain analysis, and results indicate that for a constant central film thickness, increasing the surface roughness decreases the EHL load and there is little variation in minimum film thicknesses as the surface roughness is increased.

A82-18436 * # Effects of ultra-clean and centrifugal filtration on rolling-element bearing life, S. H. Loewenthal (NASA, Lewis Research Center, Cleveland, OH), D. W. Moyer (Tribon Buaring Co., Cleveland, OH), and W. M. Needelman (Pall Corp., Glen Cove, NY). American Society of Mechanical Engineers and American Society of Lubrication Engineers, Joint Lubrication Conference, New Grleans, LA, Oct. 5-7, 1981, ASME Paper 81-Lub-35. 9 p. 20 refs. Members, \$2.00; nonmembers, \$4.00,

Fatigue tests were conducted on groups of 65-mm bore diameter deep-groove ball bearings in a MIL-L-23699 lubricant under two levels of filtration to determine the upper limit in bearing life under the strictest possible lubricant cleanliness conditions. Bearing fatigue lives, surface distress and weight loss were compared to previous

bearing fatigue tests in contaminated and noncontaminated oil filters having absolute removal ratings of 3, 20, 49, and 105 microns, with lubricant and sump temperatures maintained at 347 K. Ultra clean lubrication was found to produce bearing fatigue lives that were approximately twice that obtained in previous tests with contaminated oil using 3 micron absolute filtration, it was also observed that the centrifugal oil filter has the same effectiveness as a 30 micron absolute filter in preventing surface damage.

D,L.G.

A82-18680 Adhesion and friction of single-crystal diamond in contact with transition metals. K. Miyoshi and D. H. Buckley (NASA, Lewis Research Center, Cleveland, OH). Applications of Surface Science, vol. 6, 1980, p. 161-172, 12 refs.

An investigation was conducted to examine the adhesion and friction of single-crystal diamond in contact with various transition metals and the nature of metal transfer to diamond. Sliding friction experiments were conducted with diamond in sliding contact with the metals yttrium, titanium, zirconium, vanadium, iron, cobalt, nickel, tungsten, platinum, rhenium and rhodium. All experiments were conducted with loads of 0.05 to 0.3 N, at a sliding velocity of 0.003 m per minute, in a vacuum of 10 to the 8th Pa, at room temperature, and on the (111) plane of diamond with sliding in the 110 line type direction. The results of the investigation indicate that the coefficient of friction for diamond in contact with various metals is related to the relative chemical activity of the metals in high vacuum. The more active the metal, the higher the coefficient of friction, All the metals examined transferred to the surface of diamond in sliding. (Author)

A82-19335 * # Optimal tooth numbers for compact standard spur gear sets. M. Savage (Akron, University, Akron, OH), J. Coy (U.S. Army, Propulsion Laboratory, Cleveland, OH), and D. P. Townsend (NASA, Lewis Research Center, Cleveland, OH), American Society of Mechanical Engineers, Design Engineering Technical Conference, Hartford, CT, Sept. 20-23, 1981, Paper 81-DET-115. 9 p. 23 refs. Members, \$2.00; nonmembers, \$4.00.

The design of a standard gear mesh is treated with the objective of minimizing the gear size for a given ratio, pinlon torque, and allowable tooth strength. Scoring, pitting fatigue, bending fatigue, and the kinematic limits of contact ratio and interference are considered. A design space is defined in terms of the number of teeth on the pinion and the diametral pitch. This space is then combined with the objective function of minimum center distance to obtain an optimal design region. This region defines the number of pinion teeth for the most compact design. The number is a function of the gear ratio only. A design example illustrating this procedure is also given.

A82-30022 * Effect of tangential traction and roughness on crack initiation/propagat an during rolling contact. N. Soda (Tokyo, University, Tokyo, Japan) and T. Yamamoto (NASA, Lewis Research Center, Cleveland, OH; Tokyo University of Agriculture and Technology, Tokyo, Japan). (American Society of Lubrication Engineers, Annual Meeting, 36th, Pittsburgh, PA, May 11-14, 1981.) ASLE Transactions, vol. 25, Apr. 1982, p. 198-205; Discussion, p. 205; Authors' Closure, p. 205, 206. 17 refs. (Previously announced in STAR as N81-11395)

A82-35036 * # Small gas turbine combustor primary zone development. R. E. Sullivan, A. S. Novick, G. A. Miles (General Motors Corp., Detroit Diesel Allison Div., Indianapolis, IN), and D. Briehl (NASA, Lewis Research Center, Cleveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1159. 11 p. 6 refs. Contract No. NAS3-22762.

Designers of small gas turbine engines prefer a close-coupled compressor to turbine shafting arrangement, which in some designs necessitates the use of a small reverse-flow annular combustor. A design methodology for obtaining the maximum performance potential of these combustors is necessary. This paper describes an approach to optimize the design process and gain insight into primary zone performance through interactive theoretical analyses and experimental tests. Three candidate combustor designs are described which address the performance limiting problem areas associated with small annular combustors. Design methodology centers around understanding and controlling primary zone

aerodynamics and the interaction of the distributed fuel with internal airflow patterns. Complete three-dimensional flow field analytical performance prediction procedures are presented and results compared with performance and emission measurements described by probos located at the exit of the primary zone. The effective use of analytical performance prediction methods in the design process is demonstrated.

function and, thus, increase the dynamic loads in spur gearing. In addition, a finite element stress and mesh subprogram was developed for future introduction into the main program for calculating the gear tooth bending stresses under dynamic

A82-35062 "# Combustor development for automotive gas turbines. P. T. Ross, J. R. Williams (General Motors Corp., Detroit Diesel Allison Div. Indianapolis, IN), and D. N. Anderson (NAGA, Lewis Research Center, Cleveland, OH). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1208, 9 p. 9 refs. Research supported by the U.S. Department of Energy; Contract No. DEN3-168.

The development of a combustion system for the AGT 100 automotive gas turbine engine is described. A maximum turbine inlet temperature of 1288 C in reached during the regenerative cycle, and air up to 1024 C is supplied to the combustor inlet. A premix/prevaporization ceramic combustor employing variable geometry to control burning zone temperature was developed and tested. Tests on both metal and ceramic combustors showed that emissions were a function of burner inlet temperature (BIT). At 999 C BIT, NO(x) emissions were two orders of magnitude below program goals, and at the same temperature but at a different variable geometry position, the CO was 30 times below program goal. Tests to evaluate the durability of the ceramic materials showed no failures during steady-state operation; however, some cracks developed in the dome during extended transient operation.

A82-35468 * # Nonlinear analysis of rotor-bearing systems using component mode synthesis. H. D. Nelson, W. L. Meacham (Arizona State University, Tempe, AZ), D. P. Fleming (NASA, Lewis Research Center, Cleveland, OH), and A. F. Kascak (U.S. Army, Propulsion Laboratory, Cleveland, OH). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-(37-403, 10 p. 19 refs. Members, \$2.00; nonmembers, \$4.00. Grant Ivo. NAG3-6.

The method of component mode synthesis is developed to determine the forced response of nonlinear, multishaft, rotor-bearing systems. The formulation allows for simulation of system response due to blade loss, distributed unbalance, base shock, maneuver loads, and specified fixed frame forces. The motion of each rotating component of the system is described by superposing constraint modes associated with boundary coordinates and constrained precessional modes associated with internal coordinates. The precessional modes are truncated for each component and the reduced component equations are assembled with the nonlinear supports and interconnections to form a set of nonlinear system equations of reduced order. These equations are then numerically integrated to obtain the system response. A computer program, which is presently restricted to single shaft systems, has been written and results are presented for transient system response associated with blade loss dynamics with squeeze film dampers, and with interference rubs.

A82-37854 * Performance of PTFE-lined composite journal bearings. H. E. Sliney (NAS/4, Lewis Research Center, Cleveland, OH) and F. J. Williams (Rockwell International Corp., North American Aviation Div., Los Angeles, CA). American Society of Lubrication Engineers, Annual Meeting, 37th, Cincinnati, Oir, May 10-13, 1982, Preprint 82-AM-1A-1. 7 p. 10 refs. Contract No. NAS3-22123. (Previous) announced in STAR as N82-17263)

N82-10401*# Cleveland State Univ., Ohio. Dept. of Mechanical Engineering.

A MULTI-PURPOSE METHOD FOR ANALYSIS OF SPUR GEAR TOOTH LOADING Final Report
R. Kasuba, J. W. Evans, R. August, and J. L. Frater Oct. 1981

106 p refs

(Contract NAS3-18547)

(NASA-CR-165163) Avail: NTIS HC A06/MF A01 CSCL

A large digitized approach was developed for the static and dynamic load analysis of spur gearing. An iterative procedure was used to calculate directly the 'variable-variable' gear mesh stiffness as a function of transmitted load, gear tooth profile errors, gear tooth deflections and gear hub torsional deformation, and position of contacting profile points. The developed approach can be used to analyze the loads, Hertz stresses, and PV for the normal and high contrast ratio gearing, presently the modeling is limited to the condition that for a given gear all teeth have identical spacing and profiles (with or without surface imperfections). Certain types of simulated sinusoidal profile errors and pitting can cause interruptions of the gear mesh stiffness

N82-11465*# Rocketdyne, Caroga Park, Calif. ADVANCED SUPERPOSITION METHODS FOR HIGH SPEED TURBOPUMP VIBRATION ANALYSIS Interim Report C. E. Nielson and A. D. Campany 19 May 1981 96 p refs (Contract NAS3-22480) (NASA-CR-165379; RI/RD81-149) Avail: NTIS HC A05/MF A01 CSCL 131

The small, high pressure Mark 48 liquid hydrogen turbopump was analyzed and dynamically tested to determine the cause of high speed vibration at an operating speed of 92,400 rpm. This approaches the design point operating speed of 95,000 rpm, The initial dynamic analysis in the design stage and subsequent further analysis of the rotor only dynamics failed to predict the vibration characteristics found during testing. An advanced procedure for dynamics analysis was used in this investigation. The procedure involves developing accurate dynamic models of the rotor assembly and casing assembly by finite element analysis. The dynamically instrumented assemblies are independently rap tested to verify the analytical models. The verified models are then combined by modal superposition techniques to develop a completed turbopump model where dynamic characteristics (ire determined. The results of the dynamic testing and analysis obtained are presented and methods of moving the high speed vibration characteristics to speeds above the operating range are recommended. Recommendations for use of these advanced dynamic analysis procedures during initial design phases are Author

N82-11466*# Mechanical Technology, Inc., Latham, N, Y.
PRELIMINARY STUDY OF TEMPERATURE MEASUREMENT TECHNIQUES FOR STIRLING ENGINE RECIPROCATING SEALS Final Report

Donald F, Wilcock, Leo Hoogenboom, Maarten Meinders, and Ward O. Winer Aug. 1981 82 p Prepared in cooperation with Georgia Inst. of Tech,

(Contracts DEN3-227; DE-AI01-77CS-51040)

(NASA-CR-165479; DOE/NASA/0227-1; MTIB2-TR-4) Avail: NTIS HC A05/MF A01 CSCL 11A

Methods of determining the contact surface temperature in reciprocating seals are investigated. Direct infrared measurement of surface temperatures of a rod exiting a loaded cap seal or simulated seal are compared with surface thermocouple measurements. Significant cooling of the surface requires several milliseconds so that exit temperatures may be considered representative of internal contact temperatures.

N82-11467* Pratt and Whitney Aircraft Group, East Hartford, Commercial Products Div.

JT8D HIGH PRESSURE COMPRESSOR PERFORMANCE IMPROVEMENT Progress Report, Sep. 1978 - Apr. 1981 W. O. Gaffin 11 Nov. 1981 47 p ref

(Contract NAS3-20630)

(NASA-CR-165531; NTIS PWA-5515-162) Avail:

HC A03/MF A01 CSCL 131

An improved performance high pressure compressor with potential application to all models of the JT8D engine was designed. The concept consisted of a trenched abradable rubstrip which mates with the blade tips for each of the even rotor stages. This feature allows tip clearances to be set so blade tips run at or near the optimum radius relative to the flowpath wall, without the danger of damaging the blades during transients and maneuvers. The improved compressor demonstrated thrust specific fuel consumption and exhaust gas temperature improvements of 1.0 percent and at least 10 C over the takeoff and climb power range at sea level static conditions, compared to a bili-of-material high pressure compressor. Surge margin also improved 4 percentage points over the high power operating range. A thrust specific fuel consumption improvement of 0.7 percent at typical cruise conditions was calculated based on the sea level test results,

NS2-11468*# Rocketdyne, Canoga Park, Calif. LIQUID OXYGEN TURBOPUMP TECHNOLOGY Finel Report

C. E. Nielson Nov. 1981 252 p refs (Contract NAS3-21356)

(NASA-CR-165487; RI/RD81-199) Avail: NTIS

HC A12/MF A01 CSCL 13I
A small, high-pressure, LOX turbopump was designed, fabricated and tested. The pump is a single-stage centrifugal type with power to the pump supplied by a single-stage partial-admission axial-impulse turbine, Design conditions included an operating speed of 7330 rad/s (70,000 rpm), pump discharge pressure of 2977 N/sqcm (4318 psia), and a pump flowrate of 16.4 Kg/s (36,21 lb/s). The turbopump contains a self-compensating axial thrust balance piston to eliminate axial thrust loads on the bearings during steady-state operation. Testing of the turbopump was achieved using a gaseous hydrogen high-pressure flow to drive the turbine, which generally is propolled by LOX/LH2 combustion products, at 1041K (1874 R) inlet temperature and at a design pressure ratio of 1.424. Test data obtained with the turbopump are presented which include head-flow-efficiency performance, suction performance, balance piston performance and LOX seal performance. Mechanical performance of the turbooump is also discussed.

N82-12444*# Chrysler Corp., Detroit, Mich, AGT-102 AUTOMOTIVE GAS TURBINE

Summary Report Jun. 1981 434 p refs Sponsored by NASA. Lewis Research Center Prepared jointly with Williams Research Corp., Walled Lake, Mich.

(Contract DE-AC02-76CS-52749)

(NASA-CR-165353: DOE/NASA/2749-81/1) Avail: NTIS

HC A19/MF A01 CSCL 131

Development of a gas turbine powertrain with a 30% fuel economy improvement over a comparable S1 reciprocating engine, operation within 0.41 HC, 3.4 CO, and 0.40 NOx grams per mile emissions levels, and ability to use a variety of alternate fuels is summarized. The powertrain concept consists of a single-shaft engine with a ceramic inner shell for containment of hot gasses and support of twin regenerators, it uses a fixed-geometry, lean, premixed, prevaporized combustor, and a ceramic radial turbine rotor supported by an air-lubricated journal bearing. The engine is coupled to the vehicle through a widerange continuously variable transmission, which utilizes gearing and a variable-ratio metal compression belt. A response assist flywheel is used to achieve acceptable levels of engine response. The package offers a 100 lb weight advantage in a Chrysler K Car front-wheel-drive installation. Initial layout studies, preliminary transient thermal analysis, ceramic inner housing structural analysis, and detailed performance analysis were carried out for the basic engine.

N82-12445*# Bales-McCoin Tractionmatic, Inc., El Paso, Tex. DESIGN STUDY OF A CONTINUOUSLY VARIABLE ROLLER CONE TRACTION CVT FOR ELECTRIC VEHICLES Final Report

Dan K. McCoin and R. D. Walker Sep. 1980 197 p refs (Contract DEN3-115; EC-77-A-31-1044) (NASA-CR-159841; DOE/NASA/0115-80/1;

Balas-McCoin-80-BMT-002) Avail: NTIS HC A09/MF A01 **CSCL 13I**

Continuously variable ratio transmissions (CVT) featuring cone and roller traction elements and computerized controls are studied. The CVT meets or exceeds all requirements set forth in the design criteria, Further, a scalability analysis indicates the basic concept is applicable to lower and higher power units, with upward scaling for increased power being more readily accomplished.

N82-13427*# Aerojet Nuclear Systems Co., Sacramento, Calif.
LOW-THRUST CHEMICAL PROPULSION SYSTEM PUMP **TECHNOLOGY Final Report**

R. L. Sabiers and A. Siebenhaar Mar. 1981 201 p refs (Contract NAS3-21960)

(NASA-CR-165219) Avail: NTIS HC A10/MF A01 CSCL 13K

Candidate pump and driver systems for low thrust cargo orbit transfer vehicle engines which deliver large space structures

to geosynchronous equatorial orbit and beyond are evaluated. The pumps operate to 68 atmospheres (1000 psi) discharge prossure and flowrates suited to cryogenic engines using either LOX/methane or LOX/hydrogen propellants in thrust ranges from 445 to 8900 N (100 to 2000 lb F). Analysis of the various pumps and drivers indicate that the low specific speed requirement will make high fluid efficiencies difficult to achieve. As such, multiple stages are required. In addition, all pumps require inducer stages. The most attractive main pumps are he multistage centrifugal pumps.

N82-14520# Massachusetts Inst. of Tech., Cambridge. National Magnet Lab.

CONCEPTUAL DESIGN OF SUPERCONDUCTING MAGNET SYSTEM FOR MAGNETOHYDRODYNAMIC (MHD) ENGI-NEERING TEST FACILITY (ETF) 200 MW. POWER PLANT

Final Report Nov. 1981 259 p refs

(Grant NAG3-100)

NTIS (NASA-CR-165053; FBNML-NAS-E-2) Avail:

HC A12/MF A01 CSCL 14B

A super conducting magnet system conceptual design to meet the requirements of a magnetohydrodynamic test facility sower train is presented. A detailed description of the magnet is accompanied by numerous engineering drawings. Functional requirements, system interfaces, and design criteria are reviewed, System limits, safety precautions, operational procedures, and maintenance procedures are discussed,

N82-16409*# Transmission Research, Inc., Cleveland, Ohio. TRACTIO(1) CONTACT PERFORMANCE EVALUATION AT HIGH SPEEDS Interim Report

Joseph L. Tevaarwerk (Applied Tribology Ltd.) Sep. 1981 193 p refs

(Contract DEN3-35; EC-77-A-31-1011)

(NASA-CR-165226; DOE/NASA/0035-1) HC A09/MF A01 CSCL 131 NTIS

The results of traction tests performed on two fluids are presented. These tests covered a pressure range of 1.0 to 2.5 GPa, an inlet temperature range of 30 'C to 70 'C, a speed range of 10 to 80 m/sec, aspect ratios of .5 to 5 and spin from 0 to 2.1 percent. The test results are presented in the form of two dimensionless parameters, the initial traction slope and the maximum traction peak. With the use of a suitable rheological fluid model the actual traction curves measured can now be reconstituted from the two fluid parameters. More importantly, the knowledge of these parameters together with the fluid rheological model, allow the prediction of traction under conditions of spin, slip and any combination thereof. Comparison between theoretically predicted traction under these conditions and those measured in actual traction tests shows that this method gives good results.

N82-16410*# Eaton Corp., Southfield, Mich. Engineering and Research Center.

SMALL PASSENGER CAR TRANSMISSION TEST: CHEV-ROLET MALIBU 200C TRANSMISSION WITH LOCKUP

M. P. Bujold Aug, 1981 245 p refs (Contracts DEN3-124: DE-AI01-77CS-51044)

(NASA-CR-165182; DOE/NASA/0124-6; ERC-TR-8125) Avail:

NTIS CSCL 13F

The small passenger car transmission test was initiated to supply electric vehicle manufacturers with technical information regarding the performance of commercially available transmissions, This information would enable EV manufacturers to design a more energy efficient vehicle, With this information the manufacturers would be able to estimate vehicle driving range as well as speed and torque requirements for specific road load performance characteristics. This report covers the testing of a Chevrolet Malibu 200C automatic transmission with lockup. The transmission was tested in accordance with a passenger car automatic transmission test code (SAE J651b) which required drive performance, coast performance, and no load test conditions. Under these test conditions, the transmission attained maximum efficiencies in the mid 90 percent range both for drive performante test and coast performance tests. The torque, speed and efficiency curves map the complete performance characteristics for the Chevrolet Malibu 200C automatic transmission with lockup.

Author

N82-18603°# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

JTDD CERAMIC OUTER AIR SEAL SYSTEM REFINEMENT PROGRAM Progress Report, Jan. 1979 - Feb. 1981 W. O. Gaffin 27 Jan. 1982 84 p refs (Contract NAS3-20630)

(NASA-CR-165554; PWA-6 HC A05/MF A01 CSCL 11A PWA-5515-165) NTIS

The abradability and durability characteristics of the plasma sprayed system were improved by refinement and optimization of the plasma spray process and the metal substrate design. The acceptability of the final seal system for engine testing was demonstrated by an extensive rig test program which included thermal shock tolerance, thermal gradient, thermal cycle, erosion, and abradability tests. An interim seal system design was also subjected to 2500 endurance test cycles in a JT9D-7 engine.

N82-20540*# SKF Technology Serrices, King of Prussia, Pa. Technology Services.

SPHERICAL ROLLER BEARING ANALYSIS. SKF COMPUT-ER PROGRAM SPHERBEAN, VOLUME 1: ANALYSIS Final Report, Jun. 1978 - Dec. 1980

R. J. Kleckner and J. Pirvics Dec. 1980 86 p refs 3 Vol. (Contract NAS3-20824)

(NASA-CR-165203; NAS 1.26:165203; ATB1D006-Vol-1)

Avail: NTIS HC A05/MF A01 CSCL 131

The models and associated mathematics used within the SPHERBEAN computer program for prediction of the thermomechanical performance characteristics of high speed lubricated double row spherical roller bearings are presented. The analysis allows six degrees of freedom for each roller and three for each half of an optionally split cage. Roller skew, free lubricant, inertial loads, appropriate elastic and friction forces, and flexible outer ring are considered. Roller quasidynamic equilibrium is calculated for a bearing with up to 30 rollers per row, and distinct roller and flange geometries are specifiable. The user is referred to the material contained here for formulation assumptions and algorithm detail,

N82-2:3541*# SKF Technology Services, King of Prussia, Pa. Technicogy Services.

SPHERICAL ROLLER BEARING ANALYSIS. SKF COMPUT-ER PROGRAM SPHERBEAN, VOLUME 2: USER'S MANUAL

Final Report, Jun. 1978 - Dec. 1980 R. J. Kleckner and G. Dyba Dec. 1980 150 p refs 3 Vol. (Contract NAS3-20824)

(NASA-CR-165204; NAS 1.26:165204; AT81D007-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 131

The user's guide for the SPHERBEAN computer program for prediction of the thermomechanical performance characteristics of high speed lubricated double row spherical roller bearings is presented. The material presented is structured to guide the user in the practical and correct implementation of SPHERBEAN. Input and output, guidelines for program use, and sample executions are detailed

N82-20542* SKF Technology Services, King of Prussia, Pa. Technology Services.

SPHERICAL ROLLER BEARING ANALYSIS. SKF COMPUT-ER PROGRAM SPHERBEAN. VOLUME 3: PROGRAM CORRELATION WITH FULL SCALE HARDWARE TESTS

Final Report, Jun. 1978 - Dec. 1980 R. J. Kleckner, J. W. Rosenlieb, and G. Dyba Dec. 1980

225 p refs 3 Vol. (Contract NAS3-20824)

(NASA-CR-165205; NAS 1.26:165205; AT81D008-Vol-3)

Avail: NTIS HC A10/MF A01 CSCL 131

The results of a series of full scale hardware tests comparing predictions of the SPHERBEAN computer program with measured data are presented. The SPHERBEAN program predicts the thermomechanical performance characteristics of high speed lubricated double row spherical roller bearings. The degree of correlation between performan a predicted by SPHERBEAN and measured data is demonstrated. Experimental and calculated performance data is compared over a range in speed up to 19,400 rpm (0.8 MDN) under pure radial, pure axial, and combined loads.

N82-24496*# Eston Engineering and Research Center, Southfield, Mich.

SMALL PASSENGER CAR TRANSMISSION TEST: MER-CURY LYNX ATX TRANSMISSION Final Report M. P. Bujoid Sep. 1981 335 p (Contract DEN3-124; DE-AI01-77CS-51044)

(NASA-CR-165510; DOE/NASA/0124-7; NAS 1.26:165510; ERC-TR-B191) Avail: NTIS HC A15/MF A01 CSCL 131

The testing of a Mercury Lynx automatic transmission is reported. The transmission was tested in accordance with & passenger car automatic transmission test code (SAE J65lb) with required drive performance, coast performance, and no logistical conditions. Under these conditions, the transmission attacked maximum efficiencies in the mid-ninety percent range both for drive performance test and coust performance tests. The to:que, speed, and efficiency curves are presented, which provide the complete performance characteristics for the Mercury Lynx automatic transmission.

NS2-25516*# Illinois Univ., Chicago. Dept. of Materials

MATHEMATICAL MODELS FOR THE SYNTHESIS AND OPTIMIZATION OF SPIRAL BEVEL GEAR TOOTH SUR-FACES Final Report

F. L. Litvin, Pernaz Rahman, and Robert N. Goldrich Jun. 1982 122 p re/s

(Grant NAG3-48)

1.26:3353) (NASA-CR-3553: NAS

NTIS

HC A06/MF A01 CSCL 131

The geometry of spiral bevel gears and to their rational design are studied. The nonconjugate tooth surfaces of spiral bevel gears are, in theory, replaced (or approximated) by conjugated tooth surfaces. These surfaces can be generated by two conical surfaces, and by a conical surface and a revolution. Although these conjugated tooth surfaces are simpler than the actual ones, the determination of their principal curvatures and directions is still a complicated problem. Therefore, a new approach, to the solution of these is proposed. Direct relationships between the principal curvatures and directions of the tool surface and those of the generated gear surface are obtained. With the aid of these analytical tools, the Hertzian contact problem for conjugate tooth surfaces can be solved. These results are useful in determining compressive load capacity and surface fatigue life of spiral bevel gears. A general theory of kinematical errors exerted by manufacturing and assembly errors is developed. This theory is used to determine the analytical relationship between gear misalignments and kinematical errors. This is important to the study of noise and vibration in geared systems.

N82-26679*# Anderson (William J.), North Olmsted, Ohio. BEARINGS: TECHNOLOGY AND NEEDS Final Report William J. Anderson May 1982 21 p refs Presented at the 59th Meeting of the Propulsion and Energetics Panel Symp. on Problems in Bearings and Lubrication, Ottawa, 31 May - 3 Jun. 1982; sponsored by AGARD

(Contract NAS3-23157; DA Proj. 1L1-62209-AH-76) (NASA-CR-167908; NAS 1.26;167908) Av. HC A02/MF A01 CSCL 13I Avail:

A brief status report on bearing technology and present and near-term future problems that warrant research support is presented. For rolling element bearings a material with improved fracture toughness, life data in the low Lambda region, a comprehensive failure theory verified by life data and incorporated into dynamic analyses, and an improved corrosion resistant alloy are perceived as important needs. For hydrodynamic bearings better definition of cavitation boundaries and pressure distributions for squeeze film dampers, and geometry optimization for minimum power loss in turbulent film bearings are needed. For gas film bearings, foil bearing geometries that form more nearly optimum film shapes for maximum load capacity, and more effective surface protective coatings for high temperature operation are needed.

Author

N82-26680*# California State Univ., Los Angeles. Mechanical Engineering.

ELECTROSTATIC FUEL CONDITIONING OF INTERNAL **COMBUSTION ENGINES**

Phillip I, Gold 15 Jun. 1982 117 p refs

(Grant NAG3-73)

(NASA-CR-160029; NAS 1.26:160029) HC A06/MF A01 CSC 21A Avail: 'NTIS

Diesel engines were tested to determine if they are influenced by the presence of electrostatic and magnetic fields. Field forces were applied in a variety of configurations including pretreatment of the fuel and air, however, no affect on engine performance was observed

N82-27743* Curtiss-Wright Corp., Wood-Ridge, N.J. Rotary Engine Facility.

ADVANCED STRATIFIED CHARGE RCTARY AIRCRAFT ENGINE DESIGN STUDY

P. Badgley, M. Berkowitz, C. Jones, D. Myers, E. Norwood, W. B. Pratt, D. R. Ellis (Cessna Aircraft Corp.), G. Huggins (Cessna Aircraft Corp.), A. Mueller (Cessna Aircraft Corp.), and J. H. Hembrey (Cessna Aircraft Corp.) 29 Jan, 1982 149 p refs (Contract NAS3-21285)

(MASA-CR-165398; NAS 1.26; 165398; CW-WR-81,021) Avail:

NTIS HC A07/MF AD1 CSCL 21A

A technology base of new developments which offered potential benefits to a general aviation engine was compiled and ranked. Using design approaches selected from the ranked list, conceptual design studies were performed of an advanced and a highly advanced engine sized to provide 186/250 shaft Kw/HP under craise conditions at 7620/25,000 m/ft altitude. These are turbocharged, direct-injected stratified charge engines intended for commercial introduction in the early 1990's. The engine descriptive date includes tables, curves, and drawings depicting configuration, performance, weights and sizes, heat rejection, ignition and fuel injection system descriptions, maintenance requirements, and scaling data for varying power. An engine-airframe integration study of the resulting engines in advanced airframes was performed on a comparative basis with current production type engines. The results show simplene performance, costs, noise & installation factors. The rotary-engined airplanes display cubstantial improvements over the baseline. including 30 to 35% lower fuel usage.

N82-29609*# Cincinnati Univ., Ohio. Dept. of Mechanical Engineering

ON FINITE ELEMENT STRESS ANALYSIS OF SPUR GEARS

S. H. Chang and R. L. Huston Jul. 1982 53 p refs (Grant NsG-3188)

(NASA-CR-167938; NAS 1.26:167938) Avail: HC A04/MF A01 CSCL 131

Spur gear stress analysis results are presented for a variety of loading conditions, support conditions, root radii, and rime thicknesses. These results are obtained using the SAP-IV finite element code. The maximum stresses, occurring at the root surface, substantially increase with decreasing rim thickness for partially supported rims (that is, with loose fitting hubs). For fully supported rims (that is, with tight fitting hubs), the root surface stresses slightly decrease with decreasing rim thickness. The fillet radius has a significant effect upon the maximum stesses at the root surface. These stresses increase with decreasing fillet radius. Finally, the fillet radius has little effect upon the internal root section stresses.

The AGT101 technology - An automotive A82-11783 * # alternative. R. A. Rackley and K. A. Davis (Garrett Turbine Engine Co., Phoenix, AZ). In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 10/81, Proceedings. Volume 2. (A82-11701 C2-44) New York, American Society of Mechanical Engineers, 1981, p. 1403-1407. Contract No. DEN3-167.

The Advanced Gas Turbine Powertrain System Development Project is oriented at providing the United States automotive industry the technology base necessary to produce gas turbine powertrains for automotive applications that will have: (1) reduced fuel consumption, (2) the ability to use a variety of fuels, (3) low emissions, and (4) competitive cost/performance. The AGT101 powertrain being developed consists of a regenerated single-shaft gas turbine engine flat rated at 74.6 kW (100 hp) coupled to a split-differential gearbox and a Ford automatic overdrive production transmission. Ferformance predictions for the AGT101 powertrain represent a 59-percent improvement in mileage estimates over a 1985 conventionally-powered automobile for the combined federal driving cycle.

ORIGINAL PAGE IS OF POGR QUALITY

Alignment of fluid molecules in an EHD contact, J. L. Lauer, L. E. Keller, F. H. Choi, and V. W. King (Rensselaer Polytechnic Institute, Troy, NY). American Society of Lubrication Engineers and American Society of Mechanical Engineers, Lubrication Conference, New Orleans, LA, Oct. 5-7, 1981, ASLE Proprint 81-LC-5C-1, 8 p. 7 refs. Members, \$2.00; nonmembers, \$4.00, Grants No. AF-AFOSR-78-3473; No. NsG-3170.

Dichroic infrared emission spectra have been obtained from an operating elastohydrodynamic contact under conditions showing unequivocally that the molecules of the fluid are aligned under shear flow in the bulk of the fluid and that the extent of the alignment is increased by the presence of an additive in a small concentration. This work applied particularly to polyphenyl ether and to 1,1,2trichloroethane as the additive, but similar results have been obtained with polycyclohexyls and the same additive. The observation of two separate glass transitions for the polycyclohexyl solution is an indication of the occurrence of a phase separation in the Hertzian inlet zone. A model has been developed to explain the effect of these phenomena and their relation to traction. (Author)

A82-18426 * # Measurement of oil film thickness for application to elastomeric Stirling engine rod seals. A. I. Krauter (Carrier Corp., Research Div., Syracuse, NY). American Society of Mechanical Engineers and American Society of Lubrication Engineers, Joint Lubrication Conference, New Orleans, LA, Oct. 5-7, 1981, ASME Paper 81-Lub-9. 5 p. 10 refs. Members, \$2.00; nonmembers, \$4.00. Contract No. DEN3-22,

The rod seal in the Stirling engine has the function of separating high pressure gas from low or ambient pressure oil. An experimental apparatus was designed to measure the oil film thickness distribution for an elastomeric seal in a reciprocating application. Tests were conducted on commercial elastomeric seals having a 76 mm rod and a 3.8 mm axial width. Test conditions included 70 and 90 seal durometers, a sliding velocity of 0.8 m/sec, and a zero pressure gradient across the seal. An acrylic cylinder and a typical synthetic base automotive lubricant were used. The experimental results showed that the effect of seal hardness on the oil film thickness is considerable. A comparison between analytical and experimental oil film profiles for an elastomeric seal during relatively high speed reciprocating motion showed an overall qualitative agreement.

AR2-18431 * # Regimes of traction in concentrated contact Iubrication, S. Bair and W. O. Winer (Georgia Institute of Technology, Atlanta, GA), American Society of Mechanical Engineers and American Society of Lubrication Engineers, Joint Lubrication Conference, New Orlcans, LA, Oct. 5-7, 1981, ASME Paper 81-Lub-16. 5 p. 11 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3106.

Experimental evidence is presented for the existence of three regimes of traction in concentrated contacts. Data are obtained in a rolling contact simulator by varying the lubricant, temperature, rolling speed, load and surface roughness at a fixed slide-to-roll ratio At lower thicknesses the mixed regime is encountered, and traction is increased due to asperity interaction, while at higher film thicknesses, the lubricant pressure is distributed over a greater area than the Hertzian region, resulting in a lower average pressure and reduced traction. D.L.G.

A82-18449 * # Single pass rub phenomena - Analysis and experiment. F. E. Kennedy (Dartmouth College, Hanover, NH), American Society of Mechanical Engineers and American Society of Lubrication Engineers, Joint Lubrication Conference, New Orleans, LA, Oct. 5-7, 1981, ASME Paper 81-Lub-55. 7 p. 10 refs. Members, \$2,00; nonmembers, \$4.00. Grant No. NsG-3253.

An experimental and analytical investigation is presented of contact phenomena for the case of a fully-dense copper gas path seal segment which is rubbed by a single steel blade tip at room temperature. The experiments were executed on a pendulum-type test device, with forces, rub energy, surface temperature and residual deformation being determined for each single-path rub test. The thermal and mechanical factors influencing single-pass rub surface temperatures were modeled analytically. It is found that large plastic strains occurred on or near the contact surface of the copper rub

specimens. A study of the influence of various material properties on surface temperature showed that increased thermal conductivity of the stationary component played a role in lowering contact temperatures. Increased thermal conductivity of the moving blade tip com/yonent and increased thermal diffusivity of the stationary material also had a beneficial effect.

mag and comment of the comment of th

Surface geometry of circular cut spiral bevel A82-19334 * # gears, R. L. Huston (Cincinnati, University, Cincinnati, OH) and J. J. Coy (U.S. Army, Propulsion Laboratory, Cleveland, OH). American Society of Mechanical Engineers, Design Engineering Technical Conference, Hartford, CT. Sept. 20-23, 1981, Paper 81-DET-114. 6 p. 7 refs. Members, \$2,00; nonmembers, \$4,00. Grant No. NsG-3188.

An analysis of the surface geometry of spiral bevel gears formed by a circular cutter is presented. The emphasis is upon determining the tooth surface principal radii of curvature of crown (flat) gears. Specific results are presented for involute, straight, and hyperbolic cutter profiles. It is shown that the geometry of circular cut spiral beyol gears is somewhat simpler than a theoretical logarithmic spiral bevel gear.

A82-21967 * Anaerobic polymers as high vacuum leak sealants. B. R. F. Kendall (Pennsylvania State University, University Park, PA). Journal of Vacuum Science and Technology, vol. 20, Feb. 1982, p. 248, 249. 5 refs. Research supported by the Pennsylvania Research Corp.; Grant No. NsG-3301.

Anaerobic polymers are useful as solventless leak sealants with good vacuum properties at moderate temperatures, Loctite 290 can seal leaks in a range generally encountered in carefully constructed ultrahigh vacuum and high vacuum systems. It was found that small leaks are sealed best under vacuum, whereas large leaks should be sealed at atmospheric pressure. The high-temperature behavior of Loctite 290 is limited by its fast cure, which prevents deep penetration into small leaks; cracking eventually occurs at the entrance to the leak. Repeated thermal cycling to about 300 C is possible, however, provided viscosity, curing time, and leak size are properly matched to ensure penetration into the body of the leak. This may require special formulations for high temperature vacuum applications.

Development of CdO-graphite-Ag coatings for gas bearings to 427 C. B. Bhushan (Mechanical Technology, Inc., Latham, NY). In: Wear of materials 1981; Proceedings of the International Conference, San Francisco, CA, March 30-April 1, 1981. (A82-27051 12-37) New York, American Society of Mechanical Engineers, 1981, p. 735-746. 21 refs. Research supported by the Mechanical Technology, Inc.; Contracts No. DEN3-43; No. EY-76 C-02-2749.

Graphite is one of the most commonly known lubricants. Its effectiveness in a range between room temperature (RT) and 540 C is reportedly improved by adding cadmium oxide. CdO-graphite powder in a gas carrier has been used in numerous applications that rely on dry lubrication. A coating of this composition was developed and successfully tested in foil air bearings for long periods up to a temperature of 427 C and at a normal contacting load (during starting and stopping) of 14 kPa based on bearing projected area. The addition of ultra-fine silver to the CdO-graphite has improved the coating endurance. At 427 C, the CdO-graphite-Ag coating performed better than CdO-graphite without silver, both for extended periods at 14 kPa loading and for limited periods at 35 kPa. At 288 C, the coating was tested for an extended period up to 28 kPa and has also successfully completed high-speed shock tests to an acceleration level of 100g. (Author)

AGT 100 automotive gas turbine system development. H. E. G. Helms (General Motors Corp., Detroit Diesel Allison Div., Indianapolis, IN). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1165, 11 p. Research sponsored by the U.S. Department of Energy; Contract No. DEN3-168.

General Motors is developing an automotive gas turbine system that can be an alternate powerplant for future automobiles. Work sponsored by DOE and administered by NASA Lewis Research Center is emphasizing small component aerodynamics and high-temperature structural ceramics. Reliability requirements of the AGT 100 turbine system include chemical and structural ceramic component stability in the gas turbine environment. The power train system, its configuration and schedule are presented, and its performance tested. The aerodynamic component development is reviewed with discussions on the compressor, turbine, regenerator, interturbine duct and scroll, and combustor. Ceramic component development is also reviewed, and production cost and required capital investment are taken into consideration.

AGT101 automotive gas turbine system development. R. A. Rackley and J. R. Kidwell (Garrett Turbine Engine Co., Phoenix, AZ). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1166. 8 p. Research sponsored by the U.S. Department of Energy; Contract No. DEN3-167.

The AGT101 automotive gas turbine system consisting of a 74.6 kw regenerated single-shall gas turbine engine, is presented. The development and testing of the system is reviewed, and results for aerothermodynamic components indicate that compressor and turbine performance levels are within one percent of projected levels. Ceramic turbine rotor development is encouraging with successful cold spin testing of simulated rotors to speeds over 12,043 rad/sag. Spin test results demonstrate that ceramic materials having the required strength levels can be fabricated by net shape techniques to the thick hub cross section, which verifies the feasibility of the single-stage radial rotor in single-shaft engines.

AGT100 turbomachinery, D. L. Tipton and T. F. McKain (General Motors Corp., Detroit Diesel Allison Div., Indianapolis, IN). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AlAA Paper 82-1207. 11 p. Research supported by the U.S. Department of Energy; Contract No. DEN3-168.

High-performance turbomachinery components have been designed and tested for the AGT100 automotive engine. The required wide range of operation coupled with the small component size, compact packaging, and low cost of production provide significant aerodynamic challenges. Aerodynamic design and development testing of the centrifugal compressor and two radial turbines are described. The compressor achieved design flow, pressure ratio, and surge margin on the initial build. Variable inlet guide vanes have proven effective in modulating flow capacity and in improving part-speed efficiency. With optimum use of the variable injet guide vanes, the initial efficiency goals have been demonstrated in the critical idle-to-70% gasifier speed range. The gasifier turbine exceeded initial performance goals and demonstrated good performance over a wide range. The radial power turbine achieved 'developed' efficiency goals on the first build.

The AGT 101 advanced automotive gas turbine. R. A. Rackley and J. R. Kidwell (Garrett Turbine Engine Co., Phoenix, AZ). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-72. 9 p. Members, \$2,00; nonmembers, \$4.00. Research supported by the U.S. Department of Energy; Contract No. DEN3-167.

A development program is described whose goal is the accumulation of the technology base needed by the U.S. automotive industry for the production of automotive gas turbine powertrains. Such gas turbine designs must exhibit reduced fuel consumption, a multi-fuel capability, and low exhaust emissions. The AGT101 powertrain described is a 74.6 kW, regenerated single-shaft gas turbine, operating at a maximum inlet temperature of 1644 K and coupled to a split differential gearbox and automatic overdrive transmission. The engine's single stage centrifugal compressor and single stage radial inflow turbine are mounted on a common shaft, and will operate at a maximum rotor speed of 100,000 rpm. All high temperature components, including the turbine rotor, are ceramic

Engine dynamic analysis with general nonlinear finite element codes. Il - Bearing element implementation, overall numerical characteristics and benchmarking. J. Padovan, M. Adams, P. Lam (Akron, University, Akron, OH), D. Fertis, and I. Zeid (Northeastern University, Boston, MA). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-202 9 p. 12 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NsG-3283,

Second-year efforts within a three-year study to develop and extend finite element (FE) methodology to efficiently handle the transient/steady state response of rotor-bearing-stator structure associated with gas turbine engines are outlined. The two main areas aim at (1) implanting the squeeze film damper element into a general purpose FE code for testing and evaluation; and (2) determining the numerical characteristics of the FE-generated rotor-bearing-stator simulation scheme. The governing FE field equations are set out and the solution methodology is presented. The choice of ADINA as the general-purpose FE code is explained, and the numerical operational characteristics of the direct integration approach of FE-generated rotor-bearing-stator simulations is determined, including benchmarking, comparison of explicit vs, implicit methodologies of direct integration, and demonstration problems.

A82-35480 * # Design and development of a ceramic rad/at tw/bine for the AGT101. D. G. Finger and S. K. Gupta (Garrett Turbine Engine Co., Phoenix, AZ). AIAA, SAE, and ASME, Joint Propulsion Conference, 18th, Cleveland, OH, June 21-23, 1982, AIAA Paper 82-1209. 9 p. Contra/st No. DEN3-167.

An acceptable and feasible ceramic turbine wheel design has been achieved, and the relevant temperature, stress, and success probability analyses are discussed. The design is described, the materials selection presented, and the engine cycle conditions analysis parameters shown. Measured MOR four-point strengths are indicated for room and elevated temperatures, and engine conditions are analyzed for various cycle states, materials, power states, turbine inlet temperatures, and speeds. An advanced gas turbine ceramic turbine rotor thermal and stress model is developed, and cumulative probability of survival is shown for first and third-year properties of SiC and Si3N4 rotors under different operating conditions, computed for both blade and hub regions. Temperature and stress distributions for steady-state and worst-case shutdown transients are depicted.

C.D.

A82-48243 * # On the automatic generation of FEM models for complex gears - A work-in-progress report. R. J. Drago (Boeing Vertol Co., Philadelphia, PA). American Gear Manufacturers Association, Meeting, San Diego, CA, Feb. 1982, Paper. \$6 p. Contract No. NAS\$-22143.

A description is presented of the development and use of a preprocessor to create a NASTRAN finite element model of a complex spur, helical, or spiral bevel gear quickly, inexpensively, and accurately. The preprocessor creates a ready to run NASTRAN input deck including the executive, case control, and bulk data sections. It generates nodes and solid elements to model spur, helical, or spiral bevel gear teeth with Integral shafting. Either a complete gear shafting model or a symmetric model is created. The fundamental hullding block of the gear model is the base layer. The base layer is the mesh configuration of one layer of one tooth augment which is in turn duplicated, translated, and rotated to create the completed model of the gear. Once the base layer is created, the construction of the finite element model is straightforward. G.R.

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-18612*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
METAL HONEYCOMB TO POROUS WIREFORM SUBSTRATE DIFFUSION BOND EVALUATION

A, Vary, P. E. Moorhead, and D. R. Hull 1982 12 p refs Presented at the Spring Conf. of the Am. Soc. for Mondestructive Testing, Boston, 22-25 Mar. 1982

(NASA-754-82793; E-959) Avail: NTIS HC A02/MF A01 CSCL

14D

Two notidestructive techniques were used to evaluate diffusion bond quality between a metal foil honeycomb and porous wireform substrate. The two techniques, cryographics and acoustoultrasonics, are complementary in revealing variations of bond integrity and quality in shroud segments from an experimental aircraft turbine engine.

N82-19550*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIENCE WITH MODIFIED AEROSPACE RELIABILITY AND QUALITY ASSURANCE METHOD FOR WIND TUR-

William E. Klein 1982 11 p refs Proposed for Presentation at 9th Ann. Engr. Conf. on Reliability, Hershey, Penn., 16-18 Jan. 1982 Revised

(Contract DE-AI01-76ET-20320)

(NA SA-TM-82803; DOE/NASA/20320-38; E-1142) Avail: NTIS HC A02/MF A01 CSCL 14D

The SR&OA approach assures that the machine is not hazardous to the public or operating personnel, can operate unattended on a utility grid, demonstrates reliability or eration, and helps establish the quality assurance and mair cainability requirements for future wind turbine projects. The approach consisted of modified failure modes and effects analysis (FMEA) during the design phase, minimal hardware inspection during parts fabrication, and three simple documents to control activities during machine construction and operation. Five years experience shows that this low cost approach works well enough that it

N82-20551*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

should be considered by others for similar projects.

INTERRELATION OF MATERIAL MICROSTRUCTURE, ULTRASONIC FACTORS, AND FRACTURE TOUGHNESS OF TWO PHASE TITANIUM ALLOY

Alex Vary and David R. Huli 1982 25 p refs Presented at the Spring Conf. of the Am. Soc. for Nondestructive Testing, Boston, 22-25 Mar. 1982

(NASA-TM-82810; E-1151; NAS 1,15;82810) Avail: NTIS HC A02/MF A01 CSCL 14D

The pivotal role of an alpha-beta phase microstructure in governing fracture toughness in a titanium alloy, 71-662, is demonstrated. The interrelation of microstructure and fracture toughness is demonstrated using ultrasonic measurement techniques originally developed for nondestructive evaluation and material property characterization, It is shown that the findings determined from ultrasonic measurements agree with conclusions based on metallurgical, metallographic, and fractographic observations concerning the importance of alpha-beta morphology in controlling fracture toughness in two phase titanium alloys.

N82-18613*# Massachusetts Inst. of Tech., Cambridge, Dept. of Mechanical Engineering.

ULTRASONIC INPUT-OUTPUT FOR TRANSMITTING AND RECEIVING LONGITUDINAL TRANSDUCERS COUPLED TO SAME FACE OF ISOTROPIC ELASTIC PLATE Final

James H. Williams, Jr., Hira Karagulle, and Samson S. Lee Washington, D.C. NASA Feb. 1982 29 p refs (Grant NsG-3210)

(NASA-CR-3506) Avail: NTIS HC A03/MF A01 CSU: 14D

The quantitative understanding of ultrasonic nondestructive evaluation parameters such as the stress wave factor were studied. Ultrasonic input/output characteristics for an isotropic electic plate with transmitting and receiving longitudinal transducers coupled to the same face were analyzed. The asymptotic normal stress is calculated for an isotropic elastic half space subjected to a uniform harmonic normal stress applied to a circular region at the surface. The radiated stress waves are traced within the plate by considering wave reflections at the top and bottom faces. The output voltage amplitude of the receiving transducer is estimated by considering only longitudinal waves. Agreement is found between the output voltage wave packet amplitudes and times of arrival due to multiple reflections of the longitudinal waves.

A pad perturbation method for the dynamic A82-14400 * coefficients of tilting-pad journal bearings. P. E. Allaire, J. K. Parsell, and L. E. Barrett (Virginia, University, Charlottesville, VA). Wear, vol. 72, Oct. 1, 1981, p, 29-44. 14 refs. Contract No. EF-76-5-01-2479; Grant No. NsG-3105.

A pad assembly method for analyzing tilting-pad bearings is presented. The method results in the complete coefficient matrix for a tilting-pad bearing; the matrix is independent of the pad inertia, the pitch frequency and the number of degrees of freedom of the pad. A pad assembly method is used because it allows the collection of more pearing data with less computer time than a brute force iterative procedure. The results given show the complete dynamical matrices for a five-pad tilting-pad bearing both including and ignoring the damping effects of the unloaded (top) pads. For a symmetrical tilting-pad bearing the reduced cross-coupling coefficients are zero (Author) when the moment of inertia of the pad is ignored.

39 STRUCTURAL MECHANICS

Includes atructural element design and weight analysis; fatigue; and thermal stress.

For applications see 05 Aircrait Design, Testing and Performance and 18 Spacecraft Design, Testing and

N82-11491*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

INTEGRATED ANALYSIS OF ENGINE
Christos C. Chemis 1981 24 p refs Presented at the Ann.
Meeting of the ASME, Washington, D.C., 16-21 Nov. 1981
(NASA-TM-82713; E-995) Avail: NTIS HC A02/MF A01 CSCL

The need for light, durable, fuel efficient, cost effective aircraft requires the development of engine structures which are flexible, made from advaced materials (including composites), resist higher temperatures, maintain tighter clearances and have lower maintenance costs. The formal quantification of any or several of these requires integrated computer programs (multilevel and/or interdisciplinary analysis programs interconnected) for engine structural analysis/design. Several integrated analysis computer prorams are under development at Lewis Reseach Center. These programs include: (1) COBSTRAN-Composite Blade Structural Analysis, (2) CODSTRAN-Composite Durability Structural Analysis, (3) CISTRAN-Composite Impact Structural Analysis, (4) STAEBL-StruTailoring of Engine Blades, and (5) ESMOSS-Engine Structures Modeling Software System. Three other related programs, developed under Lewis sponsorship, are described.

N82-16419*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ELEVATED TEMPERATURE FATIGUE TESTING OF MET-ALS

Marvin H. Hirschberg Dec. 1981 24 p refs (NASA-TM-82745; E-1058) Avail: NTIS HC A02/MF A01 CSCL 20K

The major technology areas needed to perform a life prediction of an aircraft turbine engine hot section component are discussed and the steps required for life prediction are outlined. These include the determination of the operating environment, the calculation of the thermal and mechanical loading of the component, the cyclic stress-strain and creep behavior of the material required for structural analysis, and the structural analysis to determine the local stress-strain-temperature-time response of the material at the critical location in the components. From a knowledge of the fatigue, creep, and failure resistance of the material, a prediction of the life of the component is made. Material characterization and evaluation conducted for the purpose of calculating fatigue crack initiation lives of components operating at elevated temperatures are emphasized. J.D.H.

N82-20565*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ELASTIC-PLASTIC FINITE-ELEMENT ANALYSES OF THERMALLY CYCLED SINGLE-EDGE WEDGE SPECIMENS

Albert Kaufman Mar. 1982 27 p refs (NASA-TP-1982; E-687; NAS 1.60:1982) Avail; NTIS HC A03/MF A01 CSCL 20K

Elastic-plastic stress-strain analyses were performed for single-edge wedge alloys subjected to thermal cycling in fluidized beds. Three cases (NASA TAZ-8A alloy under one cycling condition and 316 stainless steel alloy under two cycling conditions) were analyzed by using the MARC nonlinear, finito-element computer program. Elastic solutions from MARC showed good agreement with previously reported solutions that used the NASTRAN and ISO3DQ computer programs. The NASA TAZ-8A case exhibited no plastic strains, and the elastic and elastic-plastic analyses gave identical results. Elastic plastic analyses of the 316 stainless steel alloy showed plastic strain reversal with a shift of the mean stresses in the compressive direction. The maximum equivalent total strain ranges for these cases were 13 to 22 percent greater than that calculated from elastic analyses.

NS2-20566* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
ELASTIC-PLASTIC FINITE-ELEMENT ANALYSES OF

THERMALLY CYCLED DOUBLE-EDGE WEDGE SPECI-

Albert Kaufman and Larry E. Hunt. Mar. 1982 31 p. refs. (NASA-TP-1973; E-626; NAS 1.60:1973) Avail: NTIS HC A03/MF A01 CSCL 20K

Elastic-plastic stress-strain analyses were performed for double-edge wedge specimens subjected to thermal cycling in fluidized beds at 316 and 1088 C. Four cases involving different nickel-base alloys (IN 100, Mar M-200, NASA TAZ-BA, and Rene 80) were analyzed by using the MARC nonlinear, finite element computer program. Elastic solutions from MARC showed good agreement with previously reported solutions obtained by using the NASTRAN and ISO3DQ computer programs. Equivalent total strain ranges at the critical locations calculated by elastic analyses agreed within 3 percent with those calculated from elastic-plastic analyses. The elastic analyses always resulted in compressive mean stresses at the critical locations. However, elastic-plastic analyses showed tensile mean stresses for two of the four alloys and an increase in the compressive mean stress for the highest plastic strain case.

N82-21604*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.
COUPLED BENDING-BENDING-TORSION FLUTTER OF A MISTUNED CASCADE WITH NONUNIFORM BLADES

Krishna Rao V. Kaza (Toledo Univ.) and Robert E. Kielb 1982 20 p refs Presented at the 23rd Struct., Structural Dyn., and Mater. Conf., New Orleans, 10-12 May 1982 (NASA-TM-82813; E-1156; NAS 1.15:82813) Avail: NTIS HC A02/MF A01 CSCL 20K

A set of aeroelastic equations describing the motion of an arbitrarily mistuned cascade with flexible, pretwisted, nonuniform blades is developed using an extended Hamilton's principle. The derivation of the equations has its basis in the geometric nonlinear theory of elasticity in which the elongations and shears are negligible compared to unity A general expression for foreshortening of a blade is derived and is explicity used in the formulation. The blade aerodynamic loading in the subsonic and supersonic flow regimes is obtained from two dimensional, unsteady, cascade theories. The aerodynamic, inertial and structural coupling between the bending (in two planes) and torsional motions of the blade is included. The equations are used to investigate the aeroelastic stability and to quantify the effect of frequency misturing on flutter in turbofans. Results indicate that a moderate amount of intentional mistuning has enough potential to alleviate flutter problems in unshrouded, high aspect ratio turbofans. S.L.

N82-24501*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. NONLINEAR STRUCTURAL AND LIFE ANALYSES OF A COMBUSTOR LINER

V. Moreno (Pratt and Whitney Aircreft Group, East Hartford, Conn.), G. J. Meyers (Pratt and Whitney Aircraft Group, East Hartford, Conn.), A. Kaufman, and G. R. Halford 1982 23 p refs Proposed for presentation at the Symp, on Advances and Trends in Struct, and Solid Mech., 4-7 Oct. 1982, Washington, D.C.; sponsored by NASA and Georgetown Univ.

(NASA-TM-82846: E-1216; NAS 1.15:82846) Avail: NTIS HC A02/MF A01 CSCL 20K

Three dimensional, nonlinear finite element structural analyses were performed for a simulated combustor liner specimen to assess the capability of nonlinear analyses using classical inelastic material models to represent the thermoplastic creep response of the one half scale component. Results indicate continued cyclic hardering and ratcheting while experimental data suggested a stable stress strain response after only a few loading cycles. The computed stress strain history at the critical location was put into two life prediction methods, strainrange partitioning and a Pratt and Whitney combustor life prediction method to evaluate their ability to predict cyclic crack initiation, It is found that the life prediction analyses over predicted the observed cyclic crack initiation life. E.A.K.

Author

N82-24502*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EVALUATION OF INCLASTIC CONSTITUTIVE MODELS FOR NONLINEAR STRUCTURAL ANALYSIS

Albert Kaufman 1982 22 p refs Presented at the Symp. on Nonlinear Constitutive Relations for High Temp. Appl., Akron, Ohio, 19-20 May 1982; sponsored by NASA and Akron Univ. (NA SA-TM-82845; E-1215; NAS 1.15:82845) Avail: NTIS HC A02/MF A01 CSCL 20K

The influence of inelastic material models on computed stress-strain states, and therefore predicted lives, was studied for thermomechanically loaded structures. Nonlinear structural analyses were performed on a fatigue specimen which had been subjected to thermal cycling in fluidized beds and on a mechanically load cycled benchmark notch specimen. Four incremental plasticity creep models (isotropic, kinematic, combined isotropic kinematic, combined plus transient creep) were exercised using the MARC program. Of the plasticity models, kinematic hardening gave results most consistent with experimental observations. Life predictions using the computed strain histories at the critical location with a strainrange partitioning approach considerably overpredicted the crack initiation life of the thermal fatigue specimen.

N82-26701°# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

BIRD IMPACT ANALYSIS PACKAGE FOR TURBINE ENGINE FAN BLADES

Murray S. Hirschbein 1982 20 p refs Presented at 23rd Struct, Dyn. and Mater. Conf., New Orleans, 10-12 Previously announced in IAA as A82-30162 May 1982; Sponsored by AIAA. ASME, ASCE, and AHS

AIAA, ASME, ASCE, and AHS
(NASA-TM-82831; NAS 1.15:82831) Avail: NTIS
HC A02/MF A01 CSCL 20K

For abstract see A82-30162

N82-31707*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LARGE DISPLACEMENTS AND STABILITY ANALYSIS OF NONLINEAR PROPELLER STRUCTURES

Robert A. Alello 1982 18 p refs Presented at the 10th NASTRAN User's Colloq., New Orleans, 13-14 May 1982

(NASA-TM-82850; NAS 1.15:82850) Avail: NTIS HC A02/MF A01 CSCL 20K

The use of linear rigid formats in COSMIC NASTRAN without DMAP procedures for the analysis of nonlinear propeller structures is described. Approaches for updating geometry and applying follower forces for incremental loading are demonstrated. Comparisons are made with COSMIC NASTRAN rigid formats and other independent finite element programs. Specifically, the comparisons include results from the four approaches for updating the geometry using RIGID FORMAT 1, RIGID FORMATS 4 and 13, MARC and MSC/NASTRAN. It is shown that 'user friendly' updating approaches (without DMAPS) can be used to predict the large displacements and instability of these nonlinear structures. These user friendly approaches can be easily implemented by the user and predict conservative results.

N82-31708*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TENSILE BUCKLING OF ADVANCED TURBOPROPS

C. C. Chamis and R. A. Aiello 1982 25 p refs Presented at the 23rd Struct., Struct. Dyn, and Mater. Conf., New Orleans, 10-12 May 1982; sponsored by AIAA, ASME, ASCE and AHS (NASA-TM-82896; E-1276; NAS 1.15:82833) Avail: NTIS HC A02/MF A01 CSCL 20K

Theoretical studies were conducted to determine analytically the tensile buckling of advanced propeller blades (turboprops) in centrifugal fields, as well as the effects of tensile buckling on other types of structural behavior, such as resonant frequencies and flutter. Theoretical studies were also conducted to establish the advantages of using high performance composite turboprops as compared to titanium. Results show that the vibration frequencies are not affected appreciably prior to 80 percent of the tensile

speed. Some frequencies approach zero as the tensile buckling speed is approached. Composites provide a substantial advantage over titanium on a buckling speed to weight basis. Vibration modes change as the rotor speed is increased and substantial geometric coupling is present.

R.J.F.

N82-33744*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NONLINEAR CONSTITUTIVE THEORY FOR TURBINE ENGINE STRUCTURAL ANALYSIS

Robert L. Thompson In NASA. Langley Research Center Res. in Struct. and Solid Mech., 1982 Oct. §982 p 67-96 refs (For primary document see N82-33739 24-39)

Avail: NTIS HC A19/MF A01 CSCL 20K

A number of viscoplastic constitutive theories and a conventional constitutive theory are evaluated and compared in their ability to predict nonlinear stress-strain behavior in gas turbine engine components at elevated temperatures. Specific application of these theories is directed towards the structural analysis of combustor liners undergoing transient, cyclic, thermomechanical load histories. The combustor liner material considered in this study is Hastelloy X. The material constants for each of the theories (as a function of temperature) are obtained from existing, published experimental data. The viscoplastic theories and a conventional theory are incorporated into a general purpose, nonlinear, finite element computer program. Several numerical examples of combustor liner structural analysis using these theories are given to demonstrate their capabilities. Based on the numerical stress-strain results, the theories are evaluated and compared. Author

A82-39852 * Impact resistance of fiber composites. C. C. Chamis and J. H. Sinclair (NASA, Lewis Research Center, Cleveland, OH). In: Composite materials: Mechanics, mechanical properties and fabrication; Proceedings of the Japan-U.S. Conference, Tokyo, Japan, January 12-14, 1981. (A82-39851 19-39) Barking, Essex, England, Applied Science Publishers, 1982, p. 1-11.

Stress-strain curves are obtained for a variety of glass fiber and carbon fiber reinforced plastics in dynamic tension, over the stress-strain range of 0.00087-2070/sec. The test method is of the one-bar block-to-bar type, using a rotating disk or a pendulum as the loading apparatus and yielding accurate stress-strain curves up to the breaking strain. In the case of glast fiber reinforced plastic, the tensile strength, strain to peak impact stress, total strain and total absorbed energy all increase significantly as the strain rate increases. By contrast, carbon fiber reinforced plastics show lower rates of increase with strain rate. It is recommended that hybrid composites incorporating the high strength and rigidity of carbon fiber reinforced plastic with the high impact absorption of glass fiber reinforced plastics be developed for use in structures subjected to impact loading.

A82-40357 * Extended range stress intensity factor expressions for chevron-notched short bar and short rod fracture toughness specimens.

J. L. Shannon, Jr., R. T. Bubsey, W. S. Pierce (NASA, Lewis Research Center, Cleveland, OH), and D. Munz (Karlsruhe, Universität, Karlsruhe, West Germany). International Journal of Fracture, vol. 19, July 1982, p. R55-R58.

A82-40358 * Crack displacements for J/I/ testing with compact specimens. T. W. Orange (NASA, Lewis Research Center, Cleveland, OH). International Journal of Fracture, vol. 19, July 1982, p. R59-R61. 5 refs.

The suggestion is made that the standard compact specimen (with opening displacement measured at the crack mouth) may be entirely suitable for J-integral determinations if a very simple conversion factor is used. Experiment determination of J-integral values requires the measurement of displacements at the points of load application. For the compact specimen this is a difficult task. On the basis of studies reported by Newman (1979) and Fisher and Buzzard (1980), it is suggested that for any J-based test the standard compact specimen can be used. A very good approximation to the load point displacement (within 3.4 percent) can be obtained by measuring the crack mouth displacement and multiplying by 0.773. G.R.

N82-14531*# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
THE APPLICATION OF PROBABILISTIC DESIGN THEORY TO HIGH TEMPERATURE LOW CYCLE FATIGUE

Paul H. Wirsching Nov. 1981 224 p refs (Grant NAG3-41)

(NASA-CR-165488) Avail: NTIS HC A10/MF A01 CSCL 20K

Metal fatigue under stress and thermal cycling is a principal mode of failure in gas turbine engine hot section components such as turbine blades and disks and combustor liners. Designing for fatigue is subject to considerable uncertainty, e.g., scatter in cycles to failure, available fatigue test data and operating environment data, uncertainties in the models used to predict stresses, etc. Methods of analyzing fatigue test data for probabilistic design purposes are summarized. The general strain life as well as homo- and hetero-scedastic models are considered, Modern probabilistic design theory is reviewed and examples are presented which illustrate application to reliability analysis of gas turbine engine components.

N82-17521*# Battelle Columbus Labs., Ohio, STRESS EVALUATIONS UNDER ROLLING/SLIDING CONTACTS Final Report

J. W. Kannel and J. L. Tevaarwerk 30 Oct, 1981 54 p refs (Contract NAS3-22808)

(NASA-CR-165561; G7782) Avail: NTIS HC A04/MF A01

CSCL 20K

The state of stress beneath traction drive type of contacts were analyzed. Computing stresses and stress reversals on various planes for points beneath the surrace were examined. The effect of tangential and axial friction under gross slip conditions is evaluated with the models, Evaluations were performed on an RC (rolling contact) tester configuration and it is indicated that the classical fatigue stresses are not altered by friction forces typical of lubricated contact. Higher values of friction can result in surface shear reversal that exceeds the stresses at the depth of maximum shear reversal under rolling contact.

N82-19563*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics. FINITE-ELEMENT MODELING OF LAYERED, ANISOTROPIC COMPOSITE PLATES AND SHELLS: A REVIEW OF RECENT RESEARCH

J. N. Reddy In Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 13, No. 12 Dec. 1981 p 3-12 refs (For primary document see N82-19562 10-39)

(Grants NAG3-208; AF-AFOSR-0142-81) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; \$15.00/set CSCL 20/11

Finite element papers published in the open literature on the static bending and free vibration of layered, anisotropic, and composite plates and chells are reviewed. A literature review of large-deflection bending and large-amplitude free oscillations of layered composite plates and shells is also presented. Non-finite element literature is cited for continuity of the discussion, J.D.H.

N82-20584*# Case Western Reserve Univ., Cleveland, Ohio. FATIGUE LIFE PREDICTION IN BENDING FROM AXIAL **FATIGUE INFORMATION**

S. S. Manson and U. Muralidharan Feb. 1982 38 p refs (Grant NAG3-39)

(NASA-CR-165563; NAS 1.26:165563) Avail:

HC A03/MF A01 CSCL 20K

Bending fatigue in the low cyclic life range differs from axial fatigue due to the plastic flow which alters the linear stress-strain relation normally used to determine the nominal stresses. An approach is presented to take into account the plastic flow in calculating nominal bending stress (S sub bending) based on true surface stress. These functions are derived in closed form for rectangular and circular cross sections. The nominal bending stress and the axial fatigue stress are plotted as a function of life (N sub S) and these curves are shown for several materials of engineering interest.

N82-24503*# Georgia Inst. of Tech., Atlanta. Center for the Advancement of Computational Mechanics.

CREEP CRACK-GROWTH: A NEW PATH-INDEPENDENT T SUB O AND COMPUTATIONAL STUDIES R. B. Stonesifer and S. N. Atluri Dec. 1981 141 p refs

(Grant NAG3-38)

ORIGINAL PAGE IS OF POOR QUALITY

NTIS (NASA-CR-168930; NAS 1.26:168930) Avail: HC A07/MF A01 CSCL 20K

Two path independent integral parameters which show some degree of promise as fracture criteria are the C* and delta T sub c integrals. The mathematical aspects of these parameters are reviewed. This is accomplished by deriving generalized vector forms of the parameters using conservation laws which are valid for arbitrary, three dimensional, cracked bodies with crack surface tractions (or applied displacements), body forces, inertial effects and large deformations. Two principal conclusions are that delta T sub c is a valid crack tip parameter during nonsteady as well as steady state creep and that delta T sub c has an energy rate interpretation whereas C* does not. An efficient, small displacement, infinitestimal strain, displacement based finite element model is developed for general elastic/plastic material behavior. For the numerical studies, this model is specialized to two dimensional plane stress and plane strain and to power law creep constitutive relations.

N82-26702*# Cincinnati Univ., Ohio, MICROSTRUCTURAL EFFECTS ON THE ROOM AND ELEVATED TEMPERATURE LOW CYCLE FATIGUE BEHAV-IOR OF WASPALOY M.S. Thesis Final Report

Bradley A. Lerch May 1982 194 p refs (Grant NsG-3263)

(NASA CR-165497; NAS HC A09/MF A01 CSCL 20K 1.26; 165497)

Longitudinal specimens of Waspaloy containing either coarse grains with small gamma or fine grains with large gamma were tested in air at a frequency of 0.33 Hz or 0.50 Hz. The coarse grained structures exhibited planar slip on (III) planes and precipitate shearing at all temperatures. Cracks initiated by a Stage 1 mechanism and propagated by a striation forming mechanism. At 700 C and 800 C, cleavage and intergranular cracking were observed. Testing at 500 C, 700 C, and 800 C caused precipitation of grain boundary carbides. At 700 C, carbides precipitated on slip bands. The fine grained structures exhibited planar slip on (111) planes. Dislocations looped the large gamma precipitates. This structure led to stress saturation and propagation was observed. Increasing temperatures resulted in increased specimen oxidation for both heat treatments. Slip band and grain boundary oxidation were observed. At 800 C, oxidized grain boundaries were cracked by intersecting slip bands which resulted in intergranular failure. The fine specimens had crack initiation later in the fatigue life, but with more rapid propagation crack propagation.

N82-26706*# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.

MECHANISMS OF DEFORMATION AND FRACTURE IN HIGH TEMPERATURE LOW CYCLE FATIGUE OF RENE 80 AND IN 100 Final Report

Glenn Roy Romanoski, Jr. Mar. 1982 227 p refs (Grant NaG-3263)

(NASA-CR-165498; NAS HC A17/MF A01 CSCL 20K 1.26:165498) NTIS Avail:

Specimens tested for the AGARD strain range partitioning program were investigated. Rene 80 and IN 100 were tested in air and in vacuum; at 871 C, 925 C, and 1000 C; and in the coated and uncoated condition. The specimens exhibited a multiplicity of high-temperature low-cycle fatigue damage. Observations of the various forms of damage were consistent with material and testing conditions and were generally in agreement with previous studies. In every case observations support a contention that failure occurs at a particular combination of crack length and maximum stress. A failure criterion which is applicable in the regime of testing studied is presented. The predictive capabilities of this criterion are straight forward,

Author

N82-26713*# Illinois Univ., Urbana-Champaign Theoretical and Applied Machanics.

BOUNDARY LAYER THERMAL STRESSES IN ANGLE-PLY COMPOSITE LAMINATES, PART 1 Final Report

S. S. Wang and I. Choi Feb. 1981 56 p refs 6 Vol.

(Contract NsG-3044)

(NASA-CR-165412; NAS HC A04/MF A01 CSCL 20K 1,26:165412) Avail: NTIS

Thermal boundary-layer stresses (near free edges) and

displacements were determined by a an eigenfunction expansion technique and the establishment of an appropriate particular solution. Current solutions in the region away from the singular domain (free edge) are found to be excellent agreement with existing approximate numerical results. As the edge is approached, the singular term controls the near field behavior of the boundary layer. Results are presented for cases of various angle-ply graphite/epoxy laminates with (theta/-theta/theta/theta) configurations. These results show high interlaminar (through-thethickness) stresses. Thermal boundary-layer thicknesses of different composite systems are determined by examining the strain energy density distribution in composites. It is shown that the boundarylayer thickness depends on the degree of anisotropy of each individual lamina, thermomechanical properties of each ply, and the relative thickness of adjacent layers. The interlaminar thermal stresses are compressive with increasing temperature. The corresponding residual stresses are tensile and may enhance interply delaminations.

N82-26714*# Illinois Univ., Urbana-Champaign. Dept, of Theoretical and Applied Mechanics,

ANALYSIS OF CRACKS EMANATING FROM A CIRCULAR HOLE IN UNIDIRECTIONAL FIBER REINFORCED COM-POSITES, PART 2 Final Report

S. S. Wang and J. F. Yau Feb. 1981 35 p refs 6 Vol. (Grant NsG-3044)

(NASA-CR-165433; NAS 1.26:165433) Avail: NTIS HC A03/MF A01 CSCL 20K

An analytical method is developed for cracks emanating from a circular hole in an off-axis unidirectional fiber-reinforced composite. The method which is formulated by using conservation laws of elasticity and fundamental relationships in anisotropic fracture mechanics, provides a convenient and accurate means to examine the complicated crack behavior, when used in conjunction with a suitable numerical scheme such as the finite element method. The formulation is eventually reduced to a system of linear algebraic equations of mixed-mode stress intensity factors. Fracture parameters, describing crack-tip deformation and fracture in the composite, are obtained explicitly. Effects of material anisotropy and crack/hole geometry are examined also. Of particular interest are the energy release rates associated with crack extension; their values are evaluated for various cases.

Results show that mixed-mode stress intensity factors and energy release rates associated with the cracks emanating from a hole change very appreciably with fiber orientation in the composite. K sub 1 and G increase monotonically with increasing theta; but K sub 2 reaches its maximum at theta = 45 deg, and then decreases gradually as theta increases further.

N82-26715*# Illinois Univ., Urbana-Champaign, Dept. of Theoretical and Applied Mechanics.

INTERLAMINAR CRACK GROWTH IN FIBER REINFORCED COMPOSITES DURING FATIGUE, PART 3 Final Report S. S. Wang and H. T. Wang Feb. 1981 37 p refs 6 Vol. (Grant NsG-3044)

(NASA-CR-165434; NAS 1 26:165434) Avail: HC A03/MF A01 CSCL 20K

Interlaminar crack growth behavior in fiber-reinforced composites subjected to fatigue loading was investigated experimentally and theoretically. In the experimental phase, inter-laminar crack propagation rates and mechanisms were determined for the cases of various geometries, laminate parameters and cyclic stress levels. A singular hybrid-stress finite element method was used in conjuction with the experimental results to examine the local crack-tip behavior and to characterize the crack propagation during fatigue. Results elucidate the basic nature of the cyclic delamination damage, and relate the interlaminar crack growth rate to the range of mixed-mode crack-tip stress intensity factors. The results show that crack growth rates are directly related to the range of the mixed-mode cyclic stress intensity factors by a power law relationship. Author

N82-26716*# Illinois Univ., Urbana-Champaign. Dept. of Theoretical and Applied Mechanics.

ANALYSIS OF INTERFACE CRACKS IN ADHESIVELY BONDED LAP SHEAR JOINTS, PART 4 Final Report

S. S. Wang and J. F. Yau Feb. 1981 39 p refs 6 Vol. (Grant NsG-3044)

(NASA-CR-165438; NAS 1,26:165438) Avail: NTIS HC A03/MF A01 CSCL 20K

Conservation laws of elasticity for nonhomogeneous materials were developed and were used to study the crack behavior in adhesively bonded lap shear joints. By using these laws and the fundamental relationships in fracture mechanics of interface cracks, the problem is reduced to a pair of linear algebraic equations, and stress intensity solutions can be determined directly by information extracted from the far field. The numerical results obtained show that: (1) in the lap-shear joint with a given adherend, the opening-mode stress intensity factor, (K sub 1) is always larger than that of the shearing-mode (K sub 2); (2) (K sub 1) is not sensitive to adherent thickness abut (K sub 2) increases rapidly with increasing thickness; and (3) (K sub 1) and (K sub 2) increase simultaneously as the interfacial crack length increases. Author

N82-26717*# Illinois Univ., Urbana-Champaign, Dept. of Theoretical and Applied Mechanics. EDGE DELAMINATION IN ANGLE-PLY COMPOSITE LAMINATES, PART 5 Final Paport S. S. Wang Feb. 1981 50 p. refs 6 Vol. (Grant NsG-3044)

(NASA-CR-165439: NAS HC A03/MF A01 CSCL 20K 1.26;165439) NTIS Avail:

A theoretical method was developed for describing the edge delamination stress intensity characteristics in angle-ply composite laminates. The method is based on the theory of anisotropic elasticity. The edge delamination problem is formulated using Lekhnitskii's complex-variable stress potentials and an especially developed eigenfunction expansion method. The method predicts exact orders of the three-dimensional stress singularity in a delamination crack tip region, With the aid of boundary collocation, the method predicts the complete stress and displacement fields in a finite-dimensional, delaminated composite. Fracture mechanics parameters such as the mixed-mode stress intensity factors and associated energy release rates for edge delamination can be calculated explicity. Solutions are obtained for edge delaminated (theta/-theta theta/-theta) angle-ply composites under uniform axial extension. Effects of delamination lengths, fiber orientations, lamination and geometric variables are studied. Author

N82-26718*# Illinois Univ., Urbana-Champaign. Dept. of Theoretical and Applied Mechanics.

BOUNDARY-LAYER EFFECTS IN COMPOSITE LAMINATES: FREE-EDGE STRESS SINGULARITIES, PART 6 Final Report

S. S. Wanag and I, Choi Apr. 1981 38 p refs 6 Vol. (Grant NsG-3044)

(NASA-CR-165440; NAS 1,26:165440) Avail: NTIS

HC A03/MF A01 CSCL 20K

A rigorous mathematical model was obtained for the boundary-layer free-edge stress singularity in angleplied and crossplied fibra composite laminates. The solution was obtained using a method consisting of complex-variable stress function potentials and eigenfunction expansions. The required order of the boundary-layer stress singularity is determined by solving the transcendental characteristic equation obtained from the homogeneous solution of the partial differential equations. Numerical results obtained show that the boundary-layer stress singularity depends only upon material elastic constants and fiber orientation of the adjacent plies. For angleplied and crossplied laminates the order of the singularity is weak in general. Author

N82-29619*# Georgia Inst. of Tech., Atlanta. Advancement of Computational Mechanics.

CREEP CRACK-GROWTH: A NEW PATH-INDEPENDENT INTEGRAL (T SUB c), AND COMPUTATIONAL STUDIES Ph.D. Thesis Final Report

R. B. Stonesifer and S. N. Atluri Jul. 1982 112 p refs (Grant NAG3-38)

(NASA-CR-167897; NAS 1.26:167897) Avail: NTIS HC A06/MF A01 CSCL 20K

The development of valid creep fracture criteria is considered, Two path-independent integral parameters which show some degree of promise are the C* and (Delta T)sub c integrals. The mathematical aspects of these parameters are reviewed by deriving generalized vector forms of the parameters using conservation laws which are valid for arbitrary, three dimensional, cracked bodies with crack surface tractions (or applied displacements), body forces, inertial effects, and large deformations. Two principal conclusions are that (Delta T)sub c has an energy rate interpretation whereas C* does not. The development and application of fracture criteria often involves the solution of boundary/initial value problems associated with deformation and stresses. The finite element method is used for this purpose. An efficient, small displacement, infinitesimal strain, displacement based finite element model is specialized to two dimensional plane stress and plane strain and to power law creep constitutive relations. A mesh shifting/remeshing procedure is used for simulating crack growth. The model is implemented with the quartz-point node technique and also with specially developed, conforming, crack-tip singularity elements which provide for the r to the [n-(1+n)] power strain singularity associated with the HRR crack-tip field. Comparisons are made with a variety of analytical solutions and alternate numerical solutions for a number of problems.

Ne2-33738*# Dayton Univ., Ohio. Dept. of Aerospace Mechanics.

A PRELIMINARY STUDY OF CRACK INITIATION AND GROWTH AT STRESS CONCENTRATION SITES Interim Technical Report, 1 Jan. - 31 Aug. 1982

D. S. Dawicke, J. P. Gallagher, G. A. Hartman, and A. M. Rajendran Sep. 1982 30 p refs

(Grant NAG3-246)

(NASA-CR-169358; NAS 1.26:169358; UDR-TR-82-119; ITR-1)

Avail: NTIS HC A03/MF A01 CSCL 20K

Crack initiation and propagation models for notches are examined. The Dowling crack initiation model and the E1 Haddad et al. crack propagation model were chosen for additional study. Existing data was used to make a preliminary evaluation of the crack propagation model. The results indicate that for the crack sizes in the test, the elastic parameter K gave good correlation for the crack growth rate data. Additional testing, directed specifically toward the problem of small cracks initiating and propagating from notches is necessary to make a full evaluation of these initiation and propagation models.

A82-11298 * Vibrations of cantilevered shallow cylindrical shells of rectangular planform, A. W. Leissa, J. K. Lee, and A. J. Wang (Ohio State University, Columbus, OH). *Journal of Sound and Vibration*, vol. 78, Oct. 8, 1981, p, 311-328. 25 refs, Grant No. NAG3-36.

A cantilevered, shallow shell of circular cylindrical curvature and rectangular planform exhibits free vibration behavior which differs considerably from that of a cantilevered beam or of a flat plate. Some numerical results can be found for the problem in the previously published literature, mainly obtained by using various finite element methods. The present paper is the first definitive study of the problem, presenting accurate non-dimensional frequency parameters for wide ranges of aspect ratio, shallowness ratio and thickness ratio. The analysis is based upon shallow shell theory. Numerical results are obtained by using the Ritz method, with algebraic polynomial trial functions for the displacements. Convergence is investigated, with attention being given both to the number of terms taken for each co-ordinate direction and for each of the three components of displacement, Accuracy of the results is also established by comparison with finite element results for shallow shells and with other accurate flat plate solutions. (Author)

A82-19341 * # Vibrations of twisted rotating blades. A. W. Leissa, J. K. Lee (Ohio State University, Columbus, OH), and A. J. Wang. American Society of Mechanical Engineers, Design Engineering Technical Conference, Hartford, CT, Sept. 20-23, 1981, Paper 81-DET-127. 8 p. 22 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NAG3-36.

The literature dealing with vibrations of turbomachinery blades is voluminous, but the vast majority of it treats the blades as beams. In a previous paper a two-dimensional analytical procedure was developed and demonstrated on simple models of blades having camber. The procedure utilizes shallow shell theory along with the classical Ritz method for solving the vibration problem. Displace-

ment functions are taken as algebraic polynomials. In the present paper the method is demonstrated on blade models having camber. Comparisons are first made with results in the literature for nonrotating twisted plates and various disagreements between results are pointed out. A method for depicting mode shape information is demonstrated, permitting one to examine all three components of displacement. Finally, the analytical procedure is demonstrated on rotating twisted blade modes, both without and with camber.

(Author)

A82-32303 * Path-independent integrals in finite elasticity and inelasticity, with body forces, inertia, and arbitrary crack-face conditions. S. N. Atluri (Georgia Institute of Technology, Atlanta, GA), Engineering Fracture Mechanics, vol. 16, no. 3, 1982, p. 341-364, 17 refs. Contract No. N00014-78-C-0636; Grants No. AF-AFOSR-81-0057; No. NAG3-38.

(Previously announced in STAR as N81-32547)

A82-35408 * # Comparison of beam and shell theories for the vibrations of thin turbomachinery blades. A. W. Leissa (Ohio State University, Columbus, OH) and M. S. Ewing (U.S. Air Force Academy, Colorado Spring, CO). American Society of Mechanical Engineers, International Gas Turbine Conference and Exhibit, 27th, London, England, Apr. 18-22, 1982, Paper 82-GT-223, 12 p. 36 refs. Members, \$2.00; nonmembers, \$4.00. Grant No. NAG3-36.

Vibration analysis of turbomachinery blades has traditionally been carried out by means of beam theory. In recent years two-dimensional methods of blade vibration analysis have been developed, most of which utilize finite elements of blade vibration to require considerable computation time. More recently a two-dimensional method of blade analysis has evolved which does not require finite elements and is based upon shell equations. The present investigation has the primary objective to demonstrate the accuracy and limitations of blade vibration analyses which utilize one-dimensional, beam theories. It is found that beam theory is generally inadequate to determine the free vibration frequencies and mode shapes of moderate to low aspect ratio turbomachinery blades. The shallow shell theory, by contrast, is capable of representing all the vibration modes accurately. However, the one-dimensional beam theory has an important advantage over the two-dimensional shell theory for blades and vibration modes. It uses fewer degrees of freedom, thus requiring less computer time.

A82-36782 * On a study of the /Delta T/c and C/asterisk/ integrals for fracture analysis under non-steady creep. R. B. Stonesifer and S. N. Atluri (Georgia Institute of Technology, Atlanta, GA). Engineering Fracture Mechanics, vol. 16, no. 5, 1982, p. 625-643. 14 refs. Grants No. NAG3-38; No. AF-AFOSR-81-0057.

Applications of a vector quantity, path-independent integral which has an energy interpretation to the characterization of crack-tip fields in the range from fast to slow crack propagation are examined. The crack tip characterization parameter is defined in terms of a conservation integral for an area around the crack tip in a two-dimensional cracked body. The actual physical interpretation of the parameter is shown to be the difference in crack lengths displayed by two identical bodies which have equal load histories. A steady-state value is obtained for the parameter for cases of steady-state creep and is shown to be related to the standard path-independent integral for macroscopic self-similar crack growth under mode I conditions. A finite element model is developed for viscoplastic material models, using an initial strain approach with steps in a size employed in tangent stiffness methods.

M.S.K.

A82-39514 * On the solution of creep induced buckling in general structure. J. Padovan and S. Tovichakchaikul (Akron, University, Akron, OH). Computers and Structures, vol. 15. no. 4, 1982, p. 379-392, 17 refs. Grant No. NAG3-54.

This paper considers the pre and post buckling behavior of general structures exposed to high temperature fields for long durations wherein creep effects become significant. The solution to this problem is made possible through the use of closed upper bounding constraint surfaces which enable the development of a new time stepping algorithm. This permits the stable and efficient solution of structural problems which exhibit indefinite tangent properties. Due to the manner of constraining/bounding successive iterates, the algorithm developed herein is largely self adaptive, inherently stable, sufficiently flexible to handle geometric material and boundary induced nonlinearity, and can be incorporated into either finite element or difference simulations. To illustrate the capability of the procedure, as well as, the physics of creep induced pre and post buckling behavior, the results of several numerical experiments are included. (Author)

A82-40066 * Moving singularity creep crack growth analysis with the /Delta T/c and C/asterisk/integrals. R. B. Stonesifer and S. N. Atluri (Georgia

/Detta T/c and C/asteriak/ Integrals. H. B. Stonesiter and S. N. Alturi (Georgia institute of Technology, Atlanta, GA). Engineering Fracture Mechanics, vol. 16, no. 6, 1982, p. 769-782, 11 refs. Grant No. NAG3-38.

The physical meaning of (Delta T)c and its applicability to creep crack growth are reviewed. Numerical evaluation of (Delta T)c and C(asterisk) is discussed with results being given for compact specimen and strip geometries. A moving crack-tip singularity, creep crack growth simulation procedure is described and demonstrated. The results of several crack growth simulation analyses indicate that creep crack growth is 304 stabless steel occurs under according to each stable. that creep crack growth in 304 stainless steel occurs under essentially steadystate conditions. Based on this result, a simple methodology for predicting creep crack growth behavior is summarized.

On ultrasonic factors and fracture toughness, L. S. Fu (Ohio State University, Columbus, OH). In: Symposium on Nondestructive Evaluation, 13th, San Antonio, TX, April 21-23, 1981, Proceedings, (A82-42851 21-38) San Antonio, TX, Southwest Research Institute, 1982, p. 149-160. 17 refs. Grant

Recent experimental and theoretical studies on ultrasonics have shown that the scattering of elastic waves by material defects yields data which characterize crack properties, such as size and orientation, and also the mechanical properties of the given material. In the present study, elastodynamic ence of a pair of inhomogeneities in a material of plate geometry are investigated by the method of equivalent inclusions. The stress amplitude change of the plates during the passage of plane time-harmonic waves is found, and the relation between fracture toughness and ultrasonic factors is determined. The approach used does not assume the existence of a sharp crack in the material.

A82-45869 * On finite deformation electo-plasticity. S, Nemat-Nasser (Northwestern University, Evanston, IL). International Journal of Solids and Structures, vol. 18, no. 10, 1982, p. 857-872. 59 refs. Grant No. NAG3-134.

Lee (1969) has proposed a theory based on the decomposition of the total deformation gradient to an elastic and plastic part, and from it has concluded that the additive decomposition of the strain rates holds only approximately. Lubarda and Lee (1981) have declared that Lee's 'exact finite-deformation kinematics shows the almost universal assumption that the total velocity strain or rate of deformation is the sum of elastic and plastic rates to be in error'. Hence questions are raised regarding the validity of essentially all finite deformation elasto-plasticity theories. The present investigation is concerned with these questions. It is shown that the additive decomposition of the strain rates follows from all common finite elasto-plasticity concepts. Lee's theory is examined, and it is shown that this theory also leads to an additive strain rate decomposition, and therefore, his conclusion stems from misinterpretation. It is found that the elastic and the plastic strain rates considered by Lee do not correspond to the same configuration. They are, therefore, not compatible measures.

A82-46109 * Interface cracks in adhesively bounded lap-shear joints. S. S. Wang and J. F. Yau (Illinois, University, Urbana, IL). International Journal of Fracture, vol. 19, Aug. 1982, p. 295-309. 29 refs. Grant No. NsG-3044.

A study on the elastic behavior of interface cracks in adhesively bonded tapshear joints is presented. The problem is investigated by using a recently developed method of analysis based on conservation laws in elasticity for nonhomogeneous solids and fundamental relationships in fracture mechanics of dissimilar materials. The formulation leads to a pair of linear algebraic equations in mixed-mode stress intensity factors. Singular crack-tip stress intensity solutions are determined directly by information extracted from the far field. Stress intensity factors and associated energy release rates are obtained for various cases of interest, Fundamental nature of the interfacial flaw behavior in lap-shear adhesive joints is examined in detail.

Boundary-layer effects in composite laminates. I - Freeedge stress singularities. II - Free-edge stress solutions and basic characteristics. S. S. Wang and I. Choi (Illinois, University, Urbana, IL). ASME, Transactions, Journal of Applied Mechanics, vol. 49, Sept. 1982, p. 541-560, 44 refs, Grant No. NsG-3044.

The fundamental nature of the boundary-layer effect in fiber-reinforced composite laminates is formulated in terms of the theory of anisotropic elasticity. The posite farilinates is formulated in terms of the freely of anisotropic elasticity. The basic structure of the boundary-layer field solution is obtained by using Lekhnit-skii's stress potentials (1963). The boundary-layer stress field is found to be singular at composite laminate edges, and the exact order or strength of the boundary layer stress singularity is determined using an eigenfunction expansion method. A complete solution to the boundary-layer problem is then derived, and the convergence and accuracy of the solution are analyzed, comparing results with existing approximate numerical solutions. The solution method is demonstrated for a symmetric graphite-epoxy composite.

ORIGINAL PAGE IS OF POOR QUALITY

U

43 EARTH RESOURCES

includes remote sensing of earth resources by aircraft and spacecraft: photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photographv.

N82-14552°# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RELIABLE AERIAL THERMOGRAPHY FOR ENERGY

CONSERVATION Final Report
John R. Jack and Robert L. Bowman Aug. 1981 35 p refs Original contains color illustrations

(Contract DE-AI01-79CS-20270)

(NASA-TM-81766; DOE/NASA/20270-1; E-828) Avail; NTIS

HC A03/MF A01 CSCL 08B

A method for energy conservation, the aerial thermography survey, is discussed. It locates sources of energy losses and wasteful energy management practices. An operational map is presented for clear sky conditions. The map outlines the key environmental conditions conductive to obtaining reliable serial thermography. The map is developed from defined visual and heat loss discrimination criteria which are quantized based on flat roof heat transfer calculations. E.A.K.

N82-18664*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GROUND TRUTH OBSERVATIONS OF ICE-COVERED NORTH SLOPE LAKES IMAGED BY RADAR

W. F. Weeks Oct. 1981 24 p refs Prepared in cooperation with CRREL, Hanover, N.H. (NASA-TM-84127; AD-A108342; CRREL-81-19) Avail: NTIS HC A02/MF A01 CSCL 08/8

Field observations support the interpretation that differences in the strength of radar returns from the ice covers of lakes on the North Slope of Alaska can be used to determine where the lake is frozen completely to the bottom. An ide/frozen soil interface is indicated by a weak return and an ice/water interface by a strong return. The immediate value of this result is that SLAR (side-looking airborne radar) imagery can now be used to prepare maps of large areas of the North Slope showing where the lakes are shallower or deeper than 1.7m (the approximate draft of the lake ice at the time of the SLAR flights). The bathymetry of these shallow lakes is largely unknown and is not obvious from their sizes or outlines. Such information could be very useful, for example in finding suitable year-round water supplies.

Author (GRA)

N82-24525*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

LANDSAT REMOTE SENSING: OBSERVATIONS OF AN APPALACHIAN MOUNTAINTOP SURFACE COAL MINING AND RECLAMATION OPERATION

Oct. 1979 7 p ref Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 Original contains color illustrations

(E82-10247; NASA-TM-84194; NAS 1.15;84194) Avail: NTIS HC A02/MF A01 CSCL 081

The potential benefits of using LANDSAT remote sensing data by state agentiles as an aide in monitoring surface coal mining operations are reviewed. A mountaintop surface mine in eastern Kentucky was surreyed over a 5 year period using satellite multispectral scanner data that were classified by computer analyses. The analyses were guided by aerial photography and by ground surveys of the surface mines procured in 1976. The application of the LANDSAT data indicates that: (1) computer classification of the various landcover categories provides information for monitoring the progress of surface mining and reclamation operations; (2) successive yearly changes in barren and revegetated areas can be qualitatively assessed for surface mines of 100 acres or more of disrupted area; (3) barren areas consisting of limestone and shale mixtures may be recognized, and revegetated areas in various stages of growth may be identified against the hilly forest background.

N82-13490* Engelhard Industries, Inc., Edison, N.J. DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEM. PINASE 3: FULL-SCALE POWER PLANT DEVELOPMENT - CONTENTS

Report, Feb. - Apr. 1981 A, Kaufmen 24 Jun. 1981 50 p

(Contract DEN3-241)

(NASA-CR-185328; DOE/NASA/0241-1; QR-1) Avail; NTIS

HC A03/MF A01 CSCL 10B

An integrated 5 kW power system based upon methanol fuel and a phosphoric acid fuel cell operating at about 473 K is described. Description includes test results of advanced fuel cell catalysts, a semiautomatic acid replenishment system and a completed 5 kW methanol/system reformer. The results of a preliminary system test on a reformer/stack/inverter combination are reported. An initial design for a 25 kW stack is presented. Experimental plans are outlined for data acquisition necessary for design of a 50 kW methanol/steam reformer. Activities related to complete mathematical modelling of the integrated power system, including wasteheat utilization, are described.

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind

For related information see also OF Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 85 Urban Technology and Transportation.

N82-10503*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

EFFECT OF POSITIVE PULSE CHARGE WAVEFORMS ON THE ENERGY EFFICIENCY OF LEAD-ACID TRACTION **CELLS Final Report**

John J. Smithrick Sep. 1981 11 p refs (Contract DE-AI01-77CS-51044)

(NASA-TM-82709: E-991: DOE/NASA/51044-22) Avail: NT:S HC A02/MF A01 CSCL 10A

The effects of four different charge methods on the energy conversion efficiency of 300 ampere hour lead acid traction cells were investigated. Three of the methods were positive pulse charge waveforms; the fourth, a constant current method, was used as a baseline of comparison. The positive pulse charge waveforms were: 120 Hz full wave rectified sinusoidal; 120 Hz silicon controlled rectified; and 1 kHz square wave. The constant current charger was set at the time average pulse current of each pulse waveform, which was 150 amps. The energy efficiency does not include charger losses. The lead acid traction cells were charged to 70 percent of rated ampere hour capacity in each case. The results of charging the cells using the three different pulse charge waveforms indicate there was no significant difference in energy conversion efficiency when compared to constant current charging at the time average pulse current

NB2-19351*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

SOLAR CELL DEVELOPMENT FOR THE POWER EXTENSION PACKAGE

Cosmo R. Baraona and James L. Cioni (NASA, Johnson Space Center) 1981 8 p refs Presented at the 16th Intersoc. Energy Conversion Conf., Atlanta, 9-14 Aug. 1981 (NASA-TM-82685; E-922) Avail: NTIS HC A02/MF A01 CSCL 10A

The PEP is a 32 kilowatt flexible substrate, retrievable, solar ar by system for use on the Space Shuttle. Solar cell costs will be reduced by increasing cell area and simplifying cell and coverglass fabrication processes and specifications. The cost goal is to produce cells below \$30 per watt. Two and ten ohm-cm silicon cells were investigated. In phase I of the cell development program a few thousand candidate cells will be produced and evaluated for utility and quality. In phase II a large number of cells will be fabricated to verify production readiness and cell yields and costs. This schedule is compatible with PEP initial operational capability in 1984. Approximately 140,000 large area (5.9 x 5.9 cm) cells will be required for two PEP solar arrays. The status of the cell development and testing, including a radiation damage test and side-by-side comparison of candidate cell types with pre- and post-irradiation airplane calibration of outer space short-circuit current, is reported.

N82-12553*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ANALYTIC INVESTIGATION OF EFFICIENCY AND PERFOR-MANCE LIMITS IN KLYSTRON AMPLIFIERS USING MULTIDIMENSIONAL COMPUTER FROGRAMS: MULTI-STAGE DEPRESSED COLLECTORS; AND THERMIONIC CATHODE LIFE STUDIES

H, G, Kosmahl In NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 139-146 refs (For primary document see N82-12538 03-44) Avail: NTIS HC A99/MF A01 CSCL 10A

Due to complexity of the program which used a hydrodynamic, axially and radially deformable disk-ring model and the resulting long computing time only the output gap was investigated. Results from independent studies were used to initiate the starting conditions for the electrons and the RF voltage using our program, Although this method of computation is less exact than processing the entire klystron interaction in 3-Dimensions it is shown that, for a confined flow focused throughout the penultimate cavity, radial velocities remain very small and the beam is highly laminar. It is concluded that possible errors resulting from treating only the output cavity in 3-D would remain small.

N82-12574* | National Aeronautics and Signs Administration.

Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF ADVANCED CHROMIUM ELEC-TRODES FOR THE NASA REDOX ENERGY STORAGE

SYSTEM Final Report
Randall F. Gahn, JoAnn Charleston, Jerri S. Ling, and Margaret

A. Reid Nov. 1981 23 p refs (Contract DE-Al04-80AL-12726) (NASA-TM-82724; E-1025; DOE/NASA/12726-15) Avail: NTIS HC A02/MF A01 CSCL 10C

Chromium electrodes were prepared for the NASA Redox Storage System with meet the performance requirements for solar-photovoltaic, wind-turbine and electric utility applications. Gold-lead catalyzed carbon felt electrodes up to 930 sq cm were fabricated and tested in single cells and multicell stacks for hydrogen evolution, coulombic efficiency, catalyst subility and electrochemical activity. Factors which affect the overall performance of a particular electrode include the carbon felt lot, the cleaning treatment and the gold catalyzation method. Effects of the chromium solution chemistry and impurities on charge/ discharge performance are also presented.

N82-13504*# National Aeronautics and Space Administration.

Lewis R'search Center, Cleveland, Ohio.

CATALYTIC COMBUSTION OF RESIDUAL FUELS

Daniel L. Bulzan and Robert R. Tacina 1981 20 p refs Presented at 5th Workshop on Catalytic Combustion, San Antonio, Tex., 15-16 Sep. 1981

(Contract DE-AI01-77ET-10350)

(NASA-TM-82731; E-1040) Avail: NTIS HC A02/MF A01 CSCL 21B

A noble metal catalytic reactor was tested using two grades of petroleum derived residual fuels at specified inlet air temperatures, pressures, and reference velocities. Combustion efficiencies greater than 99,5 percent were obtained. Steady state operation of the catalytic reactor required inlet air temperatures of at least 800 K. At lower inlet air temperatures, upstream burning in the premixing zone occurred which was probably caused by fuel deposition and accumulation on the premixing zone walls. Increasing the inlet air temperature prevented this occurrence. Both residual fuels contained about 0.5 percent nitrogen by weight. NO sub x emissions ranged from 50 to 110 ppm by volume at 15 percent excess O2. Conversion of fuel-bound nitrogen to NO sub x ranged from 25 to 50 percent. M.D.K.

N82-13509*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

GAS-TURBINE CRITICAL RESEARCH AND ADVANCED TECHNOLOGY SUPPORT PROJECT Annual Report

John S. Clark, Philip E. Hodge, Carl E. Lowell, David N. Anderson, and Donald F, Schultz Mar. 1981 50 p refs

(Contract DE-AI01-77ET-10350)

(NASA-TM-81708: DOE/NASA/2593-24; E-737) Avail: NTIS

HC A03/MF A01 CSCL 10B

A technology data base for utility gas turbine systems capable of burning coal derived fuels was developed. The following areas are investigated: combustion; materials; and system studies. A two stage test rig is designed to study the conversion of fuel bound nitrogen to NOx. The feasibility of using heavy fuels in catalytic combustors is evaluated. A statistically designed series of hot corrosion burner rig tests was conducted to measure the corrosion rates of typical gas turbine alloys with several fuel contaminants. Fuel additives and several advanced thermal barrier coatings are tested. Thermal barrier coatings used in conjunction with low critical alloys and those used in a combined cycle system in which the stack temperature was maintained above the acid corrosion temperature are also studied. E.A.K.

N82-14633*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio
ALUMINUM BLADE DEVELOPMENT FOR THE MOD-OA 200-KILOWATT WIND TURBINE Final Report

Bredford S. Linscott, Richard K. Shaltens, and A. G. Eggers (Westinghouse Electric Corp., Pittsburg) Dec. 1981 43 p refs (Contract DE-AB29-76ET-20370)

(NASA-TM-82594; DOE/NASA-20370/20) Avail: NTIS

HC A03/MF A01 CSCL 10A

The rotor blade configuration, fabrication methods, analyses. operating experience, design modifications, and cost are described. Each 60-ft -(18.3-m-) long aluminum blade used current aircraft fixed wing and rotary wing design and fabrication technologies. Structural damage, repairs, and modifications that occurred during 6500 hours of operation are summarized.

N82-16477*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NEW FEATURES AND APPLICATIONS OF PRESTO, A COMPUTER CODE FOR THE PERFORMANCE OF REGEN-ERATIVE, SUPERHEATED STEAM TURBINE CYCLES Yung K, Choo and Peter J. Staiger Jan. 1982 39 p refs

(NASA-TP-1954; E-721) Avail: NTIS HC A03/MF A01 CSCL

The code was designed to analyze performance at valves-wideopen design flow. The code can model conventional steam cycles as well as cycles that include such special features as process steam extraction and induction and feedwater heating by external heat sources. Convenience features and extensions to the special features were incorporated into the PRESTO code. The features are described, and detailed examples illustrating the use of both the original and the special features are given.

N82-16478*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

VARIABLE GAIN FOR A WIND TURBINE PITCH CONTROL Final Report

Robert C. Seidel and Arthur G. Birchenough Dec. 1981 14 p

(Contract DE-AI01-76ET-20320)

(NASA-TM-82751; DOE/NASA/20320-34; E-1067) Avail: NTIS HC A02/MF A01 CSCL 10A

The gain variation is made in the software logic of the pitch angle controller. The gain level is changed depending upon the level of power error. The control uses low gain for low pitch activity the majority of the time. If the power exceeds ten percent offset above rated, the gain is increased to a higher gain to more effectively limit power. A variable gain control functioned well in tests on the Mod-O wind turbine.

NS2-16481*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

SUMMARY AND EVALUATION OF THE CONCEPTUAL DESIGN STUDY OF A POTENTIAL EARLY COMMERCIAL MHD POWER PLANT (CSPEC) Finel Report

P. J. Staiger and P. F. Penko Jan. 1982 22 p refs (Contract DE-AI01-77ET-10769)

(NASA-TM-82734; DOE/NASA/10769-21; E-1046) Avail:

NTIS HC A02/MF A01 CSCL 10B

The conceptual design study of a potential early commercial MHD power plant (CSPEC) is described and the results are summarized. Each of two contractors did a conceptual design of an approximately 1000 MWe open-cycle MHD/steam plant with oxygen enriched combustion air preheated to an intermediate temperature in a metallic heat exchanger. The contractors were close in their overall plant efficiency estimates but differed in their capital cost and cost of electricity estimates, primarily because of differences in balance-of-plant material, contingency, and operating and maintenance cost estimates. One contractor concluded that its MHD plant design compared favorably in cost of electricity with conventional coal-fired steam plants. The other contractor is making such a comparison as part of a follow-on study. Each contractor did a preliminary investigation of partload performance and plant availability. The results of NASA studies investigating the effect of plant size and oxidizer preheat temperature on the performance of CSPEC-type MHD plants are also described. The efficiency of a 1000 MWe plant is about three points higher than of a 200 MWe plant. Preheating to

1600 F gives an efficiency about one and one-half points higher than preheating to 800 F for all plant sizes. For each plant size and preheat temperature there is an oxidizer enrichment level and MHD generator length that gives the highest plant efficiency.

NS2-16495* | National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohlo.

THE NASA LEWIS LARGE WIND TURDINE PROGRAM R. L. Thomas and D. H. Baldwin 1981 24 p refs Presented at the 5th Biennial Wind Energy Conf. and Workshop, Washington, D.C., 5-7 Oct. 1981

(Contract DE-AI01-79ET-20305)

(NASA-TM-82761; DOE/NASA/20305-7; E-1082) Avail: NTIS HC A01/MF A01 CSCL 10B

The program is directed toward development of the technology for safe, reliable, environmentally acceptable large wind turbines that have the potential to generate a significant amount of electricity at costs competitive with conventional electric generation systems. In addition, these large wind turbines must be fully compatible with electric utility operations and interface requirements. Advances are made by gaining a better understanding of the system design drivers, improvements in the analytical design tools, verification of design methods with operating field data, and the incorporation of new technology and innovative designs. An overview of the program activities is presented and includes results from the first and second generation field machines (Mod-OA, -1, and -2), the design phase of the third generation wind turbine (Mod-5) and the advanced technology projects. Also included is the status of the Department of Interior WTS-4 machine.

N82-18691*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL STUDY OF AN INTEGRAL CATALYTIC COMBUSTOR: HEAT EXCHANGER FOR STIRLING **ENGINES**

Daniel L. Bulzan 1982 20 p refs Presented at the 1982 Intern. Congr. and Exposition, Detroit, 22-26 Feb. 1982; sponsored

(Contract DE-AI01-77CS-51040)

(NASA-TM-82783; DOE/NASA/51040-36) Avail: NTIS

HC A02/MF A01 CSCL 10A

The feasibility of using catalytic combustion with heat removal for the Stirling engine to reduce exhaust emissions and also improve heat transfer to the working fluid was studied using spaced parallel plates. An internally air-cooled heat exchanger was placed between two noble metal catalytic plates. A preheated fuel-air mixture passed between the plates and reacted on the surface of the catalyzed plates. Heat was removed from the catalytic surface by radiation and convection to the aircooled heat exchangers to control temperature and minimize thermal nitrogen oxide enissions. Test conditions were inlet combustion air temperatures from 850 to 900 K, inlet velocities of about 10 m/s, equivalence ratios from 0.5 to 0.9, and pressures from 1.3x10 to the 5th power to 2.0x10 to the 5th power Pa, Propane fuel was used for all testing. Combustion efficiencies greater than 99.5 percent were measured. Nitrogen oxide emissions ranged from 1.7 to 3.3 g NO2/kg fuel. The results demonstrate the feasibility of the concept and indicate that further investigation of the concept is warranted.

N82-18694*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

ASSESSMENT OF STEAM-INJECTED GAS TURBINE SYSTEMS AND THEIR POTENTIAL APPLICATION

Robert J. Stochl Feb. 1982 21 p refs (NASA-TM-92735; E-1047) Avail: NTIS

CSCL 10B

Results were arrived at by utilizing and expanding on information presented in the literature. The results were analyzed and compared with those for simple gas turbine and combined cycles for both utility power generation and industrial cogeneration applications. The efficiency and specific power of simple gas turbine cycles can be increased as much as 30 and 50 percent, respectively, by the injection of steam into the combustor. Steam-injected gas turbines appear to be economically competitive with both simple gas turbine and combined cycles for small, clean-fuel-fired utility power generation and industrial cogeneration applications, For large powerplants with integrated coal gasifiers, the economic advantages appear to be marginal. T.M.

N82-19670* National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.
PHOSPHORIC ACID FUEL CELL TECHNOLOGY STATUS Stephen N. Simons, Robert B. King, and Paul R. Prokopius 1981 20 p refs Presented at Fuel Cells: Technol. Status and Appl., Chicago 16-18 Nov. 1981; sponsored by Institute of Gas Technology

(Contract DE-AI01-80ET-17088)

(NASA-TM-82791; DOE/NASA/17088-3) HC A02/MF A01 CSCL 10A Avail: NTIS

A review of the current phosphoric acid fuel cell system technology development efforts is presented both for multimegawatt systems for electric utility applications and for multikilowatt systems for on-site integrated energy system applications. Improving fuel cell performance, reducing cost, and increasing durability are the technology drivers at this time. Electrodes, matrices, intercell cooling, bipolar/separator plates, electrolyte management, and fuel selection are discussed.

NB2-19671*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MECHANISM AND MODELS FOR ZINC METAL MORPHOL-OGY IN ALKALINE MEDIA

Charles E. May and Harold E. Kautz Dec. 1981 36 p refs (NASA-TM-82768; E-1090) Avail: NTIS HC A03/MF A01 CSCL 10A

Based on experimental observations, a mechanism is presented to explain existence of the different morphologies of electrodeposited zinc in alkaline solution. The high current density dendrites appear to be due to more rapid growth on the nonbasal crystallographic planes than on the basal plane. The low current density moss apparently results from dissolution from the nonbasal planes at low cathodic voltages. Electrochemical models were sought which would produce such a phenomenon. The fundamental plating mechanism alone accounts only for different rates on different planes, not for zinc dissolution from a plane in the cathodic region. Fourteen models were explored; two models were in accord with the proposed mechanism. One involves rapid disproportionation of the zinc +1 species on the nonbasal planes. The other involves a redox reaction (corrosion) between the zinc-zincate and hydrogen-water systems.

N82-19672*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

PERFORMANCE AND OPERATIONAL ECONOMICS ESTIMATES FOR A COAL GASIFICATION COMBINED-CYCLE COGENERATION POWERPLANT

Joseph J. Nainiger, Raymond K. Burns, and Annie J. Easley Mar. 1982 32 p refs

(NASA-TM-82729; E-1032) Avail: NTIS HC A03/MF A01 CSCL 10B

A performance and operational economics analysis is presented for an integrated-gasifier, combined-cycle (IGCC) system to meet the steam and baseload electrical requirements. The effect of time variations in steam and electrial requirements is included. The amount and timing of electricity purchases from sales to the electric utility are determined. The resulting expenses for purchased electricity and revenues from electricity sales are estimated by using an assumed utility rate structure model, Cogeneration results for a range of potential IGCC cogeneration system sizes are compared with the fuel consumption and costs of natural gas and electricity to meet requirements without cogeneration. The results indicate that an IGCC cogeneration system could save about 10 percent of the total fuel energy presently required to supply steam and electrical requirements without cogeneration. Also for the assumed future fuel and electricity prices, an annual operating cost savings of 21 percent to 26 percent could be achieved with such a cogeneration system, An analysis of the effects of electricity price, fuel price, and system availability indicates that the IGCC cogeneration system has a good potential for economical operation over a wide range in these assumptions.

NB2-19673*# National Aeronautics and Space Administration. Lewis Research Center, Cloveland, Ohio

OPERATIONAL PERFORMANCE OF THE PHOTOVOLTAIC-POWERED GRAIN MILL AND WATER PUMP AT TANGAYE, UPPER VOLTA Summery Report, Mer. 1979 - Apr. 1981 James E. Martz, Anthony F. Katajczak, and Richard DeLombard Feb. 1982 59 p refs Sponsored in part by Bureau for **Development Support**

(NASA-TM-82767; E-1089) Avail: NTIS HC A04/MF A01

CSCL 10B

The first two years of operation of a stand alone photovoltaic (PV) power system for the village of Tangaye, Upper Volta in West Africa are described. The purpose of the experiment was to demonstrate that PV systems could provide reliable electrical power for multiple use applications in remote areas where local technical expertise is limited. The 1.8 kW (peak) power system supplies 120-V (d.c.) electrical power to operate a grain mill, a water pump, and mill building lights for the village. The system was initially sized to pump a part of the village water requirements from an existing improved well, and to meet a portion of the village grain grinding requirements. The data, observations, experiences, and conclusions developed during the first two years of operation are discussed. Reports of tests of the mills used in the project are included.

N82-20668* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio. PERFORMANCE MAPPING STUDIES IN REDOX FLOW

CELLS Mark A. Hoberecht and Lawrence H. Thaller Sep. 1981 12 p

(Contract DE-AIO4-80AL-12726)

(NASA-TM-82707; DOE/NASA/12726-13; NAS 1.15:82707; DE82-003288) Avail: NTIS HC A02/MF A01 CSCL PA

Pumping power requirements in any flow battery system constitute a direct parasitic energy loss. It is therefore useful to determine the practical lower limit for reactant flow rates. Through the use of a theoretical framework based on electrochemical first principles, two different experimental flow mapping techniques were developed to evaluate and compare electrodes as a function of flow rate. For the carbon felt electrodes presently used in NASA-Lewis Redox cells, a flow rate 1.5 times greater than the stoichiometric rate seems to be the required minimum.

Author

N82-21710*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
MICROPROCESSOR CONTROL SYSTEM FOR 200KILOWATT MOD-OA WIND TURBINES Final Report Ted W. Nyland and Arthur G. Birchenough Jan. 1982 26 p

(Contract DE-AI01-765T-20370)

(NASA-TM-82711; E-10006; NAS 1.15.82711;

DOE/NASA/20370-22) Avail: NTIS HC A03/MF A01 CSCL

The microprocessor system and program used to control the operation of the 200-kW Mod-OA wind turbines is described. The system is programmed to begin startup and shutdown sequences automatically and to control yaw motion. Rotor speed and power output are controlled with integral and proportional control of the blade pitch angle, included in the report are a description of the hardware and a discussion of the software programming technique. A listing of the PL/M software program is given.

N82-21712* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL PERFORMANCE OF THE REGENERATOR FOR THE CHRYSLER UPGRADED AUTOMOTIVE GAS TURBINE ENGINE Final Report

Jerry M. Winter and Ralph C. Nussle Feb. 1982 62 p refs (Contract DE-Al01-77CS-51040)

(NASA-TM-82671; E-953; DOE/NASA/5 1040-32; NAS 1.15:82671) Avail: NTIS HC A04/MF A01 CSCL 108

Automobile gas turbine engine regenerator performance was studied in a regenerator test facility that provided a satisfactory simulation of the actual engine operating environment but with independent control of airflow and gas flow. Velocity and temperature distributions were measured immediately downstream

of both the core high-pressure-side outlet and the core lowpressure side outlet. For the original engine housing, the regenerator temperature effectiveness was 1 to 2 percent higher than the design value, and the heat transfer effectiveness was 2 to 4 percent lower than the design value over the range of test conditions simulating 50 to 100 percent of gas generator speed. Recalculating the design values to account for seal leakage decreased the design heat transfer effectiveness to values consistent with those measured herein. A baffle installed in the engine housing high-pressure-side inlet provided more uniform velocities out of the regenerator but did not improve the difectiveness. A housing designed to provide more uniform axial flow to the regenerator was also tested. Although temperature uniformity was improved, the effectiveness values were not improved. Neither did 50-percent flow blockage (90 degree segment) applied to the high-pressure-side inlet change the effectiveness significantly.

N82-21714* # National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD FOR PREDICTING IMPULSIVE NOISE GENERATED BY WIND TURBINE ROTORS

Larry A. Viterna 1982 7 p. refs. Presented at the Intern. Conf. on Noise Control Eng., San Francisco, 17-19 May 1982 (Contract D2-AI01-76ET-20320)

(NASA-TM-82794; E-1128; DOE/NASA/20320-36; NAS 1 15 82794) Avail: NTIS HC A02/MF A01 CSCL 10B

Large wind turbines can generate both broad band and impulsive noises. These noises can be controlled by proper choice of rotor design parameters such as rotor location with respect to the supporting tower, tower geometry and tip speed. A method was developed to calculate the impulsive noise generated when the wind turbine blade experiences air forces that are periodic functions of the rotational frequency. This phenomenon can occur when the blades operate in the wake of the support tower and the nonuniform velocity field near the ground due to wind shear. Results from this method were compared with measured sound spectra taken at locations of one to two rotor diameters from the DOE/NASA Mod-1 wind turbine. The calculated spectra generally agreed with the measured data in both the amplitude of the predominant harmonics and the roll of rate with frequency. Measured sound pressure levels far from the Mod-1 (15 rotor diameters), however, were higher than predicted. Simultaneous measurements in the near and far field indicated that the propagation affects could enhance the sound levels by more than 10 dB above that expected by spherical dispersion. These propagation effects are believed to be due to terrain and atmospheric characteristics of the Mod-1 site. Author

N82-22649* # National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF ROTOR CONFIGURATION ON GUYED TOWER AND FOUNDATION DESIGNS AND ESTIMATED COSTS FOR INTERMEDIATE SITE HORIZONTAL AXIS WIND TURBINES

G. R. Frederick (Toledo Univ.), J. R. Winemiller, and J. M. Savino

Mer. 1982 39 p refs (NASA-TM-82804; DDE/NASA/20320-39; NAS 1.15:82804)

Avail: NTIS HC A03/MF A01 CSCL 10B

Three designs of a guyed cylindrical tower and its foundation for an intermediate size horizontal axis wind turbine generator are discussed. The primary difference in the three designs is the configuration of the rotor. Two configurations are two-blade rotors with teetering hubs - one with full span pitchable blades, the other with fixed pitch blades. The third configuration is a three-bladed rotor with a rigid hub and fixed pitch blades. In all configurations the diameter of the rotor is 38 meters and the axis of rotation is 30.4 meters above grade, and the power output is 200 kW and 400 kW. For each configuration the design is based upon for the most severe loading condition either operating wind or hurricane conditions. The diameter of the tower is selected to be 1.5 meters (since it was determined that this would provide sufficient space for access ladders within the tower) with guy rods attached at 10,7 meters above grade. Completing a design requires selecting the required thicknesses of the various cylindrical segments, the number and diameter of the guy rods, the number and size of soil anchors, and the size of the central foundation. The lower natural frequencies of vibration are determined for each design to ensure that operation near resonance does not occur. Finally, a cost estimate is prepared for each design. A preliminary design and cost estimate of a cantilever tower (cylindrical and not guyed) and its foundation is also presented for each of the three configurations.

NG2-226729 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. IMPROVED CHROMIUM ELECTRODES FOR REDOX CELLS

Patent Application

Vinod Jalan (Giner, Inc.), Margaret A, Reid, and Jo Ann Charleston, Inventors (to NASA) Filed 26 Feb. 1982 13 p (NASA-Cace-LEW-13653-1; US-Patent-Appl-SN-352821) Avail; NTIS HC A02/MF A01 CSCL 10C

An improved electrode having & gold coating for use in the anode compartment of a REDOX cell is described. The anode fluid utilizes a chromic/chromous couple. A carbon felt is soaked in methanol, rinsed in water, dried and then heated in KOH after which it is again washed in delonized water and dried. The felt is then moistened with a methanol water solution containing chloroauric acid and is stored in a dark place while still in contact with the gold-containing solution. After all the gold-containing solution is absorbed in the felt, the latter is dried by heat and then heat treated at a substantially greater temperature. The felt is then suitable for use as an electrode and is wetted with water or up to two molar HCl prior to installation in a REDOX cell. The novelty of the invention lies in the use of KOH for cleaning the felt and the use of alcohol as a carrier for the gold together with the heat treating procedure.

N82-22673*# National Aeronautics and Space Administration. Lawis Research Center, Cleveland, Ohio.

LIGHT WEIGHT NICKEL BATTERY PLAGUE Patent **Application**

M. A. Reid, R. E. Post, and D. G. Soltis, inventors (to NASA) Filed 19 Feb, 1982 9 p

(NASA-Case-LEW-13349-1; US-Patent-Appl-SN-350476) Avail: NTIS HC A02/MF A01 CSCL 10C

Fabrication of a nickel plaque which may be coated with another suitable metal or compound to form an electrode for use in a fuel cell or battery is described. A flexible, porous, platable, plastic substrate is positioned against a diffuser together with an apertured support plate in a conduit, Flanges are clamped together on gaskets which prevent leakage of fluid from the conduit for bypassing of the substrate by the fluid, Treatment solutions are directed under pressure from a container by a pump through the substrate, diffuser and apertured support to a treatment solution collector. The treatment solutions are first a sensitizer, then distilled water, a catalyst solution, distilled water and, lastly, a nickel plating bath solution.

N82-23678*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio,
PARAMETRIC PERFORMANCE ANALYSIS OF STEAMINJECTED GAS TURBINE WITH A THERMIONIC-ENERGY-CONVERTER-LINED COMBUSTOR

Yung K. Choo and Raymond K. Burns Feb, 1982 21 p refs (NASA-TM-82736; E-1048; NAS 1,15:82736) Avail: NTIS

HC A02/MF A01 CSCL 10B

The performance of steam-injected gas turbines having combustors lined with thermionic energy converters (STIG/TEC systems) was analyzed and compared with that of two baseline systems; a steam-injected gas turbine (without a TEC-lined combustor) and a conventional combined gas turbine/steam turbine cycle. Common gas turbine parameters were assumed for all of the systems, Two configurations of the STIG/TEC system were investigated. In both cases, steam produced in an exhaust-heat-recovery boiler cools the TEC collectors. It is then injected into the gas combustion stream and expanded through the gas turbine. The STIG/TEC system combines the advantage of gas turbine steam injection with the conversion of high-temperature combustion heat by TEC's, The addition of TEC's to the baseline steam-injected gas turbine improves both its efficiency and specific power. Depending on system configuration and design parameters, the STIG/TEC system can also achieve higher efficiency and specific power than the baseline combined Author cvcle.

NG2-23679* Mathesis Acronquies and Europe Administration. Lawis Research Contag Claveland, Unio.

EVALUATION OF FURTHING ACCOMMODATION RYSTEMS FOR WIND DRIVEN TURBINE BOTORS Final Report

H. Bankaitis Mar. 1982 49 p refs Contract DE-AIO1-76ET-20320)

(NASA-TM-82784; E-1116; DOE/NASA/20320-37; NAS 1.15;82784) Avail: NTIS HC A03/MF A01 CSCL 10B

Wind-driven turbine generators are being evaluated as an alternative source of electric energy. Areas of favorable location for the wind-driven turbines (high wind density) coincide with areas of high incidence of thunderstorm activity. These locations, coupled with the 30-m or larger diameter rotor blades, make the wind-driven turbine blades probable terminations for lightning strikes. Several candidate systems of lightning accommodation for composite-structural-material blades were designed and their effectiveness evaluated by submitting the systems to simulated lightning strikes. The test data were analyzed and system devign were reviewed on the basis of the analysis. T.M.

N82-23684* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

WIND TURBINE DYNAMICS

Robert W. Thresher, ed. (Oregon State Univ., Corvallis) May 1981 422 p refs Workshop held in Cleveland 24-26 Feb. 1981 Sponsored in part by DOE

(NASA-CP-2185; NAS 1.55;2185; CONF-81-228; SERI/CP-635-1238) Avail: NTIS HC A18/MF A01 CSCL

Recent progress in the analysis and prediction of the dynamic behavior of wind turbine generators is discussed. The following areas were addressed: (1) the adequacy of state of the art analysis tools for designing the next generation of wind power systems; (2) the use of state of the art analysis tools designers; and (3) verifications of theory which might be lacking or inadequate. Summaries of these informative discussions as well as the questions and answers which followed each paper are documented in the proceedings. For individual titles, see N82-23685 through N82-23733.

N82-23696*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPLICATIONS OF THE DOE/NASA WIND TURBINE ENGINEERING INFORMATION SYSTEM

Harold E. Neustadter and David A. Spera In its Wind Turbine Dyn. May 1981 p 113-120 refs (For primary document see N82-23684 14-44)

Avail: NTIS HC A18/MF A01 CSCL 10B

A statistical analysis of data obtained from the Technology and Engineering Information Systems was made. The systems analyzed consist of the following elements: (1) sensors which measure critical parameters (e.g., wind speed and direction, output power, blade loads and component vibrations); (2) remote multiplexing units (RMUs) on each wind turbine which frequencymodulate, multiplex and transmit sensor outputs; (3) on-site instrumentation to record, process and display the sensor output; and (4) statistical analysis of data. Two examples of the capabilities of these systems are presented. The first illustrates the standardized format for application of statistical analysis to each directly measured parameter. The second shows the use of a model to estimate the variability of the rotor thrust loading, which is a derived parameter.

N82-23699*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CALCULATION OF GUARANTEED MEAN POWER FROM WIND TURBINE GENERATORS

David A. Spera In its Wind Turbine Dyn. May 1981 p 139-150 refs (For primary document cee N82-23684 14-44)

Avail: NTIS HC A18/MF A01 CSCL 10B

A method for calculating the 'guaranteed mean' power output of a wind turbine generator is proposed. The term 'mean power' refers to the average power generated at specified wind speeds during short-term tests. Correlation of anemometers, the method of bins for analyzing non-steady data, the PROP Code for predicting turbine power, and statistical analysis of deviations in test data

from theory are discussed. Guaranteed mean power density for the Clayton Mod-OA system was found to be 8 watts per square meter less than theoretical power density at all power levels. with a confidence level of 0.999. This amounts to 4 percent of Author rated power.

NB2-23707*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.
WHIRL FLUTTER ANALYSIS OF A HORIZONTAL-AXIS WIND TURBINE WITH A TWO-BLADED TEETERING ROTOR

David C, Janetzke and Krishna R. V. Kaza (Toledo Univ.) NASA, Lewis Research Center Wind Turbine Dyn. May 1981 p 201-210 refs (For primary document see N82-23684 14-44) Avail: NTIS HC A18/MF A01 CSCL 10B

Whirl flutter and the effect of pitch-flap coupling on teetering motion of a wind turbine were investigated. The equations of totion are derived for an idealized five-degree-of-freedom mathematical model of a horizontal-axis wind turbine with a two-bladed teetering rotor. The model accounts for the out-ofplane bending motion of each blade, the teetering motion of the rotor, and both the pitching and yawing motions of the refor support. Results show that the design is free from whirl flutter. Selected results are presented indicating the effect of variations in rotor support damping, rotor support stiffness, and pitch-flap coupling on pitching, yawing, teetering, and blade Author bending motions.

NS2-23710*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPARISON OF UPWIND AND DOWNWIND ROTOR OPERATION OF THE DOE/NASA 100-kW MOD-0 WIND TURBINE

John C. Glasgow, Dean R. Miller, and Robert D. Corrigan In its Wind Turbine Dyn, May 1981 p 225-234 refs (For primary document see N82-23684 14-44)

Avail: NTIS HC A18/MF A01 CSCL 10B

Tests were conducted on a 38m diameter horizontal axis wind turbine, which had first a rotor downwind of the supporting truss tower and then upwind of the tower. Aside from the placement of the rotor and the direction of rotation of the drive train, the wind turbine was identical for both tests. Three aspects of the test results are compared: rotor blads bending loads, rotor teeter response, and nacelle yaw moments. As a result of the tests, it is shown that while mean flatwise bending moments were unaffected by the placement of the rotor, cyclic flatwise bending tended to increase with wind speed for the downwind rotor while remaining somewhat uniform with wind speed for the upwind rotor, reflecting the effects of increased flow disturbance for downwind rotor, Rotor teeter response was not significantly affected by the rotor location relative to the tower, but appears to reflect reduced teeter stability near rated wind speed for both configurations. Tester stability appears to return above rated wind speed, however. Nacelle yew moments are higher for the upwind rotor but do not indicate significant design problems for either configuration.

N82-23711*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohlo,

A REVIEW OF RESONANCE RESPONSE IN LARGE HORIZONTAL-AXIS WIND TURBINES

Timothy L. Sullivan In Its Wind Turbine Dyn. May 1981 p 237-244 refs (For primary document see N82-23684 14-44)

Avail: NTIS HC A18/MF A01 CSCL 10B

Field operation of the Mod-O and Mod-1 wind turbines is described. Operational experience shows that 1 per rev excitation exists in the drive train, high aerodynamic damping prevents resonance response of the blade flatwise modes, and teetering the hub substantially reduces the chordwise blade response to odd harmonic excitation. These results can be used by designer as a guide to system frequency placement, in addition it is found that present analytical techniques can accurately predict wind turbine natural frequencies. T.M.

N82-23730* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE NASA-LORG WIND TURBINE SOUND PREDICTION CODE

Larry A. Viterna In its Wind Turbine Dyn. May 1981 p 411-418

refs (For primary document see N82-23684 14-44)
Avail: NTIS HC A18/MF A01 CSCL 108
Since regular operation of the DOE/NASA MOD-1 wind turbine began in October 1979 about 10 nearby households have complained of noise from the machine. Development of the NASA-LeRC with turbine sound prediction code began in May 1980 as part of an effort to understand and reduce the noise generated by MOD-1. Tone sound levels predicted with this code are in generally good agreement with measured data taken in the vicinity MOD-1 wind turbine (less than 2 rotor diameters). Comparison in the far field indicates that propagation effects due to terrain and atmospheric conditions may be amplifying the actual sound levels by about 6 dB, Parametric analysis using the code has shown that the predominant contributions to MOD-1 rotor noise are: (1) the velocity deficit in the wake of the support tower: (2) the high rotor speed: and (3) off column operation. Author

N82-24647* | National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio,

DESIGN OF A 35-KILOWATT BIPOLAR NICKEL-HYDROGEN BATTERY FOR LOW EARTH ORBIT APPLICATION

Robert L. Cataldo and John J. Smithrick 1982 10 p refs To be presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8-13 Aug, 1982; sponsored by IEEE, AIAA, ACS, AIChE, ANS, ASME and SAE

(NA SA-TM-82844; E-1214; MAS 1.15;82844) Avail: NTIS HC A02/MF A01 CSCL 10C

The needs of multikilowatt storage for low Earth orbit applications are featured. The modular concept, with projected energy densities of 20-24 W-hr/lb and 700-900 W-hr/ft3, has significant improvements over state of the art capabilities. Other design features are; active cooling, a new scheme for H2-O2 recombination, and pore size engineering of all cell components.

N82-24717*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH VOLTAGE V-GROOVE SOLAR CELL Patent Applica-

tion
J. C. Evans, Jr., A. T. Chai, and C. P. Goradia, inventors (to NASA) Filed 18 Mar. 1982 11 p
(NASA-Case-LEW-13401-2; US-Patent-Appi-SN-359388) Avail:
NTIS HC A02/MF A01 CSCL 10A

A high voltage multijunction solar cell is disclosed. The cell is composed of a plurality of discrete voltage generating regions, or unit cells, which are formed in a single semiconductor wafer and are connected together so that the voltages of the individual cells are additive. The unit cells comprise doped regions of opposite conductivity types separated by a gap. V-shaped grooves are formed in the water and thereafter the water is oriented so that ions of one conductivity type can be implanted in one face of the groove while the other face is shielded. A metallization layer is applied and selectively etched away to provide connections hetween the unit cells.

N82-25636*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

IMPACT OF UNIFORM ELECTRODE CURRENT DISTRIBU-TION ON ET?

David J. Bents 1982 10 p refs Presented at the 20th Aerospace Sci. Meeting, Orlando, Fla., 11-14 Jan 1982 (Contract DE-AI01-77ET-10769)

(NASA-TM-82875; E-1044; NAS 1.15:82875;

DOE/NASA/10769-24) Avail: NTIS HC A02/MF A01 CSCL

The design impacts on the ETF electrode consolidation network associated with uniform channel electrode current distribution are examined and the alternate consolidation design which occur are presented com; -red to the basaline (non-uniform current) design with respect to performance, and hardware requirements. A rational basis is given for comparing the requirements for the different designs and the savings that result from uniform current distribution, Performance and cost impacts upon the combined cycle plant are discussed.

N82-25637* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

NASA REDOX SYSTEM DEVELOPMENT PROJECT STA-TUS

A. W. Nice 1981 18 p refs Presented at the 4th Battery and Electrochem. Contractors Conf., Washington, 2-4 Jun. 1981 (Contract DE-AI01-80AL-12726)

(NASA-TM-82665; E-939; DOE/NASA/12726-9; NAS 1.15:82665) AVBI: NTIS HC A02/MF A01 CSCL 10A

NASA-Redox energy storage systems developed for solar power applications and utility load leveling applications are discussed. The major objective of the project is to establish the discussed. The major objective of the project is to establish the technology readiness of Redox energy storage for transfer to industry for product development and commercialization by industry. The approach is to competitively contract to design, build, and test Redox systems progressively from preprototype to prototype multi-kW and megawatt systems and conduct supporting technology advantement tasks. The Redox electrode and membrane are fully adequate for multi-kW solar related applications and the viability of the Redox system technology as demonstrated for multi-kW solar related applications. The status of the NASA Redox Storage System Project is described along with the goals and objectives of the project elements.

N82-26790* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

OPTIMIZATION OF THE OXIDANT SUPPLY SYSTEM FOR
COMBINED CYCLE MHD. POWER PLANTS

Proposed as the 20th

Albert J. Juhasz 1982 14 p refs Presented a the 20th Symp. on the Eng. Aspects of Magnetohydrodyn., Irvine, Calif., 14-16 Jun. 1981

(Contract DE-AI01-77ET-10769)

(NASA-TM-82909; E-1294; DOE/NASA/10769-27; NAS

1.15:82909) Avail: NTIS HC A02/MF A01

An in-depth study was conducted to determine what, if any, improvements could be made on the oxidant supply system for combined cycle MHD power plants which could be reflected in higher thermal efficiency and a reduction in the cost of electricity, COE. A systematic analysis of air separation process varitions which showed that the specific energy consumption could be minimized when the product stream oxygen concentration is about 70 mole percent was conducted. The use of advanced air compressors, having variable speed and guide vane position control, results in additional power savings. The study elso led to the conceptual design of a new air separation process, sized for a 500 MW sub e MHD plant, referred to a internal compression is discussed. In addition to its lower overall energy consumption, potential capital cost savings were identified for air separation plants using this process when constructed in a single large air separation train rather than multiple parallel trains, typical of conventional practice

N82-26807*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio,
MOD-2 WIND TURBINE SYSTEM CLUSTER RESEARCH
TEST PROGRAM, VOLUME 1: INITIAL PLAN E-1290 Final Report

Larry H. Gordon Mar. 1982 92 p refs 2 Vol. (NASA-TM-82906; NAS 1.15:82906; DOE/NASA/20305-8) Avail; NTIS HC A05/MF A01 CSCL 10A

Upon completion of the design and development of three Mod-2 wind turbines, a series of research experiments are planned to gather data on and evaluate the performance, environmental effects, and operation of a cluster as well as a single, large multimegawatt wind turbine. Information on the program objectives, a Mod-2 system description, a planned schedule, organizational roles, and responsibilities, is included.

N82-27838*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

COMPARATIVE ANALYSIS OF THE CONCEPTUAL DESIGN STUDIES OF POTENTIAL EARLY COMMERCIAL MHD POWER PLANTS (CSPEC)

R. J. Sovie, J. M. Winter, A. J. Juhasz, and R. D. Berg (Gilbert Associates, Inc.) 1982 27 p refs Presented at the 20th Symp. on the Eng. Aspects of Magnetohydrodyn., Irvine, Calif., 14-16 Jun. 1982

(Contract DE-Al01-77ET-10769) (NASA-TM-82897; DOE/NASA/10769-26; NAS 1.15:82897) Avail: NTIS HC A03/MF A01 CSCL 10B

A conceptual design study of the MHD/steam plant that incorporates the use of oxygen enriched air preheated in a metallic heat exchanger as the combustor oxidant showed that this plant is the most attractive for early commercial applications. The variation of performance and cost was investigated as a function of plant size. The contractors' results for the overall efficiencies are in reasonable agreement considering the slight differences in their plant designs. NASA LeRC is reviewing cost and performance results for consistency with those of previous studies, including studies of conventional steam plants. LeRC in house efforts show that there are still many tradeoffs to be considered for these oxygen enriched plants and considerable variations can be made in channel length and level of oxygen anrichment with little change in overall plant efficiency.

N32-28786*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ROLLING RESISTANCE OF ELECTRIC VEHICLE TIRES FROM TRACK TESTS

Miles O. Dustin and Ralph J. Slavik Jun. 1982 26 p refs Sponsored in part by NASA (Contract DE-Al01-77CS-51044)

(NASA-TM-82836; DOE/NASA/51044-24; NAS 1.15:82836) Avail: NTIS HC A03/MF A01 CSCL 13F

Special low-rolling-resistance tires were made for DOE's ETV-1 electric vehicle. Tests were conducted on these tires and on a set of standard commercial automotive tires to determine the rolling resistance as a function of time during both constantspeed tires and SAE J227a driving cycle tests. The tests were conducted on a test track at ambient temperatures that ranged from 15 to 32 C (59 to 89 F) and with tire pressures of 207 to 276 kPa (30 to 40 psi). At a contained-air temperature of 38 C (100 F) and a pressure of 207 kPa (30 psi) the rolling resistances of the electric vehicle tires and the standard commercial tires, respectively, were 0.0102 and 0.0088 kilogram per kilogram of vehicle weight. At a contained-air temperature of 38 C (100 F) and a pressure of 276 kPa (40 psi) the rolling resistances were 0.009 and 0.0074 kilogram per kilogram of vehicle weight, respectively.

N82-29708* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

ADVANCED INORGANIC SEPARATORS FOR ALKALINE **BATTERIES Patent**

Dean W. Sheibley, inventor (to NASA) Issued 25 May 1982 5 p Filed 27 Feb. 1981 Supersedes N81-22466 (19 - 13,

(NASA-Case-LEW-13171-1; US-Patent-4,331,746; US-Patent-Appl-SN-238790; US-Patent-Class-429-144;

US-Patent-Class-429-251; US-Patent-Class-429-254) Avail: US

Patent and Trademark Office CSCL 10C

A flexible, porous battery separator comprising a coating applied to a porous, flexible substrate is described. The coating comprises: (1) a thermoplastic rubber-based resin which is insoluble and unreactive in the alkaline electrolyte; (2) a polar organic plasticizer which is reactive with the alkaline electrolyte to produce a reaction product which contains a hydroxyl group and/or a carboxylic acid group; and (3) a mixture of polar particulate filler materials which are unreactive with the electrolyte, the mixture comprising at least one first filler material having a surface area of greater than 25 meters sq/gram, at least one second filler material having a surface area of 10 to 25 sq meters/gram, wherein the volume of the mixture of filler materials is less than 45% of the total volume of the fillers and the binder, the filler surface area per gram of binder is about 20 to 60 sq meters/gram, and the amount of plasticizer is sufficient to coat each filler particle. A method of forming the battery separator is also described.

Official Gazette of the U.S. Patent and Trademark Office

N82-29709* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD OF MAKING A HIGH VOLTAGE V-GROOVE SOLAR CELL Patent

John C. Evans, Jr., An-Ti Chai, and Chandre P. Goradia, inventors (to NASA Issued 22 Jun. 1982 6 p Filed 24 Dec. 1980 Supersedes N81-16529 (19 - 07, p 092-(NASA-Case-LEW-13401-1; US-Patent-6,235,503:

US-Patent-Appl-SN-219678; US-Patent-Class-29-572; US-Patent-Class-136-249; US-Patent-Class-148-1.5;

US-Patent-Class-357-30) Avail: US Patent and Trademark Office CSCL 10A

A method is provided for making a high voltage multijunction solar cell. The cell comprises a plurality of discrete voltage generating regions, or unit cells, which are formed in a single semiconductor wafer and are connected together so that the voltages of the individual ceris are additive. The unit cells comprise doped regions of opposite conductivity types separated by a gap. The method includes forming V-shaped grooves in the wafer and thereafter orienting the wafer so that ions of one conductivity type can be implanted in one face of the groove while the other face is shielded. A metallization layer is applied and selectively etched away to provide connections between the unit cells. Official Gazette of the U.S. Patent and Trademark Office

N82-29717*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TECHNIQUES FOR ENHANCING DURABILITY AND EQUIVALENCE RATIO CONTROL IN A RICH-LEAN, THREE-STAGE GROUND POWER GAS TURBINE COMBUS-

Donald F. Schultz 1982 14 p refs Presented at 1982 Joint Power Generation Conf., Denver, 17-21 Oct. 1982; sponsored by ASME

(Contract DE-AI01-77ET-10350)

(NASA-TM-82922; DOE/NASA/10350-33-E-1313, NAS 1.15:82922) Avail: NTIS HC A02/MF A01 CSCL 10A

Rig tests of a can-type combustor were performed to demonstrate two advanced ground power engine combustor concepts: steam cooled rich-burn combustor primary zones for enhanced durability; and variable combustor geometry for three stage combustion equivalence ratio control. Both concepts proved to be highly successful in achieving their desired objectives. The steam cooling reduced peak liner temperatures to less than 800 K. This offers the potential of both long life and reduced use of strategic materials for liner fabrication. Three degrees of variable geometry were successfully implemented to control airflow distribution within the combustor. One was a variable blade angle axial flow air swirler to control primary airflow while the other two consisted of rotating bands to control secondary and tertiary or dilution air flow.

N82-30700*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESULTS OF CHOPPER-CONTROLLED DISCHARGE LIFE

CYCLING STUDIES ON LEAD ACID BATTERIES

John G. Ewashinka and Steven M. Sidik 1982 17 p Presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8-13 Aug. 1982 Sponsored in part by DOE (NASA-TM-82912; DOE/NASA/51044-26; E-1293; NAS 1.15:82912) Avail: NTIS HC A02/MF A01 CSCL 10C

A group of 108 state of the art nominally 6 volt lead acid batteries were tested in a program of one charge/discharge cycle per day for over two years or to ultimate battery failure. The primary objective was to determine battery cycle life as a function of depth of discharge (25 to 75 percent), chopper frequency (100 to 1000 Hz), duty cycle (25 to 87.5 percent), and average discharge current (20 to 260 A). The secondary objective was to determine the types of battery failure modes, if any, were due to the above parameters. The four parameters above were incorporated in a statistically designed test program. R.J.F.

N82-30704*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

LEWIS PRESSURIZED, FLUIDIZED-BED COMBUSTION

PROGRAM, DATA AND CALCULATED RESULTS

R. James Rollbuhler Mar. 1982 63 p refs
(NASA-TM-81767; E-830; NAS 1,15:81767) Avail: NTIS

HC A04/MF A01 CSCL 10B

A 200 kilowatt (thermal), pressurized, fluidized bed (PFB) reactor and research test facility were designed, constructed, and operated. The facility was established to assess and evaluate the effect of PFB hot gas effluent on aircraft turbine engine materials that may have applications in stationary powerplant turbogenerators. The facility was intended for research and development work and was designed to operate over a wide range of conditions, These conditions included the type and rate of consumption of fuel (e.g., coal) and sulfur reacting sorbent

material: the ratio of feed fuel to sorbent material: the ratio of feed fuel to combustion airflow; the depth of the fluidized reaction bed; the temperature and pressure in the reaction bed; and the type of test unit that was exposed to the combustion exhaust

N82-30710*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIENCE AND ASSESSMENT OF THE DOE-NASA MOD-1 2000-KILOWATT WIND TURBINE GENERATOR AT

MOD-1 2000-KILOWATT WIND TURBINE GENERATOR AT BOONE, NORTH CAROLINA Final Report John L. Collins, Richard K. Shaltenc, Richard H. Poor (General Electric, Philadelphia), and Robert S. Barton (General Electric, Philadelphia) Apr. 1982 55 p refs (Contract DE-AIO1-76ET-20366)

(NASA-TM-82721; E-1020; DOE/NASA/20366-2; NAS 1.15:82721) Avail: NTIS HC A04/MF A01 CSCL 10A

The Mod 1 program objectives are defined. The Mod 1 wind turbine is described. In addition to the steel blade operated on the wind turbine, a composite biade was designed and manufactured. During the early phase of the manufacturing cycle of Mod 1A configuration was designed that identified concepts such as partial span control, a soft tower, and upwind teetered rotors that were incorporated in second and third generation industry designs. The Mod 1 electrical system performed as designed, with voltage flicker characteristics within acceptable utility limits. Power output versus wind speed equaled or exceeded design predictions. The wind turbine control system was operated successfully at the site and remotely from the utility dispatcher's office, During wind turbine operations, television interference was experienced by the local residents. As a consequence, operations were restricted. Although not implemented, two potential solutions were identified. In addition to television interference, a few local residents complained bout objectionable sound, particularly the 'thump' as the blade passed behind the tower. To eliminate objections, the sound generation level was reduced by 10 dB by reducing the rotor speed from 35 rpm to 23 rpm. Bolts in the drive train fractured. A solution was identified but not implemented. The public reaction toward the Mod 1 wind turbine program was overwhelmingly favorable.

N82-30713*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

INTEGRATED GASIFIER COMBINED CYCLE POLYGENERA-TION SYSTEM TO PRODUCE LIQUID HYDROGEN

Raymond K. Burns, Peter J. Staiger, and Richard M. Donovan

Jul. 1982 37 p refs (NASA-TM-82921; E-1308; NAS 1.15:82921) Avail: NTIS HC A03/MF A01 CSCL 10A

An integrated gasifier combined cycle (IGCC) system which simultaneously produces electricity, process steam, and liquid hydrogen was evaluated and compared to IGCC systems which cogenerate electricity and process steam. A number of IGCC plants, all employing a 15 MWe has turbine and producing from 0 to 20 tons per day of liquid hydrogen and from 0 to 20 MWt of process steam were considered. The annual revenue required to own and operate such plants was estimated to be significantly lower than the potential market value of the products. The results indicate a significant potential economic benefit to configuring IGCC systems to produce a clean fuel in addition to electricity and process steam in relatively small industrial applications.

N82-30714*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ASSESSMENT OF A 40-KILOWATT STIRLING ENGINE FOR UNDERGROUND MINING APPLICATIONS

James E. Cairelli, Gary G. Kelm, and Jack G. Slaby Jun. 1982 75 p refs

(Contract DI-BM-JO-100026)

(NASA-TM-82822; E-1171; NAS 1.15:82822) Avail: NTIS

HC A04/MF A01 CSCL 081

An assessment of alternative power souces for underground mining applications was performed. A 40-kW Stirling research engine was tested to evaluate its performance and emission characteristics when operated with helium working gas and diesel fuel. The engine, the test facility, and the test procedures are described. Performance and emission data for the engine operating with helium working gas and diesel fuel are reported and compared with data obtained with hydrogen working gas and

unleaded gasoline fuel, Helium diesel test results are compared with the characteristics of current diesel engines and other Stirling engines. External surface temperature data are also presented. Emission and temperature results are compared with the Federal requirements for diesel underground mine engines. The durability potential of Stirling engines is discussed on the basis of the experience gaind during the engine tests.

N82-30715*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SYNTHETIC BATTERY CYCLING TECHNIQUES

Harold F. Leibecki and Lawrence H. Thaller 1982 Proposed for presentation at the 4th ESTEC Spacecraft Power Conditioning Seminar, Noordwijk, Netherlands, 9-11 Nov. 1982; sponsored by ESA

(NASA-TM-82945; E-1351; NAS 1,15;82945) Avail: NTIS HC A02/MF A01 CSCL 10C

Synthetic battery cycling makes use of the fast growing capability of computer graphics to illustrate some of the basic characteristics of operation of individual electrodes within an operating electrochemical cell. It can also simulate the operation of an entire string of cells that are used as the energy storage subsystem of a power system. The group of techniques that as a class have been referred to as Synthetic Battery Cycling is developed in part to try to bridge the gap of understanding that exists between single cell characteristics and battery system behavior.

N82-30716*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NICKEL-HYDROGEN BIPOLAR BATTERY SYSTEMS

Lawrence H. Thailer 1982 9 p refs Proposed for presentation at the 4th ESTEC Spacecraft Power Conditioning Seminar, Noordwijk, Netherlands, 9-11 Nov. 1982; sponsored by ESA (NASA-TM-82946; E-1352; NAS 1.15:82946) Avail: NTIS HC A02/MF A01 CSCL 10A

Nickel-hydrogen cells are currently being manufactured on a semi-experimental basis. Rechargeable nickel-hydrogen systems are described that more closely resemble a fuel cell system than a traditional nickel-cadmium battery pack. This has been stimulated by the currently emerging requirements related to large manned and unmanned low earth orbit applications. The resultant nickel-hydrogen battery system should have a number of features that would lead to improved reliability, reduced costs as well as superior energy density and cycle lives as compared to battery systems constructed from the current state-of-the-art nickel-hydrogen individual pressure vessel cells.

N82-30717*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CATALYTIC COMBUSTION OF ACTUAL LOW AND MEDIUM HEATING VALUE GASES

Daniel L. Bulzan 1982 19 p refs Presented at the Joint Power Generation Conf., Denver, 17-21 Oct. 1982 (Contract DE-AI01-77ET-10350)

(NASA-TM-82930; E-1326; DOE/NASA/10350-34; NAS 1.15:82930) Avail: NTIS HC AO2/MF AO1 CSCL 10A

Catalytic combustion of both low and medium heating value gases using actual coal derived gases obtained from operating gasifiers was demonstrated. A fixed bed gasifier with a complete product gas cleanup system was operated in an air blown mode to produce low heating value gas. A fluidized bed gasifier with a water quench product gas cleanup system was operated in both an air enriched and an oxygen blown mode to produce low and medium, heating value gas. Noble metal catalytic reactors were evaluated in 12 cm flow diameter test rigs on both low and medium heating value gases. Combustion efficiencies greater than 99,5% were obtained with all coal derived gaseous fuels. The NOx emissions ranged from 0.2 to 4 g NO2 kg fuel.

N62-31764* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH VOLTAGE PLANAR MULTIJUNCTION SOLAR CELL

John C. Evans, Jr., An-Ti Chai, and Chandra P. Goradia, inventors (to NASA) Issued 24 Dec. 1980 6 p Filed 24 Dec. 1980 Supersedes N81-16528 (19 - 07, p 0927) (NASA-Case-LEW-13400-1; US-Patent-4,341,918; US-Patent-Appl-SN-219677; US-Patent-Class-136-249; US-Patent-Class-357-30) Avail: US Patent and Trademark Office

A high voltage multijunction solar cell is provided wherein a plurality of discrete voltage generating regions or unit cells are formed in a single generally planar semiconducto; body. The unit cells are comprised of doped regions of opposite conductivity type separated by a gap or undiffused region. Metal contacts connect adjacent cells together in series so that the output voltages of the individual cells are additive. In some embodiments, doped field regions separated by a overlie the unit cells but the cells may be formed in both faces of the wafer.

Official Gazette of the U.S. Patent and Trademark Office

N82-31769*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MICRONIZED COAL BURNER FACILITY **Patent Application** F. D. Calfo and M. W. Lupton, inventors (to NASA) Filed 30 Jun. 1982 13 p

(NASA-Case-LEW-13426-1; US-Patent-Appl-SN-393588) Avail: NTIS HC A02/MF A01 CSCL 10B

A combustor or burner system in which the ash resulting from burning a coal in oil mixture is of submicron particle size is described. The burner system comprises a burner section, a flame exit nozzle, a fuel nozzle section, and an air tube by which preheated air is directed into the burner section. Regulated air pressure is delivered to a fuel nozzle. Means are provided for directing a mixture of coal particles and oil from a drum to a nozzle at a desired rate and pressure while means returns excess fuel to the fuel drum.

N82-31776*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GAS TURBINE CRITICAL RESEARCH AND ADVANCED TECH-NOLOGY (CRT) SUPPORT PROJECT Annual Report, Fiscal Year 1980

Edward R. Furman, David N. Anderson, Michael A. Gedwill, Jr., Carl E. Lowell, and Donald F. Schultz Jul. 1982 47 p refs (Contract DE-Al01-77ET-10350)

(NASA-TM-82872; E-1247; NAS 1.15:82872) HC A03/MF A01 CSCL 10A Avail: NTIS

The technical progress to provide a critical technology base for utility gas turbine systems capable of burning coal-derived fuels summarized. Project tasks include the (1) combustion - to investigate the combustion of coal-derived fuels and the conversion of fuel-bound nitrogen to NOx; (2) materials - to understand and prevent the hot corrosion of turbine hot section materials; and (3) system studies - to integrate and guide the technological efforts. Technical accomplishments include: an extension of flame tube combustion testing of propane - Toluene Fuel Mixtures to vary H2 content from 9 to 18 percent by weight and the comparison of results with that predicted from a NASA Lewis General Chemical Kinetics Computer Code; the design and fabrication of combustor sector test section to test current and advanced combustor concepts; Testing of Catalytic combustors with residual and coal-derived liquid fuels; testing of high strength super alloys to evaluate their resistance to potential fuel impurities using doped clean fuels and coal-derived liquids; and the testing and evaluation of thermal barrier coatings and bond coatings on conventional turbine materials.

N82-31777*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.
ON THE CAUSE OF THE FLAT-SPOT PHEMOMENON OB-SERVED IN SILICON SOLAH CELLS AT LOW TEMPERATURES AND LOW INTENSITIES

V. G. Weizer, J. D. Broder, H. W. Brandhorst, and A. F. Forestieri 1982 14 p refs Presented at the 3rd European Symp. on Photovoltaic Generators in Space, Bath, England, 4-6 May 1982;

sponsored by RAE, U.K. Dept. of Industry and ESA. (NASA-TM-82903; E-1286; NAS 1.15:82903) HC A02/MF A()1 CSCL 10A Avail: NTIS

A model is presented that explains the 'flat-spot' (FS) power loss phenomenon observed in silicon solar cells operating deep space (low temperature, low intensity) conditions. Evidence is presented suggesting that the effect is due to localized metallurgical interactions between the silicon substrate and the contact metallization. These reactions are shown to result in localized regions in which the PN junction is destroyed and replaced with a metal-semiconductor-like interface. The effects of thermal treatment, crystallographic orientation, junction depth, and metallurization are presented along with a method of preventing the effect through the suppression of vacancy formation at the free surface of the contact metallization. Preliminary data indicating the effectiveness of a TiN diffusion barrier in preventing the effect are also given.

N82-32853*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DETERMINATION OF OPTIMUM SUNLIGHT CONCENTRATION LEVEL IN SPACE FOR 3-4 CASCADE SOLAR CELLS

Henry B. Curtis 1982 14 p refs Presented at the 3rd European Symp. on Photovoltaic Generators in Space, Bath, Engl., 4-6 May 1982; sponsored by RAE and ESA

(NASA-TM-82899; E-1282; NAS 1.15:82899) Avail: NTIS

HC A02/MF A01 CSCL 10A

The optimum range of concentration in space for III-V cascade cells has been calculated using a realistic solar cell diode equation. Temperature was varied with concentration using several models and ranged from 55 deg at one sun to between 80 deg and 200 deg C at 100 suns. A variety of series resistance and internal resistances were used. Coefficients of the diffusion and recombination terms are strongly temperature dependent. The study indicates that the maximum efficiency of 30 percent occurs in the 50 to 100 X sun concentration range provided series resistance is below 0.015 ohm sq cm and cell temperature is about 80 C at 100 suns.

N82-32854*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LARGE AREA LOW-COST SPACE SOLAR CELL DEVELOP-MENT

C. R. Baraona and J. L. Cioni (NASA. Johnson Space Center, Houston, Tex.) 1982 9 p refs Presented at the 3rd European Symp. on Photovoltaic Generators in Space, Bath, Engl., 4-6 May, 1982; sponsored by RAE and ESA

(NASA-TM-82902; E-1285; NAS 1.15:82902) HC A02/MF A01 CSCL 10A

ry development program to produce large-area (5.9 x 5.9 cm) space quality silicon solar cells with a cost goal of 30 \$/watt is described. Five cell types under investigation include wraparound dielectric, mechanical wraparound and conventional contact configurations with combinations of 2 or 10 ohm-cm resistivity, back surface reflectors and/or fields, and diffused or ion implanted junctions. A single step process to cul cell and cover-glass simultaneously is being developed. A description of cell developments by Applied Solar Energy Corp., Spectrolab and Spire is included. Results are given for cell and array tests, performed by Lockheed, TRW and NASA. Future large solar arrays that might use cells of this type are discussed.

N82-33828# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGN DESCRIPTION OF THE TANGAYE VILLAGE PHOTO-**VOLTAIC POWER SYSTEM**

James E. Martz and Anthony F. Ratajczak Jun. 1982 113 p

(NASA-TM-82917; E-1305; NAS 1.15:82917) Avail: NTIS HC A06/MF A01 CSCL 10A

The engineering design of a stand alone photovoltaic (PV) powered grain mill and water pump for the village of Tangaye, Upper Volta is described. The socioeconomic effects of reducing the time required by women in rural areas for drawing water and grinding grain were studied. The suitability of photovoltaic technology for use in rural areas by people of limited technical training was demonstrated. The PV system consists of a 1.8-kW (peak) solar cell array, 540 ampere hours of battery storage, instrumentation, automatic controls, and a data collection and storage system. The PV system is situated near an improved village well and supplies d.c. power to a grain mill and a water pump. The array is located in a fenced area and the mill, battery, instruments, controls, and data system are in a mill building. A water storage tank is located near the well. The system employs automatic controls which provide battery charge regulation and system over and under voltage protection. This report includes descriptions of the engineering design of the system and of the load that it serves; a discussion of PV array and battery sizing methodology; descriptions of the mechanical and electrical designs including the array, battery, controls, and instrumentation; and a discussion of the safety features. The system became operational on March 1, 1979.

Author

N82-33829°# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio, ON THE ROAD PERFORMANCE TESTS OF ELECTRIC TEST

VEHICLE FOR CORRELATION WITH ROAD LOAD SIMULATOR Final Report

Miles O. Dustin and Ralph J. Slavik Aug. 1982 27 p refs (Contract DE-AI01-77CS-51044)

(NASA-TM-82900; E-1283; DOÉ/NASA/51044-25; NAS 1.15:82900) Avail: NTIS HC A03/MF A01 CSCL 13F

A dynamometer (road load simulator) is used to test and evaluate electric vehicle propulsion systems. To improve correlation between system tests on the road load simulator and on the rrad, similar performance tests are conducted using the same wehicle. The results of track tests on the electric propulsion system sest vehicle are described. The tests include range at constant speeds and over SAE J227a driving cycles, maximum accelerations. maximum gradability, and tire rolling resistance determination. Road power requirements and energy consumption were also determined from coast down tests.

N82-33830*# National Aeronautics and Space Administratioก. Lewis Research Center, Cleveland, Ohio.

THEORETICAL AND EXPERIMENTAL POWER FROM LARGE HORIZONTAL-AXIS WIND TURBINES

Larry A. Viterna and David C. Janetzke Sep. 1982 21 p refs Presented at the 5th Biennial Conf. and Workshop on Wind Energy, Washington D.C., 5-7 Oct. 1981 (Contract DE-Al01-76ET-20320)

(NASA-TM-82944; E-1346; DOÉ/NASA/20320-41; NAS

1.15:82944) Avail: NTIS HC A02/MF A01 CSCL 10A

A method for calculating the output power from large horizontalaxis wind turbines is presented. Modifications to the airfoll characteristics and the momentum portion of classical blade element-momentum theory are given that improve correlation with measured data. Improvement is particularly evident at low tip-speed ratios where aerodynamic stall can occur as the blade experiences high angles of attack. Output power calculated using the modified theory is compared with measured data for several large wind turbines. These wind turbines range in size from the DOE/NASA 100 kW Mod-0 (38 m rotor diarneter) to the 2000 kW Mod-1 (61 m rotor diameter). The calculated results are in good agreement with measured data from these machines.

A82-11774 * # NASA prepototype redox storage system for a photovoltaic stand-alone application, N. H. Hagedorn (NASA, Lewis Research Center, Cleveland, OH). In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 1981, Proceedings, Volume 1, (A82-11701 02-44) New York, American Society of Mechanical Engineers, 1981, p. 805-811.

ORIGINAL PAGE IS OF POOR QUALITY

A 1-kW preprototype redox storage system that has undergone characterization tests and been operated as the storage device for a 5-kW (peak) photovoltaic array is described and performance data are presented, Loss mechanisms are discussed, and simple design changes leading to appreciable increases in efficiency are suggested, The effects on system performance of nonequilibrium between the preduminant species of complexed chromic ion in the negative electrode reactant solution are summarized. It is noted that with the aid of the prototype system, control concepts have been shown to be valid and trouble free and some insight has been gained into interactions at the mutual interfaces of the redox system, the photovoltaic array, the load, and the control devices,

A82-44942 * Advances in high output voltage silicon solar cells. R. A. Arndt, A. Meulenberg, J. F. Allison (COMSAT Laboratories, Clarksburg, MD), and V. G. Weizer (NASA, Lewis Research Center, Cleveland, OH). In: Photovoltaic Specialists Conference, 15th, Kissimmee, FL, May 12-15, 1981, Conference Record. (A82-44928 23-44) New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 92-96, 14 refs, Research sponsored by the Communication Satellite Corp.; Contract No. NAS3-21227.

Solar cells have been fabricated from 0.1 ohm-cm, p-type silicon by means of a two-step diffusion process of emitter formation in order to delineate the factors limiting V(oc) in conventionally structured cells with the goal of achieving 700 mV. The cells are 200 microns thick and 2 x 2 cm in area with a planar front surface that has an anti-reflection coating of tantalum oxide, as well as Cr-Au-Ag contact metallization on both sides of the cell. The Cr-Au-Ag is applied over an aluminum diffused layer on the back, while it is applied through small holes in the antireflection coating on the front. Results show that the best of these cells exhibits an open-circuit voltage of 654 mV under AMO illumination.

A82-44944 * Thin foil silicon solar cells with coplanar back contacts. F. Ho, P. A. Iles (Applied Solar Energy Corp., City of Industry, CA), and C. R. Baraona (NASA, Lewis Research Center, Cleveland, OH). In: Photovoltaic Specialists Conference, 15th, Kissimmee, FL, May 12-15, 1981, Conference Record. (A82-44928 23-44) New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 102-106, 8 refs. Contract No. NAS3-22228.

To fabricate 50 microns thick, coplanar back contact (CBC) silicon solar cells, wraparound junction design was selected and proved to be effective. The process sequence used, the cell design, and the cell performance are described, CBC cells with low solar absorptance have shown AMO efficiencies to 13%, high cells up to 14%; further improvements are projected with predictable optimiza-(Author)

A82-44957 * Fabrication of multijunction high voltage concentrator solar cells by integrated circuit technology. G. J. Valco, V. J. Kapoor (Case Western Reserve University, Cleveland, OH), J. C. Evans, Jr., and A.-T. Chai (NASA, Lewis Research Center; Case Western Reserve University, Cleveland, OH). In: Photovoltaic Specialists Conference, 15th, Kissimmee, FL, May 12-15, 1981, Conference Record. (A82-44928 23-44) New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 187-192. NASA-supported research.

Standard integrated circuit technology has been developed for the design and fabrication of planar multijunction (PMJ) solar cell chips. Each 1 cm x 1 cm solar chip consisted of six n(+)/p, back contacted, internally series interconnected unit cells. These high open circuit voltage solar cells were fabricated on 2 ohm-cm, p-type 75 microns thick, silicon substrates. A five photomask level process employing contact photolithography was used to pattern for boron diffusions, phorphorus diffusions, and contact metallization. Fabricated devices demonstrated an open circuit voltage of 3.6 volts and a short circuit current of 90 mA at 80 AMI suns. An equivalent circuit model of the planar multi-junction solar cell was developed.

The effects of controls and controllable and storage A82-45027 ° loads on the performance of stand-alone photovoltaic systems. R. C. Cull (NASA, Lewis Research Center, Cleveland, OH) and A. H. Eltimsahy (Toledo, University, Toledo, OH). In: Photovoltaic Specialists Conference, 15th, Kissimmee, FL, May 12-15, 1981, Conference Record. (A82-44928 23-44) New York, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 621-626. NASAsupported research.

Stand-alone photovoltaic systems have been modeled and analyzed from sunlight in to consumer product out. By including the consumer product in the analysis, concepts such as 'product storage' (a storage tank for water or coldplates for refrigeration) and loads controllable by the system controller have been added to the system analysis. From a controls analysis viewpoint, this adds state variables to the system. The result is that the system controller can make operating control decisions on the energy flow between these various system elements

to optimize system performance and reduce system cost. The effects on system performance of various control schemes employing these concepts are presented. Analysis of water pumping and/or refrigeration systems show possible performance improvements of greater than 15% with the addition of controlla-(Author) ble loads with product storage.

A92-45055 * A theory of the n-i-p silicon solar cell, C. Goradia (Cleveland State University, Cleveland, OH), I, Weinberg, and C, Baraona (NASA, Lewis Research Center, Cleveland, OH). In: Photovoltaic Specialists Conference, 15th, Kissimmee, FL, May 12-15, 1981, Conference Record, (A82-44928 23-44) New Yest, Institute of Electrical and Electronics Engineers, Inc., 1981, p. 855-860, 11 efs, Grant No. NAG3-144.

A computer model has been developed, based on an analytical theory of the high base resistivity BSF n(+)(pi)p(+) or p(+)(nu)n(+) silicon solar cell. The model makes very few assumptions and actounts for nonuniform optical generation, generation and recombination in the junction space charge region, and bandgap narrowing in the heavily doped regions. The paper presents calculated results based on this model and compares them to available experimental data. Also discussed is radiation damage in high base resistivity n(+)(pi)p(+) space solar

40-kW phosphoric acid fuel cell field test - Project plan. A82-45325 * R. R. Woods (Gas Research Institute, Chicago, IL) and R. A. Duscha (NASA, Lewis Research Center, Cleveland, OH). In: Fuel cells: Technology status and applications; Proceedings of the Symposium, Chicago, IL, November 16-18, 1981. (A82-45317 23-44) Chicago, IL, Institute of Gas Technology, 1982, p. 215-231.

N82-10495*# Gilbert/Commonwealth, Reading, Pa MAGNETOHYDRODYNAMICS MHD ENGINEERING TEST FACILITY ETF 200 MWE POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT CDER. **VOLUME 3:** COSTS AND SCHEDULES Final Report

a strong page regularity from the following the second

Sep. 1981 61 p 5 Vol. (Contracts DEN3-224; DE-AI01-77ET-10769)

(NASA-CR-165452-Vol-3; DOE/NASA/0224-1-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 10B

The extimated plant capital cost for a coal fired 200 MWE electric generating plant with open cycle magnetohydrodynamics is divided into principal accounts based on Federal Energy Regulatory Commision account structure, Each principal account is defined and its estimated cost subdivided into identifiable and major equipment systems. The cost data sources for compiling the estimates, cost parameters, allotments, assumptions, and contingencies, are discussed. Uncertainties associated with developing the cours are quantified to show the confidence level acquired. Guidelines established in preparing the estimated costs are included. Based on an overall milestone schedule related to conventional power plant scheduling experience and starting procurement of MHD components during the preliminary design phase there is a 6 1/2-year construction period. The duration of the project from start to commercial operation is 79 months. The engineering phase of the project is 4 1/2 years; the construction duration following the start of the main power block is 37 months,

N82-10505*# Stirling Thermal Motors, Inc., Ann Arbor, Mich. EVALUATION OF THE POTENTIAL OF THE STIRLING ENGINE FOR HEAVY DUTY APPLICATION R. J. Meijer and B. Ziph Oct. 1981 62 p refs **Final Report**

(Contract NAS3-22226) (NASA-CR-165473) Avail: NTIS HC A04/MF A01 CSCL

A 150 hp four cylinder heavy duty Stirling engine was evaluated. The engine uses a variable stroke power control system, swashplate drive and ceramic insulation. The sensitivity of the design to engine size and heater temperature is investigated. Optimization shows that, with porous ceramics, indicated efficiencies as high as 52% can be achieved. It is shown that the gain in engine efficiency becomes insignificant when the heater temperature is raised above 200 degrees F.

N82-10506*# DHR, Inc., Washington, D.C. MARKET ASSESSMENT OF PHOTOVOLTAIC POWER SYSTEMS FOR AGRICULTURAL APPLICATIONS IN MEXICO William Steigelmann and Itil Asmon (ARD, Inc.) Jul. 1981

135 p refs (Contracts DEN3-180; DE-AIO1-79ET-20485) (NASA-CR-165441; DOE/NASA/0180-3) HC A07/MF A01 CSCL 10A Avail: NTIS

The first year of cost-competitiveness, the market potential, and the environment in which PV systems would be marketed and employed were examined. Market elements specific to Mexico addressed include; (1) useful applications and estimates of the potential market for PV systems; (2) power requirements and load profiles for applications compatible with PV usage: (3) operating and cost characteristics of power systems that compete against PV; (4) national development goals in rural electrification and rural services, technology programs and government policies that influence the demand for PV in Mexico; (5) financing mechanisms and capital available for PV acquisition: (6) channels for distribution, installation and maintenance of PV systems; and (7) appropriate methods for conducting business in Mexico.

N82-11546*# Stonehart Associates, Inc., Madison, Conn. SURVEY ON AGING ON ELECTRODES AND ELECTROCAT-ALYSTS IN PHOSPHORIC ACID FUEL CELLS Progress

Paul Stonehart and John Hochmuth Oct, 1981 73 p refs

(Contract DEN3-176)

(NASA-CR-165505; DOE/NASA/Q176-81/3) Avail: NTIS

HC A04/MF A01 CSCL 10A

The processes which contribute to the decay in performance of electrodes used in phosphoric acid fuel cell systems are discussed. Loss of catalytic surface area, corrosion of the carbon support, electrode structure degradation, electrolyte degradation, and impurities in the reactant streams are identified as the major areas for concern.

NS2-11546*# Spire Corp., Bedford, Mass.
PROCESSING OF SILICON SOLAR CELLS BY ION IMPLAN-TATION AND LASER ANNEALING Final Report J. A. Minnucci, K. W. Matthei, and A. C. Greenwald Feb. 1981 78 p refs

(Contract NAS3-21276)

NASA-CR-165283: FR-10066) Avail:

HC A05/MF A01 CSCL 10A

Methods to improve the radiation tolerance of silicon cells for spacecraft use are described. The major emphasis of the program was to reduce the process-induced carbon and oxygen impurities in the junction and base regions of the solar cell, and to measure the effect of reduced impurity levels on the radiation tolerance of cells. Substrates of 0.1, 1.0 and 10.0 ohm-cm float-zone material were used as starting material in the process sequence, High-dose, low-energy ion implantation was used to form the junction in n+p structures. Implant annealing was performed by conventional furnace techniques and by pulsed laser and pulsed electron beam annealing. Cells were tested for radiation tolerance at Spire and NASA-LeRC, After irradiation by 1 MeV electrons to a fluence of 10 to the 16th power per sq cm, the cells tested at Spire showed no significant process induced variations in radiation tolerance. However, for cells tested at Lewis to a fluence of 10 to the 15th power per sq cm, ion-implanted cells annealed in vacuum by pulsed electron beam consistently showed the best radiation tolerance for all cell resistivities.

N82-11547*# Munising Paper Div., Neenah, Wis. DEVELOPMENT OF BATTERY, SEPARATOR COMPOSITES Final Report, Oct. 1976 - Nov. 1981

George F. Schmidt and Robert E. Weber Nov. 1981 56 p

(Contract NAS3-20583)

(NASA-CR-165508) Avail: NTIS Hc A04/MF A01

Improved inorganic-organic separators developed by NASA were commercially prepared. A single-ply asbestos substrate was developed, as well as alternative substrates based on cellulose and on polypropylene fibers. The single-ply asbestos was bound with butyl rubber and was functionally superior to the formerly used polyphenylene oxide saturated sheet. Commercially prepared separators exhibited better measured separator properties than the NASA standard. Cycle life in Ni/Zn and Ag/Zn cells was

related to substrate, decreasing in the order; asbestos > cellulose paper > nonwoven polypropylene. The cycle life of solvent-coated separators was better than aqueous in Ni/Zn cells, while aqueous coatings were better in Ag/Zn cells.

N82-12570* # Gilbert/Commonwealth, Reading, Pa. MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MW. POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT (CDER). **VOLUME 1: EXECUTIVE SUMMARY Final Report**

Sep. 1981 48 p

(Contracts DEN3-224; DE-AI01-77ET-10769)

(NASA-CR-165452-Vol-1; DOE/NASA-0224/1-Vol-1) Avail:

NTIS HC A03/MF A01 CSCL 10B

Main elements of the design are identified and explained, and the rationale behind them was reviewed. Major systems and plant facilities are listed and discussed. Construction cost and schedule estimates are presented, and the engineering issues that should be reexamined are identified. The latest (1980-1981) information from the MHD technology program is integrated with the elements of a conventional steam power electric generating plant.

N82-12571*# Boeing Co., Seattle, Wash. TESTING OF SOLAR CELL COVERS AND ENCAPSULANTS CONDUCTED IN A SIMULATED SPACE ENVIRONMENT

Finel Report

D. A. Russell Nov. 1981 267 p

(Contract NAS3-22222)

(NASA-CR-165475: D180-26590-1)

HC A12/MF A01 CSCL 10A

Avail:

The materials included in the evaluation were 0211 microsheet, FEP-A used as a cover and as an adhesive, DC 93-500 adhesive, PFA 'hard coat' used as a cover, GE 615/UV-24 used as a cover, GR 650 used as a cover, and electrostatically bonded 7070 glass. The test environments were 1 MeV electron gradiation interspersed with thermal cycling, 0.5 MeV proton irradiation interspersed with thermal cycling and UV exposure interspersed with thermal cycling, Summary data is given describing the response of the test materials both visually and electrically to the three different environments,

N82-12572*# United Technologies Corp., South Windsor, Conn. Power Systems Div.

LOW NO SUB X HEAVY FUEL COMBUSTOR CONCEPT PROGRAM Final Report, 23 Oct. 1979 - Jul. 1981

Paul Russell, George Beal, and Bruce Hinton 15 Oct. 1981 99 p refs Prepared in cooperation with Pratt and Whitney Aircraft, East Hartford, Conn. (Contracts DEN3-149; DE-AI01-77ET-13111)

(NASA-CR-165512; DOE/NASA/0149-1; QTR-3236) Avail: NTIS HC A05/MF A01 CSCL 10B

A gas turbine technology program to improve and optimize the staged rich lean low NOx combustor concept is described. Subscale combustor tests to develop the design information for optimization of the fuel preparation, rich burn, quick air quench, and lean burn steps of the combustion process were run. The program provides information for the design of high pressure full scale gas turbine combustors capable of providing environmentally clean combustion of minimally of minimally porcessed and synthetic fuels. It is concluded that liquid fuel atomization and mixing, rich zone stoichiometry, rich zone liner cooling, rich zone residence time, and quench zone stoichiometry are important considerations in the design and scale up of the rich lean combustor. E.A.K.

N82-^3573*# Stonehart Associates, Inc., Madison, Conn. PREPARATION AND EVALUATION OF ADVANCED ELECTROCATALYSTS FOR PHOSPHORIC ACID FUEL **CELLS Quarterly Report**

Paul Stonehart, John Baris, John Hochmuth, and Peter Pagliaro 30 Sep. 1981 31 p (Contracts DEN3-176; DE-AIO3-80ET-17088)

(NASA-CR-165519: DOE/NASA/0176-81/4: QR-7) Avail: NTIS HC A03/MF A01 CSCL 10A

A riumber of electrocatalyst combinations were prepared and characterized. These electrocatalysts were formulated to contain platinum combined with transition metal carbide forming elements (W. Mo, V) for cathodes and platinum combined with palladium for anodes. High resolution electron microscopy was used to determine the crystallite size and dispersion of platinum-palladium alloy electrocatalysts in order to provide analytical support for the electrochemical determinations of the particle dispersions. An equation was derived which correlates palladium crystallite size with electrochemical hydrogen adsorption. Based on comparisons of electrocatalyst performances in the presence of pure hydrogen and hydrogen containing carbon monoxide, it was shown that the apparent poisoning of the electrocatalyst by carbon monoxide is influenced by the electrode structure.

N82-13505*# Paragon Pacific, Inc., El Segundo, Calif.
DEVELOPMENT REPORT: AUTOMATIC SYSTEM TEST AND CALIBOATION (ASTAC) EQUIPMENT Final Report

Robert J. Thoren Jul. 1981 25 p ref (Contracts DEN3-203; DE-Al01-76ET-20320)

(NASA-CR-165403; DOE/NASA/0203-1; PPI-3009-4) Avail:

NTIS HC A02/MF A01 CSCL 10A

A microcomputer based automatic test system was developed for the daily performance monitoring of wind energy system time domain (WEST) analyzer. The test system consists of a microprocessor based controller and hybrid interface unit which are used for inputing prescribed test signals into all WEST subsystems and for monitoring WEST responses to these signals. Performance is compared to theoretically correct performance levels calculated off line on a large general purpose digital computer, Results are displayed on a cathode ray tube or are available from a line printer, Excessive drift and/or lack of repeatability of the high speed analog sections within WEST is easily detected and the malfunctioning hardware identified using this system.

N82-13506*# Eaton Engineering and Research Center, Southfield. Mich.

THE ac PROPULSION SYSTEM FOR AN ELECTRIC VEHICLE, PHASE 1 Final Report

Steven Geppert Aug. 1981 307 p refs (Contracts DEN3-125; DE-AI01-77CS-51044)

(NASA-CR-165480; DOE/NASA/0125-1; ERC-TR-8101) Avail:

NTIS HC A14/MF A01' CSCL'10B

A functional prototype of an electric vehicle ac propulsion system was built consisting of a 18.65 kW rated ac induction traction motor, pulse width modulated (PWM) transistorized inverter, two speed mechanically shifted automatic transmission, and an overall drive/vehicle controller. Design developmental steps, and test results of individual components and the complex system on an instrumented test frame are described. Computer models were developed for the inverter, motor and a representative vehicle. A preliminary reliability model and failure modes effects analysis are given. E.A.K.

N82-13507* Case Western Reserve Univ., Cleveland, Ohio. TRANSIENT CATALYTIC COMBUSTOR MODEL Final Report

James S, Tien May 1981 87 p refs (Grant NsG-3230; Contract DE-AI01-77CS-51040)

(NASA-CR-165324; DOE/NASA/3230-1) Avail:

HC A05/MF A01 CSCL 108

A quasi-steady gas phase and thermally thin substrate model is used to analyze the transient behavior of catalytic monolith combustors in fuel lean operation. The combustor response delay is due to the substrate thermal ineria. Fast response is favored by thin substrate, short catalytic bed length, high combustor inlet and final temperatures, and small gas channel diameters. The calculated gas and substrate temperature time history at different axial positions provides an understanding of how the catalytic combustor responds to an upstream condition change. The computed results also suggest that the gas residence times in the catalytic bed in the after bed space are correlatable with the nondimensional combustor response time. The model also performs steady state combustion calculations; and the computed steady state emission characteristics show agreement with available experimental data in the range of parameters covered. A catalytic combustor design for automotive gas turbine engine which has reasonably fast response (< 1 second) and can satisfy the emission goals in an acceptable total combustor length is possible.

N82-13506°# Life Systems, Inc., Cleveland, Ohio. ENDURANCE TEST AND EVALUATION OF ALKALINE WATER ELECTROLYSIS CELLS Annual Report K. A. Burke and F. H. Schubert Nov. 1981 46 p refs (Contract NAS3-21287)

(NASA-CR-165424; TR-376-16) HC A03/MF A01 CSCL 10C

Service and the service of the servi

NTIS

Utilization in the development of multi-kW low orbit power systems is discussed. The following technological developments of alkaline water electrolysis cells for space power application were demonstrated; (1) four 92.9 cm2 single water electrolysis cells, two using LST's advanced anodes and two using LST's super anodes; (2) four single cell endurance test stands for life testing of alkaline water electrolyte cells; (3) the solid performance of the advanced electrode and 355 K; (4) the breakthrough performance of the super electrode; (5) the four single cells for over 5,000 hours each significant cell deterioration or cell failure. It is concluded that the static feed water electrolysis concept is reliable and due to the inherent simplicity of the passive water feed mechanism coupled with the use of alkaline electrolyte has greater potential for regenerative fuel cell system applications than alternative electrolyzers. A rise in cell voltage occur after 2,000-3,000 hours which was attributed to deflection of the polysulfone end plates due to creepage of the thermoplastic. More end plate support was added, and the performance of the cells was restored to the initial performance level.

N62-13510*# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.

DEVELOPMENT OF A HIGH-TEMPERATURE DURABLE CATALYST FOR USE IN CATALYTIC COMBUSTORS FOR ADVANCED AUTOMOTIVE GAS TURBINE ENGINES Final

H. Tong, G. C. Snow, E. K. Chu, R. L. S. Chang, M. J. Angwin, and S. L. Pessagno Sep. 1981 169 p refs (Contracts DEN3-83; DE-AI01-77CS-51040) (NASA-CR-165396; DOE/NA HC AOB/MF AO1 CSCL 10B DOE/NASA/0083-1) Avail:

Durable catalytic reactors for advanced gas turbine engines were developed. Objectives were; to evaluate furnace aging as a cost effective catalytic reactor screening test, measure reactor degradation as a function of furnace aging, demonstrate 1,000 hours of combustion durability, and define a catalytic reactor system with a high probability of successful integration into an automotive gas turbine engine. Fourteen different catalytic reactor concepts were evaluated, leading to the selection of one for a durability compustion test with diesel fuel for combustion conditions. Eight additional catalytic reactors were evaluated and one of these was successfully combustion tested on propane fuel. This durability reactor used graded cell honeycombs and a combination of noble metal and metal oxide catalysts. The reactor was catalytically active and structurally sound at the end of the durability test. E.A.K.

N82-13511*# Westinghouse Research and Development Center, Pittsburgh, Pa

CELL MODULE AND FUEL CONDITIONER DEVELOPMENT

Quarterly Report, Jul. - Sep. 1981 D. Q. Hoover, Jr. Oct. 1981 59 p (Contracts DEN3-161; DE-AI01-80ET-17088) (NASA-CR-165462; DOE/NASA/0161-9;

Rept-81-9D1-MARED-R1) Avail: NTIS HC A04/MF A01 CSCL

The results of pretesting and performance testing of Stack 564 are reported. The design features, progress in fabrication and plans for assembly of Stack 800 are given. The status of endurance testing of Stack 560 is reported. The design, fabrication, test procedures and preliminary tests of the 10 kW double counterflow reformer and the reformer test stand are described. Results of vendor contacts to define the performance and cost of fuel conditioning system components are reported. The results of burner tests and continuing development of the BOLTAR program are reported.

N82-14627* DHR, Inc., Washington, D.C.
MARKET ASSESSMENT OF PHOTOVOLTAIC POWER SYSTEMS FOR AGRICULTURAL APPLICATIONS IN **MOROCCO** Final Report

Henry Steingass and Itil Asmon (ARD, Inc.) Sep. 1981 157 p

(Contract DEN3-180; DE-AI01-79ET-20485) (NASA-CR-165477; DOE/NASA/0180-2; C4100-50) Avail: NTIS HC A08/MF A01 CSCL 10A

Results of a month-long study in Morocco aimed at assessing the market potential for stand-alone photovoltaic systems in agriculture and rural survice applications are presented. The following applications, requiring less than 15 kW of power, are described: irrigation, c/ittle watering, refrigeration, crop processing, potable water and educational TV. Telecommunications and transportation signalling applications, descriptions of power and energy use profiles, assessments of business environment, government and private sector attitudes towards photovoltaics, and financing were also considered. The Moroccan market presents both advantages and disadvantages for American PV manufacturers. The principle advantages of the Moroccan market are: a limited grid, interest in and present use of PV in communications applications, attractive investment incentives, and a stated policy favoring American investment. Disadvantages include: lack of government incentives for PV use, general unfamiliarity with PV technology, high first cost of PV, a well-established market network for diesel generators, and difficulty with financing. The market for PV in Morocco (1981-1986), will be relatively small, about 340 kwp. The market for PV is likely to be more favorable in telecommunications, transport signalling and some rural services. The primary market appears to be in the public (i.e., government) rather than private sector, due to financial constraints and the high price of PV relative to conventional power sector. M.D.K.

·

N82-14628*# Institute of Gas Technology, Chicago, III. STABILIZING PLATINUM IN PHOSPHORIC ACID FUEL **CELLS Quarterly Report**

Robert J. Remick Oct. 1981 19 p refs (Contracts DEN3-208; DE-1101-80ET-17088) (NASA-CR-165483; DOE/NASA-0208/3: IGT-61051; QR-3) CSCL 10A

A carbon substrate for use in fabricating phosphoric acid fuel cell cathodes was modified by catalytic oxidation to stabilize the platinum catalyst by retarding the sintering of small platinum crystallites. Results of 100-hour operational tests confirmed that the rate of platinum surface area loss observed on catalytically oxidized supports was less than that observed with unmodified supports of the same starting material. Fuel cell electrodes fabricated from Vulcan XC-72R, which was modified by catalytic in a nitric oxide atmosphere, produced low platium sintering rates and high activity for the reduction of oxygen in the phosphoric N.W. acid environment.

N82-14636*# General Dynamics/Convair, San Diego, Calif. STUDY OF MULTI-MEGAWATT TECHNOLOGY NEEDS FOR PHOTOVOLTAIC SPACE POWER SYSTEMS. VOLUME 1: **EXECUTIVE SUMMARY**

D. M. Peterson and R. L. Pleasant 1 Aug. 1981 28 p refs 2 Vol.

(Contract NAS3-21951)

(NASA-CR-165323-Vol-1; Rept-111-2401-204) Avail: NTIS

HC A03/MF A01 CSCL 10A

Possible missions requiring multimegawatt photovoltaic space power systems in the 1990's time frame and associated power system technology needs are examined. The following concepts for photovoltaic power approaches are considered: planar arrays, concentrating arrays, hybrid systems using Rankine engires, thermophotovoltaic and AC/DC power management approaches. battery, fuel cell, flywheel energy storage, and interactions with the electrical ion engine injection and stationkeeping system. The levels of modularity for efficient, safe, constructable, serviceable, and cost effective system design are analyzed, and the benefits of alternate approaches developed. Both manned low Earth orbit and unmanned geosynchronous Earth orbit applications were examined for technological development. Technology developments applicable to power systems which appear to have benefits independent of the absolute power level are suggested. M.D,K.

N82-14637*# General Dynamics/Convair, San Diego, Calif. STUDY OF MULTI-MEGA: WATT TECHNOLOGY NEEDS FOR PHOTOVOLTAIC SPACE POWER SYSTEMS, VOLUME 2 **Final Report**

D. M. Peterson and R. L. Pleasant 19 Mar. 1981 285 p rafs 2 Vol.

(Contract NAS3-21951)

(NASA-CR-165323-Vol-2, GDC-AST-81-019-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 10A

Possible missions requiring multimegawatt photovoltaic space power systems in the 1990's time frame and power system technology needs associated with these missions are examined. Four specific task areas were considered: (1) missions requiring power in the 3-10 megawatt average power region; (2) alternative power systems and component technologies; (3) technology goals and sensitivity trades and analyses: and (4) technology recommendations. Specific concepts for photovoltaic power approaches considered were: planar arrays, concentrating arrays, hybrid systems using Rankine engines, thermophotovoltaic approaches; all with various photovoltaic cell component technologies. Various AC/DC power management approaches, and battery, fuel cell, and flywheel energy storage concepts are evaluated. Interactions with the electrical ion engine injection and stationkeeping system M.D.K. are also considered.

N82-15527*# Burno and Roe, Inc., Woodbury, N. Y. MHD OXIDANT INTERMEDIATE TEMPERATURE CERAMIC **HEATER STUDY** Final Report

A. W. Carlson, I. L. Chait, D. P. Saari, and C. L. Marksberry Sep. 1981 199 p refs Prepared in cooperation with Fluidyne Engineering Corp.

(Contract DEN3-107; DE-AI01-77ET-10769) (NASA-CR-165453; DOE/NASA-0107/3) HC A09/MF A01 CSCL 10A

Avaii:

The use of three types of directly fired ceramic heaters for preheating oxygen enriched air to an intermediate temperature of 1144K was investigated. The three types of ceramic heaters are: (1) a fixed bed, periodic flow ceramic brick regenerative heater, (2) a ceramic pebble agenerative heater, The heater design, performance and operating characteristics under conditions in which the particulate matter is not solidified are evaluated. A comparison and overall evaluation of the three types of ceramic heaters and temperature range determination at which the particulate matter in the MHD exhaust gas is estimated to be a dry powder are presented. E.A.K.

N82-16479*# New Mexico Univ., Albuquerque. Electrical and Computer Engineering.

STUDY OF THE PHOTOVOLTAIC EFFECT IN THIN FILM BARIUM TITANATE Annual Report

W. W. Grannemann and Vineet S. Dharmadhikari Jan. 1982 24 p

(Grant NAG1-95)

(NASA-CR-185091; EE-273(82)NASA-931-1) Avail: NTIS

HC A02/MF A01 CSCL 10A

Ferroelectric films of barium titanate were synthesized on silicon and quartz substrates, and the photoelectric effect in the structure consisting of metal deposited farroelectric barium titanate film silicon was studied. A photovoltage with polarity that depends on the direction of the remanent polarization was observed. The deposition of BaTiO3 on silicon and fused quartz substrates was accomplished by an RF sputtering technique. A series of experiments to study the growth of ferroelectric BaTiO3 films on single crystal silicon and fused quartz substrates were conducted. The ferroelectric character in these films was found on the basis of evidence from the polarization electric field hysteresis loops, capacitance voltage and capacitance temperature techniques and from X-ray diffraction studies.

N82-16480*# Engelhard Industries, Inc., Edison, N.J.
DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS. PHASE 3: Quarterly FULL-SCALE POWER PLANT DEVELOPMENT Progress Report, Feb. - Apr. 1981

24 Jun. 1981 51 p

(Contracts DEN3-241; DE-AI01-80ET-17088)

(NASA-CR-165328; DOE/NASA/0241-1; QR-1) Avail: NTIS HC A04/MF A01 CSCL 10A

Progress toward an integrated 5kW power system based upon methanol fuel and a phosphoric acid fuel cell operating at about 473 K is described in detail. Description includes test results of advanced fuel cell catalysts, a semi-automatic acid replenishment system and a completed 5kW methanol/steam reformer. Design features of a 5kW fuel cell stack are included. The results of a preliminary system test on a reformer/stack/ inverter combination are reported. An initial design for a 25 kW stack is presented. Experimental plans are outlined for data acquisition necessary for design of a 50 kW methanol/steam reformer. Activities related to complete mathematical modelling of the integrated power system, including wasteheat utilization are described.

NB2-16482*# Energy Research Corp., Danbury, Conn.
TECHNOLOGY DEVELOPMENT FOR PHOSPHORIC ACID FUEL CELL POWERPLANT, PHASE 2 Final Technical Report

Larry Christner Dec. 1981 159 p refs (Contracts DEN3-67; DE-AIO3-78ET-11272)

(NASA-CR-165428; DOE/NASA/0067-79/7) Avail: NTIS HC A08/MF A01 CSCL 10A

The development of materials, cell components, and reformers for on site integrated energy systems is described. Progress includes: (1) heat-treatment of 25 sq cm, 350 sq cm and 1200 sq cm cell test hardware was accomplished. Performance of fuel cells is improved by using this material; (2) electrochemical and chemical corrosion rates of heat-treated and as-molded graphite/phenolic resin composites in phosphoric acid were determined; (3) three cell, 5 in. x 15 in, stacks operated for up to 10,000 hours and 12 in, x 17 in, five cell stacks were tested for 5,000 hours; (4) a three cell 5 in, x 15 in, stack with 0.12 mg Pt/sq cm anodes and 0.25 mg Pt/sq cm cathodes was operated for 4,500 hours; and (5) an ERC proprietary high bubble pressure matrix, MAT-1, was tested for up to 10,000 A.R.H.

N82-16483*# Engelhard Industries, Inc., Edison, N.J. Industries

DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS. PHASE 3: FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Report, May - Jul. 1981 25 Aug. 1981 35 p refs (Contracts DEN3-241; DE-AI01-80ET-17088)

(NASA-CR-165455; DOE/NASA/0241-2; QR-2) Avail; NTIS

HC A03/MF A01 CSCL 10B

A schematic and physical layout is given for the 5kW integrated system and the development status of individual components is described. The results of using a one dimensional mathematical model of the 5kW reformer are presented. Plans for a single-tube reformer test unit for the acquisition of temperature profile data are described. Tentative specifications for a 50kW dc to-ac inverter are listed. Performance data are given on two 3-cell stacks incorporating semiautomatic acid replenishment systems and improved electrocatalysts. A qualification test on methanol/steam reforming catalyst T2107RS is reported, including a portion in which the catalyst was deliberately poisoned with 800 ppm ethanol in the feed.

NB2-16484*# General Electric Co., Cincinnati, Ohio, Aircraft Engine Business Group.

DEMONSTRATION OF CATALYTIC COMBUSTION WITH RESIDUAL FUEL Final Report
W. J. Dodds and E. E. Ekstedt Aug, 1981 106 p refs

(Contracts DEN3-155; DE-A101-77ET-10350)

(NASA-CR-165369; DOE/NASA/0155-1; R81AEG590) Avail: NTIS HC AG6/MF A01 CSCL 10B

An experimental program was conducted to demonstrate. catalytic combustion of a residual fuel oil. Three catalytic reactors, including a baseline configuration and two backup configurations based on baseline test results, were operated on No. 6 fuel pil, All reactors were multielement configurations consisting of ceramic honeycomb catalyzed with palladium on stabilized alumina. Stable operation on residual oil was demonstrated with the baseline configuration at a reactor inlet temperature of about 825 K (1025 F). At low inlet temperature, operation was precluded by apparent plugging of the catalytic reactor with residual oil. Reduced plugging tendency was demonstrated in the backup reactors by increasing the size of the catalyst channels at the reactor inlet, but plugging still occurred at inlet remperature below 725 K (845 F). Operation at the original design inlet temperature of

589 K (600 F) could not be demonstrated. Combustion efficiency above 99.5% was obtained with less than 5% reactor pressure drop. Thermally formed NO sub x levels were very low (less than 0.5 g NO2/kg fuel) but nearly 100% conversion of fuel-bound strogen to NO sub x was observed.

M.D.K.

N82-16485* Ford Motor Co., Dearborn, Mich.
ADVANCED GAS TURBINE (AGT) POWERTRAIN SYSTEM INITIAL DEVELOPMENT REPORT Progress Report,

20 May - 24 Sep, 1979

Aug. 1980 150 p Prepared in cooperation with AiResearch Mfg. Co., Phoenix, Ariz.

(Contract DEN3-37)

and the second s

(NASA-CR-165130; DOE/NASA/0037-80/2; DDA-ADR-10086) Avail: NTIS HC A07/MF A01 CSCL 10B The powertrain consists of a single shaft regenerated gas turbine engine utilizing ceramic hot section components, coupled to a slit differential gearbox with an available variable stator torque converter and an available Ford intergral overdrive four-speed automatic transmission. Predicted fuel economy using gasoline fuel over the combined federal driving cycle (CFDC) is 15.3 km/1, which represents a 59% improvement over the spark-ignition-powered baseline vehicle. Using DF2 fuel, CFDC mileage estimates are 17.43 km/1. Zero to 96.6 km/hr acceleration time is 11.9 seconds with a four-second accleration distance of 21.0 m. The ceramic radial turbine rotor is discussed along with the control system for the powertrain. T.M.

NS2-16494*# IIT Research Inst., Chicago, III.
INTERNATIONAL MARKET ASSESSMENT OF STANDALONE PHOTOVOLTAIC POWER SYSTEMS FOR COTTAGE INDUSTRY APPLICATIONS Final Report

Therese M. Philippi Nov. 1981 290 p refs (Contracts DEN3-197: DE-AI01-79ET-20485)

(NASA-CR-165287; DCE/NASA/0197-1; IITRI-J06519) Avail: NTIS HC A13/MF A01 CSCL 10B

The final result of an international assessment of the market for stand-alone photovoltaic systems in cottage industry applications is reported. Nonindustrialized countries without centrally planned economies were considered. Cottage industries were defined as small rural manufacturers, employing less than 50 people, producing consumer and simple products. The date to support this analysis were obtained from secondary and expert sources in the U.S. and in-country field investigations of the Philippines and Mexico. The near-term market for photovoltaics for rural cottage industry applications appears to be limited to demonstration projects and pilos programs, based on an in-depth study of the nature of cottage industry, its role in the rural economy, the electric energy requirements of cottage industry, and a financial analysis of stand-alone photovoltaic systems as compared to their most viable competitor, diesel driven generators. Photovoltaics are shown to be a better long-term option only for very low power requirements. Some of these uses would include clay mixers, grinders, centrifuges, lathes, power saws and lighting of a workshop. Author

N82-17603*# Gilbert/Commonwealth, Reading, Pa. MAGNETORYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MW. POWER PLANT CONCEPTUAL DESIGN ENGINEERING REPORT (CDER) Final Report

Sep. 1981 593 p refs (Contracts DEN3-224; DE-AI01-77ET-10769)

(NASA-CR-165452-Vol-5: DOE/NASA/0224-1-Vol-5) Avail:

NTIS HC A25/MF A01 CSCL 10B

The reference conceptual design of the magnetohydrodynamic (MHD) Engineering Test Facility (ETF), a prototype 200 MWe coal-fired electric generating plant designed to demonstrate the commercial feasibility of open cycle MHD, is summarized. Main elements of the design, systems, and plant facilities are illustrated, System design descriptions are included for closed cycle cooling water, industrial gas systems, fuel oil, boiler flue gas, coal management, seed management, slag management, plant industrial waste, fire service water, oxidant supply, MHD power train, magnet, heat recovery/seed recovery, inverter, heating, ventillating, and air conditioning, and electrical,

NS2-17606*# Mathematical Sciences Northwest, Inc., Bellevue,

OVERVIEW STUDY OF SPACE POWER TECHNOLOGIES FOR THE ADVANCED ENERGETICS PROGRAM

R. Taussig, S. Gross, A. Millner, M. Neugebauer, W. Phillips, J. Powell, E. Schmidt, M. Wolf, and G. Woodcock Oct. 1981 341 p refs

(Contract NAS3-22477)

(NASA-CR-165289; MSNW-1169) HC A15/MF A01 CSCL 10B

NTIS Avail:

Space power technologies are reviewed to determine the state-of-the-art and to identify advanced or novel concepts which promise large increases in performance. The potential for incresed performance is judged relative to benchmarks based on technologles which have been flight tested. Space power technology concepts selected for their potentially high performance are prioritized in a list of R & D topical recommendations for the NASA program on Advanced Energetics. The technology categories studied are solar collection, nuclear power sources, energy conversion, energy storage, power transmission, and power processing. The emphasis is on electric power generation in space for satellite on board electric power, for electric propulsion, or for beamed power to spacecraft. Generic mission categories such as low Earth orbit missions and geosynchronous orbit missions are used to distinguish general requirements placed on the performance of power conversion technology. Each space power technology is judged on its own merits without reference to specific missions or power systems. Recommendations include

N82-17607*# United Technologies Corp., South Windsor, Conn. Power Systems Div.

31 space power concepts which span the entire collection of technology categories studied and represent the critical technologies needed for higher power, lighter weight, more efficient power

ELECTROCHEMICAL ENERGY STORAGE FOR AN OR-BITING SPACE STATION

R. E. Martin Dec. 1981 61 p refs

(Contract NAS3-21293)

(NASA-CR-165436; FCR-3 HC A04/MF A01 CSCL 10C FCR-3142)

NTIS Avail:

conversion in space.

The system weight of a multi hundred kilowatt fuel cell electrolysis cell energy storage system based upon alkaline electrochemical cell technology for use in a future orbiting space station in low Earth orbit (LEO) was studied. Preliminary system conceptual design, fuel cell module performance characteristics, subsystem and system weights, and overall system efficiency are identified. The impact of fuel cell module operating temperature and efficiency upon energy storage system weight is investigated. The weight of an advanced technology system featuring high strength filament wound reactant tanks and a fuel cell module employing lightweight graphite electrolyte reservoir plates is defined.

N82-17608* # Eaton Engineering and Research Center, South-Engineering and Research Center,

STRAIGHT AND CHOPPED DC PERFORMANCE DATA FOR A RELIANCE EV-250AT MOTOR WITH A GENERAL ELECTRIC EV-1 CONTROLLER Final Report

Paul C. Edie Sep. 1981 58 p (Contracts DEN3-123; DE-AI01-77CS-51044)

(NASA-CR-165447; DOE/NASA/0123-3; ERC-TR-8175) Avail: NTIS HC A04/MF A01 CSCL 10B

Straight and chopped DC motor performances for a Reliance EV-250AT motor with an EV-1 controller were examined. Effects of motor temperature and operating voltage are shown. It is found that the maximum motor efficiency is approximately 85% at low operating temperatures in the straight DC mode, Chopper efficiency is 95% under all operating conditions. For equal speeds, the motor operated in the chopped mode develops slightly more torque and draws more current than it does in the straight DC mode.

N82-17615*# Stonehart Associates, Inc., Madison, Conn. PREPARATION AND EVALUATION OF ADVANCED ELECTROCATALYSTS FOR PHOSPHORIC ACID FUEL CELLS Quarterly Report, Oct. - Dec. 1981

Paul Stonehart, John Baris, John Hochrnuth, and Peter Pagliaro Dec. 1981 44 p

(Contract DEN3-176; Contract DE-Al03-80ET-17088) (NASA-CR-165594; DOE/NASA/0176-81/5; QR-8) NTIS HC A03/MF A01 CSCL 10A Avail:

Two cooperative phenomena are required the development of highly efficient porous electrocatalysts: (1) is an increase in the electrocatelytic activity of the catalyst particle; and (2) is the availability of that electrocatalyst particle for the electromechanical reaction. The two processes interact with each other so that improvements in the electrochemical activity must be coupled with improvements in the availability of the electrocatalyst for reaction. Cost effective and highly reactive electrocatalysts were developed. The utilization of the electrocatalyst particles in the porous electrode structures was analyzed, it is shown that a large percentage of the electrocatalyst in anode structures is not utilized. This low utilization translates directly into a noble metal cost penalty for the fuel cell.

N82-18688*# Gilbert/Commonwealth, Reading, Pa. MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MWe POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT (CDER). VOLUME 4: SUPPLEMENTARY ENGINEERING DATA

Sep. 1981 548 p refs (Contract DEN3-224; DE-AI01-77ET-10769)

(NASA-CR-165452-Vol-4; DOE/NASA/0224-1-Vol-4) Avail:

NTIS HC A23/MF A01 CSCL 10B

The reference conceptual design of the Magnetohydrodynamic Engineering Test Facility (ETF), a prototype 200 MWe coal-fired electric generating plant designed to demonstrate the commercial feasibility of open cycle MHD is summarized. Main elements of the design are identified and explained, and the rationale behind them is reviewed. Major systems and plant facilities are listed and discussed. Construction cost and schedule estimates, and identification of engineering issues that should be reexamined are also given. The latest (1980-1981) information from the MHD technology program are integrated with the elements of a conventional steam power electric generating plant. Supplementary Engineering Data (Issues, Background, Performance Assurance Plan, Design Details, System Design Descriptions and Related Drawings) is presented.

N82-18689*# Applied Solar Energy Corp., City of Industry,

DEVELOPMENT OF THIN WRAPAROURD JUNCTION SILICON SOLAR CELLS Final Report, Sep. 1980 - Nov.

F. Ho and P. A. Iles Nov. 1981 43 p refs

(Contract NAS3-22228)

(NASA-CR-165570) Avail: NTIS HC A03/MF A01 10A

The state of the art technologies was applied to fabricate 50 micro thick 2x4 cm, coplanar back contact (CBC) solar cells with AMO efficiency above 12%. A requirement was that the cells have low solar absorptance. A wraparound junction (WAJ) with wraparound metallization was chosen. This WAJ approach avoided the need for very complex fixturing, especially during rotation of the cells for providing adequate contacts over dielectric edge layers. The contact adhesion to silicon was considered better than to an insulator. It is indicated that shunt resistance caused by poor WAJ diode quality, and series resistance from the WAJ contact, give good cell performance. The cells developed reached 14 percent AMO efficiency (at 25 C), with solar absorptance values of 0.73. Space/cell environmental tests were performed on these cells and the thin CSC cells performed well. The optimized design configuration and process sequence were used to make 50 deliverable CBC cells. These cells were all above 12 percent efficiency and had an average efficiency of -13 percent. Results of environmental tests (humidity-temperature, thermal shock, and contact adherence) are also given.

N82-18690*# United Technologies Corp., South Windsor, Conn. Power Systems Div.

LOW NO SUBX HEAVY FUEL COMBUSTOR CONCEPT PROGRAM. PHASE 1A: COAL GAS ADDENDUM Final Report, 29 Jun. - Oct. 1981

Thomas Rosfjord and Richard Sederquist Jan. 1982 43 p refs

(Contract DEN3-149; DE-AIO1-77ET-13111)

(NASA-CR-165577; DOE/NASA/0149-2; GTR-3932)

NTIS HC A03/MF A01 CSCL 10B

The performance and emissions from a rich-lean combustor fired on simulated coal gas fuels were investigated using a 12.7-cm diameter axially-staged burner originally designed for operation with high heating value liquid fuels. A simple, tubular fuel injector was substituted for the liquid fuel nozzle; no other combustor modifications were made. Four test fuels were studied including three chemically bound nitrogen-free gas mixtures with higher heating values of 88, 227, and 308 kj/mol (103, 258 and 349 Btu/scf), and a 227 kj/mol (258 Btu/scf) heating value doped with ammonia to produce a fuel nitrogen content of 0.5% (wt). Stable, ultra-low nitrogen oxide, smoke-free combustion was attained for the nitrogen-free fuels. Results with the doped fuel indicated that less than 5% conversion of NH3 to nitrogen oxide levels below Environmental Protection Agency limits could be achieved. In some instances, excessive CO levels were encountered. It is shown that use of a burner design employing a less fuel-rich primary zone than that found optimum for liquid fuels would yield more acceptable CO emissions.

N82-13693*# Structural Composites Industries, Inc., Azusa,

DESIGN, EVALUATION, AND FABRICATION OF LOW-COST COMPOSITE BLADES FOR INTERMEDIATE-SIZE WIND TURBINES Final Report

Oscar Weingart Sep. 1981 210 p refs (Contracts DEN3-100, DE-AI01-79ET-20320)

(NASA-CR-165342; DOE/NASA/0100-1; SCI-81520) Avail:

NTIS HC A10/MF A01 CSCL 10A

Low cost approaches for production of 60 ft long glass fiber/resin composite rotor blades for the MOD-OA wind turbine were identified and evaluated. The most cost-effective configuration was selected for detailed design. Subelement and subscale specimens were fabricated for testing to confirm physical and mechanical properties of the composite blade materials, to develop and evaluate blade fabrication techniques and processes, and to confirm the structural adequacy of the root end joint. Full-scale blade tooling was constructed and a partial blade for tool and process tryout was built. Then two full scale blades were fabricated and delivered to NASA-LeRC for installation on a MOD-OA wind turbine at Clayton, New Mexico for operational testing. Each blade was 60 ft. long with 4.5 ft. chord at root end and 2575 lbs weight including metal hub adapter. The selected blade configuration was a three cell design constructed using a resin impregnated glass fiber tape winding process that allows rapid wrapping of primarily axially oriented fibers onto a tapered mandrel, with tapered wall thickness. The ring winder/transverse filament tape process combination was used for the first time on this program to produce entire rotor blade structures. This approach permitted the complete blade to be wound on stationary mandrels, an improvement which alleviated some of the tooling and process problems encountered on previous composite blade programs.

Author

N82-18698*# DHR, Inc., Washington, D.C.
MARKET ASSESSMENT OF PHOTOVOLTAIC POWER SYSTEMS FOR AGRICULTURAL APPLICATIONS IN **NIGERIA** Final Report

David Staples, Henry Steingrass, and James Nolfi (ARD, Inc., Burlington, Vt.) Oct. 1981 115 p refs (Contracts DEN3-180; DE-AI01-79ET-20485)

(NASA-CR-165511; DOE/NASA/0180-4; C4100-50) Avail: NTIS HC A06/MF A01 CSCL 10A

The market potential for stand-alone photovoltaic systems in agriculture was studied. Information is presented on technical and economically feasible applications, and assessments of the business, government and financial climate for photovoltaic sales. It is concluded that the market for stand-alone systems will be large because of the availability of captial and the high premium placed on high reliability, low maintence power systems. Various specific applications are described, mostly related to agriculture.

N82-19669*# Arizona State Univ., Tempe.
SOCIOECONOMIC IMPACT OF PHOTOVOLTAIC POWER AT SCHUCHULI, ARIZONA Final Report Donald Bahr, Billy G. Garrett, and Carolyn Chrisman Oct. 1980 161 p refs

(Contracts DEN3-50; DE-AI01-79ET-20485)

NTIS

(NASA-CR-165551; DOF/NASA/0050-1) HC AOB/MF AO1 GSCL 10A Avail:

and the second s

The social and economic impact of photovoltaic power on a small, remote native American village is studied. Village history, group life, energy use in general, and the use of photovoltaicpowered appliances are discussed. No significant impacts due to the chotovoltaic power system were observed.

N82-20661*# TRW, Inc., Redondo Beach, Calif. CHOPPER-CONTROLLED DISCHARGE LIFE CYCLING STUDIES ON LEAD-ACID BATTERIES Final Report Joseph J. Kraml and Ernest P. Ames Mar. 1982, 79 p. refs. Sponsored in part by DOE (Contract DEN3-88)

(NASA-CR-165615; NAS 1.26:165615) HC A05/MF A01 CSCL 10C NTIS Avail:

State-of-the-art 6 volt lead-acid golf car batteries were tested. A daily charge/discharge cycling to failure points under various chopper controlled pulsed dc and continuous current load conditions was undertaken. The cycle life and failure mades were investigated for depth of discharge, average current chopper frequency, and chopper duty cycle. It is shown that battery life is primarily and inversely related to depth of discharge and discharge current. Failure mode is characterized by a gradual capacity loss with consistent evidence of cell element aging.

N82-21709*# ECO, Inc., Cambridge, Mass.
CATHODE CATALYSTS FOR PRIMARY PHOSPHORIC ACID FUEL CELLS Final Report

Dec. 1981 60 p refs (Contracts DEN3-150; DE-AI01-80ET-17088) (NASA-CR-165578; NAS 1.26:165578; DOE/NASA/150-81/7) Avail: NTIS HC A04/MF A01 CSCL 10A

Alkylation or carbon Vulcan XC-72, the support carbon, was shown to provide the most stable bond type for linking cobalt dehydrodibenzo tetraazannulene (CoTAA) to the surface of the carbon; this result is based on data obtained by cyclic voltammetry, pulse voltammetry and by release of 14C from bonded CoTAA. Half-cell tests at 100 C in 85% phosphoric acid showed that CoTAA bonded to the surface of carbon (Vulcan XC-72) via an alkylation procedure is a more active catalyst than is platinum based on a factor of two improvement in Tafel slope; dimeric CoTAA had catalytic activity equal to platinum. Half-cell tests also showed that bonded CoTAA catalysts do not suffer a loss in potential when air is used as a fuel rather than oxygen. Commercially available polytetrafluroethylene (PTFE) was shown to be unstable in the fuel cell environment with degradation occurring in 2000 hours or less. The PTFE was stressed at 200 C in concentrated phosphoric acid as well as electrochemically stressed in 150 C concentrated phosphoric acid; the surface chemistry of PTFE was observed to change significantly. Radiolabeled PTFE was prepared and used to verify that such chemical changes also occur in the primary fuel cell environ-

N82-21711*# ECO, Inc., Cambridge, Mass. CATHODE CATALYST FOR PRIMARY PHOSPHORIC ACID FUEL CELLS Final Report Fraser Walsh Dec. 1981 60 p

(Contract DEN3-150; Contract DE-AI01-80ET-17088) (NASA-CR-165578; DOE/NASA/150-81/7; NAS 1.26:165678) Avail: NTIS HC A04/MF A01 C6CL 10A

Three carbon surface functionalization procedures were carried out on Vulcan XC-72, the support carbon in the phosphoric acid fuel cell. The resulting functionalized carbons were reacted with carbon 14-labeled trimethylamine and with carbon 14-labeled dimethylamino tetraazannulene. The release of the carbon 14 from these bonded carbons was measured. Based on the results obtained, the alkylation procedure of carbon functionalization was identified as providing the most stable bond between the carbon surface and the organic electrocatalyst. R.J.F.

N82-21713*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div. CELL MODULE AND FUEL CONDITIONER DEVELOPMENT

Querissly Report, Oct. - Dec. 1981 J. M. Feret Jan, 1982 51 p (Contract DEN3-161; Contract DE-AIQ1-80ET-17088)

(NASA-CR-165620; DOE/NASA/0161-9A; NAS 1.26:16562;

OR-9) Avail: NTIS HC A04/MF A01 CSCL 10A

The efforts performed to develop a phosphoric acid fuel cell
(PAFC) stack design having a 10 kW power rating for operation at higher than atmospheric pressure based on the existing Mark Il design configuration are described. The work involves: (1) Performance of pertinent functional analysis, trade studies and thermodynamic cycle analysis for requirements definition and system operating parameter selection purposes, (2) characterization of fuel cell materials and components, and performance testing and evaluation of the repeating electrode components, (3) establishment of the state-of-the-art manufacturing technology for all fuel cell components at Westinghouse and the fabrication of short stacks of various sites, and (4) development of a 10 kW PAFC stack design for higher pressure operation utilizing the top down systems engineering approach.

N82-22666*# Acurex Corp., Mountain View, Calif. Energy and Environment Div.

COMPUTER MODEL OF CATALYTIC COMBUSTION/ STIRLING ENGINE HEATER HEAD Final Report

E. K. Chu May 1981 186 p refs (Contract DEN3-186; DE-Al01-77CS-51040)

(NASA-CR-165378; DOE/NASA/0186-1; NAS 1,26:165378; FR-81-75/EE) Avail: NTIS HC ACG/MF A01 CSCL 10B

The basic Acurex HET code was modified to analyze specific problems for Stirling engine heater head applications. Specifically, the code can model: an adiabatic catalytic monolith reactor, an externally cooled catalytic cylindrical reactor/flat plate reactor, a coannular tube radiatively cooled reactor, and a monolithic reactor radiating to upstream and downstream heat exchangers,

N82-22675*# ECO, Inc., Cambridge, Mass.
CATHODE CATALYST FOR PRIMARY PHOSPHORIC FUEL CELLS Quarterly Report, Jul. - Sep. 1980 Fraser Walsh Sep. 1980 17 p refs (Contract DEN3-150)

(NASA-CR-165198; DOE/NASA/0150-80/5; NAS

1.26:165198) Avail: NTIS HC A02/MF A01 CSCL 10A

Alkylation of Vulcan XC-72 provided the most stable bond type for linking CoTAA to the surface of the carbon; this result is based on data obtained by cyclic voltammetry, pulse voltammetry and by release of 14C from bonded CoTAA. Half-cell tests at 100 C in 85% phosphoric acid showed that CoTAA bonded to the surface of carbon (Vulcan XC-72) via an alkylation procedure is a more active catalyst than is platinum based on a factor of two improvement in Tafel slope; dimeric CoTAA has catalytic activity equal to platinum. Half-cell tests also showed that bonded CoTAA catalysts do not suffer a loss in potential when air is used as a fuel rather than oxygen. Commercially available PTFE was shown to be stable for four months in 200 C 85% phosphoric acid based on lack of change in surface wetting properties. In and physical characteristics, When stressed electrochemically in 150 C 85% phosphoric acid, PTFE also showed no changes after one month.

N82-2277/0*# DHR, Inc., Washington, D.C.

MARKET ASSESSMENT OF PHOTOVOLTAIC POWER SYSTEMS FOR AGRICULTURAL APPLICATIONS IN COLOMBIA Final Report

William Steigelmann and Sergio Neveloff Nov. 1981 124 p refs Presented in cooperation with Associates in Rural Development, Inc., Burlington, Vt. (Contracts DEN3-180; DE-AI01-79ET-20485)

(NASA-CR-165524; DOE/NASA-0180/5) HC A06/MF A01 CSCL 108 Avail: NTIS

The market potential for photovoltaic systems in the agricultural sector of Colombia is assessed, Consideration was given to over twenty specific livestock production, crop production, and rural services applications requiring less than 15 kW of power without backup power. Analysis revealed that near-term potential exists for photovoltaic technology in applications in coffee depulging, cattle watering, rural domestic users, rural water supply

and small irrigation, rural telephones, rural health posts, and vaccine refrigeration. Market size would be in the 1200 to 2500 kWp range in the 1981 to 86 timeframe. Positive factors influencing the market size include a lack of electrical services. poterrisk for developing the Llanos Orientales Territory, high fuel costs in remote areas, balance of system availability the presence of wealthy land owners, and a large government-sponsored contract for photovoltaic (PV)-powered rural telephone systems. The anticipated eligibility of photovoltaic equipment for loans would be a further positive factor in market potential. Important negative factors include relatively inexpensive energy in developed locations, reliance on hydropower, lack of familiarity with PV equipment, a lack of financing, and established foreign competition in PV technology. Recommendations to American PV manufacturers attempting to develop the Colombian market ara given.

N82-23702*# Massachusetts Inst of Tech. Cambridge of Aeronautics and Astronautics

REVIEW OF ANALYSIS METHODS FOR ROTATING SYSTEMS WITH PERIODIC COEFFICIENTS

John Dugundii and John H. Wendell In NASA Lewis Research Center Wind Turbine Dyn May 1981 p 165-172 refs (For primary document see N82-73684 14-44) (Grant NsG-3303)

Avail: NTIS HC A18/MF A01 CSCL 10B

Two of the more common procedures for analyzing the stability and forced response of equations with periodic coefficients are reviewed: the use of Floquet methods, and the use of multiblade coordinate and harmonic balance methods. The analysis procedures of these periodic coefficient systems are compared with those of the more familiar constant coefficient systems. Author

N82-24646*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SUBSYSTEMS DESIGN AND COMPONENT DEVELOP-MENT FOR THE PARABOLIC DISH MODULE FOR SOLAR

THERMAL POWER SYSTEMS] Annual Technical Report
C. K. Stein 15 Mar. 1982 30 p Prepared in cooperat
with NASA. Lewis Research Center Prepared in cooperation (Contracts NAS7-10; DE-AT04-81AL-16228)

(NASA-CR-168941; DOE/JPL-1060-51; JPL-Pub-82-22* NAS 1.26:168941) Avail: NTIS HC A03/MF A01 CSCL 10A

Solar thermal power systems parabolic dish activities ere summarized. Subsystem designs of concentrators, receivers, engines, power converters, and thermal transport are discussed.

Analyses, test results, field tests, small community system development and the parabolic dish test site are also included.

Author

NB2-24648* Engelhard Industries, Inc., Edison, N.J.
DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS: PHASE 3: FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Report, Aug. - Oct. 1981 28 Apr. 1982 59 p refs (Contracts DEN3-241; DE-Âl-c 90ET-17088)

(NASA-CR-165568; DOE/NASA/J241-3; NAS 1.26:165568; QR-3) Avail: NTIS HC A04/MF A01 CSCL 10B

The development of a commercially viable and cost-effective phospheric acid fuel cell powered on-site integrated energy system (OS/(ES) is described. The fuel cell offers energy efficients in the range of 35-40% of the higher heating value of available fuels in the form of electrical energy. In addition, by utilizing the thermal energy generated for heating, ventilating and air-conditioning (HVAC), a fuel cell OS/IES could provide total energy efficiencies in the neighborhood of 80%. Also, the Engelhard fuel cell OS/IES offers the Important Incentive of replacing imported oil with domestically produced methanol, including coal-derived methanol.

N82-24649* Parsons (Ralph w.) Co., Pasadona, Calif. FUEL QUALITY PROCESSING STUDY, VOLUME 1 Report

J. B. OHara, A. Bela, N. E. Jentz, H. T. Syverson, H. W. Klumpe, R. E. Kessler, H. T. Kotzot, and B. L. Loran Apr. 1981 203 p refs 2 Vol.

(Contracts DEN3-183: DE-AI01-77ET-13111) (NASA-CR-165327-Vol-1; DOE/NASA/0183-1; NAS 1.26.165327-Vol-1) Avail: NTIS HC A10/MF A01 CSCL

A fuel quality processing study to provide a data base for an intelligent tradeoff between advanced turbine technology and liquid fuel quality, and also, to guide the development of specifications of future synthetic fuels anticipated for use in the time period 1385 to 2000 is given. Four technical performance tests are discussed: on-site pretreating, existing refineries to upgrade fuels, new refineries to upgrade fuels, and data evaluation.

The base case refinery is a modern Midwest refinery processing

200,000 BPD of a 60/40 domestic/import petroleum crude mix The synthetic crudes used for upgrading to marketable products and turbine fuel are shale oil and coal liquids. Of these syncrudes, 50,000 BPD are processed in the existing petroleum, refinery, requiring additional process units and reducing petroleum feed, and in a new refinery designed for processing each syncrude to produce gasoline, distillate fuels, resid fuels, and turbine fuel, JPGs and coke. An extensive collection of synfuci properties and upgrading data was prepared for the application of a linear program model to investigate the most economical production state meeting petroleum product specifications and turbine fuels of various quality grades Technical and economic projections were developed for 36 scenarios, based on 4 different crude feeds to either modified existing or new refineries operated in 2 different modes to produce 7 differing grades of turbine fuels. A required product selling price of turbine fuel for each processing route was calculated. Procedures and projected economics were developed for on-site treatment of turbine fuel to meet limitations of impurities and emission of pollutants.

N82-24650*# Parsons (Ralph M.) Co., Pasadena, Calif. FUEL QUALITY/PROCESSING STUDY. VOLUME 2: APPENDIX. TASK 1 LITERATURE SURVEY Final Report J. B. OHara, A. Bela, N. E. Jentz, H. W. Klumpe, H. E. Kessler, H. T. Kotzot, and B. L. Loran Apr. 1981 274 p 7efs 2 Vol. (Contract DEN3-183; DE-AIO1-77ET-13111) (NASA-CR-165327-Vol-2; DOE/NASA/0183-1; NAS 1.26:165327-Vol-2) Avail: NTIS HC A12/MF A01

The results of a literature survey of fuel processing and fuel quality are given. Liquid synfuels produced from coal and oil shale are discussed. Gas turbine fuel property specifications are discussed. On-site fuel pretreatment and emissions from stationary has turbines are discussed. Numerous data tables and abstracts are given.

NB2-24651*# General Electric Co., Schenectady, N. Y. Turbine Div. LOW NOX HEAVY FUEL COMBUSTOR CONCEPT PRO-

GRAM, PHASE 1 Final Report

Martin B. Gutrone Oct. 1981 251 p

(Contracts DEN3-147; DE-AI01-77ET-13111)

(NASA-CR-165449; DOE/NASA/0147-1; NAS 1.26:165449)

Avail: NTIS HC A12/MF A01 CSCL 10B

Combustion tests were completed with seven concepts, including three rich/lean concepts, three lean/lean concepts, and one catalytic combustor concept. Testing was conducted with ERBS petroleum, distillate, petroleum residual, and SRC-II coal-derived liquid fuels over a range of operating conditions for the 12:1 pressure ratio General Electric MS7001E heavy-duty turbine. Blends of ERBS and SRC-II fuels were used to vary fuel properties over a wide range. In addition, pyridine was added to the ERBS and residual fuels to vary nitrogen level while holding other fuel properties constant. Test results indicate that low levels of NOx and fuel-bound nitrogen conversion can be achieved with the rich/lean combustor concepts for fuels with nitrogen contents up to 1.0% by weight, Multinozzle rich/lean Concept 2 demonstrated dry low Nox emissions within 10-15% of the EPA New Source Performance Standards goals for SRC-II fuel, with yields of approximately 15%, while meeting program goals for combustion efficiency, pressure drop, and exhaust gas temperature profile. Similar, if not superior, potential was demonstrated by Concept 3, which is a promising rich/lean combustor design.

N82-24686°# Edde (Howard), Inc., Bellevue, Wash, COLLECTION AND DISSEMINATION OF THERMAL ENERGY STORAGE SYSTEM INFORMATION FOR THE PULP AND PAPER INDUSTRY

Howard Edde In Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 133-136 refs (For primary document see N82-24652 15-44)

(Contract DEN3-190)

Avail: NTIS HC A16/MF A01 CSCL 10A

The collection and dissemination of thermal energy storage (TES) system technology for the pulp and paper industry with the intent of reducing fossil fuel usage is discussed. The study plan is described and a description presented of example TES systems.

N82-24725* Westinghouse Electric Corp., Concordville, Pa, LOW NOX HEAVY FUEL COMBUSTOR CONCEPT PRO-PHASE 1: COMBUSTION TECHNOLOGY GRAM.

GENERATION Final Report
H. G. Lew, D. R. Carl, G. Vermes, E. A. DeZubay, J. A. Schwab, and D. Prothroe Oct. 1981 143 p refs
(Contract DEN3-146; DE-AIO1-77ET-13111)
(NASA-CR-165482; DOE/NASA/0146-1; NAS 1.26:165482)
Avail: NTIS HC AO7/MF AO1 CSCL 10B

The viability of low emission nitrogen oxide (NOx) gas turbine combustors for industrial and utility application. Thirteen different concepts were evolved and most were tested. Acceptable performance was demonstrated for four of the combustors using ERBS fuel and ultralow NOx emissions were obtained for lean catalytic combustion. Residual oil and coal derived liquids containing fuel bound nitrogen (FBN) were also used at test fuels, and it was shown that staged rich/lean combustion was effective in minimizing the conversion of FBN to NOx. The rich/lean concept was tested with both modular and integral combustors, While the ceramic lined modular configuration produced the best results, the advantages of the all metal integral burners make them candidates for future development. An example of scaling the laboratory sized combustor to a 100 MW size engine is included in the report as are recommendations for future work,

N82-25635* # Detroit Diesel Allison, Indianapolis, Ind. LOW NOX HEAVY FUEL COMBUSTOR CONCEPT PROGRAM Final Report

A. S. Novick and D. L. Troth Oct. 1981 206 p refs (Contracts DEN3-148; DE-AI01-77ET-13111) (NASA-CR-165367; NAS 1,26:165367; DDA-EDR-10594; DOE/NASA/0148-1) Avail: NTIS HC A10/MF A01 CSCL

The development of the technology required to operate an industrial gas turbine combustion system on minimally processed, heavy petroleum or residual fuels having high levels of fuel-bound nitrogen (FBN) while producing acceptable levels of exhaust emissions is discussed. Three combustor concepts were designed and fabricated. Three fuels were supplied for the combustor test demonstrations; a typical middle distillate fuel, a heavy residual fuel, and a synthetic coal-derived fuel. The primary concept was an air staged, variable-geometry combustor designed to produce low emissions from fuels having high levels of FBN. This combustor used a long residence time, fuel-rich primary combustion zone followed by a quick-quench air mixer to rapidly dilute the fuel rich products for the fuel-lean final burnout of the fuel. This combustor, called the rich quench leas (RQL) combustor, was extensively tested using each fuel over the entire power range of the model 570 K engine. Also, a series of parameteric tosts was conducted to determine the combustor's sensitivity to rich-zone equivalence ratio, lean-zone equivalence ratio, rich-zone residence time, and overall system pressure drop, Minimum nitrogen oxide emissions were measured at 50 to 55 ppmv at maximum continuous power for all three fuels, Smoke was less than a 10 SAE smoke number. MG.

N82-25640*# Giner, Inc., Waltham, Mass.
REQUIREMENTS FOR OPTIMIZATION OF ELECTRODES AND ELECTROLYTE FOR THE IRON/CHROMIUM REDOX

FLOW CELL Final Report Vinod Jalan, Herbert Stark, and Jose Giner Sep. 1981 82 p

(Contracts DEN3-97; DE-AI04-80AL-12726) (NASA-CR-165218; DOE/NASA/0097-80/1; NAS 1.26:165218) Avail: NTIS HC A05/MF A01 CSCL 10C

Improved catalyzation techniques that included a pretreatment of carbon substrate and provided normalized carbon surface for uniform gold deposition were developed. This permits efficient use of different batches of carbon felt materials which initially vary significantly in their physical and surface chemical properties, as well as their electrochemical behavior. Further modification of gold impregnation technique gave the best performing electrodes. In addition to the linear sweep voltammetry, cyclic voltammetry was used to determine the effects of different activation procedures on the Cr(3)/Cr(2) Redox and H2 evolution reactions. The roles of carbon, gold and lead in the overall Redox cycle are identified. The behavior of the electrodes at both normal battery operating potentials and more extreme potentials is discussed preparing efficient and stable electrodes for the energy storage battery is implicated.

N82-27837*# Gilbert/Commonwealth, Reading, Pa. MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MW. POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT (CDER). VOLUME 2: ENGINEERING. VOLUME 3: COSTS AND SCHEDULES Final Report

Sep. 1981 163 p Volume 3 is included as MF 5 Vol. (Contracts DEN3-224; DE-AIO1-77ET-10769) (NASA-CR-165452-Vol-2; NASA-CR-165452-Vol-3; NAS 1,26;

165452-Vol-3; NAS 1,26; 165452-Vol-2;

DOE/NASA/0224-1) Avail: NTIS HC E08/MF A01 CSCL 10B

Engineering design details for the principal systems, system operating modes, site facilities, and structures of an engineering test facility (ETF) of a 200 MWE power plant are presented. The ETF resembles a coal-fired steam power plant in many ways. It is analogous to a conventional plant which has had the coal combustor replaced with the MHD power train. Most of the ETF components are conventional. They can, however, be sized or configured differently or perform additional functions from those in a conventional coal power plant. The boiler not only generates steam, but also performs the functions of heating the MHD oxidant, recovering seed, and controlling emissions.

N82-29718*# Institute of Gas Technology, Chicago, Ili. Engineering Research Div.

STABILIZING PLATINUM IN PHOSPHORIC ACID FUEL

CELLS Final Report, Dec. 1980 - Mar. 1982 Robert J. Remick Jul. 1982 47 p refs (Contracts DEN3-208; DE-AIO1-80ET-17088)

(NASA-CR-165606; DOE/NASA/0208-4; NAS 1.26 165606; Rept-61051) Avail; NTIS HC A03/MF A01 CSCL 10A

Platinum sintering on phosphoric acid fuel cell cathodes is discussed. The cathode of the phosphoric acid fuel cell uses a high surface area platinum catalyst dispersed on a conductive carbon support to minimize both cathode polarization and fabrication costs. During operation, however, the active surface area of these electrodes decreases, which in turn leads to decreased cell performance. This loss of active surface area is a major factor in the degradation of fuel cell performance over time.

N82-29719*# California Univ., Berkeley. Legal Inst. CURRENT LEGAL AND INSTITUTIONAL ISSUES IN THE COMMERCIALIZATION OF PHOSPHORIC ACID FUEL

CELLS Final Report

John T. Nimmons, Kevin D. Sheehy, Joel R. Singer, and Tom C. Gardner Jan. 1982 238 p refs (Grant NAG3-111: Contract DE-Al01-80ET-17088)

(NASA-CR-167867; DOE/NASA/0111-1; NAS 1.28:167867) Avail: NTIS HC A11/MF A01 CSCL 10A

Legal and institutional factors affecting the development and commercial diffusion of phosphoric acid fuel cells are assessed. Issues for future research and action are suggested. Perceived barriers and potential opportunities for fuel cells in central and dispersed utility operations and on-site applications are reviewed. as well as the general concept of commercialization as applied to emerging energy technologies.

ORIGINAL PAGE IS

N82-29720*# DHR, Inc., Washington, D.C. APPLICATION OF PHOTOVOLTAIC ELECTRIC POWER TO THE RURAL EDUCATION/COMMUNICATION NEEDS OF DEVELOPING COUNTRIES Final Report

Anil Cabraal, David Delansanta, and George Burrill Jul. 1982 61 p ref Prepared in cooperation with Associates in Rural Development, Inc., Burlington, Vt. Sponsored in part by Agency for International Development

(Contract DEN3-248)

(NASA-CR-167894; NAS HC A04/MF A01 CSCL 10B NAS 1.26:167894) Avail: NTIS

The suitability (i.e., cost competitiveness and reliability) of photovoltaic (PV) power systems for rural applications in developing countries is considered. Potential application sectors include health delivery, education and communication where small amounts of electricity are needed to meet critical needs. Author

N82-29721*# Aerospace Corp., El Segundo, Calif.
ENVIRONMENTAL ASSESSMENT OF THE 40 KILOWATT
FUEL CELL SYSTEM FIELD TEST OPERATION Final Report

Gary Bollenbacher May 1982 160 p refs (Contract DE-A101-80ET-17088; NASA Order C-42701D) (DOE/NASA/2701-1; NASA-CR-167923) Avail:

HC AOB/MF AO1 CSCL 10A

This environmental assessment examines the potential environmental consequences, both adverse and beneficial, of the 40 kW fuel cell system system field test operation. The assessment is of necessity generic in nature since actual test sites were not selected. This assessment provides the basis for determining the need for an environmental impact statement. In addition, this assessment provides siting criteria to avoid or minimize negative environmental impacts and standards for determining candidate test sites, if any, for which site specific assessments may be required

N82-30705*# Engelhard Industries, Inc., Edison, N.J. DEVELOPMENT AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS. PHASE 3: FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Report, Nov. 1981 - Jan. 1982

A. Kaufman 21 Jun. 1982 61 p refs (Contracts DEN3-241: DE-A 101-80ET-17088) (NASA-CR-167898; DOE/NASA/0241-4; NAS 1.26:167898;

QR-4) Avail: NTIS HC A04/MF A01 CSCL 10B
The on-site system application analysis is summarized. Preparations were completed for the first test of a full-sized single cell. Emphasis of the methanol fuel processor development program shifted toward the use of commercial shell-and-tube heat exchangers. An improved method for predicting the carbon-monoxide tolerance of anode catalysts is described. Other stack support areas reported include improved ABA bipotar plate bonding technology, improved electrical measurement techniques for specification-testing of stack components, and anodic corrosion behavior of carbon materials.

N82-30706*# Spire Corp., Bedford, Mass. DEVELOPMENT OF A LARGE AREA SPACE SOLAR CELL ASSEMBLY Finel Report, Jul. 1981 - Mer. 1982 M. B. Spitzer May 1982 65 p refs (Contract NAS3-22236)

(NASA-CR-167929; NAS 1.26:167929; FR-10081) NTIS HC A04/MF A01 CSCL 10A

The development of a large area high efficiency solar cell assembly is described. The assembly consists of an ion implanted silicon solar cell and glass cover. The important attributes of fabrication are the use of a back surface field which is compatible with a back surface reflector, and integration of coverglass application and cell fabrications. Cell development experiments concerned optimization of ion implantation processing of 2 ohm-cm boron-doped silicon, Process parameters were selected based on these experiments and cells with area of 34.3 sq cm wre fabricated. The average AMO efficiency of the twenty-five best cells was 13.9% and the best bell had an efficiency of 14.4%. An important innovation in cell encapsulation was also developed. In this technique, the coverglass is applied before the cell is sawed to final size. The coverglass and cell are then

OF POOR QUALITY unit. In this way, the cost of the coverglass is coverglass/cell alignment procedures are eliminated. Adhesive investigated were EVA, FEP-Teflon sheet and DC 93-500. Details of processing and results are reported.

N82-30709*# Tanksley (W. L.) and Associates, Inc., Brook

Park, Ohio.
VIBRATION ANALYSIS OF THREE GUYED TOWER DESIGNS FOR INTERMEDIATE SIZE WIND TURBINES

Robert J. Christie Mar. 1982 113 p refs (Contract NAS3-21900)

(NAT'-CR-165589: DOE/NASA/1900-1: NAS 1.26:165589)

Avail: NTIS HC AU6/MF A01 CSCL 10A

Three guyed tower designs were analyzed for intermediate size wind turbines. The four lowest natural frequencies of vibration of the three towers concepts were estimated. A parametric study was performed on each tower to determine the effect of varying such tower properties as the inertia and stiffness of the tower and guys, the inertia values of the nacelle and rotor, and the rotational speed of the rotor. Only the two lowest frequencies were in a range where they could be excited by the rotor blade passing frequencies. There two frequencies could be tuned by varying the guy stiffness, the guy attachment point on the tower, the tower and mass stiffness, and the nacelle/rotor/power train

N82-30711*# Ionics, Inc., Watertown, Mass.
ANION PERMSELECTIVE MEMBRANE
Russell B. Hodgdon and Warren A. Waita
(Contracts DEN3-204; DE-AI04-80AL-12726)
(NASA-CR-167872; DOE/NASA/0204-1; NAS 1.26:167872)
Avail: NTIS HC A04/MF A01 CSCL 10A

The synthesis and fabrication of polymeric anion permetective membranes for redox systems are discussed, Variations of the prime candidate anion membrane formulation to achieve better resistance and/or lower permeability were explored. Processing parameters were evaluated to lower cost and fabricate larger sizes. The processing techniques to produce more membranes per batch were successfully integrated with the fabrication of larger membranes. Membranes of about 107 cm x 51 cm were made in excellent yield. Several measurements were made on the larger sample membranes. Among the data developed were water transport and transference numbers for these prime candidate membranes at 20 C. Other work done on this system included characterization of a number of specimens of candidate membranes which had been returned after service lives of up to sixteen months. Work with new polymer constituents, with new N.P.'s, catalysts and backing fabrics is discussed. Some work was also done to evaluate other proportions of the ingredients of the prime candidate system. The adoption of a flow selectivity test at elevated temperature was explored.

N82-30712*# Westinghouse Research and Development Center,

CELL MODULE AND FUEL CONDITIONER DEVELOPMENT Final Report, Oct. 1979 - Jan. 1982

D. Q. Hoover, Jr. Feb. 1982 393 p (Contracts DEN3-161; DE-Al01-80ET-17088) (NASA-CR 165193; DOE/NASA/0161-10; NAS 1.26:185193; WEC-82-901-MARED-R1) Avail; NTIS HC A17/MF A01 CSCL

The phosphoric acid (uel cell module (stack) development which culminated in an 80 cell sir-cooled stack with separated gas cooling and treed cooling plates is described. The performance of the 80 cell stack was approx, 100 mV per cell higher than that attained furing phase 1. The components and materials performed stably for over 8000 hours in a 5 cell stack. The conceptual design of a fuel conditioning system is described.

N82-30722*# National Bureau of Standards, Washington, D.C. Metallurgy Div.

NON-NOBLE CATALYSTS AND CATALYST SUPPORTS FOR PHOSPHORIC ACID FUEL CELLS Final Report, Oct. 1979 - Sep. 1981

A. J. McAlister Sep. 1981 38 p refs (NASA Order C-46229-D; Contract DE-AI01-80ET-17088)

(NASA CR-165289: DOE/NASA/6229-2; NAS 1.26:165289) Avail NTIS HC A03/MF A01 CSCL 10A

Tungsten carbide, which is active for hydrogen oxidation is CO tolerant and has a hexagonal structure is discussed. Titanium carbide is inactive and has a cubic structure. Four different samples of the cubic alloys W sub x-1Ti sub XC sub 1-y were found to be active and CO tolerant. When the activities of these cubic alloys are weighted by the reciprocal of the square to those of highly forms of WC. They offer important insight into the nature of the active sites on W-C anode catalysts for use in phosphoric acid fuel cells.

N82-32855*# PRC Systems Sciences Co., Tucson, Ariz.
GALLIUM ARSENIDE SOLAR ARRAY SUBSYSTEM STUDY
Final Report, Jan. 1981 - Feb. 1982

F. Q. Miller Feb. 1982 221 p refs

(Contract NAS3-22667)

(NASA-CR-167869; NAS 1.26:167869) Avail:

HC A10/MF A01 CSCL 10A

The effects on life cycle costs of a number of technology areas are examined for a gallium arsenide space solar array. Four specific configurations were addressed: (1) a 250 KWe LEO mission - planer array; (2) a 250 KWe LEO mission - with concentration; (3) a 50 KWe GEO mission planer array; (4) a 50 KWe GEO mission - with concentration. For each configuration, a baseline system conceptual design was developed and the life cycle costs estimated in detail. The baseline system requirements and design technologies were then varied and their relationships to life cycle costs quantified. For example, the thermal characteristics of the baseline design are determined by the array materials and masses. The thermal characteristics in turn determine configuration, performance, and hence life cycle costs.

N82-32856*# Westinghouse Electric Corp., Madison, Pa. Synthetic Fuels Div.

LOW AND MEDIUM HEATING VALUE COAL GAS CATALYTIC COMBUSTOR CHARACTERIZATION

John A. Schwab Nov. 1982 137 p refs (Contracts DEN3-277; DE-AI01-77ET-10350)

(NASA-CR-165560; DOE/NASA/0277-1; NAS 1,26;165560) Avail: NTIS HC A07/MF A01 CSCL 10B

Catalytic combustion with both low and medium heating value coal gases obtained from an operating gasifier was demonstrated. A practical operating range for efficient operation was determined, and also to identify potential problem areas were identified for consideration during stationary gas turbine engine design. The test rig consists of fuel injectors, a fuel-air premixing section, a catalytic reactor with thermocouple instrumentation and a single point, water cooled sample probe. The test rig included inlet and outlet transition pieces and was designed for installation into an existing test loop.

S.L

NTIS

N82-33827*# Solar Turbines International, San Diego, Calif.
LOW NOX HEAVY FUEL COMBUSTOR CONCEPT PROGRAM
Final Report

David J. White, Richard T. LeCren, and Anthony P. BatAkis Nov. 1981 93 p refs

(Contracts DEN3-145; DE-AI01-77ET-13111)

(NASA-CR-165481; DOE/NASA/0145-1; NAS 1.26:165481; SR81-R-4761-21) Avail: NTIS HC A05/MF A01 CSCL 10B

A total of twelve low NOx combustor configurations, embodying three different combustion concepts, were designed and fabricated as modular units. These configurations were evaluated experimentally for exhaust emission levels and for mechanical integrits. Emissions data were obtained in depth on two of the configurations.

R.J.F.

A82-11712 * # Direct conversion of light to radio frequency energy. J. W. Freeman and S. Simons (Rice University, Houston, TX). In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 1981, Proceedings. Volume 1, (A82-11701 02-44) New York, American Society of Mechanical

Engineers, 1981, p. 95, 96. Research supported by the Brown Foundation of Houston; Grant No. NAG3-29.

A description is presented of the test results obtained with the latest models of the phototron. The phototron was conceived as a replacement for the high voltage solar cell-high power klystron combination for the solar power satellite concept. Physically, the phototron is a cylindrical evacuated glass tube with a photocathode, two grids, and a reflector electrode in a planar configuration. The phototron can be operated either in a biased mode where a low voltage is used to accelerate the electron beam produced by the photocathode or in an unbiased mode referred to as self-oscillation. The device is easily modulated by light input or voltage to broadcast in AM or FM. The range of operation of the present test model phototrons is from 2 to 200 MHz.

G,R.

A82-11816 * # Characteristic dynami/z energy equations for Stirling cycle analysis, V. H. Larson (Cleveland State University, Cleveland, OH), In: Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, August 9-14, 1981, Proceedings. Volume 2. (A82-11701 02-44) New York, American Society of Mechanical Engineers, 1981, p. 1942-1947. 12 refs. Grant No. NsG-3257.

A82-24695 * An assessment of alternative fuel cell designs for residential and commercial cogeneration. R. A. Wakefield (Mathtech, Inc., Washington, DC). In: The 1980's - A forest of energy decision trees; Proceedings of the Region Six Conference, San Diego, CA, February 20-22, 1980. (A82-24683 10-44) New York, Institute of Electrical and Electronics Engineers, Inc., 1980, p. 160-165. Research sponsored by the U.S. Department of Energy; Contract No. DEN3-89.

A comparative assessment of three fuel cell systems for application in different buildings and geographic locations is presented. The standy was performed at the NASA Lewis Center and comprised the fuel cell design, performance in different conditions, and the economic parameters. Applications in multifamily housing, stores and hospitals were considered, with a load of 10kW-1 MW. Designs were traced through system sizing, simulation/evaluation, and reliability analysis, and a computer simulation based on a fourth-order representation of a generalized system was performed. The cells were all phosphoric acid type cells, and were found to be incompatible with gas/electric systems and more favorable economically than the gas/electric systems in hospital uses. The methodology used provided an optimized energy-use pattern and minimized back-up system turn-on.

A82-37078 * # Winding for the wind. O. Weingart (Structural Composites Industries, Inc., Azusa, CA). In: Reinforced Plastics/Composites Institute, Annual Conference, 37th, Washington, DC, January 11-15, 1982, Preprints. (A82-37081 18-24) New York, Society of the Plastics Industry, Inc., 1982 (Session 22-C). 8 p. 5 refs. Research supported by the U.S. Department of Energy; Contract No. DEN3-100

The mechanical properties and construction of epoxy-impregnated fiber-glass blades for wind turbines are discussed, along with descriptions of blades for the Mod OA and Mod 5A WECS and design goals for a 4 kW WECS. Multicell structure combined with transverse filament tape winding reduces labor and material costs, while placing a high percentage of 0 deg tipers spanwise in the blades yields improved strength and elastic properties. The longitudinal, transverse, and shear modulus are shown to resist stresses exceeding the 50 lb/sq ft requirements, with constant stress resistance expected until fatigue failure is approached. Regression analysis indicates a fatigue life of 400 million operating cycles. The small WECS under prototype development features composite blades, nacelle, and tower, Rated at 5.7 kW in a 15 mph wind, the machine operates over a speed range of 9-53.9 mph and is expected to produce 16,200 kWh annually in a 10 mph average wind measured at 30 ft.

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-13554*# United Air Lines, Inc., San Francisco, Calif. Maintenance Operations Center.
AN AUTOMATED SYSTEM FOR GLOBAL ATMOSPHERIC SAMPLING USING B-747 AIRLINERS Final Report Ken Q. Lew, Ulf R. C. Gustafsson, and Robert E. Johnson Oct. 1981 31 p refs (Contract NAS3-17867) (NASA-CR-165264; UAL-C-80-31-33) Avail: NTIS

HC A03/MF A01 CSCL 13B

The global air sampling program utilizes commercial aircrafts in scheduled service to measure atmospheric constituents. A fully automated system designed for the 747 aircraft is described. Airline operational constraints and data and control subsystems are treated. The overall program management, system monitoring, and data retrieval from four aircraft in global service is described.

E.A.K.

N82-29777*# Gerrett Turbine Engine Co., Phoenix, Ariz.
COMPUTATIONS OF SOOT AND AND NO SUB X EMISSIONS FROM GAN TURBINE COMBUSTORS Final Report
S. K. Srivatsa May 1982 300 p refs
(Contract NAS3-22542)

(NASA-CR-167930; NAS 1.26:167930; Rept-21-4309) Avail: NTIS HC A13/MF A01 CSCL 13B

An analytical program was conducted to compute the soot and NOx emissions from a combustor and the radiation heat transfer to the combustor walls. The program involved the formulation of an emission and radiation model and the incorporation of this model into the Garrett 3-D Combustor Perfomance Computer Program. Computations were performed for the idle, cruise, and take-off conditions of a JT8D can combustor. The predicted soot and NOx emissions and the radiation heat transfer to the combustor walls agree reasonably well with the limited experimental data available.

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see 93 Space Radiation.

hours, and appears to coexist with the plasma sheet. More consistent measurements of the cold-ion population at midnight or at other local times would require the biasing of the ion detector with respect to the spacecraft, or the controlling of spacecraft potential. A.L.W.

NSZ-21145*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio. OZONE AND AIRCRAFT OPERATIONS

Porter J. Perkins In NASA, Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol, and Environ, Inputs to Aviation Systems Dec, 1981 p 40-44 refs (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 04A

A82-37450 * # Aircraft sampling of the sulfate layer rear the tropopause following the eruption of Mount St. Helens. E. A ezberg, D. A. Otterson, W. K. Roberts, and L. C. Papathakos (NASA, Lewis Rusearch Center, Cleveland, OH), Journal of Geophysical Research, vol. 87, Apr. 20, 1982, p. 3123-3127. 9 refs.

Twenty-three filter sampling flights of the NASA Lewis F-106 aircraft, were conducted in the Great Lakes region between June 4 and Dec. 23, 1980, following the major eruption of Mount St. Helens on May 18. The IPC-1478 filters were exposed over an altitude range spanning the local tropopause. A filter sample exposed above the tropopause on June 5 indicated a sulfate level 50 times the baseline measurements, which is consistent with the trajectory predictions of the leading edge of the cloud on its second transit around the earth. Subsequent measurements over a period of 7 months revealed the existence of a layer of sulfate above the tropopause that decayed to a level of about 4 times previously measured background levels by the beginning of August. Concentration of nitrate above the tropopause exhibited considerable variability and showed some enhancemen; compared with previously measured concentration levels. On the basis of the null results of X ray fluorescence measurements, there is no evidence of ash particle concentrations of greater than 3.4 microns/cu m persisting in the layer above the tropopause following the second transit of the cloud. (Author)

A82-31009 * Field-aligned ion streams in the earth's midnight region. R. C. Olsen (Alabama, University, Huntsville, AL). Journal of Geophysical Research, vol. 87, Apr. 1, 1982, p. 2301-2310. 20 refs. Grant No. NsG-3150; Contract No. NAS8-30563.

Plasma measurements from the University of California at San Diego auroral particles experiment on the geosynchronous Applied Technology Satellite 6 in the midnight region show that the low-energy ion fluxes (1-100 eV) are field aligned and are well characterized as thermal populations (1-10 eV) with a streaming velocity of 30-100 km/s along the magnetic field line. The lowest energies are found prior to injections, on quiet days, with an increase of the streaming velocity evident when an injection occurs near the satellite. Multiple peaks in the ion distribution functions are attributed to the presence of different ions species (H/+/, He/+/, O/+/, O/2+/) streaming at similar velocities, both during quiet times and as the plasma velocity increases in response to an injection.

(Author)

A82-32630 * The hidden ion population of the magnetosphere. R. C. Olsen (Alabama, University, Huntsville, AL). *Journal of Geophysical Research*, vol. 87, May 1, 1982, p. 3481-3488. 12 refs. Contracts No. NAS5-23481; No. NAS8-33982; No. FC4701-77-C-0062; Grant No. NsG-3150.

The presence of a cold ion population in the magnetosphere which is normally hidden from particle detector observation by the positive charging of the spacecraft is reported. Ion and electron data were obtained from particle detectors on the ATS 6 and SCATHA satellites designed to measure the 1-eV to 80-keV plasma population. The cold, isotropic ion population, with temperature 1 eV and density 10-100/cu cm, was detected only when the spacecraft were in eclipse, when spacecraft potential had dropped from +10 V in sunlight to +4 to +5 V. The hidden ion population was found at geosynchronous altitude only during geomagnetically quiet times and when there has been an absence of geomagnetic activity for several

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

NB2-16659*# FWG Associates, Inc., Tullahoma, Tenn.
DESIGN OF PROTOTYPE CHARGED PARTICLE FOG
DISPERSAL UNIT Final Report
Frank G. Collins, Walter Frost, and Philip Kessel Washington,
D.C. NASA Dec. 1981 41 p refs
(Contract NAS3-33541)
(NASA-CR-3481; M364) Avail: NTIS HC A03/MF A01 CSCL
O4B

The unit was designed to be easily modified so that certain features that influence the output current and particle size distribution could be examined. An experimental program was designed to measure the performance of the unit. The program described includes measurements in a fog chamber and in the field, Features of the nozzle and estimated nozzle characteristics are presented.

52 AEROSPACE MEDICINE

includes physiological factors, biological effects of radiation; and weightlessness.

ORIGINAL PAGE IS OF POOR QUALITY

M82-23976*# Thermo Electron Corp., Waltham, Mass. EVALUATION OF LEFT VENTRICULAR ASSIST DEVICE PUMP BLADDERS CAST FROM ION-SPUTTERED POLYTET-RAFLUGRETHYLENE MANDRELS

Mar. 1982 103 p refs (Contract NAS3-22476) (NASA-CR-167904; NAS 1.26:167904; TE200-230-82) Avail: NTIS HC A06/MF A01 CSCL 06B

A highly thromboresistant blood contacting interface for use in implanatable blood pump is investigated. Biomaterials mechanics, dynamics, durability, surface morphology, and chemistry are among the critical consideration pertinent to the choice of an appropriate blood pump bladder material. The use of transfer cast biopolymers from ion beam textured surfaces is investigated to detect subtle variations in blood pump surface morphology using Biomer as the biomaterial of choice. The efficacy of ion beam sputtering as an acceptable method of fabricating textured blood interfaces is evaluated. Aortic grafts and left ventricular assist devices were implanted in claves; the blood interfaces were fabricated by transfer casting methods from ion beam textured polytetrafluorethylene mandrels, The mandrels were textured by superimposing a 15 micron screen mesh: ion sputtering conditions were 300 volts beam energy, 40 to 50 mA beam, and a mandrel to source distance of 25 microns.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

includes human engineering; biolechnology; and space suits and protective clothing.

NB2-16743*# National Aeronautics and Space Administration.

Lewis Research Center, Cleveland, Ohio.

A HYDRODYNAMIC MODEL OF AN OUTER HAIR CELL
Bo O. Jacobson 1982 14 p refs To be presented at the
19th Ann. Northeast Bioengr. Conf., Hanover, New Hampshire, 15-16 Mar. 1982; sponsored by the Thayer School of Engineering Dartmouth Med. School, IEEE, ASME, and the American Society for Engineering Education

(NASA-TM-82773: E-1098) Avail: NTIS HC A02/MF A01

CSCL 06P

On the model it is possible to measure the force and the force direction for each individual hair as a function of the flow direction and velocity. Measurements were made at the man flow velocity .01 m/s, which is equivalent to a flow velocity in the real ear of about 1 micrometer/s. The kinematic viscosity of the liquid used in the model was 10,000 times higher than the viscosity of perilymph to attain hydrodynamic equality. Two different geometries for the sterocilia pattern were tested. First the force distribution for a W-shaped sterocilia pattern was recorded. This is the sterocilia pattern found in all real ears. It is found that the forces acting on the hairs are very regular and perpendicular to the legs of the W when the flow is directed from the outside of the W. When the flow is reversed, the forces are not reversed, but are much more irregular. This can eventually explain the half wave rectification of the nerve signals. As a second experiment, the force distribution for a V-shaped sterocilia pattern was recorded. Here the forces were irregular both when the flow was directed into the V and when it was directed against the edge of the V

N82-19147*# National Aeronautics and Space Administration. Lewis Research Center. Sleveland, Ohio,

ENVIRONMENTAL CONTROL SYSTEMS

Frank Hrach In NASA, Langley Research Center Elec. Flight Systems Feb. 1982 p 247-252 (For primary document see N82-19134 10-01)

Avail: NTIS HC A12/MF A01 CSCL 06K

A82-13289 * # Veiling glare reduction methods compared for ophthalmic applications, D. R. Buchele (NASA, Lewis Research Center, Cleveland, OH), Applied Optics, vol. 20, Nov. 1, 1981, p. 3787-3791, 11 refs.

Veiling glare in ocular viewing was simulated by viewing the retina of an eye model through a sheet of light-scattering material lit from the front. Four methods of glare reduction were compared, namely, optical scanning, polarized light, viewing and illumination paths either coaxial or intersecting at the object, and closed circuit TV. Photographs show the effect of these methods on visibility. Polarized light was required to eliminate light specularly reflected from the instrument optics. The greatest glare reduction was obtained when the first three methods were utilized together. Glare reduction using TV was limited by nonuniform distribution of scattered light over the image. (Author)

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

NB2-30949* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONSTRUCTION OF SOLUTIONS FOR SOME NONLINEAR TWO-POINT BOUNDARY VALUE PROBLEMS
James A. Pennline 1982 24 p refs Presented at the 30th Ann. Meeting of the Soc, for Ind. and Appl. Math., Stanford, Calif., 19-23 Jul. 1982
(NASA-TM-82937; E-1335; NAS 1.15:82937) Avail: NTIS HC AO2/MF AO1 CSCL 12A
Constructive existence and uniqueness results for boundary

Constructive existence and uniqueness results for boundary value problems associated with some simple special cases of the second order equation y'' = f(x,y,y') 0 < or = x < or =1, are sought. The approach considered is to convert the differential equation and boundary conditions to an integral equation via Green's functions, and then to apply fixed point and contraction map principles to a sequence of successive approximations. The approach is tested on several applied problems. Difficulties in trying to prove general theorems are discussed.

M.G.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see 33 Electronics and Electrical Engneering.

ORIGINAL PAGE IS OF POOR QUALITY

N82-16748*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
MODELING AND ANALYSIS OF POWER PROCESSING SYSTEMS (MAPPS). VOLUME 2: APPENDICES Final Technical Report, Oct. 1977 - Aug. 1980
F. C, Lee, S, Radman, R. A. Carter, C, H, Wu, Yuan Yu (TRW Defense and Space Systems Group, Redondo Beach, Calif.), and R, Chang (TRW Defense and Space Systems Group, Redondo Boach, Calif.) Dec. 1980 210 p refs (Contract NAS3-21051)

(NASA-CR-165539; TRW-32660-6001-RU-01) Avail: NTIS HC A10/MF A01 CSCL 09B

The computer programs and derivations generated in support of the modelling and design optimization program are presented. Programs for the buck regulator, boost regulator, and buck-boost regulator are described. The computer program for the design optimization calculations is presented. Constraints for the boost and buck-boost converter were derived. Derivations of state-space equations and transfer functions are presented. Computer lists for the converters are presented, and the input parameters justified.

J.D.H.

N82-17879*# Case Western Reserve Univ., Cleveland, Ohio. INVESTIGATION AND EVALUATION OF A COMPUTER PROGRAM TO MINIMIZE THREE-DIMENSIONAL FLIGHT TIME TRACKS Final Report, 15 Sep. 1980 - 12 Aug. 1981 Frederic I. Parke 12 Aug. 1981 150 p (Grant NAG3-101)

(NASA-CR-168419) Avail: NTIS HC A07/MF A01 CSCL 098

The program for the DC 8-D3 flight planning was slightly modified for the three dimensional flight planning for DC 10 aircrafts. Several test runs of the modified program over the North Atlantic and North America were made for verifying the program. While geopotential height and temperature were used in a previous program as meteorological data, the modified program uses wind direction and speed and temperature received from the National Weather Service. A scanning program was written to collect required weather information from the raw data received in a packed decimal format. Two sets of weather data, the 12-hour forecast and 24-hour forecast based on 0000 GMT, are used for dynamic processes in testruns. In order to save computing time only the weather data of the North Atlantic and North America is previously stored in a PCF file and then scanned one by one.

N82-17880*# Case Western Reserve Univ., Cleveland, Ohio.
Dept. of Computer Engineering and Science.
SHADED COMPUTER GRAPHIC TECHNIQUES FOR
VISUALIZING AND INTERPRETING ANALYTIC FLUID
FLOW MODELS Final Report, Jul. 1975 - Jun. 1981
Frederic I, Parke Jun. 1981 17 p refs
(Grant NsG-3207)
(NASA-CR-168418) Avail: NTIS HC A02/MF A01 CSCL
098

Mathematical models which predict the behavior of fluid flow in different experiments are simulated using digital computers. The simulations predict values of parameters of the fluid flow (pressure, temperature and velocity vector) at many points in the fluid. Visualization of the spatial variation in the value of these parameters is important to comprehend and check the data generated, to identify the regions of interest in the flow, and for effectively communicating information about the flow to others. The state of the art imaging techniques developed in the field of three dimensional shaded computer graphics is applied to visualization of fluid flow. Use of an imaging technique known as 'SCAN' for visualizing fluid flow, is studied and the results are presented.

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-31971*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A GENERALIZED MEMORY TEST ALGORITHM

Edward J. Milner Jul. 1982 11 p refs

(NASA-TM-82874; E-1250; NAS 1.15:82874) HC A02/MF A01 CSCL 09B Avail: NTIS

And the second control of the second control

A general algorithm for testing digital computer memory is presented. The test checks that (1) every bit can be cleared and set in each memory work, and (2) bits are not erroneously cleared and/or set elsewhere in memory at the same time. The algorithm can be applied to any size memory block and any size memory word, It is concise and efficient, requiring the very few cycles through memory. For example, a test of 16-bit-word-size memory requires only 384 cycles through memory. Approximately 15 seconds were required to test a 32K block of such memory, using a microcomputer having a cycle time of 133 nanoseconds.

N62-33020°# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AUTOMATED PROCEDURE FOR DEVELOPING HYBRID COM-PUTER SIMULATIONS OF TURBOFAN ENGINES. PART 1: **GENERAL DESCRIPTION**

John R. Szuch, Susan M. Krosel, and William M. Bruton Aug. 1982 120 p refs

(NASA-TP-1851; E-779; NAS 1.60:1851) Avail: NTIS

HC A06/MF A01 CSCL 09B

A systematic, computer-aided, self-documenting methodology for developing hybrid computer simulations of turbofan engines is presented. The methodology that is pesented makes use of a host program that can run on a large digital computer and a machine-dependent target (hybrid) program. The host program performs all the calculations and data manipulations that are needed to transform user-supplied engine design information to a form suitable for the hybrid computer. The host program also trims the self-contained engine model to match specified designpoint information, Part I contains a general discussion of the methodology, describes a test case, and presents comparisons between hybrid simulation and specified engine performance data. Part II, a companion document, contains documentation, in the form of computer printouts, for the test case.

##2-25810*# Systems Science and Software, San Diego, Calif. ADDITIONAL EXTENSIONS TO THE NASCAP COMPUTER CODE, VOLUME 1 Contractor Report, 9 Sep. 1980 - 22 Dec.

M. J. Mandell, I. Katz, and P. R. Stannard Oct. 1981 246 p. refs Revised

(Contract NAS3-22536)

(NASA-CR-167855; NAS 1.26:167855; SSS-R-82-5249-Rev) Avail: NTIS HC A11/MF A01 CSCL 09B

Extensions and revisions to a computer code that comprehensively analyzes problems of spacecraft charging (NASCAP) are documented. Using a fully three dimensional approach, it can accurately predict spacecraft potentials under a variety of conditions. Among the extensions are a multiple electron/ion gun test tank capability, and the ability to model anisotropic and time dependent space environments, Also documented are a greatly extended MATCHG program and the preliminary version of NASCAP/LEO. The interactive MATCHG code was developed into an extremely powerful tool for the study of material-environment interactions. The NASCAP/LEO, a three dimensional code to study current collection under conditions of high voltages and short Debye lengths, was distributed for preliminary testing.

N82-31968*# SKF Technology Services, King of Prussia, Pa. **Technology Services Div**

HIGH SPEED CYLINDRICAL ROLLER BEARING ANALYSIS. SKF COMPUTER PROGRAM CYBEAN. VOLUME 2: USER'S MANUAL Final Report

G. J. Dyba and R. J. Kleckner Jun. 1981 147 p refs (Contract NAS3-22690)

(NASA-CR-165364; NAS 1.26:165364; SKF-AT81D049-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 09B CYBEAN (CYlindrical Bearing ANalysis) was created to detail

radially loaded, aligned and misaligned cylindrical roller bearing performance under a variety of operating conditions. Emphasis was placed on detailing the effects of high speed, preload and system thermal coupling. Roller tilt, skew, radial, circumferential and axial displacement as well as flange contact were considered. Variable housing and flexible out-of-round outer ring geometries, and both steady state and time transient temperature calculations were enabled. The complete range of elastohydrodynamic contact considerations, employing full and partial film conditions were treated in the computation of raceway and flange contacts. The practical and correct implementation of CYBEAN is discussed. The capability to execute the program at four different levels of complexity was included. In addition, the program was updated to properly direct roller-to-raceway contact load vectors automatically in those cases where roller or ring profiles have small radii of curvature. Input and output architectures containing guidelines for use and two sample executions are detailed. R.J.F.

N82-31969*# SKF Technology Services, King of Prussia, Pa. RESEARCH REPORT: USER'S MANUAL FOR COMPUTER PROGRAM AT814003 SHABERTH. STEADY STATE AND TRANSIENT THERMAL ANALYSIS OF A SHAFT BEARING SYSTEM INCLUDING BALL, CYLINDRICAL AND TAPERED **ROLLER BEARINGS Final Report**

G. B. Hadden, R. J. Kleckner, M. A. Ragen, and L. Sheynin May 1981 254 p refs

(Contract NAS3-22690)

(NASA-CR-165365; NAS 1.26:165365; SKF-AT81DO40) Avail; NTIS HC A12/MF A01 CSCL 09B

The SHABERTH program is capable of simulating the thermomechanical performance of a load support system consisting of a flexible shaft supported by up to five rolling element bearings. Any combination of ball, cylindrical, and tapered roller bearings can be used to support the shaft. The user can select models in calculating lubricant film thickness and traction forces. The formulation of the cage pocket/rolling element interaction model was revised to improve solution numerical convergence characteris-

N62-31970*# SKF Technology Services, King of Prussia, Pa. RESEARCH REPORT: USER'S MANUAL FOR COMPUTER PROGRAM AT81Y005. PLANETSYS, A COMPUTER PROGRAM FOR THE STEADY STATE AND TRANSIENT THERMAL ANALY-SIS OF A PLANETARY POWER TRANSMISSION SYSTEM Final Report

G. B. Hadden, R. J. Kleckner, M. A. Ragen, G. J. Dyba, and L. Sheynin May 1981 142 p refs

(Contract NAS3-22690)

(NASA-CR-165366; NAS 1.26:165366; SKF-AT81DO44) Avail: NTIS HC A07/MF A01 CSCL 09B

The material presented is structured to guide the user in the practical and correct implementation of PLANETSYS which is capable of simulating the thermomechanical performance of a multistage planetary power transmission. In this version of PLANETSYS, the user can select either SKF or NASA models in calculating lubricant film thickness and traction forces.

62 COMPUTER SYSTEMS

Includes computer networks.

N82-22916*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio. ADVANCEMENTS IN REAL-TIME ENGINE SIMULATION

ADVANCEMENTS IN REAL-TIME ENGINE SIMULATION TECHNOLOGY

John R. Szuch 1982 12 p refs To be presented at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982

Sponsored in part by AIAA, SAE and ASME (NASA-TM-82825; E-1177; NAS 1.15:82825) Avail: NTIS HC A02/MF A01 CSCL 21E

The approaches used to develop real-time engine simulations are reviewed. Both digital and hybrid (analog and digital)

are reviewed. Both digital and hybrid (analog and digital) techniques are discussed and specific examples of each are cited. These approaches are assessed from the standpoint of their usefulness for digital engine control development. A number of NASA-sponsored simulation research activities, aimed at exploring real-time simulation techniques, are described. These include the development of a microcomputer-based, parallel processor system of a parallel processor system. for real-time engine simulation.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also 54 Man/System Technology and Life Support.

N82-30992* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AESOP: A COMPUTER-AIDED DESIGN PROGRAM FOR LINEAR MULTIVARIABLE CONTROL SYSTEMS
Bruce Lehtinen and Lucille C. Geyser 1982 7 p ref Presented at the Am. Control Conf., Arlington, Va., 14-16 Jun. 1982 (NA SA-TM-82871; E-1246; NAS 1.15;82871) Avail: NTIS HC AO2/MF AO1 CSCL 093

An interactive computer program (AESOP) which solves quadratic optimal control and is discussed. The program can also be used to perform system analysis calculations such as transient and frequency responses, controllability, observability, etc., in support of the control and filter design computations.

йG

A82-13143 * Model degradation effects on sensor failure detection. G. G. Leininger (Purdue University, West Lafayette, IN). In: Joint Automatic Control Conference, Charlottesville, VA, June 17-19, 1981, Proceedings. Volume 2. (A82-13076 03-63) New York, American Institute of Chemical Engineers, 1981. 8 p. (FP-3A), 11 refs, Grants No. NsG-3171; No. NsG-317; No. NsG-3084.

This paper discusses the effects of imperfect modeling on the detection and isolation of sensor failures. For systems with non-zero set points, deterministic inputs or non-zero noise biases, the model mismatch appears as a bias on the stochastic innovation process. This bias, if left unaccounted for, would be sufficient to declare a false alarm failure in one or more sensors. A practical design procedure based upon the Generalized Likelihood Ratio (GLR) form uses a finite data window sequential t-test to detect and isolate model mismatch effects and soft sensor failures. Application to an eighth order model of the QCSEE turbofan engine is discussed. (Author)

A82-19064 * // A tensor approach to modeling of nonhomogeneous nonlinear systems. S. Yurkovich and M. Sain (Notre Dame, University, Notre Dame, IN). In: Annual Allerton Conference on Communication, Control, and Computing, 18th, Monticello, IL, October 8-10, 1980, Proceedings. (A82-19051 07-63) Urbana, IL, University of Illinois, 1980, p. 604-613. 13 refs. Grant No. NsG-3048.

Model following control methodology plays a key role in numerous application areas. Cases in point include flight control systems and gas turbine engine control systems. Typical uses of such a design strategy involve the determination of nonlinear models which generate requested control and response trajectories for various commands. Linear multivariable techniques provide trim about these motions; and protection logic is added to secure the hardware from excursions beyond the specification range. This paper reports upon experience in developing a general class of such nonlinear models based upon the idea of the algebraic tensor product. (Author)

64 NUMERICAL ANALYSIS

Includes Iteration, difference equations, and numerical approximation.

N82-14849* National Aeronautics and Space Administrations. Lewis Research Center, Cleveland, Ohio.

APPLICATION OF INTEGRATION ALGORITHMS IN A PARALLEL PROCESSING ENVIRONMENT FOR THE SIMULATION OF JET ENGINES
Susan M. Krosei and Edward J. Milner 1982 25 p refs To

be presented at the 15th Ann. Simulation Symp., Tampa, Fla., 17-19 Mar. 1982

(NASA-TM-82746; E-1059) Avail: NTIS HC A02/MF A01

CSCL 12A

The application of Predictor corrector Integration algorithms developed for the digital parallel processing environment are investigated. The algorithms are implemented and evaluated through the use of a software simulator which provides an approximate representation of the parallel processing hardware. Test cases which focus on the use of the algorithms are presented and a specific application using a linear model of a turbofan engine is considered. Results are presented showing the effects of integration step size and the number of processors on simulation accuracy. Real time performance, interprocessor communication, and algorithm startup are also discussed.

N82-22922*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. MULTIPLE-GRID ACCELERATION OF LAX-WENDROFF

ALGORITHMS

Gary M. Johnson Mar. 1982 22 p refs (NASA-TM-82843; E-1213; NAS 1.15:82843) Avail: NTIS

HC A02/MF A01 CSCL 12A

A technique for accelerating the convergence of a one-step Lax-Wendroff method to a steady-state solution is discussed and its applicability extended to the more general class of two-step Lax-Wendroff methods. Several two-step methods which lead to quite efficient multiple grid algorithms are discussed. Computational results are presented using the full two dimensional Euler equations for both subcritical and shocked supercritical flows. Extensions and generalizations are mentioned.

N82-24859* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohlo.

RELAXATION SOLUTION OF THE FULL EULER EQUA-

Gary M. Johnson 1982 9 p refs Presented at the 8th Intern. Conf. on Numerical Methods in Fluid Dyn., Aschen, West Germany, 28 Jun. - 2 Jul. 1982; sponsored by Deutsche Forschungsgemeinschaft, Dornier G.m.b.H., Messerschmitt-Boelkow-Blohm G.m.b.H., ONR and ERO

(NA SA-TM-82889; E-1265; NAS 1.15:82889) Avail: NTIS HC A02/MF A01 CSCL 12A

A numerical procedure for the relaxation solution of the full steady Euler equations is described. By embedding the Euler system in a second order surrogate system, central differencing may be used in subsonic regions while retaining matrix forms well suited to iterative solution procedures and convergence acceleration techniques. Hence, this method allows the development of stable, fully conservative differencing schemes for the solution of quite general inviscid flow problems. Results are presented for both subcritical and shocked supercritical internal tows. Comparisons are made with a standard time dependent solution algorithm.

N82-29075## National Aeronautics and Space Administration.

Lawis Research Center, Cleveland, Ohio.
ACCELERATION OF CONVERGENCE OF VECTOR SE-QUENCES

Avram Sidi (Technion-Israel Inst. of Technology, Haifa), William F. Ford, and David A. Smith (Duke Univ.) 1982 10 p refs Presented at the 30th Anniv. Meeting of the Soc. for Ind. and Appl. Math., Stanford, Calif. 19-23 Jul. 1982 (NASA-TM-82931, E-1324; NAS 1.15:82931) Avail: NTIS HC A02/MF A01 CSCL 12A

A general approach to the construction of accelerated

convergence methods for vector sequences is proposed. A simplified version of minimal polynomial extrapolation is emphasized. The convergence of this method is analyzed and it is shown that it is especially suitable for accelerating the convergence of vector sequences that are obtained when one solves linear systems of equations iteratively.

A82-31438 * Numerical comparisons of nonlinear convergence accelerators, D. A. Smith (Duke University, Durham, NC) and W. F. Ford (NASA, Lewis Research Center, Computer Services Div., Cleveland, OH), Mathematics of Computation, vol. 38, Apr. 1982, p. 481-499, 23 refs. Grant No. NsG-3160.

As part of a continuing program of numerical tests of convergence accelerators, the Iterated Altken's Delta-squared method, Wynn's epsilon algorithm, Brezinski's theta algorithm, and Levin's u transform are compared on a broad range of test problems: linearly convergence alternating, monotone, and irregular-sign series, logarithmically convergent scries, power method and Bernoulli method sequences, alternating and monotone asymptotic series, and tome perturbation series arising in applications, in each category either the apsilon algorithm or the u transform gives the best results of the four methods tested. In some cases differences among methods are slight, and in others they are quite striking.

67 THEORETICAL MATHEMATICS

includes topology and number theory.

A82-33605 * Diffraction by a finite strip. M. H. Williams (Purdue University, West Lafayette, IN). Quarterly Journal of Mechanics and Applied Mathematics, vol. 35, Feb. 1982, p. 103-124. 7 refs. Grant No. NsG-3292.

A new approach is prosented to diffraction problems involving plane strip barriers or slit apertures. These are problems that display the effects of multiple interacting edges. The approach taken here provides exact, compact solutions. The theory is introduced through a series of examples that are, in fact, the 'standard' problems of the subject, diffraction of a plane oblique wave by a slit, for example. In each case, the solutions are found to depend explicitly on a single 'special' function and its Fourier transform, These fundamental functions are described, with the emphasis placed on practical computational methods. The described, with the emphasis placed on practical computational methods. The example problems are all couched in the language of acoustics.

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see 45 Environment Pollution.

N82-12890* National Aeronautics and Space Admir stration Lewis Research Center, Cleveland, Ohio.

NUMERICAL TECHNIQUES IN LINEAR DUCT ACOUSTICS, 1980-81 UPDATE

Kenneth J. Baumeister 1981 51 p. refs. Presented at the 102 Winter Ann. Meeting, Washington, D.C., 15-20 Nov. 1981; sponsored by ASME

(NASA-TM-82730. E-1034) Avail: NTIS HC A04/MF A01

CSCL 20A

A review is presented covering finite element and finite difference analysis of small amplitude (linear) sound propagation in straight and variable area ducts. This review stresses the new work performed during the 1980-1981 time frame, although a brief discussion of earlier work is also included. Emphasis is placed on the latest state of the art in numerical techniques.

Author

N82-12891* | National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.
VERIFICATION OF AN ACOUSTIC TRANSMISSION

MATRIX ANALYSIS GF SOUND PROPAGATION IN A VARIABLE AREA DUCT WITHOUT FLOW

J. H. Miles 1981 15 p refs Presented at the 102 Meeting of the Acoustical Soc. of Am., Miami Beach, Fla., 1-4 Dec. 1981

(NASA-TM-82741; E-1053) Avail: NTIS HC A02/MF A01 CSCL 20A

A predicted standing wave pressure and phase angle profile for a hard wall rectangular duct with a region of convergingdiverging area variation is compared to published experimental measurements in a study of sound propagation without flow. The factor of 1/2 area variation used is sufficient magnitude to produce large reflections. The prediction is based on a transmission matrix approach developed for the analysis of sound propagation in a variable step duct with and without flow. The agreement between the measured and predicted results is shown to be excellent Author

N82-14881* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

MODE PROPAGATION IN NONUNIFORM CIRCULAR DUCTS WITH POTENTIAL FLOW

Y. C. Cho and K. U. Ingard (MIT) 1982 15 p refs Presented at the 20th Aerospace Sci. Conf., Orlando, Fla., 11-14 Jan.

(NASA-TM-82776; E-1086, AIAA-Paper-82-0122) Avail: NTIS HC A02/MF A01 CSCL 20A

A previously reported closed form solution is expanded to determine effects of isentropic mean flow on mode propagation in a slowly converging-diverging duct, a circular cosh duct. On the assumption of uniform steady fluid density, the mean flow increases the power transmission coefficient. The increase is directly related to the increase of the cutoff ratio at the duct throat. With the negligible transverse gradients of the steady fluid variables, the conversion from one mode to another is negligible, and the power transmission coefficient remains unchanged with the mean flow direction reversed. With a proper choice of frequency parameter, many different modes can be made subject to a single value of the power transmission loss. A systematic method to include the effects of the gradients of the steady fluid variables is also described.

N82-15847*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPLICATION OF STEADY STATE FINITE ELEMENT AND TRANSIENT FINITE DIFFERENCE THEORY TO SOUND PROPAGATION IN A VARIABLE AREA DUCT: A COMPAR-ISON WITH EXPERIMENT

Kenneth J. Baumeister, W. Eversman (Missouri Univ., Rolla), R. J. Actley (Missouri, Univ., Rolla), and J. W. White (Tennessee Univ., Knoxville) 1981 14 p refs Presented at the 7th Aeroacoustics Conf., Palo Alto, Calif., 5-7 Oct. 1981; sponsored (NASA-TM-82678; E-960) Avail. NTIS HC A02/MF A01 CSCL 20A

Sound propagation without flow in a restangular duct with a converging-diverging area variation was studied experimentally and theoretically. The area variation was of sufficient magnitude to produce large reflections and induce modal scattering. The rms (root-mean-squared) pressure and phase angle on both the flat and curved surface were measured and tabulated. The steady state finite element theory and the transient finite difference theory are in good agreement with the data. It is concluded that numerical finite difference and finite element theories appear ideally suited for handling duct propagation problems which encounter large area variations.

N82-16808* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

NOISE OF THE SR-3 PROPELLER MODEL AT 2 DEG AND 4 DEG ANGLE OF ATTACK

James H. Dittmar and Robert J. Jeracki Dec 1981 30 p. (NASA-TM-82738; E-1051) Avail: NTIS HC A03/MF A01

CSCL 20A

The noise effect of operating supersonic tip speed propellers at angle of attack with respect to the incoming flow was determined. Increases in the maximum blade passage noise were observed for the propeller operating at angle of attack. The noise increase was not symmetrical with one wall of the wind tunnel having significantly more noise increase than the other wall. This was apparently the result of the rotational direction of the propeller. The lack of symmetry of the noise at angle of attack to the use of oppositely rotating propellers on opposite sides of an airplane fuselage as a way of minimizing the noise due to operation at angle of attack.

N82-16809*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A SHOCK WAVE APPROACH TO THE NOISE OF SUPER-SONIC PROPELLERS

James H. Dittmar and Edward J. Rice Dec. 1981 19 p refs (NASA-TM-82752; E-1068) Avail: NTIS HC A02/MF A01 CSCL 20A

To model propeller noise expected for a turboprop aircraft, the pressure ratio across the shock at the propeller tip was calculated and compared with noise data from three propellers. At helical tip Mach numbers over 1.0, using only the tip shock wave, the model gave a fairly good prediction of the noise for a bladed propeller and for a propeller swept for aerodynamic purposes. However for another propeller, which was highly swept and designed to have noise cancellations from the inboard propeller sections, the shock strength from the tip over predicted the noise. In general the good agreement indicates that shock theory is a viable method for predicting the noise from these supersonic propellers but that the shock strengths from all of the blade sections need to be properly included. M.G.

N82-19944* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF FACILITY VARIATION ON THE ACOUSTIC CHARACTERISTICS OF THREE SINGLE STREAM NOZ-**ZLES**

Orlando A. Gutierrez 1980 38 p refs Presented at the 100th Meeting of the Acoust Soc of Am., Los Angeles, 17-21 Nov. 1980

(NASA-TM-81635; E-646) Avail: NTIS HC A03/MF A01 CSCL

The characteristics of the jet noise produced by three single stream nozzles were investigated statistically at the NASA-Lewis Research Center outdoor jet acoustic facility. The nozzles consisted of a 7.6 cm diameter convergent conical, a 10.2 cm diameter convergent conical and an 8-lobe daisy nozzle with 7.6 cm equivalent diameter flow area. The same nozzles were tested previously at cold flow conditions in other facilities such as the Royal Aircraft Establishment (RAE) 7.3 m acoustic wind tunnel. The acoustic experiments at NASA covered pressure ratios from 1.4 to 2.5 at total temperatures of 811 K and ambient. The data obtained with four different microphone arrays are compared. The results are also compared with data taken at the RAE facility and with a NASA prediction procedure

N82-21036*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FORWARD ACOUSTIC PERFORMANCE OF A MODEL TURBOFAN DESIGNED FOR A HIGH SPECIFIC FLOW (QF-14)

James G. Lucas, Richard P. Woodward, and Charles J. Michels

Mar. 1982 20 p refs (NASA-TP-1968; E-777; NAS 1.60:1968) Avail: NTIS HC A02/MF A01 CSCL 20A

Forward noise and overall aerodynamic performance are presented for a high-tip-speed fan having an exceptionally high average axial Mach number at the rotor inlet. This high Mach number is intended to attenuate forward noise at both the design-speed takeoff point, and at the unconventional lowpressure-ratio, design-speed approach point. As speed was increased near design, all forward noise components were reduced, and rear noise in the discharge duct was increased, indicating that the high Mach number flow at the rotor face is attenuating forward noise at takeoff. The fan at takeoff is some 5.5 to 11 dB quieter than several reference fans. Data at the point closest to approach indicated tentatively that the design-speed

approach mode was 3 dB quieter than the conventional mode.

N82-21998*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

A PRELIMINARY COMPARISON BETWEEN THE SR-3 PROPELLER NOISE IN FLIGHT AND IN A WIND TUNNEL James H. Dittmar and Paul L. Lasagna 1982 14 p Presented at the 103rd Meeting of the Acoust. Soc. of Am., Chicago, 27-30 Apr. 1982

(NASA-TM-82805; E-1144; NAS 1.15:82805) Avail: NTIS

HC A02/MF A01 CSCL 20A

The noise generated by supersonic-tip-speed propellers is addressed. Models of such propellers were tested for acoustics in the Lewis 8-by-6-foot wind tunnel. One of these propeller models, SR-3, was tested in flight on the Jetstar airplane and noise data were obtained. Preliminary comparisons of the maximum blade passing tone variation with helical tip Mach number taken in flight with those taken in the tunnel showed good agreement when corrected to the same test conditions. This indicated that the wind tunnel is a viable location for measuring the noise of these propeller models. Comparisons of the directivities at 0.6 and 0.7 axial Mach number showed reasonable agreement. At 0,75 and 0.8 axial Mach number the tunnel directivity data fell off more towards the front than did the airplane data. A possible explanation for this is boundary layer refraction which could be different in the wind tunnel from that in flight. This may imply that some corrections should be applied to both the airplane and wind tunnel data at the forward angles. At and aft of the peak noise angle the boundary layer refraction does not appear to be significant and no correction appears necessary.

N82-22951*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRESSURE TRANSFER FUNCTION OF A JT15D NOZZLE DUE TO ACOUSTIC AND CONVECTED ENTROPY FLUC-**TUATIONS**

J. H. Miles 1982 39 p refs Presented at the 103rd Meeting of the Acoust, Soc. of Am., Chicago, 26-30 Apr. 1982 (NASA-TM-82842; E-1212; NAS 1.15:82842) Avail: NTIS HC A03/MF A01 CSCL 20A

An acoustic transmission matrix analysis of sound propagation in a variable area duct with and without flow is extended to include convected entropy fluctuations. The boundary conditions used in the analysis are a transfer function relating entropy and pressure at the nozzle inlet and the nozzle exit impedance. The nozzle pressure transfer function calculated is compared with JT15D turbofan engine nozzle data. The one dimensional theory for sound propagation in a variable area nozzle with flow but without convected entropy is good at the low engine speeds where the nozzle exit Mach number is low (M=0.2) and the duct exit impedance model is good. The effect of convected entropy appears to be so negligible that it is obscured by the inaccuracy of the nozzle exit impedance model, the lack of information on the magnitude of the convected entropy and its phase relationship with the pressure, and the scatter in the data. An improved duct exit impedance model is required at the higher engine speeds where the nozzle exit Mach number is high (M=0.56) and at low frequencies (below 120 Hz). B.W.

N82-24942*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AEROACOUSTIC PERFORMANCE OF AN EXTERNALLY BLOWN FLAP CONFIGURATION WITH SEVERAL FLAP NOISE SUPPRESSION DEVICES

Daniel J. McKinzie, Jr. May 1982 30 p refs (NASA-TP-1995; E-573; NAS 1.60:1995) HC A03/MF A01 CSCL 20A

Avail: NTIS

Small scale model acoustic experiments were conducted to measure the noise produced in the flyover and sideline planes by an engine under the wing externally blown flap configuration in its approach attitude. Broadband low frequency noise reductions as large as 9 dB were produced by reducing the separation distance between the nozzle exhaust plane and the flaps. Experiments were also conducted to determine the noise suppression effectiveness in comparison with a reference configuration of three passive types of devices that were located on the jet impingement surfaces of the reference configuration. These devices produced noise reductions that varied up to 10 dB at reduced separation distances. In addition, a qualitative estimate of the noise suppression characteristics of the separate devices was made. Finally static aerodynamic performance data were obtained to evaluate the penalties incurred by these suppression devices. The test results suggest that further parametric studies are required in order to understand more fully the noise mechanisms that are affected by the suppression devices used.

N82-31068*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FINITE ELEMENT-INTEGRAL SIMULATION OF STATIC AND FLIGHT FAN NOISE RADIATION FROM THE JT15D TURBOFAN ENGINE

Kenneth J. Baumeister and Scott J. Horowitz (Lockheed-Georgia, Marietta) 1982 16 p refs Presented at the Winter Ann. Meeting of the Am. Soc. of Mech. Engr., Phoenix, Ariz., 14-19 Nov. 1982

(NASA-TM-82936; E-1332; NAS 1.15:82936) Avail: NTIS HC A02/MF A01 CSCL 20A

An iterative finite element integral technique is used to predict the sound field radiated from the JT15D turbofan inlet. The sound field is divided into two regions: the sound field within and near the inlet which is computed using the finite element method and the racistion field beyond the inlet which is calculated using an integral solution technique. The velocity potential formulation of the acoustic wave equation was employed in the program. For some single mode JT15D data, the theory and experiment are in good agreement for the far field radiation

pattern as well as suppressor attenuation. Also, the computer program is used to simulate flight effects that cannot be performed on a ground static test stand.

N82-32082*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ROUGH ANALYSIS OF INSTALLATION EFFECTS ON TUR-**BOPROP NOISE**

Paul A. Durbin and John F. Groeneweg 1982 17 p refs Proposed for Presentation at the Acoust. Soc. of Am., Orlando, Fla., 8-12 Nov. 1982

(NASA-TM-62924; E-1316; NAS 1.15:82924) Avail: NTIS HC A02/MF A01 CSCL 20A

A rough analysis of noise from a propeller operated at angle of attack, and in the nonuniform flow due to a line vortex approximating a wing flow field suggests installation can significantly affect turboprop noise levels. On one side of the propeller, where the blades approach the horizontal plane from above, decreases of noise occur; while on the other side noise increases. The noise reduction is due to negative interference of steady and unsteady sources. An angle of attack, or distance between propeller and vortex, exists for which noise is a minimum.

Propeller tip vortex - A possible contributor to aircraft cabin noise, B. A. Miller, J. H. Dittmar, and R. J. Jeracki (NASA, Lewis Research Center, Cleveland, OH). Journal of Aircraft, vol. 19, Jan. 1982, p. 84-86, 8 refs.

Wind tunnel model tests support the hypothesis that a propeller tip vortex may subject a downstream wing surface to greater

excitation than would be experienced by the aircraft fuselage side wall exposed to propeller-generated noise, ultimately transmitting this structural response to incident dynamic pressure to the cabin interior. Even if structure-borne excitations are less efficient than airborne excitations in the creation of cabin noise, the higher level of the former could still govern cabin noise levels.

N82-16810*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.

PREDICTION OF SOUND RADIATION FROM DIFFERENT PRACTICAL JET ENGINE INLETS Semiannual Status Report, 1 Jun. 1981 - 1 Dec. 1981

Ben T, Zinn and William L. Meyer 1982 127 p refs (Grant NAG3-67)

(NASA-CR-165120) Avail: NTIS HC A07/MF A01 CSCL 20A

The computer codes necessary for this study were developed and checked against exect solutions generated by the point source method using the NASA Lewis QCSEE inlet geometry. These computer codes were used to predict the acoustic properties of the following five inlet configurations: the NASA Langley Bellmouth, the NASA Lewis JT15D-1 Ground Test Nacelle, and three finite hyperbolic inlets of 50, 70 and 90 degrees. Thirty-five computer runs were done for the NASA Langley Bellmouth. For each of these computer runs, the reflection coefficient at the duct exit plane was calculated as was the far field radiation pattern. These results are presented in both graphical and tabular form with many of the results cross plotted so that trends in the results verses cut-off ratio (wave number) and tangential mode number may be easily identified.

N82-18994*# California Univ., Los Angeles. School of Engineering and Applied Science.

THE VELOCITY FIELD NEAR THE ORIFICE OF A HELM-HOLTZ RESONATOR IN GRAZING FLOW

Andrew F. Charwat and Bruce E. Walker Mar. 1981 53 p refs

(Grant IssC 3236)

(NASA-CR-\68548; UCLA-E HC A04/MF A01 CSCL 20A Avail: NTIS UCLA-ENG-81-101)

Measurement of the time-dependent velocities induced inside and outside the opening of acoustically excited, two-dimensional Helmholtz resonator imbedded in a grazing flow are presented. The remarkably clear structure of the perturbation field which evokes a pulsating source and a coherently pulsating vortex-image pair is described. The simple phenomenological 'lid-model' which correlates the variation in the components of the acoustic impedance with the velocity of the grazing flow is discussed and extended. Author

N82-21031*# Avco Lycoming Div., Stratford, Conn.

YF 102 IN-DUCT COMBUSTOR NOISE MEASUREMENTS WITH A TURBINE NOZZLE, VOLUME 1 Final Report, Sep. 1979 - Mar. 1981

Craig A. Wilson and James M. OConnell Sep. 1981 63 p

ntract NAS3-21974)

.,ASA-CR-165562-Vol-1; NAS 1.26:165562-Vol-1;

LYC-81-32-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 20A The internal noise generated by an Avco Lycoming YF-102 engine combustor installed in a test rig was recorded. Two configurations were tested one with and one without the first stage turbine nozzle installed. Acoustic probes and accessories were used. Internal dynamic pressure level measurements were made at ten locations within the combustor. The combustor rig, the test procedures, and data acquisition and reduction systems are described. Tables and plots of narrow band and one third octave band pressure level spectra are included. S.L.

N82-21032*# Avco Lycoming Div., Stratford, Conn. YF 102 IN-DUCT COMBUSTOR NOISE MEASUREMENTS WITH A TURBINE NOZZLE, VOLUME 2 Final Report Craig A. Wilson and James M. OConnell Sep. 1981 232 p refs (Contract NAS3-21974)

(NASA-CR-165562-Vol-2; NAS 1.26:165562-Vol-2;

LYC-81-32-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 20A The internal noise generated by an Avco Lycoming YF-102 engine combustor installed in a test rig was recorded. The one third octave band pressure level spectra is presented.

N82-27090*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering ACQUISTIC PROPERTIES OF TURBOFAN INLETS Final Technical Report, 1 Sep. 1974 - 31 Oct. 1981 Ben T. Zinn, Robert K. Sigman, and Scott J. Horowitz 31 Oct. 1981 6 p refs

(Grant NsG-3036)

(NASA-CR-169016; NAS 1.26:169016) HC A02/MF A01 CSCL 20A Avail. NTIS

The acoustic field within a duct containing a nonuniform steady flow was predicted. This analysis used the finite element method to calculate the velocity potential within the duct. S.L.

Analytical and experimental investigation of the propagation and attenuation of sound in extended reaction lined ducts. A. S. Hersh (Hersh Acoustical Engineering, Chatsworth, CA), S. B. Dong (California, University, Los Angeles, CA), and B. Walker. American Institute of Aeronautics and Astronautics, Aeroacoustics Conference, 7th, Palo Alto, CA, Oct. 5-7, 1981, Paper 81-2014. 31 p. 10 refs, Contract No. NAS3-21975,

Results are presented of an analytical and experimental study of the attenuation and propagation of harmonically excited sound waves in an extended reaction lined cylindrical duct. The duct geometry considered consisted of an annular outer region of bulk material surrounding an inner cylinder of air. The coupled wave equations governing the motion of the sound in both the inner and annular regions were solved numerically. The numerically predicted attenuation and propagation constants were in excellent agreement with measured values using Kevlar as the liner material for plane-wave mode (0,0) excitation over the frequency from 100 to 7,000 Hz. Although the numerical model was verified using Kevlar, it can be used with any fibrous constructed bulk liner. The results of this study demonstrate that a good start has been made on the numerical modelling of the acoustic performance of extended reaction liners. (Author)

A82-10460 * # Sound generated in a cascade by threedimensional disturbances convected in a subsonic flow. H. Atassi and G. Hamad (Notre Dame, University, Notre Dame, IN). American Institute of Aeronautics and Astronautics, Aeroacoustics Conference, 7th, Palo Alto, CA, Oct. 5-7, 1981, Paper 81-2046. 14 p. 20 refs. Grant No. NsG-3195.

Discrete tone sound generation in a subsonic fan subject to three-dimensional disturbances is investigated. The analytical model used treats the fan rotor and stator as linear cascades of thin airfoils in a rectangular duct subject to a three-dimensional gust for which a complete aerodynamic theory already exists. The sound pressure can then be cast as the sum of a finite number of discrete sound waves (modes) the magnitude of which depends on an unknown function satisfying a singular integral equation. Similarity rules are derived to reduce the problem to that of a two-dimensional gust. Threedimensional effects on the cut-off condition, the sound pressure, and the acoustic power are first investigated for each mode. The theory is then applied to noise generated by typical rotor-wake-defect and rotor-tip-vortex disturbances interacting with a stator. (Author)

AR2-14044 # # Methods for the calculation of axial wave numbers in lined ducts with mean flow. W. Eversman (Missouri-Rolla, University, Rolla, MO). Acoustical Society of America, Meeting, 101st, Ottawa, Canada, May 18-22, 1981, Paper. 45 p. 50 refs. Grant No. NsG-3231.

A survey is made of the methods available for the calculation of axial wave numbers in lined ducts. Rectangular and circular ducts with both uniform and non-uniform flow are considered as are ducts with peripherally varying liners. A historical perspective is provided by a discussion of the classical methods for computing attenuation when no mean flow is present. When flow is present these techniques

bccome either impractical or impossible. A number of direct eigenvalue determination schemes which have been used when flow is present are discussed. Methods described are extensions of the classical no-flow technique, perturbation methods based on the no-flow technique, direct integration methods for solution of the eigenvalue equation, an integration-iteration method based on the governing differential equation for acoustic transmission, Galerkin methods, finite difference methods, and finite element methods.

(Author)

A82-17663 * # Acoustic transmission in lined flow ducts - A finite element eigenvalue problem. R. J. Astley (Canterbury, University, Christchurch, New Zealand) and W. Eversman (Missouri-Rolla, University, Rolla, MO). In: International Conference on Finite Elements in Flow Problems, 3rd, Banff, Alberta, Canada, June 10-13, 1980, Proceedings. Volume 2. (A82-17651 06-34) Calgary, Alberta, Canada, University of Calgary, 1981, p. 123-132. 6 refs. Research supported by the Boeing Wichita Co.; Grant No. NsG-3231.

The problem of acoustical transmission in lined ducts with subsonic mean flow is of considerable practical interest in the context of fan noise attenuation in the ducted inlet regions of turbofan aircraft engines. If nonaxisymmetric liners are present, a loss of axial symmetry results, and the study of acoustic transmission involves the solution of a full two-dimensional eigenvalue problem. The reported investigation is concerned with such an eigenvalue problem. The employed method of solution is effectively a two-dimensional analog of an approach considered by Astley and Eversman (1979). The approach makes use of a Galerkin Finite Element Method whereby the weighting and basis functions are generated automatically by the discretization.

A82-36195 * Conversion of acoustic energy by lossless liners. W. Möhring (Max-Planck-Institut für Strömungsforschung, Göttingen, West Germany) and W. Eversman (Missouri-Rolla, University, Rolla, MO). Journal of Sound and Vibration, vol. 82, June 8, 1982, p. 371-381. 16 refs. Grant No. NsG-3231.

The Blokhintzev acoustic energy equation is applied to a two-dimensional duct containing a uniform flow with a finite length lining. It is shown that the difference of the incident and outgoing acoustic energy differs in general from the energy dissipated in the liner, the difference being related to the displacements at the liner's edges. It is shown that in the case of a locally reacting lossless liner for frequencies below the first cut-off frequency and for low Mach number acoustic energy is generated if the flow and the incident sound wave are in the same direction and is absorbed if these two directions are opposite unless special edge conditions are met. Furthermore it is shown under the same conditions that the ratio of the reflection coefficient at finite flow velocity to the reflection coefficient at vanishing velocity is to first order in Mach number independent of the liner characteristics. A numerical calculation confirms these predictions at least for mass-like linear admittance.

A82-45165 The acoustical structure of highly porous open-cell foams. R. F. Lambert (Minnesota, University, Minneapolis, MN). Acoustical Society of America, Journal, vol. 72, Sept. 1982, p. 879-887, 12 refs. NSF Grant No. MEA-80-11362; Grant No. NAG3-161.

This work concerns both the theoretical prediction and measurement of structural parameters in open-cell highly porous polyurethane foams. Of particular interest are the dynamic flow resistance, thermal time constant, and mass structure factor and their dependence on frequency and geometry of the cellular structure. The predictions of cell size parameters, static flow resistance, and heat transfer as accounted for by a Nusselt number are compared with measurement. Since the static flow resistance and inverse thermal time constant are interrelated via the 'mean' pore size parameter of Biot, only two independent measurements such as volume porosity and mean filament diameter are required to make the predictions for a given fluid condition. The agreements between this theory and nonacoustical experiments are excellent. (Author)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

ORIGINAL PAGE IS OF POOR QUALITY

NB2-21033*# Avco Lycoming Div., Stratford, Conn.
YF 102 IN-DUCT COMBUSTOR NOISE MEASUREMENTS
WITH A TURBINE NOZZLE, VOLUME 3
Final Report
Craig A, Wilson and James M. OConnell
Sep. 1981 244 p
refs
(Contract NAS3-21974)
(NASA-CR-165562-Vol-3; NAS 1.26:165562-Vol-3;
LYC-81-32-Vol-3) Avail: NTIS HC A11/MF A01 CSCL 20A
The internal noise generated by an Avco Lycoming YF-102
engine combustor installed in a test rig was recorded. The narrow
band pressure level spectra is presented.
S.L.

74 OPTICS

Includes light phenomena.

ORIGINAL PAGE IS OF POOR QUALITY

ROLE OF CPTICAL COMPUTERS IN AERONAUTICAL CONTROL APPLICATIONS
Robert J. Baumbick In NASA. Langley Research Center Opt. Inform. Process. for Aerospace Appl. Dec. 1981 p 33-43 (For primary document see N82-15894 08-74)
Avail: NTIS HC A15/MF A01 CSCL 30F
The role that optical computers play in aircraft control is determined. The optical computer has the potential high speed canability required agracially for matrix/matrix operations. The

The role that optical computers play in aircraft control is determined. The optical computer has the potential high speed capability required, especially for matrix/matrix operations. The optical computer also has the potential for handling nonlinear simulations in real time. They are also more compatible with fiber optic signal transmission. Optics also pelmit the use of peesive sensors to measure process variables. No illectrical energy need by supplied to the sensor. Complex interfacing between optical sensors and the optical computer is avoided if the optical computer.

S.L.

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

N82-12943*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

END REGION AND CURRENT CONSOLIDATION EFFECTS UPON THE PERFORMANCE OF AN MHD CHANNEL FOR THE ETF CONCEPTUAL DESIGN

S. Y. Wang and J. Marlin Smith [1981] 9 p refs To be presented at the 20th Aerospace Sci. Conf., Orlando, Fla., 11-14 Jan, 1982; apponsored by AIAA (Contract DE-AI01-7) ET-10769)

(NASA-TM-82744; DCE/NASA/10769-22; E-1057) Avail: NTIS HC A02/MF A01 CSCL 201 The effects of MHD channel end regions on the overall

power generation were considered. The peak plant thermodynamic efficiency was found to be slightly lower than for the active region (41%). The channel operating point for the peak efficiency was shifted to the supersonic mode (Mach No., M sub c approx. 1.1) rether than the previous subsonic operation (M sub c approx. 0.9). The sensitivity of the channel performance to the B-field, diffuser recovery coefficient, channel load parameter, Mach number, and combustor pressure is also discussed. In addition, methods for operating the channel in a constant-current mode are investigated. This mode is highly desirable from the standpoint of simplifying the current and voltage consolidation for the inverter system. This simplification could result in significant savings in the cost of the equipment. The initial results indicate that this simplification is possible, even under a strict Hall field constraint, with resonable plant thermodynamic efficiency (40,5%).

N82-13908*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF VACUUM EXHAUST PRESSURE ON THE

PERFORMANCE OF MHD DUCTS AT HIGH D-FIELD

J. Marlin Smith, J. L. Morgan, and Shih-Ying Wang 1982

13 p refs Presented at the 20th Aerospace Sci, Meeting, Orlando, Fla., 11-14 Jan. 1982; sponsored by AIAA

(Contract DE-AIO1-77ET-10769)

(NASA-TM-82750; DOE/NASA/10769-23; F-1066) Avail:

NTIS HC A02/MF A01 CSCL 201

The effect of area ratio variation on the performance of a supersonic Hall MHD duct is investigated. Results indicate that for a given combustion pressure there exists an area ratio below which the power generating region of the duct is shock free and the power output increases linearly with the square of the magnetic field. For area ratios greater than this, a shock forms in the power generating region which moves upstream with increasing magnetic field strength resulting in a less rapid raise in-the power output. The shock can be moved downstream by either increasing the combustion pressure of decreasing the exhaust pressure. The influence of these effects upon duct performance is presented.

N82-25961*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

RESULTS AND COMPARISON OF HALL AND DW DUCT **EXPERIMENTS**

J, Marlin Smith and J. L. Morgan 1982 10 p refs Proposed for presentation at the 20th Symp. on Eng. Aspects of Magnetohydrodyn., Los Angeles, 14-16 Jun. 1982 (Contract DE-AI01-77ET-10769)

(NASA-TM-82864; DOE/NASA/10769-25; E1233; NAS

1.15:82864) Avail: NTIS HC A02/MF A01 CSCL 201 Experimental data from recent tests of a 45 deg diagonal wall duct are presented and compared with the results of a similar Hall duct. It is shown that while the peak power density of the two devices is approximately equal that the diagonal wall duct produces greater total power output due to its ability to better utilize the available magnetic field. Author

> ORIGINAL PAGE IS OF POOR QUALITY

A82-17889 * # End region and current consolidation effects upon the performance of an MHD channel for the ETF conceptual design. S. Y. Wang and J. M. Smith (NASA, Lewis Research Center, Cleveland, OH), American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0325, 5 p. 6 refs.

It is noted that operating conditions which yielded a peak thermodynamic efficiency (41%) for an EFT'-size MHD/steam power plant were previously (Wang et al., 1981; Stalger, 1981) identified by considering only the active region (the primary portion for power production) of an MHD channel. These previous efforts are extended here to include an investigation of the effects of the channel end regions on overall power generation. Considering these effects, the peak plant thermodynamic efficiency is found to be slightly lowered (40.7%); the channel operating point for peak efficiency is shifted to the supersonic mode (Mach number of approximately 1.1) rather than the previous subsonic operation (Mach number of approximately 0.9). Also discussed is the sensitivity of the channel performance to the B-field, diffuser recovery coefficient, channel load parameter, Mach number, and combustor pressure,

A82-17941 * # Impact of uniform electrode current distribution on ETF. D. J. Bents (NASA, Lewis Research Center, Cleveland, OH). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0423. 8 p. 5 refs.

A basic reason for the complexity and sheer volume of electrode consolidation hardware in the MHD ETF Powertrain system is the channel electrode current distribution, which is non-uniform. If the channel design is altered to provide uniform electrode current distribution, the amount of hardware required decreases considerably, but at the possible expense of degraded channel performance. This paper explains the design impacts on the ETF electrode consolidation network associated with uniform channel electrode current distribution, and presents the alternate consolidation designs which occur. They are compared to the baseline (non-uniform current) design with respect to performance, and hardware requirements. A rational basis is presented for comparing the requirements for the different designs and the savings that result from uniform current distribution. Performance and cost impacts upon the combined cycle plant are discussed. (Author)

A82-20292 * # Effect of vacuum exhaust pressure on the performance of MHD ducts at high B-field. J. M. Smith, J. L. Morgan, and S.-Y. Wang (NASA, Lewis Research Center, Cleveland, OH). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper

The effect of area ratio variation on the performance of a supersonic Hall MHD duct showed that for a given combustion pressure there exists an area ratio below which the power generating region of the duct is shock free and the power output increases linearly with the square of the magnetic field. For area ratios greater than this, a shock forms in the power generating region which moves upstream with increasing magnetic field strength resulting in a less rapid raise in the power output. The shock can be moved downstream by either increasing the combustion pressure or decreasing the exhaust pressure. The influence of these effects upon duct performance is presented in this paper. (Author)

N82-10880*# Colorado State Univ., Fort Collins.

EXPERIMENTAL SIMULATION OF BIASED SOLAR ARRAYS WITH THE SPACE PLASMA Annual Report

Harold R. Kaufman and Raymond S. Robinson 71 p refs (Grant NsG-3196)

(NASA-CR-165485) Avail; NTIS HC A04/MF A01 CSCL

The phenomenon of unexpectedly large leakage currents collected by small exposed areas of high voltage solar arrays operating in a plasma environment was investigated. Polyimide (Kapton) was the insulating material used in all tests, Both positive bias (electron collection) and negative bias (ion collection) tests

NTIS

were performed. A mode change in the electron collection mechanism was associated with a glow discharge process and was found to be related to the neutral background density. Results indicate that the glow discharge collection mode does not occur in a space environment where the background density is considerably lower than that of the vacuum facility used. B.W.

N82-24078*# Wichita State Univ., Kans. Dept. of Mechanical Engineering.

NUMERICAL MODELING OF THREE-DIMENSIONAL CONFINED FLOWS Final Report

Mahesh S. Greywall Aug. 1981 76 p refs (Grant NsG-3186; Contract DE-AI01-77ET-10769) (NASA-CR-165583; NAS 1.26:166583) Avail;

HC A05/MF A01 CSCL 201

A three dimensional confined flow model is presented. The flow field is computed by calculating velocity and enthalpy along a set of streamlines. The finite difference equations are obtained by applying conservation principles to streamtubes constructed around the chosen streamlines. With appropriate substitutions for the body force terms, the approach computes three dimensional magnetohydrodynamic channel flows. A listing of a computer code, based on this approach is presented in FORTRAN IV language. The code computes three dimensional compressible viscous flow through a rectangular duct, with the duct cross section specified along the axis.

S.L.

A82-11117 * Turbulence in argon shock waves. J. A. Johnson, III, J. P. Santiago, and L. I (Rutgers University, New Brunswick, NJ), *Physics Letters*, vol. 83A, June 29, 1981, p. 443-445, 12 refs, Grant No. NsG-3280.

Irregular density fluctuations with turbulent-like behaviors are found in ionizing shock fronts produced by an arc-driven shock tube, Electric probes are used as the primary diagnostic. Spectral analyses show statistical patterns which seem frozen-in and characterizable by a dominant mode and its harmonics. (Author)

A82-17585 * Stoichiometry-controlled compensation in liquid encapsulated Czochralski GaAs. D. E. Holmes, R. T. Chen, K. R. Elliott, and C. G. Kirkpatrick (Rockwell International Microelectronics Research and Development Center, Thousand Oaks, CA). Applied Physics Letters, vol. 40, Jan. 1, 1982, p. 46-48. 15 refs. Contract No. NAS3-22224.

It is shown that the electrical compensation of undoped GaAs grown by the liquid encapsulated Czochralski technique is controlled by the melt stoichiometry. The concentration of the deep donor EL2 in the crystal depends on the As concentration in the melt, increasing from about 5 x 10 to the 15th per cu cm to 1.7 x 10 to the 16th per cu cm as the As atom fraction increases from 0.48 to 0.51, Furthermore, it is shown that the free-carrier concentration of semi-insulating GaAs is determined by the relative concentrations of EL2 and carbon acceptors. As a result, semi-insulating material can be obtained only above a critical As concentration (0.475-atom fraction in the material here) where the concentration of EL2 is sufficient to compensate residual acceptors. Below the critical As concentration the material is p type due to excess acceptors.

(Author)

A82-20747 * # Comparative analysis of CCMHD power plants. F. N. Alyea, C. H. Marston, V. B. Mantri (General Electric Co., Energy Systems Programs Dept., Philadelphia, PA), B. G. Geisendorfer (Babcock and Wilcox Co., Fossil Power Generation Div., Barberton, OH), and H. Doss (Bechtel National, Inc., San Francisco, CA). Symposium on the Engineering Aspects of MHD, 19th, Tullahoma, TN, June 15-17, 1981, Paper. 8 p. Contract No. DEN3-135; No. DE-AC01-73ET-10818.

A study of Closed Cycle MHD (CCMHD) power generation systems has been conducted which emphasizes both advances in component conceptual design and overall system performance. New design data are presented for the high temperature, regenerative argon heaters (HTRH) and the heat recovery/seed recovery (HRSR) subsystem. Contamination of the argon by flue gas adsorbed in the HTRH is examined and a model for estimation of contamination

effects in operating systems is developed. System performance and cost data have been developed for the standard CCMHD/steam cycle as powered by both direct fired cyclone combustors and selected coal gasifiers. In addition, a new CCMHD thermodynamic cycle has been identified.

(Author)

A82-20750 * # MHD channel performance for potential early commercial MHD power plants. D. W. Swallom (Avco-Everett Research Laboratory, Inc., Everett, MA). Intersociety Energy Conversion Engineering Conference, 16th, Atlanta, GA, Aug. 9-14, 1981, Paper, 7 p. 15 refs, Contract No, DEN3-51.

The commercial viability of full and part load early commercial MHD power plants is examined. The load conditions comprise a mass flow of 472 kg/sec in the channel, Rosebud coal, 34% by volume oxygen in the oxidizer preheated to 922 K, and a one percent by mass seeding with K. The full load condition is discussed in terms of a combined cycle plant with optimized electrical output by the MHD channel. Various electrical load parameters, pressure ratios, and magnetic field profiles are considered for a baseload MHD generator, with a finding that a decelerating flow rate yields slightly higher electrical output than a constant flow rate. Nominal and part load conditions are explored, with a reduced gas mass flow rate and an enriched oxygen content. An enthalpy extraction of 24.6% and an isentropic efficiency of 74.2% is predicted for nominal operation of a 526 MWe MHD generator, with higher efficiencies for part load operation.

M.S.K.

A82-26952 * Standing waves along a microwave generated surface wave plasma. J. Rogers and J. Asmussen (Michigan State University, East Lansing, MI). *IEEE Transactions on Plasma Science*, vol. PS-10, Mar. 1982, p. 11-16. 24 refs. Grant No. NSG-3299.

Two surface wave plasma columns, generated by microwave power in argon at gas pressures of 0.05 torr to 330 torr, interact in the same discharge tube to form standing surface waves. Radial electric field and azimuthal magnetic field outside the discharge tube are measured to be 90 deg out of phase with respect to axial position and to decay exponentially with radial distance from the tube axis. Maximum light emission occurs at the position of maximum azimuthal magnetic field and minimum radial electric field. Electron temperature and density are measured at low pressures with double probes inserted into the plasma at a null of radial electric field. Measured electron densities compare well with those predicted by Gould-Trivelpiece surface wave theory. (Author)

76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

N82-11959* Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Electrical Computer and Systems Engineering.
LOW TEMPERATURE GROWTH AND ELECTRICAL CHARACTERIZATION OF INSULATORS FOR GAAS MISFETS
Semiannual Status Report, 1 May - 31 Oct. 1981
J. M. Borrego and S. K. Ghandhi 31 Oct. 1981 11 p
(Contract NAG3-175)
(NASA-CR-164972) Avail: NTIS HC A02/MF A01 CSCL

Progress in the low temperature growth of oxides and layers on GaAs and the detailed electrical characterization of these oxides is reported. A plasma anodization system was designed, assembled, and put into operation. A measurement system was assembled for determining capacitance and conductance as a function of gate voltage for frequencies in the range from 1 Hz to 1 MHz. Initial measurements were carried out in Si-SiO2 capacitors in order to test the system and in GaAs MIS capacitors abricated using liquid anodization.

J.M.S.

N82-23030*# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
HIGH PURITY LOW DISLOCATION GaAs SINGLE CRYSTALS Final Report, 25 Feb. 1980 - 24 Feb. 1981
R. T. Chen, D. E. Holmes, and C. G. Kirkpatrick Jan. 1982
46 p

(Contract NAS3-22224) (NASA-CR-165533; NAS 1.26; 165593; ERC41054,36FR) Avail: NTIS HC A03/MF A01 CSCL 20B

Recent advances in GaAs bulk crystal growth using the LEC (liquid encapsulated Czochralski) technique are described. The dependence of the background impurity concentration and the dislocation density distribution on the materials synthesis and growth conditions were investigated. Background impurity concentrations as low as 4 x 10 to the 15th power were observed in undoped LEC GaAs. The dislocation density in selected regions of individual ingots was very low, below the 3000 cm .3000/sq cm threshold. The average dislocation density over a large annular ring on the wafers fell below the 10000/sq cm level for 3 inch diameter ingots. The diameter control during the program advanced to a diameter variation along a 3 Inch ingot less than 2 mm.

A82-13754 * Undoped semi-insulating LEC GaAs - A model and a mechanism. J. R. Oliver, R. D. Fairman, R. T. Chen (Rockwell International Microelectronics Research and Development Center, Thousand Oaks, CA), and P. W. Yu (Wright State University, Dayton, OH). Electronics Letters, vol. 17, Oct. 29, 1981, p. 839-841. 8 refs. Contract No. NAS3-22224.

Undoped semi-insulating GaAs grown by the high-pressure liquid encapsulated Czochralski (LEC) method has been produced for use in direct ion implantation in several laboratories. A clear understanding of the factors controlling impurity transport and compensation in these materials has been lacking to date. In this work, detailed characterization has been performed on undoped semi-insulating crystals grown from both SiO2 and PBN crucibles followed by a proposed impurity model and compensation mechanism. (Author)

A82-21965 * Surface diffusion activation energy determination using ion beam microtexturing. S. M. Rossnägel and R. S. Robinson (Colorado State University, Fort Collins, CO). *Journal of* Vacuum Science and Technology, vol. 20, Feb. 1982, p. 195-198. 18 refs. Grant No. NAG3-43.

The activation energy for impurity atom (adatom) surface diffusion can be determined from the temperature dependence of the spacing of sputter cones. These cones are formed on the surface during sputtering while simultaneously adding impurities. The impurities form clusters by means of surface diffusion, and these clusters in turn initiate cone formation. Values are given for the

surface diffusion activation energies for various materials on polycrystalline Cu, Al, Pb, Au, and Ni. The values for different impurity species on each of these substrates are approximately independent of impurity species within the experimental uncertainty, suggesting the absence of strong chemical bonding effects on the diffusion. (Author)

A82-30335 * Quasi-liquid states observed on ion beam microtextured surfaces. S, M. Rossnagel and R. S. Robinson (Colorado State University, Fort Collins, CO), (American Vacuum Society, National Symposium, 28th, Anaheim, CA, Nov. 2-6, 1981.) Journal of Vacuum Science and Technology, vol. 20, Mar. 1982, p. 506-509, 13 refs. Grant No. NAG3-43,

Liquid-like properties have been observed on surface structures developed by means of ion beam microtexturing. The structures include cones, pyramids, or wavelike formations. The observed liquid-like effects are drips and ripples on the sides of cones, droplet formation, the apparent flow and coalescence of closely packed structures, wetting angle and other surface tension effects, and the bending of cones by additional heating. The bulk temperatures are in the range of 50-600 C. These effects are seen to some extent on Cu, Al, Au, Pb, and Ni substrates. (Author)

A82-31276 * Impedance conversion using quantum limit nonreciprocity for superconductor-insulator-superconductor mixer compensation. S. R. Whiteley (California, University, Berkeley, CA), Applied Physics Letters, vol. 40, May 1, 1982, p. 842, 843. 8 refs. NSF Grant No. ECS-79-23877; Contract No. NAG3-88.

It is shown how a superconductor-insulator-superconductor (SIS) mixer when inductively terminated at the IF port has inductive reactance at the signal port. This reactance may be used to compensate for the geometric capacitance of a conventionally operated SIS mixer over twice the bandwidth available through signal port resonance techniques. (Author)

A82-38411 * OM-VPE growth of Mg-doped GaAs. C. R. Lewis, W. T. Dietze, and M. J. Ludowise (Varian Corporate Solid State Laboratory, Palo Alto, CA). *Electronics Letters*, vol. 18, June 24, 1982, p. 569, 570. 5 refs. Contract No. NAS3-22232.

The epitaxial growth of Mg-doped GaAs by the organometallic vapor phase epitaxial process (OM-VPE) has been achieved for the first time. The doping is controllable over a wide range of input fluxes of bis (cyclopentadienyl) magnesium, (C5H5)2Mg, the organometallic precursor to Mg. (Author)

A82-41546 * Electron beam induced damage in ITO coated Kapton. I, Krainsky, W. L. Gordon, and R. W. Hoffman (Case Western Reserve University, Cleveland, OH). Applications of Surface Science, vol. 9, 1981, p. 39-46. 17 refs. Grant No. NsG-3197.

Data for the stability of thin conductive indium tin oxide films on 0,003 inch thick Kapton substrates during exposure of the surface to electron beams are reported. The electron beam energy was 3 keV and the diameter was about 0.8 mm. Thermal effects and surface modifications are considered. For primary current greater than 0.6 microamperes, an obvious dark discoloration with diameter approximately that of the beam was produced. The structure of the discolored region was studied with the scanning electron microscope, and the findings are stated. Surface modifications were explored by AES, obtaining spectra and secondary emission coefficient as a function of time for different beam intensities. In all cases beam exposure results in a decrease of the secondary yield but because of thermal effects this change, as well as composition changes, cannot be directly interpreted in terms of electron beam dosage.

C,D.

A82-42912 * Stationary state model for normal metal tunnel junction phenomena. S. R. Whiteley and T. K. Gustafson (California, University, Berkeley, CA). IEEE Journal of Quantum Electronics, vol. QE-18, Sept. 1982, p. 1387-1398, 21 refs. NSF Grant No. ECS-79-23877; Grant No. NAG3-88.

A model applicable to normal metal tunnel junctions is presented. This model, referred to herein as the stationary state model, is an extension of the extended basis function theory of Kleinman and Duke (1972). Under the assumption that elastic tunneling is the dominant transport mechanism under static bias, the theory has been extended to include the case where there is an ac component of bias potential, and the fluctuation spectrum has been derived. In this approach structure eigenstates are used as the basis, allowing observables to be evaluated without recourse to the perturbation theory inherent in the transfer Hamiltonian model. Comparison is made to the appropriate results of the first order transfer

Hamiltonian model, and it is found that there is close but not always exact agreement to lowest order in the tunneling exponential. The stationary state model should be accurate with large barrier transmission, as it includes all orders of the tunneling exponential. The model as presented here should be applicable to normal metal tunnel junctions, where elastic tunneling is the dominant transport mechanism (under static blas), up to infrared excitation frequencies. (Author)

A82-46426 Ion-beam-induced topography and surface diffusion. R. S. Robinson and S. M. Rossnagel (Colorado State University, Fort Collins, CO). (American Vacuum Society, Annual Symposium on Plasma and Ion-Beam Processing, 13th, Yorktown Heights, NY, June 2, 1982.) Journal of Vacuum Science and Technology, vol. 21, Sept.-Oct. 1982, p. 790-797, 32 rofs. Grant No. NAG3-43.

It is pointed out that the development of surface topography along with enhanced surface and bulk diffusion processes accompanying ion bombardment have generated growing interest among users of ion beams and plasmas for the film or material processing. Interest in these processes stems both from attempts to generate topographic changes for specific studies or applications and from the need to suppress or control undesirable changes. The present investigation provides a summary of the current status of impurity-induced texturing, with emphasis on recent developments. Particular attention is given to the texturing accompanying deposition of an impurity material onto a solid surface while simultaneously etching the surface with an ion beam. A description of experimental considerations is provided, and a thermal-diffusion model is discussed along with the development of sputter cones, and aspects of impact-enhanced surface diffusion.

G.R.

A82-46517 * Effect of melt stolchlometry on twin formation in LEC GaAs. R. T. Chen and D. E. Holmes (Rockwell International Microelectronics Research and Development Center, Thousand Oaks, CA). Electrochemical Society, Journal, vol. 129, Oct. 1982, p. 2382, 2383. 5 refs. Contract No. NAS3-22224.

It is shown that the incidence of twin formation in large diameter, undoped, (100) LEC GaAs is reduced when the melt composition is slightly As-rich. Twenty GaAs crystals were grown from stoichiometric and nonstoichiometric melts. The results suggest that the barrier to twin formation is related to the stoichiometry of the solid at the solidification front. C,D.

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Fleat Transfer.

N82-32186*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPER-TIES OF HYDROCARBONS WITH AIR. PART 1: PROPERTIES IN SI UNITS

Sanford Gordon Jul. 1982 397 p refs

(NASA-TP-1906; E-946; NAS 1.60:1908) Avail: NTIS

HC A17/MF A01 CSCL 20M

Thermodynamic and transport combustion properties were calculated for a wide range of conditions for the reaction of hydrocarbons with air. Three hydrogen-carbon atom ratios (H/C = 1.7, 2.0, 2.1) were selected to represent the range of aircraft fuels. For each of these H/C ratios, combustion properties were calculated for the following conditions: Equivalence ratio: 0, 0.25, 0.5, 0.75, 1.0, 1.25 Water - dry air mass ratio: 0, 0.03 Pressure, kPa: 1.01325, 10.1325, 101.325, 1013.25, 5066.25 (or in atm: 0.01, 0.1, 1, 10, 50) Temperature, K: every 10 degrees from 200 to 900 K; every 50 degrees from 900 to 3000 K Temperature, R: every 20 degrees from 360 to 1600 R; very 100 degrees from 1600 to 5400 R. The properties presented are composition, density, molecular weight, enthalphy, entropy, specific heat at constant pressure, volume derivatives, isentropic exponent, velocity of sound, viscosity, thermal conductivity, and Prandtl number. Property tables are based on composites that were calculated by assuming both: (1) chemical equilibrium (for both homogeneous and heterogeneous phases) and (2) constant compositions for all temperatures. Properties in SI units are presented in this report for the Kelvin temperature schedules.

N82-32187*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPER-TIES OF HYDROCARBONS WITH AIR. PART 2: COMPOSI-TIONS CORRESPONDING TO KELVIN TEMPERATURE SCHED-**ULES IN PART 1**

Sanford Gordon Jul. 1982 281 p refs (NASA-TP-1907; E-947; NAS 1.60:1907) NTIS Avail:

HC A13/MF A01 CSCL 20M

The equilibrium compositions that correspond to the thermodynamic and transport combustion properties for a wide range of conditions for the reaction of hydrocarbons with air are presented. Initially 55 gaseous species and 3 coin condensed species were considered in the calculations. Only 17 of these 55 gaseous species had equilibrium mole fractions greater than 0.000005 for any of the conditions studied and therefore these were the only ones retained in the final tables. J.M.S.

N82-32188*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPER-TIES OF HYDROCARBONS WITH AIR. PART 3: PROPERTIES IN US CUSTOMARY UNITS

Sanford Gordon Jul. 1982 362 p refs

(NASA-TP-1908; E-948; NAS 1.60:1908) Avail: NTIS

HC A16/MF A01 CSCL 20M

Thermodynamic and transport properties are presented for a wide range of conditions for the reaction of hydrocarbons with air. The values given are in U.S. customary units. J.M.S.

N82-32189*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio,

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPER-TIES OF HYDROCARBONS WITH AIR. PART 4: COMPOSITIONS CORRESPONDING TO RANKINE TEMPERATURE **SCHEDULES IN PART 3**

Sanford Gordon Jul. 1982 281 p refs (NASA-TP-1909; E-949; NAS 1.60:1909) Avail: NTIS

HC A18/MF A01 CSCL 20M

The equilibrium compositions corresponding to the thermodynamic and transport combustion properties for a wide range of conditions for the reaction of hydrocarbons with air are presented. The compositions presented correspond to Rankine temperature schedules.

81 ADMINISTRATION AND **MANAGEMENT**

Includes management planning and research.

N82-20006*# National Appropriates and Space Administration. Lewis Research Center, Cisvaland, Ohio, LOCAL AND NATIONAL IMPACT OF AEROSPACE RESEARCH AND TECHNOLOGY

John F. McCarthy, Jr. Dec. 1981 10 p refs Presented at Cieveland City Club, Ohio, 4 Dec. 1981
(NASA-TM-82775; E-1106) Avail: NTIS HC A02/MF A01 CSCI 05A

CSCL 05A

An overview of work at the NASA Lewis Research Center in the areas of aeronautics space, and energy is presented. Local and national impact of the work is discussed. Some aspects of the U.S. research and technology base, the aerospace industry, and foreign competition are discussed. In conclusion, U.S. research and technology programs are cited as vital to U.S. economic health.

85 URBAN TECHNOLOGY AND **TRANSPORTATION**

includes applications of space technology to urban problems, 1/44 Slogy transfer; technology assessment; and surface and mass transportation.

For related information see 03 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.

NS2-13013*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio,
TEST RESULTS AND FACILITY DESCRIPTION FOR A
40-KILOWATT STIRLING ENGINE Final Report Gary G. Kelm, James E. Ceirelli, and Robert J. Welter Jun. 1981 47 p refs (Contract DE-AI01-77CS-51040) (NASA-TM-82820; DOE/NASA/51040-27; E-871) Avail: NTIS HC A03/MF A01 CSCL 10B

A 40 kilowatt Stirling engine, its test support facilities, and

the experimental procedures used for these tests are described, Operating experience with the engine is discussed, and some initial test results are presented

N82-26051*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRELIMINARY ANALYSIS OF A DOWNSIZED ADVANCED GAS-TURBINE ENGINE IN A SUBCOMPACT CAR

John L. Klann and Roy L. Johnsen 1982 25 p refs Presented at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982 (Contract DE-AI01-77CS-51040)

(NASA-TM-82848; E-1218; NAS 1.15:82848;

DOE/NASA/51040-40) Avail: NTIS HC A02/MF A01 CSCL 13F

Relative fuel economy advantages exist for a ceramic turbine engine when it is downsized for a small cri ware investigated. A 75 kW (100 hp) single shaft engine under development was analytically downsized to 37 kW (50 hp) and analyzed with a metal belt continuously variable transmission in a synthesized car. With gasoline, a 25% advantage was calculated over that of a current spark ignition engine, scaled to the same power, using the same transmission and car. With diesel fuel, a 21% advantage was calculated over that of a similar diesel engine vehicle. Author

N82-27191*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. BIBLIOGRAPHY OF LEWIS RESEARCH CENTER TECHNI-

CAL PUBLICATIONS ANNOUNCED IN 1981 May 1982 295 p

(NASA-TM-82838: E-1205, NAS 1.15:82838) Avail: NTIS HC A13/MF A01 CSCL 058

Technical reporting that resulted from the scientific and engineering work performed and managed by the Lewis Research Center in 1981 are indexed and abstracted. All the publications were announced in the 1981 issues of STAR (Scientific and Technical Aerospaca Reports) and/or IAA (International Aerospace Abstracts). It bluded are research reports, journal articles, conference presentations, patent applications, and theses. A total of 384 technical publications is listed.

N82-31160*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PROGRESS ON ADVANCED de AND ac INDUCTION

DRIVES FOR ELECTRIC VEHICLES
Harvey J. Schwartz 1922 16 p refs Presented at the Drive Elec. Amsterdam '82, Amsterdam, 25-29 Oct. 1982

(Contract DE-AI01-77CS-51044)

(NASA-TM-82895; E1273; NAS 1.15:82895; DOE/NASA/51044-27) Avail: NTIS HC A02/MF A01 CSCL

Progress is reported in the development of complete electric vehicle propulsion systems, and the results of tests on the Road Load Simulator of two such systems representative of advanced do and ac drive technology are presented. One is the system used in the DOE's ETV-1 integrated test vehicle which consists of a shunt wound do traction motor under microprocessor control using a transistorized controller. The motor drives the vehicle through a fixed ratio transmission. The second system uses an ac induction motor controlled by transistorized pulse width modulated inverter which drives through a two speed automatically shifted transmission. The inverter and transmission both operate under the control of a microprocessor. The characteristics of these systems are also compared with the propulsion system technology available in vehicles being manufactured at the inception of the DOE program and with an advanced, highly integrated propulsion system upon which technology development was recently initiated.

N82-11993*# Rasor Associates, Inc., Sunnyvale, Calif.
JET IMPINGEMENT HEAT TRANSFER ENHANCEMENT FOR THE GPU-3 STIRLING ENGINE

Douglas C. Johnson, Craig W. Congdon, Lester L. Begg, Edward J. Britt, and Lanny G. Thieme Oct, 1981 28 p refs (NASA-TM-82727; DOE/NASA/51040/33) Avail: NTIS HC A03/MF A01 CSCL 13F

A computer model of the combustion-gas-side heat transfer was developed to predict the effects of a let impingement system and the possible range of improvements available. Using low temperature (315 C (600 F)) pretest data in an updated model. a high temperature silicon carbide jet impingement heat tansfer system was designed and fabricated. The system model predicted that at the theoretical maximum limit, jet implygement enhanced heat transfer can: (1) reduce the flame temperature by 275 C (500 F); (2) reduce the exhaust temperature by 110 C (200 F); and (3) increase the overall heat into the working fluid by 10%. all for an increase in required pumping power of less than 0.5% of the engine power output. Initial tests on the GPU-3 Stirling engine at NASA-Lewis demonstrated that the jet impingement system increased the engine output power and efficiency by 5% - 8% with no measurable increase in pumping power. The overall heat transfer coefficient was increased by 65% for the maximum power point of the tests.

N82-16937*# AiResearch Mfg. Co., Phoenix, Ariz, ADVANCED GAS TURBINE (AGT) POWERTRAIN SYSTEM DEVELOPMENT FOR AUTOMOTIVE APPLICATIONS Progress Report, Oct. 1979 - Jun. 1980

Nov, 1980 431 p refs (Contract DEN3-167)

(NASA-CR-165175; DOE/NASA/0167-80/1;

AiResearch-31-3725; PR-1) Avail: NTIS HC A19/MF A01

Progress in the development of a gas turbine engine to improve fuel economy, reduce gaseous emissions and particulate levels, and compatible with a variety of alternate fuels is reported. The powertrain is designated AGT101 and consists of a regenerated single shaft gas turbine engine, a split differential gearbox and a Ford Automatic Overdrive production transmission. The powertrain is controlled by an electronic digital microprocessor and associated actuators, instrumentation, and sensors. Standard automotive accessories are driven by engine power provided by an accessory pad on the gearbox. Component/subsystem development progress is reported in the following areas: compressor, turbine, combustion system, regenerator, gearbox/ transmission, structures, ceramic components, foil gas bearing, bearings and seals, rotor dynamics, and controls and accessories.

N82-16938*# Boeing Computer Services Co., Tukwila, Wash, HYBRID AND ELECTRIC ADVANCED VEHICLE SYSTEMS (HEAVY) SIMULATION Final Report

Ronald A. Hammond and Richard K. McGehee Nov. 1981 89 p refs

(Contract D'2N3-151; DE-AI01-77CS-51044)

(NASA-CR-165536; DOE/NASA/0151-1; BCS-40357) Avail: NTIS HC A05/MF A01 CSCL 13F

A computer program to simulate hybrid and electric advanced vehicle systems (HEAVY) is described. It is intended for use early in the design process; concept evaluation, alternative comparison, preliminary design, control and management strategy development, component sizing, and sensitivity studies, it allows the designer to quickly, conveniently, and economically predict the performance of a proposed drive train. The user defines the system to be simulated using a library of predefined component models that may be connected to represent a wide variety of propulsion systems. The development of three models are discussed as examples.

N82-18068*# Department of Transportation, Cambridge, Mass. FUEL ECONOMY AND EXHAUST EMISSIONS CHARACTER-ISTICS OF DIESEL VEHICLES: TEST RESULTS OF A PROTOTYPE FIAT 131TC 2.4 LITER AUTOMOBILE S, S, Quayle Jan. 1982 58 p refs

(NASA Order C-32817-D; Contract DE-AI01-80CS-50194) (NASA-CR-165535; DOE/NASA/2817-2;

DCT-TSC-NASA-81-2) Ávail; NTIS HC A04/MF A01 CSCL

The results obtained from fuel economy and emission tests conducted on a prototype Fiat 131 turbocharged diesel vehicle are presented. The vehicle was tested on a chassis dynamometer over selected drive cycles and steady-state conditions. Two fuels were used, a United States number 2 diesel and a European diesel fuel. Particulate emission rates were calculated from dilution tunnel measurements and large volume particulate samples were collected for biological and chemical analysis. It was determined that turbocharging accompanied by complementary modifications results in small but substantial improvements in regulated emissions, fuel economy, and performance. Notably, particulate levels were reduced by 30 percent,

N82-29235*# Mechanical Technology, Inc., Latham, N. Y. Stirling Engine Systems Div.

AUTOMOTIVE STIRLING ENGINE DEVELOPMENT PRO-GRAM Quarterly Technical Progress Report, 1 Apr. - 30 Jun.

Steven Piller, Al Richey, Mark Dowdy, and Kelly Mather May 1982 111 p refs

(Contracts DEN3-32; EC-77-A-31-10040)

(NASA-CR-167907; DOE/NASA/0032-15; NAS 1.26:167907; MTI-91ASE229QT13) Avail: NTIS HC A06/MF A01 CSCL

The background and history of the Stirling engine, the technology, materials, components, controls, and systems, and a technical assessment of automotive stirling engines are presented.

N82-31158*# Detroit Diesel Allison, Indianapolis, Ind. CERAMIC APPLICATIONS IN TURBINE ENGINES Semian-

nual Report, 1 Jan. - 30 Jun. 1980 S. Michael Hudson, Michael A. Janovicz, and Franklin A. Rockwood

Nov. 1980 177 p (Contracts DEN3-17; EC-77-A-31-1040) (NASA-CR-165197; NAS 1.26;165197; EDR-10383) Avail:

NTIS HC A09/MF A01 CSCL 13F

The design and testing of gas turbine engines employing ceramic components is discussed. Thermal shock and vibration test results as well as spin tests of various engine components are discussed.

N82-34311*# Mechanical Technology, Inc., Latham, N. Y. AUTOMOTIVE STIRLING ENGINE MOD 1 DESIGN REVIEW, **VOLUME 1 Final Report**

Aug. 1982 654 p refs Presented at Automotive Stirling Engine (ASE) Mod 1 Engine Design Review, Cleveland, 22-23 May 1980 3 Vol.

(Contracts DEN3-32; DE-Al01-77CS-51040) (NASA-CR-16/935; DOE/NASA/0032-16-Vol-1; NAS

1.26:167935; MTI-80ASE142DR1-Vol-1) Avail: NTIS

HC A99/MF A01 CSCL 13F

Risk assessment, safety analysis of the automotive stirling engine (ASE) mod I, design criteria and materials properties for the ASE mod I and reference engines, combustion are flower development, and the mod I engine starter motor are discussed. The stirling engine system, external heat system, hot engine system, cold engine system, and engine drive system are also discussed.

N82-34312*# Mechanical Technology, Inc., Latham, N. Y. AUTOMOTIVE STIRLING ENGINE MOD 1 DESIGN REVIEW, **VOLUME 3 Final Report** Aug. 1982 362 p refs Review held in Cleveland, 22-23 May

1980 3 Vol.

(Contracts DEN3-32; DE-Al01-77CS-51040)

(NASA-CR-167397; DOE/NASA/0032-18-Vol-3; NAS

1.20:167937; Rept-80ASE142DR1-Vol-3) Avail: HC A16/MF A01 CSCL 13F

Engineering drawings for the stirling engine, external heat, hot and cold engine, engine drive, and control systems and auxiliaries are provided. Vehicle integration is also illustrated.

NTIS

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

A82-23750 Potentials of surfaces in space. E. C. Whipple (California, University, La Jolla, CA). Reports on Progress in Physics, vol. 44, Nov. 1981, p. 1197-1250. 334 refs. Grants No. NGL-05-005-007; No. NAG3-152; Contract No. F04701-77-C-0062.

The subject of surface potentials on natural and artificial bodies in space is reviewed with particular emphasis on recent developments, Following a brief survey of work done up to the early 1970s on the charging of astrophysical objects in interstellar and interplanetary space and spacecraft charging, the various charging mechanisms in space are examined, including the collection of plasma particles, photoemission, and secondary electron emission by electron impact and ion impact, and the effects on charging of nonisotropic plasmas, wakes, and environmental magnetic and electric fields are considered, The concept of equilibrium potential is discussed, along with differential charging, potential barriers and discharge processes. The measurement of spacecraft potentials is then considered, and recent work on spacecraft potential modification and control by active and passive means is presented. Finally, astrophysical applications where charging effects may be important are discussed, and areas for further work are indicated.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see 18 Spacecraft Design Testing, and Performance. For space stations see 15 Launch Vehicles and Space Vehicles.

A82-29316 Evidence for Pu-244 fission tracks in hibonites from Murchison carbonaceous chondrite. R. S. Rajan (California Institute of Technology, Jet Propulsion Laboratory, Earth and Space Sciences Div., Pasadena, CA; Carnegie Institution of Washington, Washington, DC) and A S. Tamhane (Carnegie Institution of Washington, Washington, DC; Tata Institute of Fundamental Research, Bombay, India). Earth and Planetary Science atters, vol. 58, no. 1, Mar. 1982, p. 129-135, 15 refs. Grant No. NAGW-38.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

A82-10156 * VLA observations of solar active regions at 6 cm wavelength. M. R. Kundu, E. J. Schmahl, and A. P. Rao (Maryland, University, College Park, MD). Astronomy and Astrophysics, vol. 94, no. 1, Jan. 1981, p. 72-79. 24 refs. NSF Grant No. ATM-78-21762; Grants No. NGR-21-002-199; No. NsG-5320; No. NsG-398.

Synthesized maps of two solar active regions obtained from observations with the Very Large Array (VLA) with 9-arcsec resolution are presented. The most intense sources in these regions are found to be associated with filamentary structures and magnetic neutral lines as shown in H-alpha and photospheric magnetograms. These sources are not located directly over sunspots in disagreement with earlier observations. EUV and X-ray observations have suggested that similar structures should be visible at cm wavelengths around but, outside of, sunspots if the magnetic field is sufficiently strong. These results are consistent with the locations of hot (greater than 1,000,000 K) plasmas in active regions expected from generalization based on optical photographs. Given the sizes of the radio sources, the volume emission measures of soft X-rays observed from OSO-8 rule out the possibility of thermal bremsstrahlung being of any significance, as far as the 6 cm emission is concerned. Therefore, gyroresonance absorption process is the most likely cause of 6 cm emission from these sources, and its likelihood is enhanced by the magnetic field geometry that is known to exist over filaments and neutral lines. (Author)

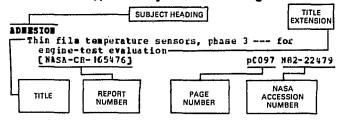
A82-26003 * Time variability and structure of quiet sun sources at 6 cm wavelength. F. T. Erskine and M. R. Kundu (Maryland, University, College Park, MD). Solar Physics, vol. 76, Mar. 1982, p. 221-237. 14 refs. NSF Grant No. ATM-76-22415; Grants No. NGR-21-022-199; No. NsG-398.

Results are presented of a detailed soudy of quiet sun emitting regions at 6 cm and their correspondence with regions observed at optical wavelengths. The Westerbork Synthesis Radio Telescope was used to obtain a 12-hr synthesis map of a quiet sun region with a resolution of 6 arcsec. Comparison of this map with a Ca(+) K filtergram indicates the features on the 6-cm map to correspond to Ca(+) K chromospheric networks and cells. In addition, about 72% of the magnetic field enhancements observed on photospheric magnetograms coincides with 6-cm emissive regions. Intercomparison of the 12-hr synthesis map, a 4-hr synthesis map and 6-cm fan beam scans along with the Ca(+) K and magnetogram results reveals all of the time-varying 6-cm elements to be located on Ca(+) K networks, and about 40% of them to be coincident with magnetogram enhancements. Lifetimes of the time-varying sources vary from a few minutes to several tens of minutes, and intensity varies by factors of 2 to 7.

A82-27323 * Magnetic structure of a flaring region producing impulsive microwave and hard X-ray bursts. M. R. Kundu, E. J. Schmahl (Maryland, University, College Park, MD), and T. Velusamy, Astrophysical Journal, Part 1, vol. 253, Feb. 15, 1982, p. 963-974. 18 refs. NSF Grant No. ATM-78-2176; Grants No. NGR-21-002-199; No. NsG-5320; No. NsG-398.

Using VLA observations of the 1B/M1 flare of June 25, 1980, 6-cm 'snapshot' maps are synthesized. The spatial and temporal resolutions during the 9 minutes of the impulsive phase were, respectively, 1 arcsec x 2 arcsec and 10 s. Some displacement is noted between the locations of the burst source and the preflare loop structures seen in the preflare map. The burst peak occurred on the neutral line of the preflare polarization map, between the two oppositely polarized microwave 'loop' structures approximately 40 arcsec long. Concurrent hard X-ray observations were made of the burst, although these had no spatial resolution. The 6-cm maps show the locations of a number of the X-ray burst spikes. The 6-cm burst was fully resolved into at least eight components, many of which were bipolar.

Typical Subject Index Listing



The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, a title extension is added, separated from the title by three hyphens. The STAR or IAA accession number is included in each entry to assist the user in locating the abstract in the abstract section. If applicable a report number is also included as an aid in identifying the document. The page and accession numbers are located beneath and to the right of the title. Under any one subject heading the accession numbers are arranged in sequence with the IAA accession numbers appearing first.

```
ABRASION
   Elucidation of wear mechanisms by ferrographic
     analysis
     [NASA-TM-82737]
                                               p0066 N82-15199
   Composite seal for turbcmachinery [NASA-CASE-LEW-12131-3]
                                               p0099 N82-19540
ABUNDÂNCE
    Evidence for Pu-244 fission tracks in hibonites
     from Murchison carbonaceous chondrite
                                               p0166 A82-29316
AC (CURRENT)
 U TEPHATING CURRENT
AC GENERATORS
   Development of a dual-field heteropoplar power
     converter
     [ NASA-CE- 165168]
                                               p0084 N82-24424
ACCELERATED LIFE TESTS
   Elevated temperature fatique testing of metals
                                               p0058 N82-13281
ACCELERATION (PHYSICS)

NI HIGH ACCFLERATION

NI PLASMA ACCELERATION
ACCESSORIES
   Component technology for space power systems
     [NASA-IM-82928]
                                               p0082 N82-30474
ACCRETION
 I POSITION
ACCOMULATORS
 NT SOLAR COLLECTORS
 NI SOLAR REFLECTORS
   Multistage depressed collector for dual mode operation --- for microwave transmitting tubes [NASA-CASE-LEW-13282-1] p0081 N82-24415
ACIDS
 NT FHOSPHORIC ACID
ACOUSTIC ATTENUATION
HT SHOCK WAVE ATTENUATION
   On ultrasonic factors and fracture toughness
                                               p0116 A82-42863
ACOUSTIC COMBUSTION
 U MBUSTION STABILITY
ACOUSTIC DUCTS
   Analytical and experimental investigation of the
      propagation and attervation of sound in extended
      reaction lined ducks
     [ AIAA PAPER 81-2014]
                                               p0 153 A82- 10454
   Methods for the calculation of axial wave numbers
      in lined ducts with mean flow
   p0153 A82-14044 Effect of vacuum exhaust pressure on the
```

performance of MIID ducts at high B-field

```
[AIAA PAPER 82-0396]
                                              p0157 A82-20292
   Conversion of acoustic energy by lossless liners
p0154 A82-36195
   Numerical techniques in linear duct acoustics,
      1980-81 update
     [NASA-TH-82730]
                                              p0151 M82-12890
   Application of steady state finite element and
      transient finite difference theory to sound
      propagation in a variable area duct: A
     comparison with experiment
     [ NASA-TM-82678]
                                              p0151 #82-15847
ACOUSTIC HEASUREMENT
 NT NOISE MEASUREMENT
   Effects of vane/blade ratio and spacing on fan noise
   [ATAA PAPER 81-2033] p0029 A
Prediction of sound radiation from different
                                               p0029 A82-10457
     practical jet engine inlets [NASA-CR-165120]
                                              p0153 N82-16810
ACOUSTIC MICROSCOPES
   Acoustic microscopy of silicon carbide materials
                                               p0075 A82-33031
ACOUSTIC PROPAGATION
   Acoustic transmission in lined flow ducts - A finite element eigenvalue problem
                                              p0154 A82-17663
   Numerical techniques in linear duct acoustics,
      1980-81 update
     [NASA-TM-82730]
   Verification of an acoustic transmission matrix analysis of sound propagation in a variable area
      duct without flow
      [ NASA-TM-82741]
                                              p0151 N82~12891
   Application of steady state finite element and transient finite difference theory to sound
      propagation in a variable area duct:
      comparison with experiment
                                              p0151 N82-15847
      [NASA-TM-82678]
   Pressure transfer function of a JTI5D nozzle due
to acoustic and convected entropy fluctuations
      [ NASA-TM-828421
                                               p0 152 N82-22951
ACOUSTIC PROPERTIES
 NT ACOUSTIC VELOCITY
   In-flight acoustic results from an advanced-design
   propeller at Mach numbers to 0.8
[AIAA PAPER 82-1120] p002
The acoustical structure of highly porous
                                               p0021 A82-35017
      open-cell foams
                                               p0154 A82-45165
   Prediction of sound radiation from different
     practical jet engine inlets [NASA-CR-165120]
                                               p0153 N82-16810
   Effect of facility variation on the acoustic
      characteristics of three single stream nozzles
                                               p0 15 1 N82-19944
      FNASA-TM-816351
   Acoustic properties of turbofan inlets
     [ NASA-CR-169016 ]
                                               p0153 N82-27090
ACOUSTIC RADIATION
 U UND WAVES
ACOUSTIC SIMULATION
   QCSER over-the-wing engine acoustic data
     [ NASA-TM-82708]
                                               p0020 N82-29324
ACOUSTIC VELOCITY
   On ultrasonic factors and fracture toughness
                                               p0116 A82-42863
ACOUSTIC TIBRATIONS
 U UND WAVES
ACOUSTICS
 NT AEROACOUSTICS
   Verification of an acoustic transmission matrix
      analysis of sound propagation in a variable area
      duct without flow
      [NASA-TH-82741]
                                               p0 151 N82-12891
   Bibliography of Levis Research Center technical
```

publications announced in 1981

p0163 N82-27191

NASA-TH-828381

ACQUISITION NT DATA ACQUISITION ACTIVIDE SERIES NT PLUTCHIUM 244 ACTINOMETERS TT INFRARED DETECTORS ACTIVATION ENERGY Surface diffusion activation energy determination using ion beam microtexturing p0159 A82-21965 ACTIVE CONTROL CF6 jet engine performance improvement: High pressure turbine active clearance control [NASA-CR-165556] p0027 N8 p0027 N82-28297 ACTIVE VOLCAROES U LCANOES ACTUATORS Electromechanical actuators Preliminary study, analysis and design for a power switch for digital engine actuators [NASA-CR-159559] p0085 N82-23394 Kevlar/PMF-15 reduced drag EC-9 reverser stang fairing [NASA-CP- 165448] p0052 N82-31448 ADAPTIVE CONTROL NT ACTIVE CONTROL
Role of optical computers in aeronautical control applications p0156 N62-15897 NASA Adaptive Multibeam Phased Array (AMFA): An application study [NASA-CP- 1691257 p0079 N82-28503 ADAPTIVE CONTROL SYSTEMS U APTIVE CONTROL ADDITIVES HT ANTIICING ADDITIVES NT FLASTICIZERS Effect of aluminum phosphate additions on composition of three-component plasma-sprayed solid lubricant [NASA-TP- 1990] [NASA-TP-1990]
Additional experiments on flowability improvements of aviation fuels at low temperatures, volume 2 rnasa-cp-167912] p0059 N82-21298 ADHEROMETERS U HESION TESTS ADHESION Universal binding energy relations in metallic adhesion [NASA-IM-82706] D0058 NB2-11183 Application of surface analysis to solve problems of wear [NASA-TH-82753] p0099 N82-14519 Thin film temperature sensors, phase 3 --- for engine-test evaluation [NASA-CR-165476] Refractory coatings [NASA-CASE-LEW-13169-2] pC097 N82-22479 p0061 N82-30371 Wear mechanism based on adhesion [NASA-TP-2037] p0103 N82-32737 ADDESION TESTS Adhesion and friction of single-crystal diamond in contact with transition metals p0 103 A82-18680 ADDESIVE BONDING Interface cracks in adhesively bounded lap-shear p0116 A82-46109 Analysis of interface cracks in adhesively bonded lap shear joints, part 4 [NASA-CR-165438] p0114 N82-26716 ADBITTANCE U ECTRICAL IMPEDANCE ADSORBENTS Analysis of infrared emission from thin adsorbates p0056 A82-21431 **APROACOUSTICS** Analytical and experimental investigation of the propagation and attenuation of sound in extended reaction lined ducts
[AIAA PAPER 81-2014] p0153 A82-104 [AIAA PAPER 81-2014] p0 153 A82-10454 Aeroacoustic performance of an externally blown flar configuration with several flar noise suppression devices

[NASA-TP- 1995]

AERODY NAMIC BUZZ

U UTTER

ARRODYNAMIC CHARACTERISTICS NT AERODYNAMIC STABILITY Aerodynamic characteristics of airfoils with ice accretions [AIAA PAPER 82-0282] Finite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] p0010 A82-The effect of rotor blade thickness and surface p0010 A82-31933 finish on the performance of a small axial flow turbine FASHE PAPER 82-GT-2221 Rapid approximate determination of nonlinear solutions - Application to aerodynamic flows and design/optimization problems p0012 A82-35571 Plow aerodynamics modeling of an MHD swirl combustor - Calculations and experimental verification p0094 A82-44782 The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine [NASA-TH-82726] p0003 N Computer program for aerodynamic and blading D0003 N82-13114 design of multistage axial-flow compressors [NASA-TP-1946] p0016 NB p0016 N82-15039 Rime ice accretion and its effect on airfoil performance [NASA-CR-165599] p0008 N82-24166 Laser anemometer measurements in an annular cascade of core turbine vanes and comparison with theory [NASA-TP-2018] p0004 H82-26234 Aerodysamic performance of high turning core turbine vanes in a two dimensional cascade [NASA-TM-82894] p0004 N p0004 H82-26240 A SUMMary of V/STOL inlet analysis methods [NASA-TM-82885] p0005 p0005 N82-28249 Comparison of laser anemometer measurements and theory in an annular turbine cascade with experimental accuracy determined by parameter estimation [NASA-TM-82860] p0005 N82-28250 Energy efficient engine: High pressure turbine uncooled rig technology report
[NASA-CR-165149] p0031 N82-32383 Propeller flow visualization techniques p0096 N82-32672 AERODYNAMIC CHORDS U RFOIL PROPILES ABRODYNAMIC CONFIGURATIONS Effect of heavy rain on aircraft N82-21149 Rime ice accretion and its effect on airfoil performance [NASA-CR-165599] ARRODYNAMIC FORCES p0008 N82-24166 NT AERODYNAMIC INTERFERENCE NT AERODYNAMIC LOADS Aerodynamic damping measurements in a transonic COMPressor [ASME PAPER 82-GT-287] An experimental investigation of gapwise periodicity and unsteady aerodynamic response in an oscillating cascade. Volume 2: Data report. Part 1: Text and mode | data [NASA-CR-165457-VOL-2-PT-1] p0006 M82-181 p0006 N82-18180 Hydrodynamic and aerodynamic breakup of liquid sheets [NASA-TM-82800] D0087 N82-19494 ABRODYBANIC INTERFERENCE Effects of vane/blade ratio and spacing on fan noise [AIAA PAPER 81-2033] p0029 A82-10457 An experimental study of airfoil icing characteristics [NASA-TH-82790] p0001 N82-17083 AERODYNAMIC LOADS Effects of blade loading and rotation on COMPRESSOR rotor wake in end wall regions [AIAA PAPER 82-0193] p0010 p0010 A82-22063 Analytic investigation of effect of end-wall contouring on stator performance [NASA-TP- 1943] p0003 N82-14051 Performance deterioration due to acceptance testing and flight loads; JT90 jet engine

diagnostic program

p0027 N82-27309

[NASA-CR-165572]

p0152 N82-24942

```
B747/JT90 flight loads and their effect on engine
                                                                                       ARROSC!.S
      cunning clearances and performance deterioration; BCAC NAIL/P and WA JT9D engine
                                                                                           Aircraft sampling of the sulfate layer near the
                                                                                               tropopause following the eruption of Mount St.
       diagnostics programs
[MASA-CP-165573]
                                                                                                                                                p0 140 A82-37450
                                                        p0027 N82-28296
    On the road performance tests of electric test
vehicle for correlation with road load simulator
[NASA-TM-82920] p0127 N82-338
                                                                                       ARROSPACE ENGINEERING
                                                                                         NT REPORAUTICAL ENGINEERING
                                                                                            Local and national impact of aerospace research and technology
                                                        p0127 N82-33829
AERODYWANIC WOISE
    The NASA-IORC wind turbine sound prediction code p0123 N82-23730
                                                                                               [ NASA-TH-82775]
                                                                                                                                                p0 162 NB2-20006
                                                                                            Bibliography of Levis Research Center technical
                                                                                       publications announced in 1981
[NASA-TH-82838]
ABBOSPACE ENVIRONMENTS
BY DREP SPACE
    Aeroacoustic performance of an externally blown
                                                                                                                                                p0163 N82-27191
       flar configuration with several flap noise
       suppression devices
[ NASA-TP-1995]
AEBODYNAMIC STABILITY
                                                        p0 152 N82-24942
                                                                                         NT INTERPLANETARY SPACE
    Coupled bending-bending-torsion flutter of a
                                                                                            First results of material charging in the space
       mistured cascade with nonuniform blades
                                                                                               environment
                                                                                                                                                p0081 N82-24431
                                                                                               [NASA-TH-84743]
       [ NASA-TM-82813]
                                                        p0111 N82-21604
    An experimental investigation of gapwise
                                                                                            Pree electron lasers for transmission of energy in
       periodicity and unsteady aerodynamic response in
an oscillating cascade, 1: Experimental and
theoretical results --- turbine blades
                                                                                               space
                                                                                               [ NASA-CR-165520 ]
                                                                                                                                                p0098 N82-25499
                                                                                            Additional extensions to the NASCAP computer code,
    [NASA-CF-3513] pCC08 N82-26229
Large displacements and stability analysis of
                                                                                               volume i
                                                                                               [ NASA-CR-167855]
                                                                                                                                                p0 146 N82-25810
Large displacements and stability analysis of nonlinear propeller structures
[NASA-TM-82850] p0112 N82-31

APPLICATION of an airfoil stall flutter computer prediction program to a three-dimensional wing:
Prediction versus experiment
                                                                                        ARBOSPACE REDICINE
                                                                                            Ozone and aircraft operations
                                                         p0112 N82-31707
                                                                                                                                                p0001 N82-21145
                                                                                        ARROTHERMODYNAMICS
                                                                                            A real time Pegasus propulsion system model for
                                                                                               VSTOL piloted simulation evaluation
                                                                                                                                                p0016 NB2-13144
       [ NASA-CP- 168586]
                                                                                               [NASA-TM-82770]
     Performance of single-stage axial-flow transonic
                                                                                            Demonstration of catalytic combustion with
       compressor with rotor and stator aspect ratios of 1.63 and 1.77, respectively, and with design pressure ratio of 2.05
[NASA-TP-2001] p0018 N82-22
                                                                                               residual fuel
                                                                                                                                                p0 13 1 N82-16484
                                                                                               [NASA-CR-165369]
                                                                                        ARROZINE
                                                                                         NT LIQUID FUELS
                                                         p0018 NB2-22269
AURODYNAMICS
                                                                                        AGE HARDENING
 NT AEROTHERMODYNAMICS
                                                                                         U ECIPITATION HARDENING
  NT ROTOF AERODYNAMICS
                                                                                        AGING (MATERIALS)
                                                                                        Survey on aging on electrodes and electrocatalysts in phosphoric acid fuel cells
[NASA-CR-165505] p0128 N82-115
     The three-dimensional boundary layer on a rotating
       helical blade
                                                                                                                                                p0128 N82-11545
                                                         p0009 A82-15459
     Effect of a part span variable inlet quide vane on
                                                                                            Market assessment of photovoltaic rower systems for agricultural applications in Mexico
[NASA-CR-165441] p0128 1882-
       TP34 fan performance
[NASA-CR-165458]
                                                         p0023 N82-12075
     Cold-air performance of a 15.41-cm-tip-diameter
                                                                                                                                                p0 128 #82-10506
                                                                                            Market assessment of photovoltaic power systems
       axial-flow power turbine with variable-area
       stator designed for a 75-kW automotive gas
                                                                                               for agricultural applications in Morocco
                                                                                            [NASA-CR-165477] p0130 N82-
Market assessment of photovoltaic power systems
for agricultural applications in Nigeria
[NASA-CR-165511] p0133 N82-
                                                                                                                                                p0130 N82-14627
       turbine engine
    Turnine enquing
[NASA-TH-82644]

Aerodynamic analysis of VTOL irlets and definition
of a short, blowing-lip inlet
[NASA-CF-165617]

p0007 N82-222
                                                         n0024 N82-21193
                                                                                                                                                p0133 N82-18698
                                                                                            Market assessment of photovoltaic power systems
for agricultural applications in Colombia
                                                         D0007 N82-22211
AEBOELASTICITY
                                                                                                                                                p0134 N82-22770
     Aeroelastic characteristics of a cascade of
                                                                                               [ NASA-CR-165524 ]
       mistured blades in subsonic and supersonic flows
[ASME PAPER 81-DET-122] p0021 A82-193
                                                                                        AIR BEARINGS
                                                        p0021 182-19337
                                                                                         U S BEARINGS
     Aerodynamic damping measurements in a transonic
                                                                                        AIR BREATHING ENGINES

NT BRISTOL SIDDELEY BS 53 ENGINE
       compressor
                                                                                         NT GAS TURBINE ENGINES
NT JET ENGINES
       [ ASME PAPER 02-GT-287]
                                                         p0012 A82-35459
     Application of an airfoil stall flutter computer prediction program to a three-dimensional wing: Prediction vorsus experiment [NASA-CR-168586] p0007 N82-19
                                                                                         NT TURBOFAN ENGINES
NT TURBOJET ENGINES
NT TURBOPROP ENGINES
                                                         p0007 NB2-19169
     Coupled bending-bending-torsion flutter of a
                                                                                        AIR COOLING
     mistured cascade with nonuniform blades
[NASA-TM-82813] p0111 N82-210
Submary and recent results from the BUSA advanced
                                                                                            Thermal and flow analysis of a convection,
air-cooled ceramic coated porous metal concept
                                                         p9111 N82-21604
                                                                                               for turbine vanes
        High Speed Propeller Fesearch Program
                                                                                               [ASRE PAPER 81-HT-48]
                                                                                                                                                 p0020 A82-10952
       [ NASA-IM-82891]
                                                         p0001 N82-26219
                                                                                        AIR DUCTS
     Propeller flow visualization techniques
                                                                                            Turbofan forced mixer-nozzle internal flowfield.
                                                                                               Volume 2: Computational fluid dynamic predictions [NASA-CR-3493] p0091 N82-22459
                                                         p0096 N82-32672
AERONAGNETISM
  U OMAGNETISM
                                                                                        AIR FLOW
AERONAGNETO FLUTTER
                                                                                             Methods for the calculation of axial wave numbers
                                                                                               in lined ducts with mean flow
  U UITER
 AERONAUTICAL ENGINEERING
     NASA research in aircraft propulsion
[ASME FAPER 82-GT-177]
                                                                                             Experimental performance of the regenerator for
                                                         p0022 A82-35389
                                                                                               the Chrysler upgraded automotive gas turbine
     NASA research in aircraft propulsion
                                                                                                engine
                                                                                            [NASA-TN-82671] p0120 N82-2171

Development of a spinning wave heat engine
[NASA-CR-165611] p0028 N62-3132

Active clearance control system for a turbomachine
[NASA-CASE-LEM-12938-1] p0020 N82-3236
                                                                                                                                                 p0120 N82-21712
       [ NASA-TM-82771]
                                                         p0016 N82-13146
     NASA research activities in aeropropulsion
                                                                                                                                                P0028 N62-31328
       [ NASA-TM-82788]
                                                         p00 $7 N82-16084
AERCHAUTICS
     Rotor fragment protection program: Statistics on aircraft gas turbine ngine rotor failures that occurred in U.S. commercial aviation during 1978 [NASA-CF-165388] p0027 N82-273
                                                                                                                                                 p0020 N82-32366
```

p0027 N82-27316

AIR INLETS U R INTAKES

SUBJECT TEDEX

OF POOR QUALITY			
AIR INTAKES NI ENGINE INLETS	0. •	[E-708] Engine technology	p0081 N82-15313
AT SUPERSCRIPT INLETS Low speed testing of the inlets desi	anàd for a	Power systems	p0001 N82-19145
tanden-fan V/STOL nacelle cond Levis 10 by 19 foot wind tupnel		Power systems	p0001 N82-19146
[NASA-TM-62728] Aerchynamic analysis of Vuol inlets	p0003 NB2-11042	Environmental control systems	p0001 NB2-19146
of a short, blowing-lip inlet	p0007 N82-22211	Electromechanical actuators	p0001 #82-19147
AIR JETS Flow distributions and discharge coe		YF 102 in-duct combustor noise meas	N82-19148 urements with a
offects for jet array impingement crossflow		turbine nozzle, volume 1 [NASA-CR-165562-VOL-1]	p0153 N82-21031
	p0011 A82-35379	YF 102 in-duct combustor noise meas turbine nozzle, volume 2	urements with a
J190 ceramic outer air seal system program	efinement	[NASA-CR-165562-VOL-2] p0153 N82-21032 YF 102 in-duct combustor noise measurements with a	
[NASA-CE-165554] AIR TRANSPORTATION	p0 106 NB2-18603	turbine nozzle, volume 3 [WASA-CR-165562-VOL-3]	p0155 N82-21033
MASA research activities in aeroprop	ulsion p0017 N82-16084	Preliminary results on performance turbocharged rotary combustion en	testing of a qine
An assessment of the crash fire haza	rd of liquid	[NASA-TM-82772] Analytical investigation of nonreco	P0017 N82-21194
hydrogen fueled aircraft [NASA-CF-1655261	p0013 N82-19196	[NASA-TM-82792] The role of modern control theory i	P0018 N82-21195
NASA research in aircraft propulsion		centrols for aircraft turbine eng [NASA-TM-82815]	
[ASME PAPER 82-GT-177] NASA research in aircraft propulsion	p0022 182-35389	Advanced general aviation comparati engine/airframe integration study	•
[NASA-TM-82771] AIRCRAFT CONSTRUCTION MATERIALS	p0016 N82-13146	[NASA-CR-165564] Advanced Low-Emissions Catalytic-Co	
Cost/henefit studies of advanced mat technologies for future aircraft (Program, phase 1 aircraft gas [NASA-CR-159656]	p0025 N82-22265
engines: Materials for advanced to [NASA-CF-167849]	rhine engines p0026 NB2-25254	Advanced general aviation engine/ai integration study	
Richart Couteol Role of optical computers in anronat	itical control	[NASA-CR-165565] Evaluation of inelastic constitutiv	
applications	pn 156 N82-15897	nonlinear structural analysis turbine engines	
AIRCRAPT DESIGN NT HFIICOPTER DESIGN		[NASA-TH-82845] Cost/benefit studies of advanced ma	
Engine technology	p0001 N82-19145	technologies for future aircraft engines: Baterials for advanced t	urbine engines
Power systems	p0001 H82-19146	[NASA-CR-167849] Development potential of Intermitte	p0026 N82-25254 ent Combustion
Power systems	p0001 N82-19146	(I.C.) aircraft engines for commu	
Environmental control systems	p0001 N92-19147	[NASA-TM-82869] NASA research in supersonic propuls	p0019 N82-26297 sion: A decade
Electromechanical actuators	N82-19148	of progress [NASA-TM-82862]	p0019 N82-26300
AIRCRAFT ENGINES NT HELICOPTER ENGINES		Performance deterioration due to ac testing and flight loads; JT90 je	
NT 1F-34 ENGINE NT VARIABLE CYCLE ENGINES		diagnostic program [NASA-CR-165572] Advanced stratified charge rotary a	p0027 N82-27309
V/STCL propulsion control technology [AIAA PAPER 81-2634] pn029 A82-16909 Blade loss transient dynamic aralysis of		design study	p0107 NB2-27743
turbomachinery	p0030 A82-34982	[NASA-CR-165398] Advances in high-speed rolling-elem [NASA-TM-82910]	
[MIAN PAPER 82-1957] The influence of Coriolis forces on motion of spinning blades		QCSEE over-the-wing engine acoustic	
fishe Paper 82-GT-1631 Optical tip clearance sensor for ai	p0030 882-35384	Advanced turboprop testbed systems [NASA-CR-167895]	
CONTROLS [AIAA PAPER 82-1131]	p0019 A82-37691	Structural tailoring of engine blad [NASA-CR-167949]	
Propulsion study for Small Transpor Technology (STAT), Appendix D		Exhaust emissions reduction for int combustion aircraft engines	
[NASA-CF-165499-APP-B] Lightweight diesel engine designs f	p0022 NB2-10038	[NASA-CR-167914] Energy erficient engine: Turbine (p0029 N82-33392 transition duct
type aircraft [NASA-CP-1654701	p0023 N82-11068	model technology report [NASA-CR-167996]	p0029 N82-33394
JIPD high pressure compressor performance improvement		AIRCRAFT FUEL SYSTEMS Experimental study of external fuel	l vaporization
Integrated analysis of engine struc	p0104 N82-11467 tures	[ASME PAPER 82-GT-59] Experimental study of fuel heating	p0075 A82-35312 at low
[NASA-TM-82713] Thrust modulation methods for a sub	p0111 N82-11491	temperatures in a wing tank model	p0073 NB2-11224
aircraft FNASA-TM-62747]	p0003 N82-13112	External fuel vaporization study [NASA-CR-165513]	p0073 N82-14371
A real time Pegasus propulsion syst VSTOL piloted simulation evaluati	on :	AIRCRAFT FUELS NT LIQUID PUELS	
[NASA-TM-82770] Sensor failure detection system	p0016 N82-13144	The NASA MERIT program - Developing for accurate flight planning	
turbofan engine [NASA-GE-165515]	p0023 N82-13145	[AIAA PAPER 82-0340] NASA Broad Specification Fuels Com	
High temperature electronic require aeropropulsion systems	ments in	Technology program - Pratt and Wi Phase I results and status	iltney Aircraft

flutter cascade

The effect of rotor blade thickness and surface

finish on the performance of a small axial flow

```
[AIAA PAPER 82-1088] p002
Fxperimental study of fuel beating at low
                                                          p0021 182-34999
                                                                                                  turbine
                                                                                              [MASA-TM-82726] p0003 N8
Computer program for aerodynamic and blading
design of multistage axial-flow compressors
[MASA-TP-1946] p0016 M8
                                                                                                                                                     p0003 N82-13114
    temperatures in a wing tank model, volume 1 [NASA-CE-165391] p0073 N8 External fuel vaporization study [NASA-CE-165513] p0073 N8
                                                           D0073 N82-11224
                                                                                                                                                     p0016 M82-15039
                                                                                               An experimental study of airfoil icing characteristics
     [NASA-CR-165513] p0073 N82-14371
An assessment of the crash fire hazard of liquid
       hydrogen fueled aircraft
[NASA-CP-165526]
                                                                                                  [ HASA-TH-82790]
                                                                                                                                                     p0001 #82-17083
                                                          p0013 N82-15196
                                                                                               Core compressor exit stage study, volume 6
    LOW NOx heavy fuel combustor concept program [NASA-CR-165367] p0136 N
                                                                                                  [ #ASA-CR- 165553]
                                                                                                                                                     p0027 M82-27310
                                                          p0136 N82-25635
                                                                                           AIRPOIL SECTIONS
    Additional experiments on flowability improvements of aviation fuels at low temperatures, volume 2 [NASA-CR-167912] p0074 N82-31546
                                                                                          U BPOIL PROFILES
AIRFOIL TRICKERSS
U BPOIL PROFILES
    Characterization of an Experimental Referee
Broadened Specification (ERBS) aviation turbine
                                                                                           AIRFOILS
                                                                                            MT EXTERNALLY BLOWN PLAPS
NT PROPELLER BLADES
    fuel and EFBs fuel blends
[NASA-TM-82883]

Tupact of advanced propeller technology on
aircraft/mission characteristics of several
general aviation aircraft
                                                          p0972 N82-32504
                                                                                            NT THIN AIRFOILS
                                                                                            NT TILTING ROTORS
                                                                                            NT WINGS
                                                                                               Aerodynamic characteristics of airfoils with ice
       [ NASA-CR- 167984]
                                                                                                 accretions
[ALAA PAPER 82-0282]
                                                           p0009 N82-33347
AIRCRAFT BAZARDS
                                                                                                                                                     p0010 A82-22081
                                                                                               Mathematical modeling of ice accretion on airfoils
[AIRA PAPER 82-0284] p0014 A82-270
    Selected bibliography of MACA-NASA aircraft icing
       publications
                                                                                                                                                    p0014 A82-27098
    [NASA-TM-81651] p0014 N82-1
An assessment of the crash fire hazard of liquid
hydrogen fueled aircraft
[NASA-CR-165526] p0013 N82-1
                                                                                               CAS22 - FORTRAM program for fast design and analysis of shock-free airfoil cascades using
                                                           p0014 N82-11053
                                                                                              fictitious-qas concept
[NASA-CR-3507]
An experimental investigation of gapwise
periodicity and unsteady aerodynamic response in
an oscillating cascade, Volume 2: Data report.
Part 1: Text and mode 1 data
                                                           p0013 M82-19196
     Rime ice accretion and its effect on airfoil
        performance
        ( NASA-CR- 1655991
                                                          p0008 NB2-24166
AIRCHAFT INSTRUMENTS
 NT DRIG PORCE ANEMOMETERS NT HOT-WIRE ANEMOMETERS
                                                                                                  [ NASA-CR-165457-VOL-2-PT-1]
                                                                                                                                                    p0006 N82-18180
                                                                                              Numerical analysis and FORTRAN program for the computation of the turbulent wakes of turbomachinery rotor blades, isclated airfoils and cascade of airfoils [NASA-CR-3509]
    Aircraft icing research at NASA (NASA-TM-82919)
                                                           p0013 N82-30297
AIRCRAFT HANEUVERS
    Performance deterioration due to acceptance
        testing and flight loads: JT90 jet engine
                                                                                               Application of an airfoil stall flutter computer
       diagnostic program [NASA-CR-165572]
                                                                                                  Prediction program to a three-dimensional wing:
Prediction versus experiment
[NASA-CR-168586] p0007 N82-19
                                                           p0027 N82-27309
AIRCHAFT HODELS
                                                                                                                                                     p0007 N82-19169
    Alternatives for (et engine control [NASA-CP-168894]
                                                                                               NASA/Lewis Research Center Icing Research Program p000 | N62-21148
                                                          p0026 N82-23247
AIRCRAFT MOISE
                                                                                               Rime ice accretion and its effect on airfoil
                                                                                                  performance
 NT JET AIRCHAFT NOISE
                                                                                                  [ NASA-CR-1655991
     Sound generated in a cascade by three-dimensional
                                                                                                                                                     p0008 N82-24166
       disturbances convected in a subsenic flow
                                                                                          ALCOHOLS
    [AIAA PAPER 81-2046] p0153 A82-16
Propeller tip vortex - A possible contributor to
aircraft cabin noise
                                                          p0153 A82-10460
                                                                                            NT POLYVINYL ALCOHOL
                                                                                           ALGEBRA
                                                                                            NT EIGENVALUES
                                                          DO 152 A82-17603
                                                                                            NT EIGENVECTORS
    Acoustic transmission in lined flow ducts - A
                                                                                            NT MATRICES (MATHEMATICS)
NT NONLINEAR EQUATIONS
       finite element eigenvalue problem
                                                                                            NT VECTORS (MATHEMATICS)
                                                          p9154 A82-17663
    A shock wave approach to the noise of supersonic
                                                                                           ALGORITHMS
       propellers [NASA-TM-82752]
                                                                                               Application of integration algorithms in a
                                                          p0151 982-16809
                                                                                                  parallel processing environment for the
    A preliminary comparison between the SR-3
                                                                                                  simulation of jet engines [NASA-TM-82746]
       propeller noise in flight and in a wind tunnel [NASA-TM-82805] p0152 N82-2
                                                                                                                                                     p0149 N82-14849
                                                          PO 152 N82-21998
                                                                                               Multiple-grid acceleration of Lax-Wendroff
AIRCRAFT NOISE PREDICTION
                                                                                                  algorithms
 U ISE PREDICTION (AIRCRAFT)
                                                                                                  [NASA-TM-82843]
                                                                                                                                                     p0149 NB2-22922
AIRCRAPT PARTS
                                                                                               A generalized memory test algorithm
    Geometrical aspects of the tribological properties of graphite fiber reinforced polymide composites [NASA-TM-82757] p0066 N82-15198
                                                                                                  [NASA-TM-82874]
                                                                                                                                                     p0146 N82-31971
                                                                                          ALIPHATIC COMPOUNDS
NT ALKYL COMPOUNDS
NT HETHANE
AIRCHAPT PERFORMANCE
 NT HELICOPTER PERFCHANCE
                                                                                            NT PROPANE
    Kevlar/PMR-15 reduced drag DC-9 reverser stand
                                                                                           ALKALI HALIDES
        fairing
                                                                                            NT SODIUM CHLORIDES
[NASA-CE-1654481
AIRCRAFT POWER SOURCES
U RCPAFT ENGINES
AIRCRAFT WAKES
                                                           P0052 N82-31448
                                                                                          ALKALI METALS
                                                                                            NT CESIUM
                                                                                          ALKALINE BATTERIES
                                                                                              Alkaline regenerative fuel cell systems for energy
NT PROPELLEP SLIPSTEEAMS
AIRFOIL CHARACTERISTICS
                                                                                                  storage
 U RFOILS
                                                                                               Mechanism and models for zinc metal morphology in
AIRFOIL PROFILES
The effect of rotor blade thickness and surface finish on the performance of a small axial flow
                                                                                                  alkaline media
                                                                                                  [NASA-TM-82768]
                                                                                                                                                     p0120 N82-19671
                                                                                               Cross-linked polyvinyl alcohol films as alkaline
       turtine
                                                                                                  battery separators
    (ASME PAPER 82-GT-2221 p0022 A82-3: Three-dimensional shock structure in a transonic
                                                          p0022 A82-35409
                                                                                                  [NASA-TM-82802]
                                                                                                                                                     p0054 N82-22327
                                                                                               Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] p0124 N82-29708
```

p0006 A82-37937

ALKALINE BARTH OXIDES

NT MAGNESIUM OXIDES

```
ALKALIBITY
                                                                                   ALUMINUM BORON COMPOSITES
    Endurance test and evaluation of alkaline water
                                                                                        Work of fracture in aluminum metal-matrix composites
                                                                                                                                         p0053 A82-31339
      electrolysis cells
      [ NASA-CR- 1654241
                                                      p0 130 N82-13508
                                                                                       Analysis of crack propagation as an energy absorption mechanism in metal matrix composites
ALKALOTOS
 NT CHINOLINE
                                                                                           [ NASA-CR-165051]
                                                                                                                                         p0052 N82-14288
ALKANES
                                                                                        Micromechanical predictions of crack propagation
 NT METHANE
                                                                                          and fracture energy in a single fiber
boron/aluminum model composite
[NASA-CR-168550] p0
 NT PRCPANE
ALKYL COMPOUNDS
                                                                                                                                          p0052 N82-18326
                                                                                       Strength advantages of chemically polished boron fibers before and after reaction with aluminum
    Thermal oxidative degradation reactions of linear
      perfluoroalky lethers
       | NASA-TH-828341
                                                      p0068 N82-26468
                                                                                          [ NASA-TH-82806]
                                                                                                                                          P0049 N82-21258
ALKYLATION
                                                                                    ALUMINUM COATINGS
                                                                                       Method of protecting a surface with a
    Cathode catalysts for primary thosphoric acid fuel
                                                                                          silicon-slurry/aluminide coating --- coatings for gas turbine engine blades and vanes
      cells
      [ NASA -CF- 165578]
                                                      p0 134 N82-21709
                                                                                   [NASA-CASE-LEW-13343-1]
ALUMINUM COMPOUNDS
ALLOYS
                                                                                                                                         p0068 N82-28441
NT ALUMINUM ALLOYS
NT CHROMIUM ALLOYS
NT COBALT ALLOYS
NT COEPER ALLOYS
NT EUTECTIC ALLOYS
NT FEAT RESISTANT ALLOYS
NT FEAT RESISTANT ALLOYS
NT HEAD ALLOYS
                                                                                     WT ALUMINUM OXIDES
Recrystallization and grain growth in NiAl
                                                                                                                                         p0065 A82-44529
                                                                                    ALUMINUM OXIDES
                                                                                       Castable high temperature fractory materials
[NASA-CASE-LEW-13080-2] p0066 N82-11210
Thermal degradation of the tensile properties of
undirectionally reinforced PP-AI203/EZ 33
 NT HAGNESTUM ALLOYS
NT HANGANPSE ALLOYS
 NT HOLYBDENUM ALLOYS
                                                                                           magnesium composites
 NT NICKEL ALLOYS NT FLATINUM ALLOYS
                                                                                           [NASA-TH-82817]
                                                                                        Modulus, strength and thermal exposure studies of
 NT STAINLESS STEELS
                                                                                          PP-A1203/aluminum and FP-A1203/magnesium
 NT STEELS
NT TEBNARY ALLOYS
                                                                                          composites
[NASA-TM-82868]
                                                                                                                                          p0050 N82-30335
 NT TITANIUM ALLOYS
                                                                                       Plastic deformation and wear process at a surface
 NT UDINET ALLOYS
                                                                                          during unlubricated sliding
 NT WASPALOY
                                                                                          [NASA-TM-82820]
                                                                                                                                          p0 102 N82-32735
 NT WROUGHT ALLOYS
    Blastic-plastic finite-element analyses of
thermally cycled double-edge wedge specimens
[NASA-TP-1973] p0111 N82-
                                                                                     U ELD THEORY (PHYSICS)
                                                                                    ANIDES
                                                                                     NT POLYIMIDES
                                                      p0111 N82-20566
ALTROUATING CURRENT
                                                                                    AMORPHOUS MATERIALS
    The ac propulsion system for an electric vehicle,
                                                                                       Friction and surface chemistry of some
                                                                                          ferrous-base metallic glasses
      [ NASA -CR- 165480 ]
                                                      p0129 N82-13506
                                                                                          [ NASA-TP-1991]
                                                                                                                                          p0059 N82-21301
    P0 129 N82-
Progress on advanced dc and ac induction drives
for electric vehicles
[NASA-TM-82895] p0 163 N82-
                                                                                    AMPERAGE
                                                                                   U ECTRIC CURRENT
                                                      p0163 N82-31160
ALTERNATING CURRENT GENERATORS
                                                                                     NT POWER GAIN
 U GENERATORS
                                                                                    AMPLIPIER DESIGN
ALTERNATORS (GENERATORS)
U GENERATORS
                                                                                       Investigation of a comb-type slow-wave structure
                                                                                           for millimeter-wave masers
ALUMINA
                                                                                                                                                  A82-18368
                                                                                   IMPATT power building blocks for 20 GHz spaceborne transmit amplifier
[AIAA 82-0498] p0086 AB2-2356
AMPLIFIERS
 U DMINUM OXIDES
ALUMINIZING
 U UNINUM COATINGS
                                                                                                                                          p0086 A82-23566
ALUMINOM
                                                                                     NT MAGNETIC AMPLIFIERS
    Detection of a change in the oxidation state on
      aluminum surface using angular correlation of
                                                                                     NT MICROWAVE AMPLIFIERS
       positron annihilation radiation
                                                                                     NT POWER AMPLIFIERS
                                                              A82-30374
                                                                                        Analytic investigation of efficiency and
    Tensile properties of SiC/aluminum filamentary
                                                                                          performance limits in klystron amplifiers using
      composites - Thermal degradation effects
                                                                                          multidimensional computer programs; multi-stage depressed collectors; and thermionic cathode
                                                      p0053 A82-46220
    Factors influencing the thormally-induced strength degradation of B/Al composites
                                                                                          life studies
                                                                                                                                          p0118 NB2-12553
      [ NASA-TM-82823]
                                                      p0050 N82-24297
                                                                                    ANALOG SIMULATION
    The orthogonal in-situ maclining of single and polycrystalline aluminum and copper, volume 1 [NASA-CP-168929] p0076 N82-24361
                                                                                       Advancements in real-time engine simulation
                                                                                          technology --- of digital electronic aircraft
                                                                                        engine controls
[AIAA PAPER 82-1075] p0021 Advancements in real-time engine simulation
ALUBINUM ALLOYS
                                                                                                                                          p0021 A82-3499 /
    Patique of Ni-Al-Mo aligned extectics at elevated
      temperatures
                                                                                          technology
                                                                                           [NASA-TH-82825]
                                                      D0052 A82-13403
                                                                                                                                          p0147 NB2-22915
                                                                                    AMALYSIS (MATHEMATICS)
MT APPROXIMATION
    Permanent magnet properties of Mn-11-C between -50
       C and +150 C
                                                                                     MT CAUCHY INTEGRAL FORMULA
MT COMPUTATIONAL FLUID DYNAMICS
MT COMPORMAL HAPPING
MT DIFFERENCE EQUATIONS
MT DIFFERENTIAL EQUATIONS
                                                      p0085 A82-20505
    Ionq-term high-velocity oxidation and hot corrosion testing of several NiCrAl and FeCrAl hase oxide dispersion strengthened alloys
                                                      p0062 A82-37151
    Applications of high-temperature powder metal
                                                                                     NT ERROR ANALYSIS
                                                                                     NT FINITE DIFFERENCE THEORY
NT FINITE ELEMENT METHOD
NT FOURIER ANALYSIS
NT FOURIER SERIES
       aluminum alloys to small gas turbines
                                                      p0065 A82-48244
    Solute transport during the cyclic oxidation of Ni-Cr-Al alloys [NASA-CR-165544] p0064 N82-
                                                      p0064 N82-27462
                                                                                     NT HALF PLANES
    Nicral ternary alloy having improved cyclic
                                                                                     NT HELMHOLTZ VORTICITY EQUATION
      oxidation resistance
                                                                                     NT INTEGRAL EQUATIONS
      [ NASA-CASE-LEW-13339-1]
                                                      p0061 N82-31505
                                                                                     NT J INTEGRAL
```

```
NT MATHIEU FUNCTION
                                                                                        [NASA-TP-2018] p0004 N
The design and instrumentation of the Purdue
                                                                                                                                          p0004 N82-26234
 NT RESTON-BAPESON BETHOD
 HT NONLINEAR EQUATIONS
NT NUMBERCAL ANALYSIS
                                                                                           annular cascade facility with initial data acquisition and analysis
 HT NUMERICAL INTEGRATION
HT PEFIODIC FUNCTIONS
HT RAYLFIGH-RITZ HETHED
HT RFLAXATION BETHOD (MATERNATICS)
HT SINGULARITY (MATERNATICS)
                                                                                           [ NASA-CR-16786 1]
                                                                                    ABBULAR BOXILES
                                                                                        Three dimensional mean velocity and turbulence
                                                                                           characteristics in the annulus wall region of an
                                                                                          axial flow compressor rotor passage [NASA-CR-169003]
 NT TANGENTS
                                                                                                                                           p0026 N82-25252
NT VECTOR ANALYSIS
AMALITIC GRONETRY
                                                                                    ANODES
                                                                                        Endurance test and evaluation of alkaline water
NT TANGENTS
                                                                                           electrolysis cells
                                                                                           [NASA-CR-165424]
                                                                                                                                           p0130 N82-13508
                                                                                    AUTARCTIC ENVIRONMENT
U E ENVIRONMENTS
AUTARCTIC REGIONS
 NT AORTA
 NT EYE (ANATONY)
AMERON ETERS
                                                                                        An attempt at magnetic-variation sounding in the
 NT DEAG PORCE ANEHOMETERS
                                                                                           Antarctic
 NT HOT-FILM ANEMOMETERS
NT HOT-WIRE ANEMOMETERS
                                                                                                                                                   A82-25290
                                                                                    ANTARCTICA
 NT LASER ANEMOMETERS
                                                                                      U TARCTIC REGIONS
AWENCH ETRY
                                                                                    ANTENNA ARRAYS
 " LCCITY MEASUREMENT
                                                                                         NASA Adaptive Hultibeam Phased Array (ARPA): An
ANGLE OF ATTACK
                                                                                          application study [NASA-CR-169125]
    Three-dimensional flow calculations including
                                                                                                                                           p0079 N82-28503
       boundary layer effects for supersonic inlets at angle of attack
                                                                                    ANTENNA COMPONENTS
                                                                                      NT ANTENNA PEEDS
      [ AINA PAPER 82-0061]
                                                      p0005 182-19778
                                                                                    ANTENNA DESIGN
    Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet [ATAA PAPER 82-1084] p0005 A82-35|95 Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet
                                                                                        30/20 GHz communications satellite multibeam antenna
                                                                                        [AIAA 82-0449] p0079 A82-2: Focal surfaces of offset dual-reflector antennas
                                                                                                                                           P0079 A82-23486
                                                                                                                                           p0080 A82-36265
                                                                                        Coaxial prime focus feeds for paraboloidal
       [ NASA-TM-82847]
                                                      p0004 N82-24165
                                                                                           reflectors
    Calculation of the flow field including boundary
                                                                                          [NASA-CR-167934]
                                                                                                                                           P0078 N82-31585
      layer effects for supersonic mixed compression inlets at angles of attack
[NASA-CF-167941] p0009 N82-2
                                                                                    ANTENNA PEEDS
                                                                                        Coaxial prime focus feeds for paraboloidal
                                                      P0009 N82-29269
                                                                                    reflectors
[NASA-CR-167934]
ABTENNA FIELDS
    Rough analysis of installation effects on
                                                                                                                                           D0078 N82-31585
       turboprop noise
       T NASA-TH-829241
                                                      p0 152 NS2-32082
                                                                                      U TENNA RADIATION PATTERNS
ANGLES (GEOMETRY)
NT ANGLE OF ATTACK
                                                                                    ANTENNA RADIATION PATTERNS
                                                                                        Focal surfaces of offset dual-reflector antennas
AUGULAR CORRELATION
                                                                                                                                           p0080 A82-36265
    Detection of a change in the oxidation state on
aluminum surface using angular correlation of
positron annihilation radiation
                                                                                        NASA Adaptive Multibeam Phased Array (AMPA): An
                                                                                           application study [NASA-CR-169125]
                                                                                        Coaxial prime focus feeds for paraboloidal reflectors
                                                               A82-30374
AMIONS
    Anion permselective membrane
                                                                                           [NASA-CR-167934]
                                                                                                                                           p0078 N82-31585
      T NASA-CR- 1678721
                                                      p0137 N82-30711
                                                                                    ANTENNAS
ANISOTEOPIC BEDIA
                                                                                      NY SATELLITE ANTENNAS
    Permanent magnet properties of Mn-X1-6 between -50
                                                                                     NT SPACECRAFT ANTENNAS
NT TWO REFLECTOR ANTENNAS
      C and +150 C
                                                                                        Coupled cavity traveling wave tube with velocity tapering
                                                      pnc65 ##2-20505
AWISOTROPY
    Feptesentation and material charging response of
                                                                                           [ NASA-CASE-LEW- 12296-1]
                                                                                                                                           p0082 N82-26568
       qeoplasma environments
                                                                                    ANTIPRICTION BRARINGS
                                                      p0039 N82-14249
                                                                                      NT BALL BEARINGS
AMMERLING
                                                                                    NT ROLLER BEARINGS
AUTICING ADDITIVES
    Processing of silicon sclar cells by ion
       implantation and laser annealing
                                                                                        Icing tunnel tests of a composite porous leading edge for use with a liquid anti-ice system ---
      [ NASA-CP- 165283]
                                                      P0128 N82-11546
ANNIHILATION REACTIONS
NT FOSITACH ANNIHILATION
ANNUAL VAMIATIONS
                                                                                           Lewis icing research tunnel [NASA-CR-164966]
                                                                                                                                           D0014 N82-11052
                                                                                    ARTIREPLECTION COATINGS
    Illustration of a new test for detecting a shift in mean in precipitation series
                                                                                        Advances in high output voltage silicon solar cells
                                                                                                                                           p0 127 A82-44942
                                                               A82-13217
AMBULAR DUCTS
                                                                                        Evaluation of left ventricular assist device pump
    Valuating gradient method for calulating velocities
                                                                                           bladders cast from ion-sputtered
      in an axisymmetric annular duct
                                                                                           polytetrafluorethylene mandrels
       [ NASA-TP= 2029]
                                                      p0005 N82-29270
                                                                                           [NASA-CR-167904]
                                                                                                                                           p0142 N82-23976
ANNULAR FLOW
                                                                                    APATITES
   A comprehensive methol for preliminary design optimization of axial gas turbine stages [AIAN PAPER 82-1269] p0030 A82-350 Thips-dimensional flow field in the tip region of a comprehenging rotor passage, I - Mean velocity publishes and annulus wall boundary layer [ASME PAPER 82-67-11] p0091 A82-35
                                                                                      U NERALS
                                                                                    12 ERTURES
                                                      p0030 A82-35091
                                                                                        Diffraction by a finite strip
                                                                                                                                           p0150 A82-33605
                                                                                    APPALACHIAN HOUNTAINS (NORTH AMERICA)
                                                                                        LANDSAT Remote Sensing: Observations of an
                                                      p0011 A82-35280
                                                                                           Appalachian mountaintop surface coal mining and
      Tree-dimensional flow field in the tip region of the compressor rotor passage. II - Turbulence properties
                                                                                           reclamation operation --- kentucky
                                                                                    [282-10247]
APPROXIMATION
NT FINITE DIPPERENCE THEORY
HT PINITE ELBRENT METHOD
HT NEWTON-RAPHSON HETHOD
                                                                                                                                           p0117 N82-24525
      TASME PAPER B2-GT-230 T
                                                      p0011 X82-35416
    Laser anchometer measurements in an annular
```

NT RAYLEIGH-RITZ METHOD

cascade of core turbine vapes and comparison

with theory

Adaptive rain fade compensation

```
MT BELAXATION HERHOD (MATHEMATICS)
                                                                           ATMOSPHERIC BOUNDARY LAYER
   Rapid approximate determination of nonlinear solutions - Application to serodynamic flows and
                                                                               Natural convection with combined driving forces
                                                                                                                            p0093 A82-31445
      design/optimization problems
                                                                           ATMOSPHERIC CIRCULATION
                                                p0012 A82-35571
                                                                               Stratosphoric-mesospheric midvinter disturbances -
APPROXIMATION METHODS
                                                                                 A summary of observed characteristics
 U PROXIMATION
                                                                                                                                   A82-12135
                                                                               Natural convection with combined driving forces p0093 A82-31445
AQUEOUS SOLUTIONS
   Inexpensive cross-linked polymeric separators made from water-soluble polymers --- for secondary
                                                                           ATHOSPHERIC REFECTS
      alkaline nickel-zinc and silver-zinc cells
                                                                               Environmental effects on solar concentrator mirrors
                                                p0048 A82-23778
                                                                                                                                   182-23394
ARC DISCHARGES
                                                                               Effect of heavy rain on aircraft
   Brushfire arc discharge model
                                                                                                                                   N82-21149
                                                 p0038 N82-14224
                                                                           ATMOSPHERIC ELECTRICITY
ARCHITECTURE (COMPUTERS)
                                                                               NASA research programs responding to workshop
   Film shape calculations on supercomputers [FASA-TE-82856] p0 10
                                                                                 recommendations
                                                p0100 N62-25519
                                                                                                                                   M82-21146
ARCTIC ENVIRONMENTS
                                                                           ATMOSPHERIC HEATING
 U E ENVIRONMENTS
                                                                               Stratospheric-mesospheric midwinter disturbances -
ARGON PLASMA
                                                                                 A summary of observed characteristics
    Turbulence in argon shock waves
                                                                                                                                   182-12135
                                                 DO 158 A82-11117
                                                                           ATHOSPHERIC IONIZATION
ARIP (IMPACT PREDICTION)
                                                                           NT AURORAL IONIZATION ATMOSPHERIC PHYSICS
 U MEUTEFIZED SIMULATION
ARMATURES
                                                                            NT CLOUD PHYSICS
   Straight and chopped DC performance data for a
                                                                           ATMOSPHERIC SCATTERING
     General Electric 5BY436A! DC shunt motor with a
                                                                             NT TROPOSPHERIC SCATTERING
                                                                           ATMOSPHERIC SOUNDING
      General Plectric EV-1 controller
      [ NASA-CP- 165507]
                                                 p0085 N82-24425
                                                                               Aircraft sampling of the sulfate layer near the
AROHATIC COMPOUNDS
                                                                                 tropopause following the eruption of Mount St.
   High-temperature resins
                                                                                 Helens
                                                 p0051 A82-42657
                                                                                                                            p0 140 A82-37450
ARRAYS
                                                                           ATMOSPHERIC TEMPERATURE
HT ANTENNA APRAYS
HT PHASED APRAYS
HT SOLAR ARRAYS
ARSENIC COMPOUNDS
HT GALLIUM ARSENIDES
                                                                               Stratospheric-mesospheric midwinter disturbances -
                                                                                 A summary of observed characteriatics
                                                                               Natural convection with combined driving forces
                                                                                                                            p0093 182-31445
ARSENIDES
                                                                           ATORIZATION
 NT GALLIUM ARSENIDES
                                                                            U OMIZING
                                                                           ATOMIZING
ARTERIES
 NT AORTA
                                                                               Atomization and combustion properties of flashing
ARTIFICIAL SATELLITES
                                                                                 injectors
 NT ATS 5
NT COMMUNICATION SATELLITES
NT SCATHA SATELLITE
                                                                                 [AÎAA PAPER 82-0300]
                                                                                                                            p0092 A82-17880
                                                                           ATS
                                                                            NT ATS 5
 NT SOLAR POWER SATELLITES
NT SYNCHRONOUS SATELLITES
                                                                           ATS 5
                                                                               Modification of spacecraft potentials by thermal electron emission to ATS-5
   Potentials of surfaces in stace
                                                 p0 165 A82-23750
                                                                                                                            p0040 A82-16194
ARYL COMPOUNDS
                                                                           ATTACHMENTS
 U ONATIC COMPOUNDS
                                                                            U CESSORIES
ASPECT RATIO
                                                                           ATTENUATION
   Performance of single-stage axial-flow transon, compressor with rotor and stator aspect ratios of 1.63 and 1.78, respectively, and with design pressure ratio of 1.82

[NASA-TP-1974]

p0017 N82-19
                                                                            NT ACOUSTIC ATTENUATION
NT ATMOSPHERIC ATTENUATION
                                                                             NT SHOCK WAVE ATTENUATION
                                                                           ATTITUDE (INCLINATION)
NT PITCH (INCLINATION)
                                                 p0017 N82~ 19222
ASSEMBLING
                                                                             NT YAV
 NT CREITAL ASSEMBLY
                                                                           ATTITUDE CONTROL
   A pad perturbation method for the dynamic coefficients of tilting-pad journal bearings
                                                                            NT THRUST VECTOR CONTROL
                                                                               Variable gain for a wind turbine pitch control
[NASA-TH-82751] p0119 N82-
                                                 p0 1 10 A82- 14400
                                                                                                                            p0119 N82-16478
                                                                            ATTITUDE STABILITY
 NT TECHNOLOGY ASSESSMENT
                                                                             NT GYROSCOPIC STABILITY
ASSURANCE
                                                                            AUGER SPECTROSCOPY
    Experience with modified aerospace reliability and
                                                                               Application of surface analysis to solve problems
      quality assurance method for wind turbines
                                                                                  of Wear
      [ NASA -TH-82803]
                                                 PO110 N82-19550
                                                                            [NASA-TH-82753]
                                                                                                                             p0099 N82-14519
ASTRONOMICAL MAPS
                                                                               Charging of a large object in low polar Earth orbit --- space shuttle orbiter
    Time variability and structure of quiet sun
      sources at 6 cm wavelength
                                                 p0 167 A82-26003
                                                                                                                             p0039 N82-14275
ASTRONOMY
                                                                            AUTOCOLLINATORS
 NT BALIO ASTRONOMY
                                                                             U LLIMATORS
ATLAS CENTAUR LAUNCH VEHICLE
                                                                            AUTONATIC CONTROL
NT ACTIVE CONTROL
NT ADAPTIVE CONTROL
   Centaur capabilities for communications satellite
Addicas

[ ALAA PAPER 82-0558]

ATLAS LAUNCE VEHICLES

HT ATLAS CENTAUR LAUNCH VEHICLE

ATHOSPHERIC ABSORPTION

H MOSEURES
      launches
                                                                             KT DYNAMIC CONTROL
                                                 p0034 A82-36286
                                                                             NT PEEDBACK CONTROL
                                                                             NT NUMERICAL CONTROL
                                                                             NT OPTIMAL CONTROL
 U MOSPHERIC ATTENUATION
                                                                               Sensor failure detection system --- for the F100
ATHOSPHERIC ATTEMUATION
                                                                                  turbofan engine [NASA-CR-165515]
    Advanced 30/20 GHz communication satellites
                                                                                                                             p0023 N82-13145
                                                 00034 A82- 12623
                                                                            AUTOMATIC DATA PROCESSING
```

p0080 A82-27178

U TA PROCESSING

MAGNITUTO TORVER THUISE TETRICORDE	10 At 1770 170
NUTORATIC ROCKET IMPACT PREDICTORS U MPUTEFIZED SIMULATION	AV-SA AIRCRAFT
AUTOHOBILE ENGINES	U RRIER AIRCRAFT
The AGT101 technology - An automotive alternative	AVALANCHE DIODES IMPATT power building blocks for 20 GHz spaceborne
AGT 100 automotive gas turbine system development	transmit amplifier [ATAA 82-0498] p0086 A82-23566
[AIAA PAPER 82-1165] p0 108 A82-35038 AGT 10 1 automotive gas turbine system development	AVERAGE NT HEAN
[AIAA PAPER 82-1166] p0 108 A82-35039 AGT100 turbomachinery for automobiles	AVIATIOE U RONAUTICS
[AIAA PAPER 82-1277] p) 108 A82-35061 Combustor development for automotive gas turbines	AVIONICS Real time rigregaranten girulation for garde
[ATAA PAPER 82-1208] p0 104 A82-35062	Real-time microcomputer simulation for space Shuttle/Centaur avionics
The AGT 101 advanced automotive gas turbine	p0033 A82-48245
[ASNE PAPER 82-GT-72] p0 108 A82-3532 Jet impingement heat transfer enhancement for the	Bibliography of Lewis Research Center technical publications announced in 1981
GPU-3 Stirling engine	[NASA-TH-82638] p0163 M82-27191
[NASA-TM-82727] p0163 N82-11993 AGT-102 automotive gas turbine	AXES (ERPERMENT LINES) HT AXES OF ROTATION
[NASA-CR- 165353] p0 105 N82- 12444	AXES OF ROTATION
Test results and facility description for a 40-kilowatt stirling engine	Whirl flutter analysis of a horizontal-axis wind turbine with a two-bladed teetering rotor
[NASA-TM-826201 p0163 NB2-13013	p0122 N82-23707
Advanced Gas Turbino (AGT) powertrain system initial development report	AXIAL COMPRESSION LOADS Compression behavior of unidirectional fibrous
[NASA-CR- 165130] p0132 N82-16485	composite
Advanced Gas Turbine (AGT) powertrain system development for automotive applications	[NASA-TM-82833] p0050 NB2-22313 AXIAL COMPRESSORS
[NASA-CE- 165175] p0163 N82-16937	######################################
Cold-air performance of a 15.41-cm-tip-diameter axial-flow power turbine with variable-area	AXIAL PLOS
stator designed for 3 75-kW automotive gas	Plow through axially aligned sequential apertures of the orifice and Borda types
turbine engine	[ASHE PAPER 81-HT-79] p0089 A82-10964
[NASA-TM-92644] p0024 NB2-21193 Preliminary results on performance testing of a	Three dimensional flow field inside the passage of a low speed axial flow companies rotor
turhocharged rotary combustion engine	[AIAA PAPER 82-1006] p0011 A82-31964
[NASA-TM-82772] p0017 N82-21194 Experimental performance of the regenerator for	Performance of single-stage axial-flow transonic compressor with rotor and stator aspect ratios
the Chrysler upgraded automotive gas turbine	of 1.63 and 1.77, respectively, and with design
engine [NASA-TM-82671] p0120 N82-21712	pressure ratio of 2.05 [NASA-TP-2001] p0018 N82-22269
Preliminary analysis of a downstred advanced	STGSTK: A computer code for predicting multistage
qas-turbine engine in a subcoupact car [NASA-TH-82848] p0163 N82-26051	axial flow compressor performance by a meanline
Multiroller traction drive speed reducer:	stage stacking method [NASA-TP-2020] p0018 N82-25250
Evaluation for automotive gas turbine engine [NASA-TF-2027] p0 101 N82-26678	Investigation of the tip clearance flow inside and
[NASA-TF-2027] p0101 N82-26678 Automotive Stirling engine development program	at the exit of a compressor rotor passage [NASA-CR-169004] p0026 N82-25253
[NASA-CR-167907] p2164 N82-29235	AXIAL FLOW COMPRESSORS
Evaluation of candidate stirling engine heater tube alloys at 820 deg and 860 deg C	U RBOCOMPRESSORS AXIAL PLOW PUMPS
[NASA-TM-82837] P0061 N82-30372	NT TURBINE PUMPS
Automotive Stirling Engine Hod Design Review,	ATIAL FLOW TURBINES A comprehensive method for preliminary design
[NASA-CR- 167935] p0 164 N82- 34311	optimization of axial gas turbine stages
Automotive Stirling Engine Mod Design Review, volume 3 engineering drawings	[AIAA PAPER 82-1264] p0030 A82-35091 The use of optimization techniques to design
[NASA-CB- 167397] p0 164 NB2-34312	controlled diffusion compressor blading
NUTOHOBILE FUELS NT LIQUID FUELS	[ASME PAPER 82-GT-149] pho22 A82-35373 The use of optimization techniques to design
NUTONO BILES	controlled diffusion compressor blading
NT ELECTRIC AUTOMOBILES Sigh temperature durable catalyst development	[NASA-TM-82763] p0016 N82-14094
p.056 A82-20739	Small axial turbine stator technology program [NASA-CR-165602] p0028 N82-32367
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype	Rotor tip clearance effects on overall and
fiat 13 ITC 2.4 liter automobile	blade-element performance of axial-flow transonic fan stage
[NASA-CP- 165535? p0164 NB2-18068 AURILIARY POWER SOURCES	[NASA-TP-2049] p0020 H82-33389
NT SPACE POWER UNIT REACTORS	AXIAL LOADS NT AXIAL COMPRESSION LOADS
AUXILIARY PROPULSION	Modulus, strength and thermal exposure studies of
Heasuring the spacecraft and environmental interactions of the 8-cm recoury ion thrusters	PP-A1203/aluminum and PP-A1203/magnesium composites
on the FBO-1 mission	[NASA-TH-82868] p0050 N82-30335
p0043 182-15438 Study of electrical and chemical propulsion	AXIAL STRESS Analytical and experimental evaluation of biaxial
systems for auxiliary propulsion of large space	contact stress
systems. Volume 1: Executive summary [NASA-CR-165502-VOL-1] p0046 N82-11110	p0071 A82-20741 Fatigue life prediction in bending from axial
Study of electrical and chemical propulsion	fatigue information
systems for auxiliary propulsion of large space	[NASA-CR-165563] p0113 N82-20564
systems, volume 2 [NASA-CR-165502-VC: -27 p0044 N82-11111	AXISYMMETRIC BODIES GRID3C: Computer program for generation of C type
An insight into auxiliary propulsion requirements of large space systems	multilevel, three dimensional and boundary
[NASA-TM-92827] p0042 N82-24286	conforming periodic grids [NASA-CR-167846] p0008 N82-26239
Large Space Systems/Propulsion Interactions [NASA-TY-82904] p0042 H82-27358	Investigations of flowfields found in typical
F aven to 051341 hands 1105-51330	combustor geometries [NASA-CR-169295] p0092 M82-31643

ORIGINAL PAGE IS OF POOR QUALITY

AXISYMERTRIC FLOW HT ANNULAR FLOW On the prediction of swirling flowfields found in axisymmetric combustor quometries p0029 182-12120 Distorted turbulence in axisymmetric flow p0089 A82-16071 Mean flowfields in axisymmetric combustor geometries with swirl Turbulence measurements in a confined jet using a six-orientation hot-wire probe technique [AIAA PAPER 92-1262] p0094 A82-37710 AILES U AFTS (MACHINE ELEMENTS) AZOLES NT INDOLES NT PYRROLES BACKWARD PACING STEPS Tangential blowing for control of strong normal shock - Boundary layer interactions on inlet ramps [AIAA FAPER 82-1082] p0005 A82-37684 BALL BEARINGS Effects of ultra-clean and centrifugal filtration on rolling-element bearing life [ASME PAPER 81-LUB-35] p0 103 A82-18436 Development of high-speed rolling-element
bearings. A historical and technical perspective [NASA-TH-82884] p0100 N82-24
Research report: User's manual for computer
program AT819003 SHABERTH. Stendy state and
transient thermal analysis of a shaft bearing
system including ball, cylindrical and tapered p0100 N82-24497 coller bearings [NASA-CR- 165365] p0146 N82-31969 PARDER APPROXIMATION U RPACE PROPERTIES BARTON CONFOUNDS NT FAPIUM TITANATES BARIUM TITANATES Study of the photovoltaic effect in thin film barium titanate [NASA-CR- 165081] p0131 N82-16479 BAROTROPISH NT PLANETARY WAVES BARS Extended range stress intensity factor expressions
for chevron-notched short bar and short rod fracture toughness specimens p0115 A82-40357 BASES (FOUNDATIONS) U UNDATIONS **EATTERIES** O ECTRIC BATTERIES BATTERY CHARGERS Effect of positive pulse charge waveforms on the energy efficiency of lead-acid traction cells
[NASA-TH-82709] p0118 N82BATTERY SEPARATORS p0118 N82-10503 U PARATORS PEADS A study of the nature of solid particle impact and shape on the erosion morphology of ductile metals [NASA-TM-82933] p0061 N82-33493 BEAMS (RADIATION) NT ELECTRON BEAMS NT ION BEAMS NT PARTICLE BEAMS NT RELATIVISTIC ELECTRON BEAMS 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] p0C79 A82-23486 EBANS (SUPPORTS)

NT CANTILEVER BEAMS NT RECTANGULAR BEAMS Comparison of beam and shell theories for the vibrations of thin turbomachinery blades
[ASME PAPER 82-GT-223] p0115 A8 p0115 A82-35408 **PEARINGS** NT BALL BEAFINGS NT GAS BEARINGS NT JOURNAL BEARINGS NT LIQUID EFARINGS NT BOLLER PEARINGS Engine dynamic analysis with general nonlinear finite element codes. II - Bearing element implementation, overall numerical

characteristics and benchmarking [ASME PAPER 82-GT-292] p0 10 8 A82-354 Wonlinear analysis of rotor-bearing systems using p0108 A82-35462 component mode synthesis p0104 A82-35468 [ASHE PAPER 82-GT-303] Engine dynamic analysis with general nonlinear finite element codes. Part 2: Bearing element implementation overall numerical characteristics and benchmaking [NASA-CR-167944] p0028 NB2-33390 BEHARD CELLS Eigenvalues of the Rayleigh-Benard and Marangoni problems D0092 A82-13396 BENDING Pinite-element modeling of layered, anisotropic composite plates and shells: A review of recent research BENDING PATIGUE Patique life prediction in bending from axial fatigue information
[NASA-CR-165563] p0 113 N8 DO 113 N82-20564 BENDING HOMENTS Comparison of upwind and downwind rotor operation of the DOE/NASA 100-kW MOD-0 wind turbine P0122 N82-23710 BENDING VIBRATION Coupled bending-bending-torsion flutter of a mistuned cascade with nonuniform blades
[NASA-TM-82813] p0111 N p0111 N82-21604 BETA FACTOR Effect of vacuum exhaust pressure on the performance of MHD ducts at high B-field [ATAN PAPER 82-0396] p0157
BIBLIOGRAPHIES p0157 182-20292 Selected bibliography of NACA-NASA aircraft icing publications [NASA-TH-81651] p0014 N82-11053 Bibliography of NASA published reports on general aviation, 1975 to 1981
[NASA-TH-83307] p0001 N82-19 p0001 N82-19132 Bibliography of Levis Research Center technical publications announced in 1981 [NASA-TM-82838] p0163 N82-27191 BINARY MIXTURES NT EUTECTIC ALLOYS BINARY STARS NT ECLIPSING BINARY STARS BINARY SYSTEMS (DIGITAL) U GITAL SYSTEMS BINARY SYSTEMS (MATERIALS) HT EUTECTIC ALLOYS BINDING Universal binding energy relations in metallic adhesion [NASA-TM-82706] p0058 N82-11183 BIOLOGICAL CELLS U LLS (BIOLOGY) BIOTECHEOLOGY Evaluation of left ventricular assist device pump bladders cast from ion-sputtured polytetrafluorethylene mandrels [NASA-CR-167904] p01
BIPOLAR TRANSISTORS
A 10kW series resonant converter design, p0142 N82-23976 transistor characterization, and base-drive optimization [NASA-CR- 165546] D0084 N82-17439 BIREPRIEGENCE Pockels-effect cell for gas-flow simulation [NASA-TP-2007] p0095 NB2-23515 BIT STUCHROSIZATION Open-loop nanosecond-synchronization for wideband satellite communications p0036 A82-27224 Illustration of a new test for detecting a shift in mean in precipitation series A82-13217 BLADE TIPS Propeller tip vortex - A possible contributor to aircraft cabin noise p0152 A82-17603 Single pass rub phenomena - Analysis and experiment [ASME PAPER 81-LUB-55] p0107 A82-18449

Turbine blade nonlinear structural and life analysis

D0021 A82-34981

[AIAA PAPER 82-1056]

```
Three-dimensional flow field in the tip region of
      a compressor rotor passage I - Mean velocity
   profiles and annulus wall boundary layer
[ASME FAPER 82-GT-11] p0011 A82-3528
Investigation of the tip-clearance flow inside and
at the exit of a compressor rotor passage. I -
Mean velocity field
                                                    p0011 A82-35280
      [ASME PAPER 82-GT-12]
   [ASME PAPER 82-GT-12] p0011 A82-35281 Three-dimensional flow field in the tip region of
      a compressor rotor passage II - Turbulence
      properties
      [ ASME PAPER 82-GT-234 ]
                                                     p0011 A82-35416
   Optical tip clearance sensor for aircraft engine controls
      [ AIAA PAPER 82-1131 ]
                                                    p0015 A82-37691
    Analytic investigation of effect of end-wall
      contouring on stator performance
       [ NASA-TP- 1943]
                                                     p0003 N82-14051
   CF6 Jet Engine Diagnostics Frogram:
compressor clearance investigation
[NASA-CF-165580]
                                                    High pressure
                                                    p0025 N82-21197
   Core compressor exit stage study, volume 6 [NASA-CP-165553] p0027
   [NASA-CP-165553] p0027 N82-27310
Rotor tip clearance effects on overall and
      blade-element performance of axial-flow
      transonic fan stage
[NASA-TP-2049]
                                                    p0020 NR2-33389
BLASIUS PLOW
   Generation of instability waves at a leading edge

FNASA-TM-828351 pC087 N82-22453
      [ NASA-TM-82835]
BLEED-OFF
 U ESSURE REDUCTION
ELENDS
 U KTUPES
BLOOD PUMPS
   Evaluation of left ventricular assist device pump
bladders cast from ion-sputtered
      polytetrafluorethylene mandrels
      [ NASA-CP-167904]
                                                    p0142 N82-23976
BLOOD VESSELS
NT AORTA
BLOWING
   Experimental and analytical results of tangential
      blowing applied to a subsonic V/STOL inlet
[ ALAA PAPER 82-1084] p0005 A
                                                    p0005 A82-35195
    Tangential blowing for control of strong normal
      shock - Boundary layer interactions on inlet ramps
   [AIAA PAPER 82-1082] p0005 A82-376
Aerodynamic analysis of VTCL inlets and definition
                                                    p0005 A82-37684
      of a short, blowing-lip inlet [NASA-CR-165617]
                                                     p0007 N82-22211
    Experimental and analytical results of tangential hlowing applied to a subsonic V/STOL inlet [NASA-TM-82947] p0004 N82-24
                                                    p0004 N82-24165
BLOWN FLAPS
 U TERNALLY BLOWN PLAPS
BLUFF EODIES
   Secondary effects in combustion instabilities leading to flashback
      FAIAA PAPER 82-00371
                                                     p0056 382-17746
    Bluff-body flameholder wakes - A simple numerical
      solution
      [ ALAA FAPER 82-1177]
                                                     PC093 A82-35043
BODIES OF REVOLUTION NT CYLINDRICAL BODIES
 NT ROTATING CYLINDERS
 NT SPHERES
BOEING AIRCRAFT
NT BOEING 747 AIRCRAFT
BOEING 747 AIRCRAFT
    B747/JT9D flight loads and their effect on engine
      running clearances and performance
deterioration: ECAC NATL/P and WA JT9D engine
      diagnostics programs [NASA-CP-165573]
                                                     p0027 N82-28296
    Study of vapor flow into a capillary acquisition
      device --- for cryogenic rocket propellants [NASA-CP-167883] p0091 N8
                                                    p0091 N82-24452
   The dryout region in frictionally heated sliding
      contacts
      [ NASA-TM-82796 ]
                                                     DC088 N82-28574
BONDING
 NT ADHESIVE BONDING
 NT CERAMIC BONDING
 NT REACTION BONDING
    Surface texturing of fluoropolymers
      [ NASA-CASE-LEW-13028-1]
                                                     p0070 N82-33521
```

```
BOOSTER ROCKET ENGINES
    Fuel/oxidizer-rich high-pressure preburners ---
      staged-combustion rocket engine
      [NASA-CR-165404]
                                                        p0073 N82-10245
PORITES
    Raman study of the improper ferroelectric phase transition in iron iodine boracite
                                                                A82-30297
 NT BORON PIBERS
BORON COMPOUNDS
 NT BORATES
NT BORON NITRIDES
BORON FIBERS
    Durability/life of fiber composites in
       hygrothermomechanical environments
                                                       p0049 N82-14287
       [NASA-TH-827491
    Micromechanical predictions of crack propagation and fracture energy in a single fiber boron/aluminum model composite [NASA-CR-168550] p0052 N82-18
    [NASA-CR-168550] p0052 N82-18326
Strength advantages of chemically polished boron
fibers before and after reaction with aluminum
       [ NASA-TM-82806 ]
                                                        p0049 N82-21258
    Pactors influencing the thermally-induced strength degradation of B/Al composites
       [ NASA-TM-82823]
                                                        p0050 N82-24297
    Method and apparatus for strengthening boron fibers
--- bigh temperature oxidation
[NASA-CASE-LEW-13826-1] p0050 N82-26389
                                                        p0050 N82-26385
BORON WITRIDES
    Development of an 1100 deg P capacitor
                                                        p0083 N82-15315
BOROW REINFORCED MATERIALS
    Durability/life of fiber composites in
       hydrothermomechanical environments
    [NASA-TM-82749] p0049 N82-14287
Strength advantages of chemically polished boron
fibers before and after reaction with aluminum
       [NASA-TH-82749]
       [NASA-TM-82806]
                                                        p0049 N82-21258
BOROSILICATE GLASS
    Secondary electron emission yields
                                                        D0038 N82-14226
BOUNDARIES.
 NT LIQUID-SOLID INTERPACES
BOUNDARY INTEGRAL METHOD
    Experimental boundary integral equation
       applications in speckle interferometry
                                                        p0097 A82-36987
BOUNDARY LAYER CONTROL
    Experimental and analytical results of tangential
    blowing applied to a subsonic V/STOL inlet
[AIAA PAPER 82-1084] p0005 A82-35195
Tangential blowing for control of strong normal
shock - Boundary layer interactions on inlet ramps
       [ATAA PAPER 82-1082]
                                                        p0005 A82-37684
    Aerodynamic analysis of VTOL inlets and definition
       of a short, blowing-lip inlet [NASA-CR-165617]
                                                        p0007 N82-22211
    Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet [NASA-TM-82847] p0004 N82-24
    | MASA-TM-82847| p0004 N82-24165
A summary of V/STOL inlet analysis methods
[N85A-TM-82885]
       [NASA-TM-82885]
                                                        p0005 N82-28249
    Flow visualization of shock-boundary layer
       interaction
                                                        p0096 N82-32675
BOUNDARY LAYER EQUATIONS
    The three-dimensional boundary layer on a rotating
       helical blade
                                                        p0009 A82-15459
BOUNDARY LAYER PLOW
 NT BOUNDARY LAYER SEPARATION
 NT SECONDARY PLOW
 NT SEPARATED FLOW
    Interaction of compressor rotor blade wake with wall boundary layer/vortex in the end-wall region [ASME PAPER 81-GE/GT-1] p0010 A82-1930
    [ASME PAPER 81-GB/GT-1] p0010 A82-9301
Three-dimensional flow field in the tip region of
       a compressor rotor passage. I - Mean velocity
       profiles and annulus wall boundary layer
[ASME PAPER 82-GT-11] p0011
                                                        p0011 A82-35280
    Nonlinear Marangoni convection in bounded layers.
I - Circular cylindrical containers. II -
       Rectangular cylindrical containers
    p0094 A82-39501
Core compressor exit stage study. Volume 4: Data
       and performance report for the best stage
       configuration
```

```
[ NASA -CP- 165257]
                                                                              BRISTOL-SIDDELEY BS 53 ENGINE
                                                  p0023 882-14092
    Core compressor exit stage study. Volume 5:
                                                                                  A real time Pegasus propulsion system model for
      Design and performance report for the Rotor
                                                                                    VSTOL piloted simulation evaluation
      C/Stator B configuration
                                                                                    [AIAA PAPER 81-2663]
                                                                                                                                 p0020 A82-19221
      [ NASA-CP- 165358]
                                                  p0023 N82-14093
                                                                              BRITTLE MATERIALS
    Numerical modeling of three-dimensional confined
                                                                                  Application of a gripping system to test a uniaxial graphite fiber reinforced composite /PMR 15/Celion 6000/ in tension at 316 C
      flows.
      [ NASA-CP- 165583]
                                                  P0158 N82-24078
   [NASA-CP-165583] p0158 N82-24078
Comparison of experimental and analytical
performance for contoured endwall stators
[NASA-TK-82877] p0019 N82-26299
Three dimensional flow field inside compressor
rotor, including blade boundary layers
[NASA-CP-169120] p0091 N82-27686
                                                                                                                                 p0051 A82-40796
                                                                                  Recrystallization and grain growth in NiAl
                                                                                                                                 p0065 A82-44529
                                                                              BUCKLING
   [NASA-CR-169120] p0091 N82-27686
Calculation of the flow field including boundary
                                                                               NT CREEP BUCKLING
                                                                                  Tensile buckling of advanced turboprops
      layer effects for supersonic wixed courression
                                                                                    [ NASA-TH-82896]
                                                                                                                                 p0112 N82-31708
      inlets at angles of attack
      [ NASA-CP-167941]
                                                  p0009 N82-29269
                                                                               NT ELECTRON BUNCHING
   Turbulent solution of the Navier-Stokes equations for uniform shear flow
                                                                              BUOYANCY
                                                                                  Buoyancy effects on the temperature field in
      [ NASA -TM-82925]
                                                  p0089 N82-32634
                                                                                    downward spreading flames
    Flow visualization of shock-boundary layer
                                                                                                                                 p0094 A82-41203
      interaction
                                                  p0096 N82-32675
                                                                                  On the opening of premixed Bunsen flame tips
BOUNDARY LAYER HOISE
                                                                                                                                p0057 A82-37570
 U RODYNAMIC NOISP
U UNDARY LAYERS
                                                                                  Low NO sub x heavy fuel, combustor concept program.
                                                                                    Phase IA: Combustion technology generation coal
BOUNDARY LAYER SEPARATION
                                                                                    gas fuels
[NASA-CR-1656141
   A summary of V/STOL inlet analysis methods
                                                                                                                                 p0055 N82-22326
      [ NASA-TM-82725]
                                                  p0003 NB2-11043
                                                                                  Micronized coal burner facility
    Some aspects of calculating flows about
                                                                                    [ NASA-CASE-LEW- 13426-1]
                                                                                                                                 p0126 W82-31769
three-limensional subsonic inlets [NASA-TM-82789]
BOUNDARY LAYER STABILITY
                                                                              BURNING
                                                  D0004 N82-25213
                                                                               U MBUSTION
                                                                              BURNING PROCESS
    Bigenvalues of the Rayleigh-Benard and Marangoni
                                                                               U MBUSTION
                                                                              BURNING RATE
      problems
                                                                                  Turbofan forced mixer-mozzle internal flowfield,
Volume I: A benchmark experimental study
                                                  p0092 A82-13396
    Three-dimensional flow calculations including
      boundary layer effects for superscnic inlets at
                                                                                    [ NASA-CR-3492]
                                                                                                                                 p0090 N82-22458
angle of attack
[AIAA PAPER 62-0061] p0005 A82-197

BOUNDARY LAYER TRANSITION
Turbulent boundary layer heat transfer experiments
- A separate effects study on a convexly-curved
                                                                              BURSTS
                                                  p0005 A82-19778
                                                                               NT SOLAR RADIO BURSTS
                                                                              BYPASS RATIO
                                                                                  NASA Redox cell stack shunt current, pumping
                                                                                    power, and cell performance tradeoffs [NASA-TH-82686]
                                                                                                                                 p0054 N82-19333
      [ASME PAPER 81-HT-78]
                                                  p0092 A82-10963
                                                                              BYPASSES
    Turbulent boundary layer heat transfer
                                                                                  Thrust reverser for a long duct fan engine --- for
      experiments: Convex curvature effects including introduction and recovery
[NASA-CP-3510] p0090 N82-174
                                                                                    turbofan engines
                                                                                    [NASA-CASE-LEW-13199-1]
                                                                                                                                 p0019 N82-26293
                                                  p0090 N82-17456
EOUNDABY LAYERS
 NT ATMOSPHERIC BOUNDARY LAYER
 NT LABINAF BOUNDARY LAYER
                                                                              CABIN ATMOSPHERES
 NT PLANETARY BOUNDARY LAYER
NT THREE CIMENSIONAL BOUNDARY LAYER
NT TURBULFNY BOUNDARY LAYER
                                                                                  Environmental control systems
                                                                                                                                 P0001 N82-19147
                                                                                  Ozone and aircraft operations
    Boundary layer thermal stresses in angle-ply
                                                                                                                                 p0001 882-21145
      composite laminates, part | --- graphite-epoxy
                                                                              CAD (DESIGN)
      composites
                                                                              U MPUTER AIDED DESIGN
CADMIUM COMPOUNDS
      [ NASA -CP- 1654 12]
                                                  p0113 N82-26713
    Boundary-layer effects in composite laminates:
                                                                                  Development of CdO-graphite-lg coatings for gas
      Free-edge stress singularities, part 6
                                                                                    bearings to 427 C
                                                  p0114 N82-26718
      [ NASA-CP-165440]
                                                                                                                                 P0108 A82-27079
    Small axial turbine stator technology program [NASA-CH-165602] p0028 N82-32367
                                                                              CADEION FICKEL BATTERIES
                                                                              U CKEL CADMIUM BATTERIES CALCIUM COMPOUNDS
BOUNDARY LUBRICATION
                                                                              NT CALCIUM SILICATES
CALCIUM STLICATES
    Regimes of traction in concentrated contact
      lubrication
      [ ASME PAPER 81-LUB-16]
                                                  p0 107 A82- 18431
                                                                                  Thermodynamics and kinetics of the sulfation of
    The effect of oxygen concentration on the houndary-lubricating characteristics of a C ether and a polyphenyl ether to 300 C
                                                                                    porous calcium silicate
                                                                                    [NASA-TM-82769]
                                                                                                                                 p0048 882-15119
                                                                              CALCULATION
                                                  p0070 182-21699
                                                                               U MPUTATION
    Improved boundary lubrication with formulated C-
                                                                              CALCULUS
      ethers
                                                                               NT POURIER SERIES
      [ NASA-TM-82808]
                                                  pn067 N82-20313
                                                                                NT VECTOR ANALYSIS
Boundary lubrication: Fevisited [NASA-TM-82858]
BOUNDARY VALUE PROBLEMS
                                                                              CARBER
                                                  p0069 N82-29458
                                                                                  Vibrations of twisted rotating blades
                                                                                    [ASHE PAPER 81-DET-127]
                                                                                                                                 p0115 A82-19341
 NT DIFICHLET PROBLEM
                                                                              CANTILEVER BEAMS
   Construction of solutions for some nonlinear two-point boundary value problems
                                                                                  Miniature drag-force anemometer
                                                                                                                                 D0097 A82-40132
      [ NASA-TM-82937]
                                                  DO144 N82-30949
                                                                              CANTILEVER MEMBERS
BOW SHOCK WAVES
U OCK WAVES
                                                                               NT CANTILEVER BEAMS
                                                                                  Vibrations of cantilevered shallow cylindrical
BREAKAWAY
                                                                                    shells of rectangular planform
U UNDARY LAYER SEPARATION BREAKERS (ELECTRIC)
U RCUIT BREAKERS
                                                                                                                                 p0115 A82-11298
```

CANTILEVER WINGS

U NGS

Elutter cascade

```
CAPACITORS
                                                                                                                                                      p0006 182-37937
    Development of an 1100 deg F capacitor
                                                                                               Interaction of upstream flow distortions with high
    p0083 M82-15315
Preliminary design development of 100 KW rotary
                                                                                               Mach number cascades
[MASA-TM-82759] p0003 M82-
CAS22 - FORTRAN program for fast design and
analysis of shock-free airfoil cascades using
                                                                                                                                                      p0003 N82-12043
       power transfer device [NASA-CP-165431]
                                                           p0084 N82-23395
CAPILLARY CIRCULATION
                                                                                                  fictitious-gas concept
                                                                                               [NASA-CR-3507] p000
An experimental investigation of gapwise
 U PILLARY FLOW
CAPILLARY PLOW
                                                                                                  periodicity and unsteady aerodynamic response in
an oscillating cascade. Volume 2: Data report.
Part 1: Text and mode | data
[NASA-CR-165457-VOL-2-PT-1] p0006 M82-1816
    Study of vapor flow into a capillary acquisition
       device --- for cryogenic rocket propellants [NASA-CR-167883] p0091 N8
                                                           p0091 N82-24452
CARBIDES
                                                                                                                                                      p0006 #82-18180
                                                                                               Numerical analysis and FORTRAN program for the computation of the turbulent wakes of
 NT SILICON CARBIDES
    MC carbide structures in M(lc2)ar-M247
[NASA-CR-167892]
                                                                                                  turbomachinery rotor blades, isolated airfoils and cascade of airfoils
                                                           p0064 N82-30374
CARRON
    Evaluation of fuel injection configurations to control carbon and soot formation in small GT
                                                                                                  [NASA-CR-3509]
                                                                                                                                                      p0006 N82-18184
                                                                                               Design of supercritical cascades with high solidity
[NASA-CR-165600] p0007 N82-22210
An experimental investigation of gapwise
       combustors
    [ NIMA PAPER 82-1175] p002; A8:
Investigation of soot and carbon formation in
                                                           p0021 A82-35041
                                                                                                  periodicity and unsteady aerodynamic response in
an oscillating cascade. I: Experimental and
theoretical results --- turbine blades
       small gas turbine combustors
       [ NASA-CR- 167853]
                                                           p0025 N82-22267
    Improved chromium electrodes for REDOX cells [NASA-CASE-LEW-13653-1] p0 121 W8;
Ion beam sputter deposited diamond like films
                                                                                                                                                      p0008 N82-26229
                                                                                                  [NASA-CR-3513]
                                                           p0121 N82-22672
                                                                                               Aerodynamic performance of high turning core
                                                                                                  turbine vanes in a two dimensional cascade [NASA-TM-02894] p0004 N
    p0069 N82-28445
Stabilizing platinum in phosphoric acid fuel cells
[NASA-CR-165606]
                                                                                                                                                      p0004 N82-26240
                                                                                               Thrust reverser for a long duct fan engine --- for
                                                                                                  turbofan engines
                                                                                                  [ NASA-CASE-LEW- 13 199-1]
CARBON COMPOUNDS
                                                                                               Computer program for calculating full potential transonic, quaxi-three-dimensional flow through a rotating turbomachinery blade row
[NASA-TP-2030] p0005 N82-28
 NT CARBIDES
 NT FLUOFOFCLYMERS
 NT SILICON CARBIDES
                                                                                               [NASA-TP-2030] p0005 N82-28247
Comparison of laser anemometer measurements and
theory in an annular turbine cascade with
experimental accuracy determined by parameter
estimation
CARBON DIOXIDE LASERS
    Optically pumped high-pressure DF-CO2 transfer laser
CARBON FIBER REINFORCED PLASTICS
Impact resistance of fiber composites
                                                           p0112 A82-39852
                                                                                                  [NASA-TM-82860]
                                                                                                                                                      p0005 N82-28250
                                                                                               Past generation of three-dimensional computational boundary-conforming periodic grids of C-type --- for turbine blades and propellers
CARBON MONOXIDE
    Preparation and evaluation of advanced electrocatalysts for rhosphoric acid fuel cells
                                                                                               [NASA-CR-165596] p0009 N82-20
Plow visualization study of the horseshoe vortex
       [ NASA-CR- 165519]
                                                          p0129 N82-12573
                                                                                                                                                      p0009 N82-28253
    Exhaust emissions reduction for intermittent
       combustion aircraft engines
                                                                                                  in a turbine stator cascade
[ NASA-CR- 1679 14]
CARBONACEOUS CHORDRITES
                                                                                                  [ NASA-TP-1884]
                                                           p0029 N82-33392
                                                                                                                                                      p0088 N82-30498
                                                                                           CASCADE WIND TUNNELS
    Evidence for Pu-244 fission tracks in hibonites
                                                                                               Aerodynamic performance of high turning core
       from Murchison carbonaceous chondrite
                                                                                           turbine vanes in a two-dimensional cascade
[AIAA PAPER 82-1288] p0005 A
CASCADES (FLUID DYMANICS)
                                                           p0166 A82-29316
                                                                                                                                                      P0005 A82-37716
CARBONACEOUS ROCKS
                                                                                            U UID DYNAMICS
CARDIOVASCULAR SYSTEM
                                                                                           CASCODE HOSFET
 NT AORTA
                                                                                            U ELD EFFECT TBANSISTORS
CARRIER TRANSPORT (SOLID STATE)
    Stationary state model for normal metal tunnel junction phenomena
                                                                                           CASTING
                                                                                               Texturing polymer surfaces by transfer casting ---
                                                                                                  cardiovascular prosthesis
[MASA-CASE-LEW-13120-1]
                                                           p0159 A82-42912
                                                                                                                                                      D0068 N82-28440
                                                                                           CASTING SOLVENTS
CARTOGRAPHY
                                                                                            U ASTICIZERS
 U PPING
CARTRIDGE ACTUATED DEVICES
                                                                                           CASTINGS
 U TCATORS
                                                                                            NT INGOTS
CASCADE FLOW
                                                                                               Castable high temperature fractory materials
    Sound generated in a cascade by three-dimensional disturbances convected in a subsonic flow
                                                                                           [NASA-CASE-LEW-13080-2]
                                                                                                                                                      p0066 N82-11210
       [ AIAA PAPER 81-2046]
                                                          p0153 A82-10460
                                                                                               Demonstration of catalytic combustion with
                                                                                                  residual fuel
[NASA-CR-165369]
    Aeroelastic characteristics of a cascade of
    mistured blades in subsonic and supersonic flows
[ASME PAPER 81-DET-122] p0021 A82-1933
A comprehensive method for preliminary design
optimization of axial gas turbine stages
[AIAA PAPER 82-1264] p0030 A82-3509
Investigation of the tip-clearance flow inside and
at the exit of a compressor totor passage. I
                                                                                                                                                      p0131 N82-16484
                                                          p0021 A82-19337
                                                                                               Requirements for optimization of electrodes and
                                                                                                  electrolyte for the iron/chromium Redox flow cell
                                                                                                  [NASA-CR-165218]
                                                                                                                                                      p0136 N82-25640
                                                          p0030 A82-35091
                                                                                           CATALYSTS
                                                                                            NT ELECTROCATALYSTS
                                                                                               High temperature durable catalyst development
       Mean velocity field [ASNE PAPER 82-GT-12]
                                                                                                                                                      p0056 A82-20739
                                                           p0011 A82-35281
                                                                                                Endurance test and evaluation of alkaline water
    A computational design method for transonic turbomachinery cascades
[ASME PAPER 82-GT-117] p0022 A82-35348
Three-dimensional flow field in the tip region of
                                                                                                  electrolysis cells
                                                                                                  [NASA-CR-165424]
                                                                                                                                                      PO 130 N82-13508
                                                                                               Experimental study of an integral catalytic
                                                                                                  combustor: Heat exchanger for Stirling engines [NASA-TM-82783] p0119 N82-180
       a compressor rotor passage, II - Turbulence
                                                                                                                                                      p0119 N82-18691
       properties
                                                                                           CATALYTIC ACTIVITY
       [ ASME FAPER 82-GT-234 ]
                                                                                               High temperature durable catalyst development
    Aerodynamic performance of high turning core
                                                                                                                                                      p0056 A82-20739
    turbine vanes in a two-dimensional cascade
[AIMA PAPER 82-1288] p0C05 M82-3
Three-dimensional shock structure in a transonic
                                                                                               Catalytic combustion of residual fuels
                                                           p0C05 A82-37716
                                                                                                  [ NASA-TM-82731]
                                                                                                                                                      p0 118 N8 2-13504
```

Transient catalytic combustor model

p0129 N82-13507

[NASA-CR-165324]

Advanced Low-Emissions Catalytic-Combustor	CEDANIC BONDING
Program, phase 1 aircraft gas turbine engines [NASA-CR-159656] p0025 N82-22265	Review of MASA progress in thermal barrier
Computer model of catalytic combustion/Stirling	coatings for stationary gas turbines [NASA-TM-81716] p0058 N82-17335
engine heater head	CRRAMIC COATINGS
[NÁSA-CR-165378] p0 134 N82-22666	Ceramic thermal barrier coatings for gas turbine
Catalytic combustion of actual lew and medium	engines
heating value gases [NASA-TM-82930] p0125 N82-30717	[ASHE PAPER 82-GT-265] p0071 A82-35441
Low and medium heating value coal gas catalytic	Evaluation of the potential of the Stirling engine for heavy duty application
combustor characterization	[NASA-CR-165473] p0128 H82-10505
[NASA-CR-165560] p0138 N82-32856	Gas turbine ceramic-coated-vane concept with
CATHODES	convection-cooled porous metal core
NT CELL CATHODES Stabilizing platinum in phosphoric acid fuel cells	[NASA-TP-1942] p0016 N82-14090 MHD oxidant intermediate temperature ceramic
[NASA-CR-165606] p0136 N82-29718	heater study
CATHODIC COATINGS	[NASA-CR-165453] p0131 N82-15527
Mechanism and models for zinc metal morphology in	Review of NASA progress in thermal barrier
alkaline media	Coatings for stationary gas turbines
[NASA-TM-82768] p0120 N82-19671 CAUCHY INTEGRAL FORMULA	[NASA-TM-81716] p0058 N82-17335 Evaluation of present thermal barrier coatings for
Cauchy integral method for two-dimensional	potential service in electric utility gas turbines
sclidification interface shapes	[NASA-CE-165545] p0063 N82-18368
p0089 A82-39899	JT9D ceramic outer air seal system refinement
CAVITATION U VITATION FLCW	program [NASA-CR-165554] p0106 N82-18603
CAVITATION PLOW	High temperature composites. Status and future
High-speed motion picture camera experiments of	directions
cavitation in dynamically loaded journal bearings	[NASA-TH-82929] p0051 N82-30336
[NASA-TM-82798] p0 100 N82-20543 CAVITY RESONATORS	Use of fiber like materials to augment the cycle
Analytic investigation of efficiency and	life of thick thermoprotective seal coatings [NASA-TM-82901] p0089 N82-32633
performance limits in klystron amplifiers using	CERALICS
multidimensional computer programs; multi-stage	Strength distributions of SiC ceramics after
depressed collectors; and thermionic cathode life studies	oxidation and oxidation under load
p0 118 W82-12553	[ACS PAPER 9-C-80C] p007 t A82-20143 Analytical and experimental evaluation of biaxial
Three-dimensional relativistic field-electron	Contact stress
interaction in a multicavity high-power	p0071 A82-20741
klystron. 1: Basic theory	Progress in ceramic component fabrication technology
[NASA-TP-1992] p008 N82-22439 CELESTIAL BODIES	[AIAA PAPER 82-1211] p0071 A82-35064 Design and development of a ceramic radial turbine
NT CARBONACEOUS CHONDRITES	for the AGTIOI
NT ECLIESING BINARY STARS	[AIAA PAPER 82-1209] p0109 A82-35480
NT NATURAL SATELLITES	Effects of oxidation and oxidation under load on
CELL CATHODES Moderate temperature Na cells. III -	strength distributions of Si3N4
Electrochemical and structural studies of	[ACS PAPER 69-B-80] p0071 A82-35871 Fabrication of sinterable silicon nitride by
Cr0,5V0.5S2 and its Na intercalates	injection molding
p0055 A82-15732	p0071 182-37015
Moderate temperature Na cells, IV - VS2 and	Development of low modulus material for use in
NbS2Cl2 as rechargeable cathodes in molten NaAlCl4 p0055 N82-15743	ceramic gas path seal applications [NASA-CE-165469] p0022 N82-10039
Stabilizing platinum in phosphoric acid fuel cells	Castable high temperature fractory materials
[NASA-CR-165483] p0130 N82-14628	[NASA-CASE-LEW-13080-2] p0066 N82-11210
Cathode catalysts for primary phosphoric acid fuel cells	Ultrasonic velocity for estimating density of
F NASA-CR-165578] p0134 N82-21709	structural ceramics [NASA-TM-82765] p0066 N82-14359
CELLS (BIOLOGY)	Pully plasma-sprayed compliant backed ceramic
A hydrodynamic model of an outer hair cell	turbine seal
[NASA-TH-82773] p0143 N82-16743 CENTRUR LAUNCH VEHICLE	[NASA-CASE-LEW-13268-2] p0101 N82-26674
NT ATLAS CENTAUR LAUNCH VEHICLE	Fully plasma-sprayed compliant backed ceramic turbine seal
Real-time computer simulation/emulation for	[NASA-CASE-LEW-13268-1] p0069 N82-29453
verification of multi-fault-tolerant control of	High temperature composites. Status and future
Centaur-in-Shuttle [AIAA 81-2263] p0040 A82-13494	directions
Real-time microcomputer simulation for space	[NASA-TM-82929] p0051 N82-30336 Ceramic applications in turbine engines
Shuttle/Centaur avionics	[NASA-CR-165197] p0164 N82-31148
p0033 A82-48245	Occurrence of spherical ceramic debris in
CRUTAUR VEHICLE	indentation and sliding contact
U NTAOR LAUNCH VEHICLE CRETHETER BAYES	[NASA-TP-2048] p0069 N82-32491 Advanced ceramic coating development for
VLA observations of solar active regions at 6 cm	industrial/utility gas turbines
wavelength	[NASA-CR-169852] p0065 N82-33494
p0 167 A82- 10 156	CESION
Time variability and structure of quiet sun sources at 6 cm wavelength	Cesiation of W/001/ - Work function lowering by multiple dipole formation
p0167 A82-26003	A82-30002
CENTRIFUGAL COMPRESSORS	CPRP
'Coriolis resonance' within a rotating duct	U RBON FIBER REINFORCED PLASTICS
flow induced vibrations in centrifugal compressors p0012 A82-37938	CHALCOGRADES
CENTRIFUGAL PUMPS	NT ALUMINUM OXIDES NT CARBON MONOXIDE
Liquid oxygen turbopump technology	NT HYDROGEN PEROXIDE
[NASA-CR-165487] p0105 N82-11468	NT INORGANIC SULPIDES
CERABAL PROTECTIVE COATINGS O OTECTIVE COATINGS	NT MAGNESIUM OXIDES
" OTECTIVE CONTRION	NT METAL OXIDES NT HOLYBDENUM SULPIDES

ORIGINAL PAGE IS OF POOR QUALITY

SUBJECT THORY

```
NT HITRIC OXIDE
                                                                              CHEMICAL BLEMENTS
NT ALUMINUM
 NT KITRCGEN OXIDES
 NT NITROUS OXIDES
                                                                                NT CARBON
 NI CXIDES
                                                                                NT CESIUM
 NT CUARTZ
                                                                                NT CHRONIUM
 NI SILICON CIOXIDE
NT TIN GXICES
                                                                                NT COBALT
                                                                                NT COPPER
 NT YTTRIUM OXIDES
                                                                                NT GOLD
 NT ZIFCGNIUM CXIDES
                                                                                NT HYDROGEN
CHARREL FLOW
                                                                                NT INDIUM
   Numerical modeling of three-dimensional confined
                                                                                NT IRON
      flows
                                                                                NT LIQUID HYDROGEN
      [ NASA-CR-165583]
                                                   p0158 N82-24078
                                                                                NT NIOBIUM
    Study of vapor flow into a capillary acquisition device --- for cryogenic rocket propellants
[NASA-CR-167883] p0091 N82-24
                                                                                NT NITROGEN
                                                                                NT NITROGEN IONS
                                                  p0091 N82-24452
                                                                                NT OXYGEN
CHAPBAN-JOUGET FLAME
                                                                                NT PLATINUM
 U AME PROPAGATION
                                                                                NT PLATINUM ISOTOPES
CHARACTERISTIC EQUATIONS
                                                                                NT PLUTONIUM 244
 U GENVALUES
U GENVECTORS
                                                                                NT BARE GASES
                                                                                NT SILICON
CHARACTERISTIC FUNCTIONS
                                                                                NT TANTALUK
 U GENVALUES
                                                                                NT TITANIUM
 U GENVECTORS
                                                                                NT TUNGSTEN
CHARACTERISTIC METHOD
                                                                                NT ZINC
 U THOO OF CHARACTERISTICS
                                                                                NT ZIRCONIUM
CHARACTERIZATION
                                                                               CHENICAL PRACTIONATION
   Characterization of an Experimental Referee
Broadened Specification (ERBS) aviation turbine
fuel and ERBS fuel blends
                                                                                  Quantitative separation of tetralin hydroperoxide
                                                                                     from its decomposition products by high
                                                                                     performance liquid chromatography
      [ NASA-TM-82893]
                                                   p0072 N82-32504
                                                                                                                                 p0048 A82-15696
CHARGE DISTRIBUTION
                                                                              CHEMICAL FUELS
NT AIRCRAFT FUELS
    Secondary electron emission from a charged
      dielectric in the presence of normal and oblique
                                                                                NT DIESEL FUELS
      electric fields [NASA-CF-168558]
                                                                                NT HYDROCARBON FUELS
                                                   p0084 N82-18507
                                                                                NT JET ENGINE PUELS
CHARGE EXCHANGE
                                                                                NT LIQUID FUELS
NT RP-1 ROCKET PROPELLANTS
    Additional extensions to the NASCAP computer code,
      volume 3
                                                                                NT SYNTHETIC FUELS
      [ NASA-CP- 167857]
                                                   p0040 N82-26378
                                                                               CHENICAL KINETICS
CHARGED PARTICLES
                                                                                U ACTION KINETICS
                                                                              CHEMICAL PROPERTIES
NT HEAT OF COMBUSTION
CHEMICAL PROPULSION
 NT ANIONS
 HT AFECH PLASMA
NA CYLINDRICAL PLASMAS
DT ENEGRATO PARTICLES
                                                                                  study of electrical and chemical propulsion systems for auxiliary propulsion of large space systems. Volume 1: Executive summary [NASA-CR-165502-VOL-1] p0046 H82-11
 UT PLASME SPEATHS
 NT PLASMAS (PHYSICS)
 BY SELATIVISTIC ELECTRON BEAMS
                                                                                                                                p0046 N82-11110
    happament for NASA/OAST - USAF/AFSC space
                                                                                  Study of electrical and chemical propulsion
      interdependency on spacecraft environment
                                                                                     systems for auxiliary propulsion of large space
      interaction
                                                                                     systems, volume 2
                                                   p0038 N82-14271
                                                                                     [ NASA-CR-165502-VOL-2 ]
                                                                                                                                 p0044 N82-11111
    Mapping of electrical potential distributions with
                                                                                   Low-thrust chemical propulsion system pump
      charged particle beams
[NASA-CR-168556]
                                                                                     technology
                                                   P0064 N82-18508
                                                                                     [ NASA-CR-165219]
CHARTS
                                                                                   An insight into auxiliary propulsion requirements
NT FLOW CHARTS
CHECKOUT EQUIPMENT
                                                                                     of large space systems
                                                                                     [NASA-TM-82827]
 U ST FOULPMENT
                                                                                  Low-thrust chemical propulsion system propellant
CHEMICAL ANALYSIS
                                                                                     expulsion and thermal conditioning study. Executive summary
 NT CZONCHETRY
 NT SPECTROSCOPIC ANALYSIS
                                                                                     [ NAS A-CR- 165622 ]
    Fuel economy and exhaust emissions characteristics
                                                                                  Low-thrust chemical propulsion system propellant
      of diesel vehicles: Test results of a prototype
fiat 131TC 2.4 liter automobile
[NASA-CR-165535] p0164 N82-180
                                                                                     expulsion and thermal conditioning study [NASA-CR-167841] p0045
                                                                                                                                 p0045 N82-24288
                                                                                  Large Space Systems/Propulsion Interactions
[MASA-TM-82904]
                                                   p0164 N82-1806B
CHEMICAL COMPOSITION
                                                                                                                                 p0042 N82-27358
                                                                              CHEMICAL BEACTIONS
NT ALKYLATION
    Effects of nadic ester concentration and processing on physical and mechanical properties of IMR/Celion 6000 composites
                                                                                NT DEOXIDIZING
                                                   p0051 A82-27440
                                                                                NT ELECTROCHEMICAL OXIDATION
    NASA Broad Specification Fuels Combustion
                                                                                NT FLUORINATION
      Technology program - Pratt and Whitney Aircraft Phase I results and status
                                                                                NT NITRIDING
                                                                                NT OXIDATION
      [ AIAA PAPER 82-1088]
                                                   p0021 182-34999
                                                                                NT OXIDATION-REDUCTION REACTIONS
    Some properties of RP sputtered hafnium nitride
                                                                                NT SULFATION
      coatings
                                                                                NT THERMAL DECOMPOSITION
   [NASA-TM-82826] p0067 NB2-213. Thermodynamic and transport combustion properties of hydrocarbons with air. Part 2: Compositions corresponding to Kelvin temperature schedules in
                                                                                  Surface chemistry and wear behavior of
                                                   p0067 NB2-21331
                                                                                     single-crystal silicon carbide sliding against
                                                                                     iron at temperatures to 1500 C in vacuum [NASA-TP-1947] p0067
                                                                                                                                  p0067 N82-19374
                                                                               CHEMICAL REACTORS
Catalytic combustion of residual fuels
[NASA-TH-82731]
p
      part 1
      [ NASA-TP- 1907]
    Thermodynamic and transport combustion properties
                                                                                                                                  p0118 #82-13504
      of hydrocarbons with air. Part 4: Compositions
                                                                               CHENICAL TESTS
      corresponding to Rankine temperature schedules
                                                                                NT CHEMICAL ANALYSIS
      in part 3 [NASA-IP-1909]
                                                                                NT OZONOMETRY
                                                   p0161 N82-32189
                                                                                NT SPECTROSCOPIC ANALYSIS
```

NT TRANSISTOR CIRCUITS

SUBJECT INDEX

```
CHEETLUNINESCENCE
                                                                                       Proceedings of the Conference on High-temperature
   Flame structure in a swirl stabilized combustor inferred by radiant emission measurements
                                                                                          Electronics
                                                                                          [NASA-TH-84069]
                                                                                                                                         p0081 N82-15311
                                                                                       High voltage power translator development [NASA-CR-165547] p008
                                                      D0056 A82-28694
CHEMONUCLEAR PROPULSION
                                                                                                                                         p0084 #82-18506
 U PRICAL PROPULSION
                                                                                   CIRCULAR CYLINDERS
CHILLING
                                                                                       Monlinear Marangoni convection in bounded layers.
                                                                                          I - Circular cylindrical containers. II -
Rectangular cylindrical containers
 U CLING
CHIPS (BLECTRONICS)
    Multijunction high voltage concentrator solar cells
                                                                                                                                         p0094 A82-39501
                                                                                       Surface-tension induced instabilities: Effects of lateral boundaries
                                                      p0043 A82-11796
CHLORIDES
                                                                                       [AASA-CR-165530] p0092 N82-11396 Effect of location in an array on heat transfer to
 NT HYDROGEN CHLORIDES
 NT IRON CHLORIDES
NT SOCIUM CHLORIDES
CHLOBIBE COMPOUNDS
NT IRON CHLORIDES
NT SODIUM CHLORIDES
CHOKES (YUEL SYSTEMS)
                                                                                          a cylinder in crossflow [NASA-TM-82797]
                                                                                                                                         p0087 N82-19493
                                                                                   CIRCULATION
                                                                                    NT ATMOSPHERIC CIRCULATION
                                                                                   CIRCULATORY SYSTEM
    Plow through aligned sequential orifice type inlets
[NASA-TF-1967] pC087 N82-20467
                                                                                    NT ACRTA
                                                                                   CIVIL AVIATION
                                                                                       Bibliography of NASA published reports on general aviation, 1975 to 1981
[NASA-TM-83307] p0001 N82-19
CHOKES (RESTRICTIONS)
    Toward the use of similarity theory in two-phase
      choked flows
                                                                                                                                         p0001 N82-19132
                                                                                   CLARK Y AIRFOIL
U RFOIL PROFILES
CLEAR EMERGY
                                                      p0089 A82-16570
CHOMBRITES
 NT CARBONACEOUS CHONDFITES
CHOPPERS (ELECTRIC)
U ECTFIC CHOPPERS
                                                                                       Interfacing wind energy conversion equipment with
                                                                                          utility systems
CHRCHATOGRAPHY
 NT LIQUID CHROMATOGRAPHY
                                                                                       Mod-2 wind turbine system cluster research test
CHROER
                                                                                          program.
                                                                                                       Volume 1: Initial plan E-1290
 U ROMIUM
                                                                                          [NASA-TM-82906]
                                                                                                                                         p0123 N82-26807
CHRONIUM
                                                                                   CLEAN FUELS
NT FUEL OILS
    Performance of advanced chromium electrodes for
      the NASA Fedor Energy Storage System
                                                                                   CLEARANCES
      [ NASA-TM-82724]
                                                     p0 118 N82-12574
                                                                                       Optical tip clearance sensor for aircraft engine
   A status review of NASA'S COSAM (Conservation Of Strategic Aerospace Faterials) program
[NASA-TM-82852] p00060 N82-2:
                                                                                          controls
                                                                                                                                         p0015 182-37691
                                                                                          [AIAA PAPER 82-1131]
                                                      p0060 NB2-24326
                                                                                       CF6 Jet Engine Diagnostics Program:
                                                                                                                                         High pressure
   Requirements for optimization of electrodes and electrolyte for the iron/chrcwium Redox flow cell [NASA-CR-165218] p0136 N82-25640
                                                                                          compressor clearance investigation
                                                                                          [NASA-CR-165580]
                                                                                                                                         P0025 N82-21197
                                                                                       Investigation of the tip clearance flow inside and at the exit of a compressor rotor passage
CHROHIUM ALLOYS
                                                                                                                                         p0026 N82-25253
    Long-term high-velocity oxidation and hot
                                                                                          [NASA-CR-169004]
      corrosion testing of several NiCrAl and FeCrAl
                                                                                       CF6 jet engine performance improvement: High
                                                                                          pressure turbine active clearance control [NASA-CR-165556] p0027
       base oxide dispersion strengthened alloys
                                                      p0062 A82-37151
                                                                                                                                         p0027 N82-28297
    Solute transport during the cyclic oxidation of
                                                                                       Active clearance control system for a turbomachine [NASA-CASE-LEW-12938-1] p0020 N82-32366 Rotor tip clearance effects on overall and
      Ni-Cr-Al alloys
[NASA-CF-165544]
                                                      p0064 N82-27462
                                                                                          blade-element performance of axial-flow
transonic fan stage
    Nicral ternary alloy having improved cyclic
      oxidation resistance
       [ NASA-CASE-LEW- 13339-1]
                                                                                          [ NASA-TP-2049]
                                                      D0061 N82-31505
                                                                                                                                         p0020 N82-33389
CHROETUM COMPOUNDS
                                                                                   CLOSE PACKED LATTICES
    Moderate temperature Na cells. III -
Electrochemical and structural studies of
Cr0.5V0.5S2 and its Na intercalates
                                                                                       Net shape fabrication of Alpha Silicon Carbide
                                                                                          turbine components
[ASME PAPER 82-GT-216]
                                                                                                                                         p0071 A82-35403
                                                      p0055 A82-15732
                                                                                   CLOSED CYCLES
   Improved chromium electrodes for REDOX celis [NASA-CASE-LEW-13653-1] p0121 N
                                                                                       Comparative analysis of CCMHD power plants ---
                                                      p0121 N82-22672
                                                                                          Closed Cycle MHD
    Chemical and electrochemical behavior of the
                                                                                                                                         p0 158 A82-20747
       Cr(3)/Cr(2) half cell in the NASA Redox Energy
                                                                                    CLOSED LOOP SYSTEMS
      Storage System [NASA-IM-82913]
                                                                                     U EDBACK CONTROL
                                                      p0055 N82-33463
                                                                                    CLOUD PHYSICS
CHRCHOSPHERE
                                                                                       Design of prototype charged particle fog dispersal
    Time variability and structure of quiet sun
                                                                                          unit
       sources at 6 cm wavelength
                                                                                          [NASA-CR-3481]
                                                                                                                                         p0141 N82-16659
                                                      p0167 A82-26003
CHUCGING
                                                                                       Magnetohydrodynamics (MHD) Engineering Test
 U MBUSTION STABILITY
                                                                                          Facility (ETF) 200 MWe power plant Conceptual
CIRCUIT BREAKERS
                                                                                       Design Engineering Report (CDER)
[NASA-CR-165452-VOL-5]
Techniques for enhancing durability and
equivalence ratio control in a rich-lean,
three-stage ground power gas turbine combustor
   High voltage Dr. switchgear development for multi-ky space power system: Aerospace technology development of three types of solid state power controllers for 200-1100VDC with
                                                                                                                                         P0132 N82-17603
      current ratings of 25, 50, and 80 amperes with
                                                                                          [NASA-TM-82922]
                                                                                                                                         p0124 N82-29717
      one type utilizing an electromechanical device [NASA-CF-165413] p0083 N82-1
                                                                                   COAL DERIVED GASES
                                                                                       Low NO subx heavy fuel combustor concept program.

Phase IA: Coal gas addendum

[NASA-CR-165577] p0133 N82-18
                                                      p0083 N82-13357
CIRCUITS
 NT FLECTRIC ERIDGES
                                                                                                                                         p0133 N82-18690
 NT ENCAPSULATED MICROCIRCUITS
                                                                                       Low NO sub x heavy fuel combustor concept program.

Phase 11: Combustion technology generation coal
 NT EQUIVALENT CIPCUITS
 NT INTEGRATED CIRCUITS
NT MATRICES (CIRCUITS)
NT MICROWAVE CTROUITS
                                                                                          gas fuels
                                                                                          [NASA-CR-165614]
                                                                                                                                         P0055 N82-22326
                                                                                       Low NO sub x heavy fuel combustor concept program
 NT FOWER SUPPLY CIRCUITS
                                                                                          phase IA gas tests
[NASA-CR-167877]
 NT SWITCHING CIRCUITS
                                                                                                                                          p0055 N82-25337
```

```
Catalytic combustion of actual low and medium
      heating value gases
      [ NASA-TM-82930]
                                                   n0125 K82-30717
   Low and medium heating value coal gas catalytic combustor characterization
[NASA-CR-165560] p0 138 882-
                                                   p0 138 N82-32856
COAL DERIVED LIQUIDS
    Deposit formation in liquid fuels. I - Effect of
      coal-derived Lewis bases on storage stability of
      Jet A turbine fuel
                                                   p0074 A82-22241
Low NOx heavy fuel combustor concept program [NASA-CR-165367] PO136 NO
                                                   p0136 N82-25635
    Performance and operational economics estimates
      for a coal qualification combined-cycle
      cogeneration powerplant [NASA-TM-827291
                                                   p0120 N82-19672
    Integrated gasifier combined cycle polygeneration
      system to produce liquid hydrogen
      [ NASA-TM-82921 ]
                                                   p0125 N82-30713
   Micronized coal burner facility
[NASA-CASE-LEW-13426-1] p0126
Gas turbine critical research and advanced technology (CRT) support project
[NASA-TH-82872] p0126
                                                   00126 N82-31769
                                                   p0126 N82-31776
COAL UTILIZATION
    Levis Research Center's coal-fired, pressurized,
      fluidized-bed reactor test facility
                                                   PC087 NS2-11397
       [ NASA-TM-81616]
CONTING
 NT ENCAPSULATING
NT HETALLIZING
COATINGS
 NT ALUMINUM COATINGS
 NT ANTIBEFLECTION COATINGS
 NT CATHODIC COATINGS
NT CERAMIC COATINGS
NT ENCAPSULATING
 NT GLAZES
 NT GOLD COATINGS
 NT HETAL COATINGS
 NT METALLIZING
 NT PLASTIC COATINGS
NT PROTECTIVE COATINGS
NT REPRACTORY COATINGS
NT SPRAYED COATINGS
 NT THERMAL CONTROL COATINGS
    Deposition of reactively ion heam sputtered
      silicon nitride coatings
      [ NASA-TM-82942]
                                                    p0069 N82-30401
COANTAL PLOW
    Mass and momentum turbulent transport experiments
      with confined coaxial jets [NASA-CR-165574]
                                                    p0090 N82-19496
COANTAL TRANSMISSION
 U ANSMISSION
    A status review of NASA's CCSAM (Conservation Of
      Strategic Aerospace Materials) program
                                                   p0060 N82-24326
       [NASA-TM-82852]
COBBLT ALLOYS
    Effects of cobalt on structure, microchemistry and properties of a wrought nickel-base superalloy
                                                   pC065 A82-34973
    The influence of cohalt on the tensile and stress-rupture properties of the nickel-base
       superalloy MAR-M247
                                                    p0063 A82-47399
    The influence of cobalt on the microstructure of the nickel-base superalloy EAR-M247
                                                    p0063 A82-47400
    Effects of cobalt on the microstructure of Udimet
       700
    [NASA-CR-165605] p0064 N82-
Evaluation of candidate stirling engine heater
                                                    p0064 N82-28409
      tube alloys at 820 deg and 860 deg C [NASA-TM-82837] P
                                                    p0061 N82-30372
    Overlay metallic-cermet allcy coating systems -
      for gas turbine engines [NASA-CASE-LEW-13639-1]
                                                    p0070 NB2-33522
COEFFICIENT OF PRICTION
    Stress evaluations under rolling/sliding contacts
      [NASA-CR- 165561]
                                                   p0113 N82-17521
    Priction and wear of iron in corrosive metal [NASA-TP-1985] p0058 N8
                                                    p0058 N82-20291
CORPETCIENTS
 NT COEFFICIENT OF PRICTION
```

NT DISCHARGE CORFFICIENT

```
NT NOZZLE THRUST COEPFICIENTS
COGRERRATION
    An assessment of alternative fuel cell designs for
      residential and commercial cogeneration
                                                  p0138 A82-24695
    Performance and operational economics estimates for a coal gasification combined-sycle
      cogeneration powerplant [NASA-TH-82729]
COMESION
    Universal binding energy relations in metallic
      adhesion
      [NASA-TH-82706]
                                                  p0058 N82-11183
COLD WEATHER TESTS
Experiments on fuel heating for connectial aircraft
p0072 M82-26483
COLLECTORS
 U CUMULATORS
COLLIBATO RS
    Secondary electron emission from a charged
      dielectric in the presence of normal and oblique
      electric fields [NASA-CR-168558]
                                                   p0084 N82-18507
COLLOIDS
 NT AEROSOLS
COLOR CODING
    Application of image processing techniques to
      fluid flow data analysis [NASA-TM-82760]
                                                   p0004 N82-16049
COLUMBIUM
 U OBIUM
COMBINED CYCLE POWER GENERATION
    Assessment of steam-injected gas turbine systems
      and their potential application
                                                   p0119 N82-18694
      [NASA-TM-82735]
    Performance and operational economics estimates for a coal gasification combined-cycle
      cogeneration posseplant [NASA-TM-82729]
                                                   p0120 N82-19672
    Parametric performance analysis of steam-injected
       gas turbine with a
       thormionic-energy-converter-lined combustor
                                                   p0121 N82-23678
       [NASA-2M-82736]
    Integrated gasifier combined cycle polygeneration system to produce liquid hydrogen [NASA-TM-82921] p0125 N82-30
                                                   p0125 N82-30713
COMBUSTIBILITY
 U AMMABILITY
COMBUSTIBLE FLOW
    Time resolved density measurements in premixed
       turbulent flames
      [ATAA PAPER 82-0036]
                                                   p0056 A82-22033
    Numerical modeling of turbulent combustion in
       premixed dases
                                                   p0056 A82-28708
    The premixed flame in uniform straining flow
                                                   p0055 A82-43194
COMBUSTION
 NT FUEL COMBUSTION
NT HYDROCARBON COMBUSTION
NT SOLID PROPELLANT COMBUSTION
  NT SUPERSONIC COMBUSTION
    Catalytic combustion of actual low and medium
      heating value gases
[NASA-TM-82930]
                                                   p0125 N82-30717
COMBUSTION CHAMBERS
    On the prediction of swirling flowfields found in
       axisymmetric combustor geometries
                                                   p0029 A82-12120
    Mean flowfields in axisymmetric combustor geometries with swirl [AIAA PAPER 82-0177] p009
                                                   p0092 A82-17824
    Dilution jet behavior in the turn section of a
    reverse flow combustor
[AIAA PAPER 82-0192] p002; A8:
High temperature durable catalyst development
                                                   p0021 A82-20291
                                                   p0056 A82-20739
    Flame structure in a swirl stabilized combustor
       inferred by radiant emission measurements
                                                   p0056 A82-28694
    Modeling parameter influences on MHD swirl combustion nozzle design
[AIMA PAPER 82-0984] p0011 A82-3194
Experimental study of the effects of secondary air on the emissions and stability of a lean
                                                   p0011 A82-31947
       premixed combustor
       [AIAA PAPER 82-1072]
                                                   p0021 A82-34992
    NASA Broad Specification Fuels Combustion
       Technology program - Pratt and Whitney Aircraft
```

p0021 A82-34999

Phase I results and status

Small gas turbine combustor primary zone development

[AIAA PAPER 82-1088]

SUBJECT INDEX

[AIAA FAPER 82-1159]	p0 103 A82-35036
Evaluation of fuel injection configue control carbon and soot formation	
combustors	
[AIAA FAPER 82-1175] Combustor development for automotive	p0021 A82-35041
[AIAA PAPER 82-1208]	p0 104 A82-35062
Turbulence measurements in a confine	d jet using a
six-orientation hot-wire probe tec	
Flow aerodynamics modeling of an HHD	00094 A82-37710 swirl
combustor - Calculations and exper	
verification	p0094 A82-44782
Trends in high temperature gas turbi	
[NASA-TM-62715]	p0058 NB2-11182
Low NO sub x heavy fuel combustor co [NASA-CR-165512]	
Catalytic combustion of residual fue	p0129 N82-12572 ls
[NASA-TH-82731]	p0 118 N82-13504
Transient catalytic combustor model [NASA-CR-165324]	p0129 N82-13507
Gas-turbine critical research and ad	
technology support project	
[NASA-TM-81708] Effect of fuel injector type on perf	p0118 N82-13509
emissions of reverse-flow combusto	C and
[NASA-TP-1945]	p0016 N82-15040
Investigations of flowfields found in combustor geometries	n typical
[NASA-CR- 165061]	p0090 N82-15360
Lew NO subx heavy fuel combuster con	cept program.
Phase IA: Coal gas addendum [NASA-CP-165577]	DO 133 N82-18690
Dilution jet behavior in the turn se	
reverse flow combuster	
[NASA-TM-82776] Investigations of flowfields found i	p0017 N82-19220
combustor quometries	" cibrost
[NASA-CR- 168585]	р0090 N82-19495
YF 102 in-duct combustor noise measu turbine nozzle, volume 1	rements with a
[NASA-CR- 165562-VOL-1]	p0153 N82-21031
YF 102 in-duct combustor noise reasu	rements with a
turbine nozzle, volume 2 [NASA-CP-165562-VOL-2]	p0 153 N82-21032
YF 102 in-duct combustor noise measu	
turbine nozzle, volume 3	
[NASA-CR-165562-VOL-3] Advanced Low-Emissions Catalytic-Com	p0155 N82-21033 bustor
Program, phase ! aircraft gas	
[NASA-CR-159656]	p0025 N82-22265
Investigation of soot and carbon for small gas turbine combustors	mation in
[NASA-CP- 167853]	p0025 N82-22267
Low NO sub x heavy fuel combustor con Phase IA: Combustion technology q	
Phase II: Combustion technology q	eneracion coar
[NASA-CR- 1656147	p0055 N82-22326
Nonlinear structural and life analys combustor liner	es of a
[NASA-TH-82846]	p0111 N82-24501
Low Nox heavy fuel combustor concept	program,
phase 1 [NASA-CR-165449]	p0 135 N82-24651
Low Nor heavy fuel combustor concept	program.
Phase 1: Combustion technology ge	neration
[NASA-CP-1654821 Practure mechanics criteria for turb	p0136 N82-24725 ine engine hot
section components	- · · ·
[NASA-CF-167896]	p0027 N82-25257
Low MO sub x heavy fuel combustor co phase IA gas tests	ucehr brodram
[NASA-CP- 167877]	p0055 N82-25337
Low NOx heavy fuel combustor concept	
addendum: Low/mid heating value g evaluation	assous ruet
[NASA-CR- 165615]	p0055 NB2-25738
Low NOx heavy fuel combustor concept [NASA=CR-165367]	program p0136 HB2-25635
Low NOx heavy fuel combustor concept	
[NASA-CH-167876]	p0074 N82-26482
Optimization of the oxidant supply s combined cycle MHD power plants	Ascem tot
[NASA-TE-82909]	p0123 N82-26790

```
Techniques for enhancing durability and equivalence ratio control in a rich-lean,
      three-stage ground power gas turbine combustor
      [ WASA-TM-82922]
                                               p0124 ¥82-29717
   Computations of soot and and NO sub x emissions
      from gas turbine combustors [NASA-CR-167930]
                                                p0139 N82-29777
   Levis pressurized, fluidized-bed combustion program. Data and calculated results
      [ NASA-TH-8 1767]
                                                p0 124 M82-30704
    Exhaust gas measurements in a propane fueled swirl
      stabilized combustor
                                                p0091 N82-31641
      [NASA-CR-169293]
   Flow process in combustors
   [NASA-CR-169294] p0092 N8;
Investigations of flowfields found in typical
                                                p0092 N82-31642
      combustor geometries [NASA-CR-169295]
                                                p0092 N82-31643
    Micronized coal burner facility
      [ NASA-CASE-LEW-13426-1]
                                                p0 126 N82-31769
   Gas turbine critical research and advanced
      technology (CRT) support project [NASA-TM-82872]
                                                p0126 N82-31776
   Nonlinear constitutive theory for turbine engine
      structural analysis
                                                p0 112 N82-33744
   Low NOx heavy fuel combustor concept program [NASA-CR-165481] p0138 N
                                                DO 138 N82-33827
COMBUSTION CONTROL
   Computer model of catalytic combustion/Stirling engine heater head
      [NASA-CR-165378]
                                                p0134 NB2-22666
COMBUSTION EFFICIENCY
   Atomization and combustion properties of flashing
      injectors
      [AÏAA PAPER 82-0300]
                                                D0092 X82-17880
   High temperature durable catalyst development
                                                p0056 A82-20739
   NASA Broad Specification Fuels Combustion
      Technology program - Pratt and Whitney Aircraft
      Phase I results and status
      [AIAA PAPER 82-1088]
                                                p0021 A82-34999
   Catalytic combustion of residual fuels [NASA-TM-8273]]
                                                p0118 #82-13504
   Demonstration of catalytic combustion with
      residual fuel
      [NASA-CR-165369]
                                                p0131 N82-16484
   Experimental study of an integral catalytic combustor: Heat exchanger for Stirling engines
      [ NASA-TH-82783]
                                                PO 119 NB2-18691
    Preliminary results on performance testing of a
      turbocharged rotary combustion engine [NASA-TM-62772] p0
                                                p0017 H82-21194
   Testing of fuel/oxidizer-rich, high-pressure
      preburners
      [ NASA-CR-165609]
                                                p0074 N82-24353
    Low NOx heavy fuel combustor concept program,
      phase 1
      [NASA-CR-165449]
                                                P0135 N82-24651
    Exhaust cas measurements in a propane fueled swirl
      stabilized combustor
      [ NASA-CR-169293]
                                                p0091 N82-31641
   Low and medium heating value coal gas catalytic
      combustor characterization
      [NASA-CR-165560]
                                                p0138 N82-32856
COMBUSTION HEAT
U AT OF COMPUSTION
COMBUSTION INSTABILITY
 U MBUSTION STABILITY
COMBUSTION PHYSICS
   Symposium /International/ on Combustion, 18th,
University of Waterloo, Waterloo, Ontario,
Canada, August 17-22, 1980, Proceedings
                                                p0056 A82-28651
   Experimental and theoretical studies of the laws
      governing condensate deposition from combustion
                                                p0057 A82-28709
   Thermodynamic and transport combustion properties
      of hydrocarbons with air. Part 1: Properties
   in SI units
[NASA-TP-1906] p0 161 N82-3210
Thermodynamic and transport combustion properties
of hydrocarbons with air. Part 2: Compositions
                                                p0 16 1 N82-32186
      corresponding to Kelvin temperature schedules in
      [ NASA-TP- 1907 ]
                                                p0161 N82-32187
   Thermodynamic and transport combustion properties
```

of hydrocarbons with air. Part 3: Properties

[AIAA 82-0482]

```
in US customary units
                                                                                         COMMUNICATION NETWORKS
       [ NASA-TP- 1998 ]
                                                         p0161 NB2-32188
                                                                                              The 30/20 GHz communications Litellite trunking
    Thermodynamic and transport combustion properties
                                                                                                network study
       of hydrocarbons with air Part 4: Compositions
                                                                                                [ NASA-CR-165467]
       corresponding to Rankine temperature schedules
in part 3
[NASA-TP-1909]
COMBUSTION PRODUCTS
                                                          p0161 N82-32189
    Pormation of oxides of nitrogen in monodisperse
                                                                                                [AIAA 82-0449]
       spray combustion of hydrocarbon fuels
                                                                                                switching system [AIAA 82-0458]
                                                          p0057 A82-37571
   Catalytic combustion of residual fuels
[NASA-TH-82731] p0118 N82-13
Low NC subx heavy fuel combustor concept program.
Phase 1A: Coal gas addendum
[NASA-CH-165577] p0133 N82-18
                                                         P0118 N82-13504
                                                                                                [AIAA 82-0526]
                                                          DO 133 N82-18690
    Investigation of soot and carbon formation in
    small das turbine combustors
[NASA-CF-167853]
Exhaust emissions survey of a turbofan engine for flame holder swirl type augmentors at simulated altitude flight conditions
                                                          p0025 N82-22267
       [ NASA-TM-82787]
    Low NCx heavy fuel combustor concept program addendum: Low/mid heating value gaseous fuel
                                                                                                launches
                                                                                                [AIA: PAPER 82-0558]
       evaluation
       [ BASA-CP- 165615]
                                                          p0055 N82-25338
    Low NOx heavy fuel combustor concept program
[NASA-CR-165367] p0136 N82-25635

Effect of fuel to air ratic on Mach 0.3 burner rig
hct corrosion of Zr02-Y203 thermal barrier
                                                                                                satellites
                                                                                                SS-TDMA applications
       coatings
    [NASA-TM-82879] p0061 N82-30373 Exhaust gas measurements in a propane fueled swirl
       [ NASA-TM-82879]
       stabilized combustor
                                                                                                [ NASA-CR-165467]
       [ NASA-CR- 169293]
                                                          p0091 N82-31641
COMBUSTION STABILITY
 NT FLAME STABILITY
                                                                                                [NASA-CR-165154]
    Secondary effects in combustion instabilities
       leading to flashback [AIAA PAPER 82-0037]
                                                          p0056 A82-17746
    Testing of fuel/oxidizer-rich, high-pressure
       preturners
       [ NASA-CR- 165609]
                                                          p0074 N82-24353
COMBUSTION WAVES
 U AME PEOPAGATION
COMBUSTION WIND TUNKELS
    Numerical modelling of turbulent flow in a
       combustion tunnel
                                                          p0093 A82-27000
COMBUSTORS
 U MBUSTION CHAMBERS
COMBERCIAL AIRCRAFT

NT FOEING 747 AIRCRAFT

NT DC 9 AIRCRAFT

NT DC 10 AIRCRAFT

Lightweight diesel engine designs for commuter
                                                                                                application study
                                                                                                INASA-CR-1691257
                                                                                         COMMUNICATION SYSTEMS
                                                                                           U LECOMMUNICATION
       type aircraft
                                                                                          COMPARISON
       [ NASA-CR- 165470]
                                                          p0023 N82-11068
    Bihlicgraphy of NASA published reports on general aviation, 1975 to 1981
[NASA-TM-83307] p0001 N82-19
                                                          p0001 N82-19132
                                                                                                [NASA-CR-168586]
    NASA/Lewis Research Center Icing Research Program p0001 N82-21148
                                                                                          COMPARTMENTS
                                                                                           NT AIR LOCKS
NT PRESSURE CHAMBERS
    Future propulsion opportunities for commuter
       airplanes
                                                                                          COMPRESATION
       [ NASA-TM-82880 ]
                                                          p0018 N82-24203
COMMERCIAL AVIATION
U VIL AVIATION
U MMRRCIAL AIRCRAFT
COMMERCIAL ENERGY
                                                                                         COMPLEX VARIABLES

NT CAUCHY INTEGRAL FORMULA
    An assessment of alternative fuel cell designs for residential and commercial cogeneration
                                                                                           NT CONFORMAL MAPPING
                                                                                           NT MATHIEU PUNCTION
                                                          p0 138 AB2-24695
                                                                                           NT SINGULARITY (MATHEMATICS)
    Magnetohydrodynamics (MBD) Engineering Test
Pacility (ETF) 200 NWe power plant Conceptual
                                                                                         COMPLIANCE (ELASTICITY)
U DULUS OF ELASTICITY
    Dosign Engineering Report (CDER)
[NASA-CF-165452-VOL-5]
[Nevelopment and test fuel cell powered on-site integrated total energy systems. Phase 3: Full-scale power plant development
                                                                                          COMPONENT RELIABILITY
                                                          p0132 N82-17603
       [ NASA-CR- 167898]
                                                          p0137 NS2-30705
COMMUNICATION CABLES
NT WAVEGUIDES
COMMUNICATION EQUIPMENT
    Baseband-processed SS-TDMA communication system architecture and design concepts
                                                                                                 relationships
```

```
D0078 N82-13302
COMMUNICATION SATELLITES
Advanced 30/20 GHz communication satellites
                                              p0034 A82-12623
   30/20 GHz communications satellite multibeam antenna
                                               p0079 A82-23486
   Dynamic switch matrix for the TDMA satellite
                                               p0085 A82-23494
   Planning satellite communication services and
      spectrum-orbit utilization
                                               p0080 A82-23538
   Adaptive rain fade compensation
                                               P0080 A82-27178
   30/20 GHz demonstration system for improving orbit
                                               D0080 A82-27189
   Open-loop nanosecond-synchronization for wideband
      satellite communications
                                               p0036 A82-27224
   Centaur capabilities for communications satellite
                                               p0034 A82-36286
   Microwave intersatellite links for communications
                                               p0036 A82-36925
   Wideband, high speed switch matrix development for
                                               p0086 A82-43784
   The 30/20 GHz communications satellite trunking network study
                                               p0078 N82-13302
   Cross-impact study of foreign satellite
      communications on NASA's 30/20 GHz program
                                              p0078 N82-17420
   The 30/20 GHz flight experiment system, phase 2.
      Volume 1: Executive summary [NASA-CR-165409-VOL-1]
                                              p0078 N82-20362
   The 30/20 GHz flight experiment system, phase 2.

Volume 2: Experiment system description

FNASA-CR-165409-VOL-2] p0078 N82-20363
   The 30/20 GHz flight experiment system, phase 2.
      Volume 3: Experiment system requirement document
[NASA-CR-165409-VOL-3] p0078 N82-2036
                                              P0078 N82-20364
   The 30/20 GHz flight experiment system, phase 2.
     Volume 4: Experiment system devolopment plan
[NASA-CR-165409-VOL-4] p0078 N82-20365
   Communications satellite systems capacity analysis
   [NASA-CR-16791] p0034 N82-2733 | NASA Adaptive Multibeam Phased Array (AMPA): An
                                               p0079 N82-28503
   Application of an airfoil stall flutter computer
      prediction program to a three-dimensional wing:
      Prediction versus experiment
                                               p0007 N82-19169
   Compensation mechanism in liquid encapsulated
      Czochralski GaAs Importance of nelt stoichiometry
                                              p0086 A82-40403
   Internal breakdown of charged spacecraft dielectrics
   The application of probabilistic design theory to high temperature low cycle fatigue [NASA-CR-165488]
   Research and development program for non-linear
      structural modeling with advanced
      time-temperature dependent constitutive
      [NASA-CR-165533]
                                               p0024 N82-16080
   Reliability model for planetary gear [NASA-TH-82859]
                                               p0101 182-28643
```

p0079 A82-23508

[NASA-CR- 168842]

```
COMPOSITE MATERIALS
                                                                                             COMPRESSION LOADS
 NT ALTHINUM BORON COMPOSITES
ST EORGW REINFORCED MATERIALS
NT CAFECN FIBER REINFORCED PLASTICS
NT EPOXY MATRIX COMPOSITES
                                                                                              NT AXIAL COMPRESSION LOADS
                                                                                                 Analytical and experimental evaluation of biaxial
                                                                                                    contact stress
                                                                                                                                                         p0071 A82-20741
     EUTECTIC COMPOSITES
                                                                                             COMPRESSIVE STREETH
  NT FIBER COMPOSITES
                                                                                                 Compression behavior of unidirectional fibrous
 NT FIBER BEINFORCED COMPOSITES
NT GLASS FIRER REINFORCED PLASTICS
NT GRAPHITE-PPOXY COMPOSITES
                                                                                                    composite
                                                                                                    [ NASA-TH-82833]
                                                                                            COMPRESSOR BLADES
 NT GFAPHITE-POLYIMIDE COMFOSITES
                                                                                                 Characteristics of the flow in the annulus-wall region of an axial-flow compressor rotor blade
  HT LANINATES
 NT HETAL MATRIX COMPOSITES
                                                                                                     passage
 NT ECLYBER MATRIX COMPOSITES
                                                                                                 [AIAA PAPER 82-0413] p0009 A82-179
Three-dimensional flow field in the tip region of
 NT RESIN MATRIX COMPOSITES
 NT WHISKER COMPOSITES
                                                                                                    a compressor rotor passage. I - Mean velocity
                                                                                                 profiles and annulus wall boundary layer
[ASHE PAPER 82-GT-!!]
The use of optimization techniques to design
controlled diffusion compressor blading
[ASHE PAPER 82-GT-!49]
p0022 A
    Effects of madic ester concentration and processing on physical and mechanical properties of PMR/Celion 6000 composites
                                                                                                                                                        p0011 182-35280
                                                            p0051 A82-27440
    Kevlar/PMR-15 polyimide matrix composite for a complex shaped DC-9 drag reduction fairing [AIAA PAPER 82-1047] p0002 A82-Novel improved PMR polyimides [NASA-TM-82733] p0049 N82-
                                                                                                                                                        p0022 A82-35373
                                                                                                 The effect of rotor blade thickness and surface finish on the performance of a small axial flow
                                                            p0002 A82-37678
                                                                                                     turbine
                                                                                                 (ASME PAPER 82-GT-222) p0022 A82-:
Aerodynamic damping measurements in a transonic
                                                            p0049 NB2-11117
                                                                                                                                                         p0022 A82-35409
    Development of battery separator composites
       [ NASA-CF- 16550 8]
                                                            p0128 N82-11547
                                                                                                    compressor
    Indentation law for composite laminates
                                                                                                    [ASME PAPER 82-GT-287]
                                                                                                                                                         p0012 A82-35459
       [ HASA-CR- 165460]
                                                            p0052 N82-15123
                                                                                                  The effect of rotor blade thickness and surface
    Tribological characteristics of a composite
                                                                                                    finish on the performance of a small axial flow
       total-surface hip replacement
                                                                                                     turbine
                                                                                                 p0003 N82-13114
Core compressor exit stage study. Volume 4: Data
and performance report for the best stage
configuration
fW181-CON-16666
       [ NASA-TE- 1853]
                                                            p0066 N82-16239
    Bibliography of Lewis Research Center technical publications announced in 1981
       [ NASA-TM-82839]
                                                            p0163 NB2-27191
    Tribological avaluation of composite materials
                                                                                                    [ HASA-CR-165357]
                                                                                                                                                         p0023 N82-14092
       made from a partially fluorinated polyimide [NASA-TM-82832] p0069 N8
                                                                                                  Core compressor exit stage study. Volume 5:
                                                            p0069 N82-29459
                                                                                                     Design and performance report for the Rotor
                                                                                                    C/Stator B configuration [NASA-CR-165358]
    Kevlar/PMF-15 reduced drag DC-9 reverser stang
       fairing
                                                                                                                                                         p0023 N82-14093
       [ NASA-CR- 165448]
                                                            p0052 N82-31448
                                                                                                  The use of optimization techniques to design
    Environmental and High-Strain Bate effects on
                                                                                                     controlled diffusion compressor blading
    composites for engine applications
[NASA-TM-82882] p0051 N82
Structural tailoring of engine blades (STAEBL)
                                                                                                    [NASA-TH-82763]
                                                                                                                                                         p0016 882-14094
                                                                                                 Computer program for aerodynamic and blading design of multistage axial-flow compressors [NASA-TP-1946] p0016 N8
                                                            p0051 N82-31449
       I NASA-CR- 167949]
                                                            p0028 N82-33391
                                                                                                                                                         p0016 N82-15039
                                                                                                 Performance of single-stage axial-flow transonic compressor with rotor and stator aspect ratios of 1.63 and 1.78, respectively, and with design pressure ratio of 1.82
COMPOSITE STRUCTURES
 NT LAMINATES
    Structural dynamics of shroudless, hollow, fan
    Structural dynamics of shroudless, hollow, ran blades with composite in-lays
[ASKE FAPIR 82-GT-284]

Performance of PTFE-lined composite journal bearings
[ASLZ FREPRINT 82-AM-1A-1]

Cirq tunnel tests of a composite porous leading edge for use with a liquid anti-ice system ---
                                                                                                     [ NASA-TP-1974]
                                                                                                  A FORTRAN program for calculating three
                                                                                                    dimensional, inviscid and rotational flows with shock waves in axial compressor blade rows:
                                                                                                     User's manual
                                                                                                    [NASA-CR-3560]
       Levis icing research tunnel
                                                                                                                                                         p0008 N82-26230
                                                                                                  Core compressor exit stage study, volume 6 [NASA-CR-165553] p0027
       [ NA 14 - 164966]
    Ferform two of PTFT-lined composite journal bearings [NASA-TM-82779] p0048 N82-17263
                                                                                                                                                         p0027 N82-27310
                                                                                                  B747/JT9D flight loads and their effect on engine
                                                            p0048 N82-17263
    Numerical simulation of one-dimensional heat
transfer in composite holies with phase change
--- wing deicing pads
[NASA-CF-165607] p0002 N82-2
                                                                                                    running clearances and performance deterioration: BCAC NAIL/P and WA JT9D engine
                                                                                                    diagnostics programs [NASA-CR-165573]
                                                            p0002 N82-22142
                                                                                                                                                         p0027 N82-28296
    Structural dynamics of shroudless, hollow fan
                                                                                             COMPRESSOR EFFICIENCY
       blades with composite in-lays
                                                                                                  Progress in the development of energy efficient
       [ NASA-TM-82816]
                                                            p0018 N82-22266
                                                                                                     engine components
    Compression behavior of unidirectional fibrous
                                                                                                     [ASHE PAPER 82-GT-275]
                                                                                                                                                          p0030 A82-35450
       ccmposite
                                                                                                  JT8D high pressure compressor performance
       [ NASA-TM-82833]
    [NASA-TM-82833] P0050 N82-22313
Experience and assessment of the DOE-NASA Mod-1
                                                                                                     improvement
                                                                                                     [ NASA-CR- 165531 ]
                                                                                                                                                          p0 104 N82-11467
       2000-Kilowatt wind turbine generator at Boone,
                                                                                                  CF6 Jet Engine Diagnostics Program:
                                                                                                                                                         High pressure
       North Carolina [NASA-TM-82721]
                                                                                                    compressor clearance investigation [NASA-CH-165580]
                                                            p0125 N82-30710
                                                                                                                                                          P0025 N82-21197
COMPOSITES
                                                                                                  STGSTK: A computer code for predicting multistage axial flow compressor performance by a meanline
  U REOSLIE MATERIALS
COMPOSITION (PROPERTY)
NT CHEMICAL COMPOSITION
NT MOISTURE CONTENT
                                                                                                    stage stacking method [NASA-TP-2020]
                                                                                                                                                         p0018 NB2-25250
                                                                                             COMPRESSOR BOTORS
COMPRESSIBLE FLOW

NT TRANSONIC FLOW

Solutions of the compressible Navier-Stokes equations using the integral method

[ALAA PAPER 81-0046] p0093 1
                                                                                                  Interaction of compressor rotor blade wake with
                                                                                                     wall boundary layer/vortex in the end-wall region [ASME PAPER 81-GR/GT-1] p0010 A82-1930
                                                                                                                                                         p0010 A82-19301
                                                                                                 Effects of blade loading and rotation on Compressor rotor wake in end wall regions
[AIAA PAPER 82-0193] p0010 A82-2206
Three dimensional flow field inside the passage of a low speed axial flow compressor rotor
    [AIAA PAPER 81-0046] p0093 A82-23832 Computer program for aerodynamic and blading
                                                                                                                                                         D0010 A82-22063
       design of multistage axial-flcw compressors [NASA-TP-1946] p0016 N8
                                                            p0016 N82-15039
      new numerical approach for compressible viscous
                                                                                                     [AIAA PAPER 82-1006]
                                                                                                                                                          p0011 A82-31964
       flows
                                                                                                  Investigation of the tip-clearance flow Inside and
```

at the exit of a compressor rotor passage. I -

D0090 N82-22455

p0017 N82-15041

p0006 N82-16044

p0007 N82-22210

```
Hean velocity field [ASME PAPER 82-GT-12] p0011 A82-35281 Three-dimensional flow field in the tip region of
                                                                                           Effects of internal hoat transfer on the structure
                                                                                             of self-similar blast vaves
                                                                                                                                               p0093 A82-32225
       a compressor rotor passage II - Turbulence
                                                                                           Small gas turbine combustor primary zome development
                                                                                           [ATAA PAPER 82-1159] p0 103 A82-35
Bluff-body flameholder wakes - A simple numerical
                                                                                                                                               PO 103 A82-35036
    [ASKE PAPER 82-GT-234] p0011 A82-3:
In-plane inertial coupling in tuned and severely
mistured bladed disks
                                                        P0011 A82-35416
                                                                                             solution
                                                                                             [AIAA PAPER 82-1177]
       [ASME PAPER 82-GT-2881
                                                        p0012 A82-35460
                                                                                           A computational design method for transonic
    Performance of single-stage axial-flow transonic compressor with rotor and stator aspect ratios
                                                                                             turbomachinery cascades
[ASME PAPER 82-GT-117]
                                                                                                                                               p0022 A82-35348
    of 1.63 and 1.78, respectively, and with design pressure ratio of 1.82
[NASA-TP-1974] PC017 N82-19222
High-speed laser anemometer system for intrarotor
                                                                                           Plow distributions and discharge coefficient
                                                                                              effects for jet array impingement with initial
                                                                                              crossflow
                                                                                           [ASME PAPER 82-GT-156] p0011 A82-35379
A study of viscous flow in stator and rotor passages
      flow mapping in turbomachinery [NASA-TP-1663]
                                                                                             [ASHE PAPER 82-GT-248]
                                                                                                                                              p0011 A82-35427
    [NASA-TP-1663]
Performance of single-stage axial-flow transonic compressor with rotor and stator aspect ratios of 1.63 and 1.77, respectively, and with design pressure ratio of 2.05
[NASA-TP-2001]
Investigation of the tip clearance flow inside and at the exit of a compressor rotor passage
[NASA-CR-169004]
D0026 N82-25253
                                                                                           Rapid approximate determination of nonlinear solutions - Application to aerodynamic flows and
                                                                                              design/optimization problems
                                                                                           p0012 A82-35571
Investigation of rotational transonic flows
                                                                                              through ducts using a finite element scheme [AIAA PAPER 82-1267] p0012 A8
                                                                                                                                               p0012 A82-37711
                                                        p0026 N82-25253
       [ NASA-CR- 169004]
                                                                                           A summary of V/STOL inlet analysis methods
                                                                                                                                              p0006 A82-40921
      PCRIBAN program for calculating three
                                                                                           Plow aerodynamics modeling of an MHD swirl
      dimensional, inviscid and rotational flows with shock waves in axial compressor blade rows:
                                                                                              combustor - Calculations and experimental verification
       User's manual
       I NASA-CR- 3560 1
                                                                                                                                               p0094 A82-44782
                                                        p0008 N82-26230
    Three dimensional flow field inside compressor
                                                                                           Comparison of two and three dimensional flow
       rotor, including blade boundary layers [NASA-CR-169120]
                                                                                              computations with laser anemometer measurements in a transonic compressor rotor
                                                        p0091 N82-27686
    Active clearance control system for a turbomachine
                                                                                              [NASA-TM-82777]
                                                                                                                                               p0004 M82-15020
                                                                                           numerical analysis and FORTRAN program for the computation of the turbulent wakes of turbomachinery rotor blades, isolated airfoils and cascade of airfoils
      [ NASA-CASE-LEW- 129 38- 1]
                                                        p0020 N82-32366
    Status of laser anemometry in turbomachinery
       research at the Lewis Research Center
                                                        p0096 N82-32686
                                                                                              [ NASA-CR-3509 ]
COMPRESSORS
 NT CENTRIFUGAL COMPRESSORS
                                                                                           Development of a locally mass flux conservative
 NT SUPERCHARGERS
                                                                                              computer code for calculating 3-D viscous flow
 NT TRANSONIC COMPRESSORS
NT TURBCCOMPRESSORS
                                                                                              in turbomachines
                                                                                                                                               p0007 NB2-22214
                                                                                              [NASA-CR-3539]
                                                                                           A new numerical approach for compressible viscous
    JIBD high pressure compressor performance
                                                                                              flows
       improvement
    [NASA-CR-165531] p0104 N82-1146
Investigation of the tip clearance flow inside and at the exit of a compressor rotor passage
                                                        p0104 N82-11467
                                                                                             [ NASA-CR-168842]
                                                                                           Turbofan forced mixer-nozzle internal flowfield.
                                                                                              Volume 2: Computational fluid dynamic predictions [NASA-CR-3493] p0091 N82-22459
                                                                                                                                               p0091 N82-22459
       [ NASA-CF- 169004]
                                                        p0026 N82-25253
COMPUTATION
                                                                                           Multiple-grid acceleration of Lax-Wendroff
                                                                                              algorithms
 NI CREIT CALCULATION
                                                                                           [NASA-TM-82843] p0 149 N
Rime ice accretion and its effect on mirfoil
    Film shape calculations on supercomputers [NASA-TM-82856] p010
                                                                                                                                               p0 149 N82-22922
                                                        p0 100 N82-25519
COMPUTATIONAL PLUID DYNAMICS
                                                                                              performance
    The three-dimensional boundary layer on a rotating
                                                                                              [NASA-CR-165599]
                                                                                                                                               p0008 N82-24166
                                                                                           Computer program for calculating full potential transonic, quasi-three-dimensional flow through
       helical blade
                                                        p0009 A82-15459
                                                                                              a rotating turbomachinery blade row
    Toward the use of similarity theory in two-phase
                                                                                              [NASA-TP-2030]
                                                                                                                                               p0005 N82-28247
       choked flows
                                                                                           Past generation of three-dimensional computational boundary-conforming periodic grids of C-type --- for turbine blades and propellers
                                                        p0089 A82-16570
    A simple finite difference procedure for the
       vertex controlled diffuser
       [ MIAA FAPER 82-0109]
                                                        p0030 A82-17788
                                                                                              [NASA-CR-165596]
                                                                                                                                               p0009 N82-28253
                                                                                           Flow process in combustors
[NASA-CR-169294]
    Forms of three-dimensional supersonic free jets in
       linear approximation
                                                                                                                                               p0092 N82-31642
                                                                                       COMPUTER AIDED DESIGN
    Three-dimensional flow calculations including boundary layer effects for supersonic inlets at angle of attack
                                                                                           Experimental verification of a computational procedure for the design of TWT-refocuser-MDC systems --- Multistage Depressed Collectors
                                                                                                                                               p0082 A82-16128
       TAINA FAPER 82-00611
                                                        p0005 A82-19778
    Solutions of the compressible Navier-Stokes
                                                                                           A new approach to the minimum weight/loss design
       equations using the integral method [AIAA PAPER 91-0046]
                                                                                              of switching power converters
                                                        P0093 A82-23832
                                                                                                                                               p0082 A82-16831
    Numerical analysis of confined turbulent flow p0093 A82-24748
                                                                                           Modeling and Analysis of Power Processing Systems (MAPPS). Volume 1: Technical report [NASA-CR-165538] p0083 N82-14
                                                                                                                                               P0083 N82-14447
    Numerical modelling of turbulent flow in a
                                                                                           Computer program for aerodynamic and blading design of multistage axial-flow compressors [NASA-TP-1946] p0016 N8
       combustion tunnel
                                                        D0093 A82-27000
                                                                                                                                               P0016 N82-15039
    Multigrid simulation of asymptotic curved-duct
       flows using a semi-implicit numerical technique
                                                                                           Interactive-graphic flowpath plotting for turbine
```

engines

[NASA-TH-82756]

[NASA-CR-3507]

[NASA-CR- 165600]

fictitious-gas concept

CAS22 - PORTRAN program for fast design and analysis of shock-free airfoil cascades using

Design of supercritical cascades with high solidity

p00 10 A82-29003

p0010 A82-31933

p00 10 A82-31939

Natural convection with combined driving forces p0093 A82-31445

Finite volume calculation of three-dimensional

Application of a finite element algorithm for the

sclution of steady transonic Euler equations

potential flow around a propeller [AIAA PAPER 82-0957]

FATAA FAPER 82-09701

```
The optimal design of involute gear teeth with
      unequal addenda
                                                  p0101 N82-28645
            A computer-aided design program for linear
      multivariable control systems
      T NASA-TH-928711
    Automated procedure for develoring hybrid computer
simulations of turbofan engines. Part 1:
General description
      [ NASA-TP- 1851 ]
                                                  p0146 M82-33020
   Structural tailoring of engine blades (STABEL)
[NASA-CP-167949] p0028 M82
                                                   p0028 M82-3339:
COMPUTER GRAPHICS
    Interactive-graphic flowpath plotting for turbine
      engines
[NASA-TM-82756]
                                                   p0017 N82-15041
   Shaded computer graphic techniques for visualizing and interpreting analytic fluid flow models
                                                  PO 145 N82-17880
      [ NASA-CE- 168418]
Synthetic battery cycling techniques [MASA-TH-82945]
COMPUTER METHODS
U MPUTER PROGRAMS
                                                  p0125 N82-30715
COMPUTER PROGRAMS
 NT HASTEAN
 NT OPERATING SYSTEMS (CONFUTERS)
    On the automatic generation of FEM mcdels for
      ccaplex quars - A work-in-progress report
                                                  p0 109 A82-48243
   Integrated analysis of engine structures [NASA-TM-82713] p01
                                                   p0111 N82-11491
   Numerical simulation of plasma insulator interactions in space. Part !: The self
      consistent calculation
                                                  p0039 N82-14277
   Numerical simulation of plasma insulator
      interactions in space. Part 2: Dielectric
      effects
                                                   p0039 N82-14273
    CAS22 - FORTRAN program for fast design and
      analysis of shock-free airfoil cascades using
      fictitious-qas concept
      [ NASA-CR-35077
    Research and development program for non-linear
      structural modeling with advanced
      time-temperature dependent constitutive
      relationships
      [ NASA-CR- 1655331
                                                   p0024 N82-16080
    Modeling and Analysis of Power Processing Systems
      (MAFPS). Volume 2: Appendices [NASA-CE-165539]
                                                   p0145 N82-16748
    Prediction of sound radiation from different
      practical jet engine inlets [NASA-CR-1651201
                                                   p0153 N82-16810
    Hybrid and electric advanced vehicle systems
      (beavy) simulation
      [ NASA-CR- 165536]
    Investigation and evaluation of a computer program
      to minimize three-dimensional flight time tracks
    [NASA-CR-168419] p0145 N82-17
Numerical analysis and FORTRAN program for the computation of the turbulent wakes of turbomachinery rotor tlades, isolated airfoils and cascade of airfoils
                                                  p0145 N82-17879
      [ NASA -CR-3509]
    Application of an airfoil stall flutter computer
      prediction program to a three-dimensional wing:
Prediction versus experiment
    [NASA-CR-169586] p0007 N8;
Investigations of flowfields found in typical
                                                   p0007 N82-19169
      combustor geometries [NASA-CF-168585]
    Development of a locally mass flux conservative
      computer code for calculating 3-D viscous flow
      in turbomachines
      [ NASA-CR-3539 ]
                                                   p0007 N82-22214
    SIGSTM: A computer code for predicting multistage
      axial flow compressor performance by a meanline
      stage stacking method
      [ NASA-TP-2020]
                                                   p0018 N82-25250
    Additional extensions to the NASCAP computer code,
      volume 1
      [ NASA-CR- 167855]
                                                   p0146 N82-25810
    A FOETRAN program for calculating three
dimensional, inviscid and rotational flows with
shock waves in axial compressor blade rows:
      User's manual
      [ NASA-CR-3560 ]
                                                   p0008 N82-26230
```

```
Bird impact analysis package for turbine engine
      [ MASA-TH-0283] p0112 M82-26701
Computer program for calculating full potential
transonic, quasi-three-dimensional flow through
a rotating turbomachinery blade row
[ NASA-TP-2030] p0005 M82-20247
AESOP: A computer of the c
           fan blades
[MASA-TH-82831]
       APSOP: A computer-aided design program for linear
           multivariable control systems [WASA-TH-8287]]
                                                                                         p0148 N02-30992
       Pinite element-integral simulation of static and
flight fan noise radiation from the JT15D
            turbofan engine
            [ NASA-TH-82936]
                                                                                         p0152 N82-31068
       Large displacements and stability analysis of
           nonlinear propeller structures [NASA-TH-82850]
                                                                                         p0:12 N82-31707
       High speed cylindrical roller bearing analysis.
SYP computer program CYDEAM. Volume 2: User's
            [ NASA-CR-165364]
                                                                                         p0146 N82-31968
       Automated procedure for developing hybrid computer
            simulations of turbofan engines.
                                                                                      Part 1:
           General description [NASA-TP-1851]
                                                                                         p0146 N82-33020
 COMPUTER SIMULATION
   O MPUTERIZED SIMULATION
 COMPUTER STORAGE DEVICES
A generalized memory test algorithm (NASA-TH-82074)
COMPUTER SYSTEMS PROGRAMS
ET OPERATING SYSTEMS (COMPUTERS)
                                                                                         p0 146 N82-31971
 COMPUTER TECHNIQUES
       The NASA MERIT program - Developing new concepts for accurate flight planning
            [AIAA PAPER 82-0340]
                                                                                         p0014 A82-17894
 COMPUTERIZED CONTROL
U HERICAL CONTROL
COMPUTERIZED DESIGN
   U MPUTER AIDED DESIGN
 COMPUTERIZED SIMULATION
   HT ANALOG SIMULATION
   NT DIGITAL SIMULATION
       Design and verification of a multiple fault
            tolerant control system for STS applications
       using computer simulation
[AIAA 81-2173] p0035
Maximum entropy image reconstruction from
                                                                                         p0035 A82-10124
            projections
                                                                                                      A82-11053
        Real-time computer simulation/emulation for
            verification of multi-fault-tolerant control of
            Centaur-in-Shuttle
            [AIAA B1-2283]
       A simple finite difference procedure for the wortex controlled diffuser
       [ATAN PAPER 82-0109] p0030 A82-1'
Validation of the NASCAP model using spaceflight
                                                                                         D0030 A82-17788
                                                                                         p0038 A82-17872
            [AIAA PAPER 82-0269]
            real time Pegasus propulsion system model for VSTOL piloted simulation evaluation [AIAA PAPER 81-2663] p0020 A82-
                                                                                         P0020 A82-19221
       Mathematical modeling of ice accretion on airfoils
[ATAN PAPER 82-0284] p0014 A82-2709
                                                                                         p0014 A82-27098
       On the automatic generation of PEN models for
            complex gears - A work-in-progress report
                                                                                         p0 109 A82-48243
       Oblique-incidence secondary emission from charged
            dielectronics
                                                                                         D0039 N82-14227
       New features and applications of PRESTO, a computer code for the performance of
            reqenerative, superheated steam turbine cycles [NASA-TP-1954] p0119 N82-16477
       Hybrid and electric advanced vehicle systems
       (heavy) simulation
[NASA-CR-165536] p0163 N82-1693
Mapping of electrical potential distributions with
                                                                                          p0163 N82-16938
            charged particle beams [NASA-CR-168556]
                                                                                         p0084 N82-18508
        Numerical simulation of one-dimensional heat
            transfer in composite bodies with phase change
            --- wing deicing pads [NASA-CR-165607]
                                                                                          p0002 N82-22142
       Additional extensions to the NASCAP computer code,
            volume 2
            [ NASA-CR-167856]
                                                                                          p0040 MB2-26377
```

combustor liner

[NASA-TM-82846]

```
Pinite element-integral simulation of static and flight fun noise cadiation from the JT15n
                                                                                Monlinear constitutive theory for turbine engine
                                                                                  structural analysis
      turbofan engino
                                                                                                                              DO 112 N82-33744
      [ NASA-TM-82936]
                                                 p0 152 N82-31068
                                                                            CONSTRUCTION
   Automated procedure for develoging hybrid computer simulations of turbofan engines. Part 1:
                                                                                Study of multi-megawatt technology needs for photovoltaic space power systems. Volume
                                                                                                                             Volume 1:
                                                                                  Executive summary [NASA-CH-165323-VOL-1]
      General description
      [ NASA-TP- 1851]
                                                 p0146 N82-33020
                                                                                                                             p0130 N82-14636
COMPUTERS
                                                                            CONSTRUCTION IS SPACE
 NT DIGITAL COMPUTERS
                                                                             U BITAI ASSEMBLY
NT HYERID CCHPUTFRS
NT HYEROCOMPUTERS
CONCENTRATION (COMPOSITION)
NT MOISTUPE CONTENT
                                                                            CONSUMABLES (SPACECRAFT)
NT PROPELLANT STORAGE
                                                                              NT STORABLE PROPELLANTS
                                                                            CONSUMPTION
NT ENERGY CONSUMPTION
CONCENTRATORS
   Subsystems design and component development for
                                                                              NT PUEL CONSUMPTION
      the parabolic dish module for solar thermal
                                                                            CONTACT RESISTANCE
   power systems
[NASA-CR-168941], p0135 N82-2
Determination of optimus sunlight concentration
level in space for 3-4 cascade solar cells
[NASA-TH-82899] p0126 N82-2
                                                                                Bolling resistance of electric vehicle tires from track tests
                                                 p0135 N82-24646
                                                                                  [NASA-TH-82836]
                                                                                                                              p0 124 N82-28786
                                                                            COUTABLINARIS
                                                                            NT TRACE CONTAMINANTS
CONTAMINATION
                                                 p0126 N82-32853
CONDENSATES
   Experimental and theoretical studies of the laws
                                                                              NT FUEL CONTAMINATION
      governing condensate deposition from combustion
                                                                            CONTOURS
      dages
                                                                                Analytic investigation of effect of end-wall
                                                 p0057 A82-28709
                                                                                  contouring on stator performance
CONDENSATION
                                                                                  [NASA-TP-1943]
                                                                                                                              p0003 x82-14051
                                                                                Comparison of experimental and analytical performance for contoured endwall stators [NASA-TM-82877] p0019 1
   Effects of condensation and surface action on the
      structure of steady-state fronts
                                                        AB2= 19360
                                                                                                                             p0019 N82-26299
COMDITIONS
                                                                            CONTROL DEVICES
NT KUITA-JOUKOWSKI CONDITION CONDUCTING HEDIA
                                                                             U NTROL EQUIPMENT
                                                                            CONTROL EQUIPMENT
 U NDUCTORS
                                                                                The effects of controls and controllable and
CONDUCTIVE HEAT TRANSFER
                                                                                  storage loads on the performance of stand-alone
   Heat transfer in cooled porous region with curved
                                                                                  photovoltaic systems
                                                                                p0127 A82-45027 Sensor failure detection system --- for the F100
                                                 p0089 182-14848
   Self-alaptive closed constrained solution algorithms for nonlinear conduction
                                                                                  turbofan engine
                                                                                   [ NASA-CR- 1655 15 ]
                                                 p0094 A82-45157
                                                                            CONTROL SIMULATION
   Numerical simulation of one-dimensional heat
                                                                                A tensor approach to addeling of nonhomogeneous
      transfer in composite hodies with phase change --- wind deicing pads
                                                                                  nonlinear systems
                                                                                                                              p0 148 A82-19064
      [ NASA-CR- 165607]
                                                 p0002 N82-22142
                                                                            CONTROL SURFACES
CONDUCTORS
                                                                             NT EXTERNALLY BLOWN FLAPS
 NT ELECTRIC CONDUCTORS
                                                                             NT GUIDE VANES
 NT ELECTROLYTES
NT ION EXCHANGE MEMERANE ELECTROLYTES
                                                                              NT JET VANES
                                                                            COUTROL THEORY
 NT MOLTEN SALT PLECTROLYTES
                                                                                The role of modern control theory in the design of
                                                                            CONTROLLS ATMOSPHERES

(CATAL ATMOSPHERES
 NT FHCTCCONDUCTORS
 NT SUPERCONFUCTORS
                                                                                                                             p0018 N82-22262
   Component technology for space power systems [NASA-TM-62928] p0082 N
                                                 P0082 N82-34474
CORFERENCES
                                                                            Cour Bullery
   Symposium /International/ on Combusting, 18th,
University of Waterloo, Waterloo, University,
Canada, August 17-22, 1980, Proceedings
                                                                                Past recovery, high voltage silicon diodes for AC motor controllers
                                                                                                                              p0086 A82-36926
                                                 p0056 A82-28651
                                                                                Straight and chopped DC performance data for a General Electric 58143641 DC shunt motor with a
   Spacecraft Charging Technology, 1980 [NASA-CP-2182]
                                                 p0037 NB2-14213
                                                                                   General Electric EV-1 controller
   Proceedings of the Conference on High-temperature
                                                                                  [ NASA-CR-165507]
                                                                                                                             p0085 N82-24425
      Electronics
                                                                                Summary of electric vehicle dc motor-controller
      [ NASA-TM-84069]
                                                 p0081 N82-15311
                                                                                  tests
   Future propulsion opportunities for commuter
                                                                                  INASA-TM-828637
                                                                                                                              P0082 N82-33636
      airplanes
                                                                            CONVECTION
      [NASA-TM-82880]
                                                 p00 18 N82-24203
                                                                             NT PREE CONVECTION
CONFLUENCE
                                                                                Gas turbine ceramic-coated-vane concept with
 U NYFRGENCE
                                                                                  convection-cooled porous metal core
COMPORNAL NAPPING
                                                                                  [ NASA-TP-1942]
                                                                                                                              p0016 N82-14090
   Oblique-incidence secondary emission from charged dielectronics
                                                                            CONVECTIVE PLON
                                                                                Sound generated in a cascade by three-dimensional
                                                                                  disturbances convected in a subsonic flow [AIAA PAPER 81-2046] p0 153
                                                 p0039 N82-14227
COMPORMAL TRANSFORMATIONS
                                                                                                                             PO 153 A82-10460
                                                                                Heat transfer in cooled porous region with curved
 U NEORMAL MAPPING
CONSERVATION
                                                                                  boundary
NT ENERGY CONSERVATION

CONSERVATION LAWS

Multiple-qrid acceleration of Lax-Wendroff algorithms
                                                                                                                              p0089 A82-14848
                                                                                Nonlinear Marangon, convection in bounded layers.
                                                                                  I - Circular cylindrical containers. II -
                                                                                  Rectangular cylindrical containers
     [NASA-TM-82843]
                                                 p0149 NB2-22922
                                                                                                                              p0094 A82-39501
CONSTITUTIONAL DIAGRAMS
                                                                            CONVECTIVE HEAT TRANSPER
 U ASE CIAGRAMS
                                                                                Effects of condensation and surface motion on the
CONSTITUTIVE EQUATIONS
                                                                                  structure of steady-state fronts
   Nonlinear structural and life analyses of a
                                                                                                                                     A82-19360
```

p0111 N82-24501

An experimental investigation into the feasibility

p0095 ¥82-14494

of a thermoelectric heat flux gage

[NASA-TM-82755]

```
CONTERGRACE
    Numerical comparisons of nonlinear convergence
      accelerators
                                                 p0149 A92-31438
   Acceleration of convergence of vector sequences [NASA-TM-82931] p0149 N82-
                                                 p0149 N82-29075
CONVERTAPLANES
 D STOL AIRCFAFT
CONVERTERS
    A 10-kH series resonant converter design,
transistor characterization, and base-drive
      octimization
                                                  p0086 A82-36927
CONVEXITY
    Turbulent boundary layer heat transfer
      experiments: Convex curvature effects including introduction and recovery
      [ NASA-CR-35 17]
                                                  p0090 N82-17456
COOLING
 NT AIF COCLING
NI FILM COCLING
 NT SWEAT CCCLING
   Low-thrust Isp sensitivity study
[NASA-CR-165621]
                                                  p0045 N82-22309
COPPER
    The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 p0076 N82-24361
COPPER ALLOYS
    High temperature low cycl fatigue mechanisms for
      nickel base and a coppe base alloy
      [ NASA-CH- 3543]
                                                  p0064 N82-26436
CORES
                                              Volume 4: Data
   Core compressor exit stage study.
      and performance report for the best stage
      configuration
      [ NASA-CP- 165357]
    Core compressor exit stage study. Volume 5:
      Design and performance report for the Rotor
      C/Stator E configuration [NASA-CR-165358]
                                                  P0023 N82-14093
CORICLIS EFFECT
    The influence of Coriolis forces on gyroscopic
    motion of spinning blades
[ASME FAPER 82-GT-163] p0030 A82
'Coriolis resonance' within a rotating duct --
                                                  p0030 A82-35384
      flow induced vibrations in centrifugal compressors
                                                  D0012 A82-37938
CORMER PLOW
    Dilution jet behavior in the turn section of a
      reverse flow combustor
      FAIAA PAPER 82-0192]
    Experimental study of turbulence in blade end wall
      ccrner region
[NASA-CF-169283]
                                                  DC091 N82-31639
CORPOSCULAR RADIATION
HT FLICTRON BEAMS
HT FRERGETIC PARTICLES
  NT PELATIVISTIC ELECTRON BEAMS
CORBELATION
 NT ANGULAR CORRELATION
CORROSION
 NT HOT CORECSION
    Influence of corrosive solutions on microhardness
      and chemistry of magnesium exide /001/ surfaces
[NASA-PP-2047] p0102 N82-31
                                                  p0102 N82-31691
CORROSION PREVENTION
    Method of protecting a surface with a silicon-slurry/aluminide coating --- coatings
      for gas turbine engine blades and wanes [NASN-CAST-LEW-13343-1] p006
                                                  p0068 N82-28441
CORROSION BESISVANCE
  NT CXICATION RESISTANCE
    Development of improved high temperature coatings
      for IN-792 + HP
      [ NASA-CP- 165395]
    Review of NASA progress in thermal barrier
      coatings for stationary gas turbines [NASA-TM-81716]
                                                  p0058 N82-17335
    Covering solid, film cooled surfaces with a duplex thermal barrier coating [NASA-CASY-LBW-13450-1] p0088 N82-2546
                                                  p0088 N82-25463
CORROSION TESTS
    Tong-term high-valucity oxidation and hot
      corrosion testing of several NiCrAl and FeCrAl
      base oxide dispersion strengthened alloys
                                                  p0062 A82-37151
    Friction and wear of iron in corrosive metal
```

[NASA -TP- 1985]

```
CORUNDUK
 U UNINUM OXIDES
COST AVALYSIS
   Cost/benefit studies of advanced materials
technologies for future aircraft turbine
engines: Materials for advanced turbine engines
      [ NASA-CR-167849]
                                                  p0026 N82-25254
COST EFFECTIVENESS
   Comparative analysis of CCMHD power plants ---
      Closed Cycle MHD
                                                  p0158 A82-20747
COST ESTIBATES
   Magnetohydrodynamics MHD Engineering Test Facility
      ETF 200 NWe power plant. Conceptual Design
Engineering Report CDER. Volume 3: Costs and
      schedules
   [MASA-CR-165452-VOL-3] p0128 M82-101
Summary and evaluation of the conceptual design
study of a potential early connectal MHD power
plant (CSPEC)
                                                  p0128 N82-10495
      [ WASA-TH-82734]
COSTS
 NT LIFE CYCLE COSTS
COUNTER-RATATING WHEELS
Precision of spiral-bevel gears
      [ NASA-TH-82888]
                                                  p0102 #82-30552
COUPLING
   In-plane inertial coupling in tuned and severely
      mistuned bladed disks
      [ASME PAPER 82-GT-288]
                                                  p0012 A82-35460
   Coupled cavity traveling wave tube with velocity
      tapering
[NASA-CASE-LEW-12296-1]
                                                  p0082 N82-26568
COVERINGS
    Testing of solar cell covers and encapsulants
      conducted in a simulated space environment
      [ NASA-CR-165475]
                                                  p0129 N82-12571
CONBLL METEOD
 U MERICAL INTEGRATION
COLLINGS
   Low speed testing of the inlets designed for a tanden-fan V/STOL nacelle --- conducted in the Lewis 10 by 10 foot wind tunnel
      [NASA-TM-82728]
    Thrust reverser for a long duct fan engine --- for
      turbofan engines
[NASA-CASE-LEW-13199-1]
CRACK FORMATION
U ACK INITIATION
                                                  p0019 N82-26293
CRACK GRONETRY
   Creep crack-growth: A new path-independent T sub o and computational studies
      [ NASA-CR- 168930]
                                                  p0113 N82-24503
CRACK INITIATION
    Effect of tangential traction and roughness on
      crack initiation/propagation during rolling
      contact
                                                  p0103 182-30022
    Turbine blade nonlinear structural and life analysis
                                                  p0021 A82-34981
      [AIAA PAPER 82-1056]
    Analysis of crack propagation as an energy
      absorption mechanism in metal matrix composites [NASA-CR-165051] p0052 N82-14
                                                   p0052 N82-14288
    Elevated temperature fatigue testing of metals
      [NASA-TH-82745]
                                                  p0111 N82-16#19
    Mechanisms of deformation and fracture in high
       temperature low cycle fatigue of Rene 80 and IN
       100
      [ NASA-CR-165498]
                                                   p0113 N82-26706
    A preliminary study of crack initiation and growth at stress concentration sites
      [ NASA-CR-1693581
                                                   DD 115 N82-33738
CRACK PROPAGATION
    Effect of tangential traction and roughness on
      crack initiation/propagation during rolling
                                                   p0 10 3 A82-30022
    Effects of oxidation and oxidation under load on
      strength distributions of Si3N4
      [ACS PAPER 69-B-80]
    On a study of the /Delta T/c and C/asterisk/
integrals for fracture analysis under non-steady
    Hoving singularity creep crack growth analysis
      with the /Delta T/c and C/asterisk/ integrals --- path-independent vector and energy rate line
      integrals
                                                   p0116 A82-40066
```

p0058 N82-20291

ORIGINAL PAGE IS OF POOR QUALITY

	4 SOUTH
Crack displacements for J/I/ testing with compact specimens	p0063 A82-47399 Creep shear behavior of the oxide dispersion
p0112 #82-40358 Analysis of crack propagation as an energy	strengthened superalloy HA 6000E [NASA-TH-82704] p0058 #82-10195
absorption mechanism in metal matrix composites [NASA-6%-165051] p0052 N82-14288	CREEP TESTS Fatigue and creep-fatigue deformation of several
Microsechanical predictions of crack propagation and fracture energy in a single fiber	nickel-base superalloys at 650 C p0062 A62-47398
boron/aluminum model composite [NASA-CR-168550] p0052 N82-18326	CRESTATEONS U AVELING WAVE TUBES
Environmental effects on defect growth in	CREVICES
Composite materials	U ACKS CPITERIA
Ultrasonic scanning system for imaging flav growth in composites	WT STRUCTURAL DHSIGN CRITERIA CRITICAL HACH MUHBER
[NASA-TH-82799] p0076 M82-22386	U CH NUMBER CRITICAL REYNOLWS NUMBER
Creep crack-growth: A new path-independent T sub o and computational studies	U YNOLDS HUNEZR
[NASA-CR-168930] P0113 NR2-24503 Fracture mechanics criteria for turbine engine hot section components	CROSS FLOW Flow distributions and discharge coefficient effects for jet array impingement with initial
[NASA-CR-167896] p0027 N82-25257	crossflow
Interlaminar crack growth in fiher reinforced composites during fatigue, part 3	[ASME PAPER 82-GT-156] p0011 A82-35379 CROSS POLARIZATION
[NASA-CR-165434] p0114 N82-26715 Creep crack-growth: A new path-independent	Coarial prime focus feeds for paraboloidal reflectors
integral (T sub c), and computational studies	[NASA-CR-167934] p0078 N82-31585
[NASA-CR-167857] p0114 N82-29619 A preliminary study of crack initiation and growth	CROSSLIBKING Cross-linked polyvinyl alcohol films as alkaline
at stress concentration sites [NASA-CR-169358] p0115 N82-33738	hattery separators [MASA-TM-82802] p0054 N82-22327
(RACKING (PRACTURING)	CRYOGRUIC FLUID STORAGE
NT STRESS CORROSION CRACKING Interface cracks in adhesively bounded lap-shear	An experiment to evaluate liquid hydrogen storage in space
joints p0 16 A82-46 09	A82-20748 Cryogenic fluid management experiment
CRACKS Analysis of cracks emanating from a circular hole	[NASA-CR-165495] p0039 N82-15117 CRYOGRUIC FLUIDS
in unidirectional fiber reinforced composites,	MI LIQUID HYDROGEN
part 2 [NASA-CR-165433] p0114 N82-26714	NT LIQUID OXYGEN CRYGGENIC ROCKET PROPELLANTS
Analysis of interface cracks in adhesively bonded lap shear joints, part 4	NT LIQUID PUELS Study of vapor flow into a capillary acquisition
[NASA-CR-165438] PO114 N82-26716	device for cryogenic rocket propellants
CRASHES An assessment of the crash fire hazard of liquid	[NASA-CB-167883] p0091 N82-24452 CRYOGENICS
hydrogen fueled aircraft [NASA-CR-165526] p0013 N82-19196	Plows through sequential orifices with heated spacer reservoirs
CRATERS NT THNAR CRATERS	[NASA-TM-82855] p0088 N82-24455
NT MUTEORITE CRATERS	NT CRYSTAL DISLOCATIONS
CREEP ANALYSIS Moving singularity creep crack growth analysis	NT VACANCIES (CRYSTAL DEFECTS) Naterial and processing needs for silicon solar
with the /Delta T/c and C/asterisk/ integrals path-independent vector and energy rate line	cells in space p0032 N82-26336
integrals p0116 A82-40066	CRYSTAL DISLOCATIONS On finite deformation elasto-plasticity
Creep crack-growth: A new path-independent	p0116 A82-45869
integral (T sub c), and computational studies [NASA-CR-167897] p0114 N82-29619 CREEP BUCKLING	The influence of orientation on the stress rupture properties of nickel-base superalloy single crystals
On the sclution of creep induced buckling in	p0062 A82-47397
qeneral structure p0115 A82-39514	High purity low dislocation GaAs single crystals [NASA-CR-165593] p0 159 N82-23030
CREEP PROPERTIES NI SHEAF CREEP	CRYSTAL GROWTH NT CZOCHRALSKI METHOD
On a study of the /Delta T/c and C/asterisk/ integrals for fracture analysis under non-steady	NT DIRECTIONAL SOLIDIFICATION (CRYSTALS) NT VAPOR PHASE EPITAXY
creep p0115 AB2-36782 Creep crack-growth: A new fath-independent T sub	Undoped semi-insulating LEC GaAs - A model and a mechanism Liquid Encapsulated Czochralski p0 159 A82-13754
o and computational studies [NASA-CR-168930] p0113 N82-24503	CRYSTAL LATTICES NT CLOSE PACKED LATTICES
CREEP SUPTURE STRENGTH Croop and rupture of an ODS alloy with high stress	NT FACE CENTERED CUBIC LATTICES CRYSTAL OPTICS
rupture ductility Oxide Dispersion	Investigation of a comb-type slow-wave structure for millimeter-wave masers
Strengthened p0065 A82-40335	A82-18368
Structure and creep rupture properties of directionally solidified eutectic gamma/gamma-prime-alpha alloy	Pockels-effect cell for gas-flow similation [NASA-TP-2007] p0095 N82-23515 CRYSTAL RECTIFIZES
p0062 A82-42774	Past recovery, high voltage silicor diodes for AC
The influence of orientation on the stress rupture properties of nickel-tase superalloy single crystals	motor controllers p0086 A82-36926 CRYSTAL STRUCTURE
p0062 A82-47397 The influence of cobalt on the tensile and	Cauchy integral method for two-dimensional
stress-rupture properties of the nickel-base superalloy MAR-M247	solidification interface shapes p0089 A82-39899

```
Mechanism and models for zinc metal acrphology in
                                                                                                                       p0115 A82-11298
     alkaline media
                                                                        CILINDROIDS
                                               p0 120 N82-19671
                                                                         U LIMDRICAL BODIES
                                                                        CEOCHRALSKI METHOD
   Morphological and frictional behavior of sputtered
      MoS2 files
                                                                            Stoichiometry-controlled compensation in liquid
      [ NASA-TM- 82809 ]
                                               p0076 N82-22387
                                                                              encapsulated Czochralski Gals
                                                                                                                       p0158 A82-17585
CRYSTAL SURFACES
   Influence of mineral oil and additives on
                                                                            Compensation mechanism in liquid encapsulated
Czochralski Gals Importance of melt stoichiometry
     microhardness and surface clemistry of magnesium oxide (001) surface
                                                                                                                       p0086 A82-40403
                                                                            Effect of selt stoichiometry on twin formation in LEC GaAs --- Liquid Encapsulated Czochralski
     [ NASA-TP- 1986 ]
                                               p0067 N82-20316
CHYSTALLIZATION
 NT DIRECTIONAL SOLIDIFICATION (CRYSTALS)
                                                                               technique
 NT BECRYSTALLIZATION
                                                                                                                        no 160 A82-46517
CRYSTALLOGRAPHY
   Crystallographic texture in
                                                                                                       D
      oxide-dispersion-strengthened alloys
                                                                        DARHO (DATA AWALYSIS)
U TA PROCESSING
                                               p0062 182-40041
CRYSTALS
 NT COPED CRYSTALS
                                                                         DANAGE
 NT LIQUID CRYSTALS
                                                                         MT IMPACT DAMAGE
 NT FOLYCRYSTALS
                                                                          MT RADIATION DAMAGE
 MT SINGLE CRYSTALS
                                                                         DAMPING
CUBIC LATTICES
                                                                          NT VIBRATION DAMPING
                                                                            An experimental investigation of gapwise periodicity and unstendy aerodynamic response in an oscillating cascade. Volume 2: Data report. Part 1: Text and mode 1 data
 NT FACE CENTERED CUBIC LATTICES
CURING
   High-temperature resins
                                               p0051 A82-42657
                                                                              [ NASA-CR-165457-VOL-2-PT-1]
CURRENT CONVERTERS (AC TO DC)
                                                                                                                       P0006 N82-18180
   Simplified do to do converter [NASA-CASE-LEW-13495-1]
                                                                            Extending the frequency of response of lightly
                                               p0082 N82-24432
                                                                              damped second order systems: Application to the
CURRENT DEWSITY
                                                                              drag force anemometer [NASA-TM-82927]
   On the cause of the flat spct phenomenon observed
                                                                                                                       p0096 N82-32662
      in silicen solar cells at low temperatures and
                                                                         DAMPING FACTOR
      low intensities
                                                                         U MPING
                                                                         DAMPING IN PITCH
                                               p0044 A82-44965
   Additional extensions to the NASCAP computer code,
                                                                          U MPING
                                                                        U TCH (INCLINATION)

DREPING IN BOLL
      volume 3
     [ NASA-CR- 1678571
                                               D0040 N82-26378
CURRENT DISTRIBUTION
                                                                         II MPTNG
   Impact of uniform electrode current distribution
                                                                         DANDING TH YAU
     on ETF --- Engineering Test Facility MAD generator
                                                                         U MPING
   Impact of uniform electrode current distribution
                                                                         DAMPHESS
      on ETF
                                                                          U ISTURE CONTENT
      [ NASA-TM-82875]
                                               p0123 ¥82-25636
                                                                         DANCER
CURRENT REGULATORS
                                                                          U ZARDS
   Input filter compensation for switching regulators [NASA-CR-169005] p00e5 N82-25442
                                                                         DART TURBOPROP ENGINES
                                                                         II RHOPROP ENGINES
CURRENT STABILIZERS
                                                                         DATA ACQUISITION
 U RRENT REGULATORS
                                                                            A remote millivolt multiplexer and amplifier
                                                                              module for wind tunnel data acquisition
                                                                                                                       p0083 A82-41845
   Turbulent boundary layer heat transfer
      experiments: Convex curvature effects including introduction and recovery
                                                                         DATA ADAPTIVE EVALUATOR/HOWITOR
                                                                        U TA PROCESSING
      [ NASA-CR-3510]
                                               p0096 #82-17456
CURVED SURFACES
                                                                         U TA PROCESSING
 U NTOURS
                                                                         DATA PROCESSING
 U APES
                                                                          MT OPTICAL DATA PROCESSING
CURVES (GEOMETRY)
                                                                          MT PARALLEL PROCESSING (COMPUTERS)
   Precision of spiral-bevel gears
                                                                          MT SIGNAL PROCESSING
                                                                            Applications of the DOE/NASA wind turbine
      [ NASA-TH-828887
                                               n0 10 2 NB2-30552
CUTTERS
                                                                              engineering information system
   Surface geometry of circular cut spiral bevel gears
[ASHE FAPER 81-DET-114] p0106 A82-19334
                                                                                                                       PT 122 NB2-23696
                                                                         DATA PROCESSING EQUIPMENT
                                                                          MT DIGITAL COMPUTERS
CUTTING
 NI METAL CUTTING
                                                                          NT HYBRID COMPUTERS
   Surface geometry of circular cut spiral bevel gears
[ASME PAPER 81-DET-114] p0108 A82-1933
                                                                          NT MICROCOMPUTERS
                                               p0 108 A82- 19334
                                                                          NT MICROPROCESSORS
CICLES
                                                                         DATA TRANSHISSION
                                                                        NT FREQUENCY DIVISION MULTIPLE ACCESS DC (CURRENT)
U RECT CURRENT
 NT STIRLING CYCLE
NT STRESS CYCLES
 NT THERMODYNAMIC CYCLES
CYLINDRICAL APTERBODIES
                                                                         DC 9 AIRCRAFT
 U LINDRICAL BODIES
                                                                            Kevlar/PMR-15 reduced drag DC-9 reverser stang
CYLINDRICAL BODIES
                                                                              fairing
 NT ROTATING CYLINDERS
                                                                              [ NASA-CR-165448]
                                                                                                                        p0052 N02-31448
   Surface-tension induced instabilities: Effects of lateral boundaries
                                                                        DC 10 AIRCRAFT
                                                                            Investigation and evaluation of a computer program
                                                                              to minimize three-dimensional flight time tracks [NASA-CR-168419] p0145 N82-17879
      T NASA-CR- 1655301
                                               p0092 N82-11390
   Turbine endwall single cylinder program
      [ NASA-CR- 169278]
                                               p0091 N82-31638
                                                                            Advanced turboprop testbed systems study [NASA-CR-167895] p00
CYLINDRICAL PLASMAS
                                                                                                                       p0014 N82-33375
   Standing waves along a microwave generated surface
                                                                         DEADURIGHT
      wave plasma
                                                                          U ATIC LOADS
                                               p0 158 A82-26952
                                                                         DEBRIS
CYLINDRICAL SHELLS
                                                                            Occurrence of spherical ceramic debris in
   Vibrations of cantilevered shallow cylindrical
                                                                              indentation and sliding contact
```

[NASA-TP-2048]

00069 N82-32491

shells of rectangular planform

p0074 A82-22240

D0069 N82-28445

D0065 N82-31509

p0074 A82-23238

p0075 A82-35307

p0088 N82-26611

p0117 N82-18664

p0119 N82-16481

P0157 A82-17889

p0158 A82-20750

p0079 A82-23508

p0030 A82-35091

p0022 A82-35348

p0083 A32-46388

p0105 N82-14520

p0024 N82-16081

p0119 N82-16481

p0133 N82-18693

D0024 N82-19221

p0025 N82-22265

p0084 N82-23395

ORIGINAL PAGE IS

```
CF POOR QUALITY NT VACUUM DEPOSITION NT VAFOR DEPOSITION
DECAY
 HT CHEMILUMINESCENCE
 NT ELECTRON EMISSION
                                                                             Deposit formation in liquid fuels. II - The effect
 NT EXHAUST FMISSION
                                                                               of selected compounds on the storage stability
 NT MICROWAVE EMISSION
NT SECONDARY EMISSION
NT SOLAR RADIO BURSTS
NT SOLAR BADIO EMISSION
                                                                               of Jet A turbine fuel
                                                                             Ion beam sputter deposited diamond like films
                                                                             [NASA-TH-82873] p0069
Deposition of reactively ion beam sputtered
DECOMPOSITION
 NT PROPELLANT DECOMPOSITION
                                                                               silicon nitride coatings
 NT THERMAL DECOMPOSITION
                                                                               [ NASA-TM-82942]
   Quantitative separation of tetralin hydroperoxide
                                                                             Ion beam microtexturing and enhanced surface
     from its decomposition products by high
                                                                               diffusion
     performance liquid chromatography
                                                                               [NASA-CR-167948]
                                               n0048 A82-15696
                                                                         DEPOSITS
                                                                             Analysis of infrar/5 emission from thin adsorbates
DECORPRESSION
 U MESORE REDUCTION
                                                                             p0056 A82-21431
Deposit formation in liquid fuels. III - The
DELT SPACE
                                                                               effect of selected nitrogen compounds on diesel
 NT INTERPLANETARY SPACE
   On the cause of the flat-spot phenomenon observed
     in silicon solar cells at low temperatures and
     low intensities --- in deep space environments
                                                                             Deposit formation in hydrocarbon fuels
                                                                             [ASNE PAPER 82-GT-49] p0075 A82-353(
Deposit formation in hydrocarbon rocket fuels with
an evaluation of a propage heat transfer
                                               p0043 A82-39599
DEFECTS
 NT CRYSTAL DEFECTS
HT CRYSTAL DISLOCATIONS
NT SURFACE DEFECTS
                                                                               correlation
                                                                               [ NASA-TM-82911]
 NT VACANCIES (CRYSTAL DEFECTS)
                                                                         DEPRESSURIZATION
   Environmental and High-Strain Rate effects on
                                                                          U ESSURE REDUCTION
      composites for engine applications
                                                                         DEPTH MEASUREMENT
                                               p0051 N82-31449
                                                                             Ground-truth observations of ice-covered North
      [ NASA-TH-82082]
DEFLATING
                                                                               Slope Lakes imaged by radar [NASA-TM-84127]
 U ESSURE REDUCTION
DEFORMATION
                                                                          DESIGN
 NT PLASTIC DEFORMATION
                                                                             Summary and evaluation of the conceptual design
                                                                               study of a potential early commercial MHD power plant (CSPEC)
   On finite deformation elaste-plasticity
                                               p0116 A82-45869
                                                                               [ NASA-TH-827341
DEGRADATION
 NT THERMAL DEGRADATION
                                                                         DESIGN ANALYSIS
                                                                             End region and current consolidation effects upon
   model degradation effects on sensor failure
                                                                               the performance of an MUD channel for the ETP
conceptual design --- Engineering Test Facility
     detection
                                               p0 148 A82- 13143
                                                                               [AIAA PAPER 82-0325]
DETCERS
                                                                             An experiment to evaluate liquid hydrogen storage
   Numerical simulation of one-dimensional huat
     transfer in composite hodies with phase change
                                                                               in space
     --- wing descing pads [NASA-CP-165607]
                                                                             HHD channel performance for potential early
                                               p0002 N32-22142
                                                                               connercial MHD power plants
DETCING
   Aircraft icing research at NASA
[NASA-TM-82919]
                                               p0013 N82-30297
                                                                             Baseband-processed SS-TDMA communication system
DEICING SYSTEMS
                                                                               architecture and design concepts
                                                                               [AIAA 82-0482]
 U ICEFS
DELANINATING
                                                                             A comprehensive method for preliminary design
   Interlaminar crack growth in fiber reinforced
                                                                               optimization of axial gas turbine stages
                                                                               [AIAA PAPER 82-1264]
     composites during fatigue, part 3
   composites during fatigue, part 3
[NASA-CR-165434] p01
Edge delamination in angle-rly composite
laminates, part 5
[NASA-CR-165439] p01
                                                                             A computational design method for transonic
                                               n0114 N82-26715
                                                                               turbomachinery cascades
[ASME PAPER 82-GT-117]
                                                                             Analysis and design of a standardized control
                                               p0114 N82-26717
DELAY LINES
                                                                                module for switching regulators
   Near optimum delay-line detection filters for
     serial detection of MSK signals
                                                                             Conceptual design of superconducting magnet system
                                                                             for Magnetohydrodynamic (MHD) Engineering Test
Facility (ETF) 200 MWe power plant
[NASA-CB-165053] p0105 N82-14
Study of controlled diffusion stator blading. 1.
                                               p0086 A82-43867
DENSIMETERS
 NT CLIBASONIC DENSINETERS
DENSITY (MASS/VOLUME)
NT GAS CENSITY
                                                                               Aerodynamic and mechanical design report
[NASA-CR-165500]
   Ultrasonic velocity for estimating density of
     structural ceramics
                                                                             Summary and evaluation of the conceptual design
                                                                               study of a potential early commercial MHD power plant (CSPEC)
     [NASA-TM-82765]
                                               p0066 N82-14359
   The transmission or scattering of elastic waves by
                                                                               [ NASA-TH-82734]
     an inhomogeneity of simple quemetry: A
                                                                             Modeling and Analysis of Power Processing Systems (MAPPS). Volume 2: Appendices
     comparison of theories
[NASA-CR-169034]
DENSITY (NUMBER/VOLUME)
                                               p0079 W82-26526
                                                                               [ NASA-CR-165539]
 NT ELECTRON DISTRIBUTION
                                                                             Design, evaluation, and fabrication of low-cost
                                                                               composite blades for intermediate-size wind
 NT ION DENSITY (CONCENTRATION)
 NT HAGNETOSPHERIC ICH DENSITY
                                                                                turbines
                                                                               FNASA-CR-165342]
DEWSITY MEASUREMENT
                                                                             Cooled variable-area radial turbine technology
   Time resolved density measurements in premixed
                                                                               ргодгал
     turbulent flames [AIAA FAPER 82-0036]
                                                                             [NASA-CR-165408] p0024
Advanced Low-Emissions Catalytic-Combustor
                                               p0056 A82-22033
DECKIDIZING
                                                                               Program, phase I --- airgraft gas turbine engines [NASA-CR-159656] p0025 M82-2226
   Stabilizing platinum in phosphoric acid fuel cells
     [ NASA-CR- 165483]
                                               p0130 N82-14628
                                                                             Preliminary design development of 100 KW rotary
DEPENDENCE
 NT TEMPERATURE DEPENDENCE
                                                                               pover transfer device
                                                                               [ WASA-CR-165431]
DEPOSITION
 NT ELECTRODEPOSITION
```

```
Comparative analysis of the conceptual design studies of potential early commercial MHD power
     plants (CSPEC)
     [ NASA-TH-82897]
                                            p0123 N82-27838
   Pyrolytic graphite collector development program
f NASA-CR-1679091 p0052 M82-29363
   Vibration analysis of three guyed tower designs
     for intermediate size wind turbines
     f NASA-CR- 1655891
                                            p0137 #82-30709
   Design flexibility of Redox flow systems --- for
     energy storage applications [NASA-TH-82854]
                                            p0054 N82-31459
DETECTION
 NT SIGNAL DETECTION
NT ULTRASCRIC FLAW DETECTION
   Sensor failure detection system --- for the F100
     turbofan engine
                                            p0023 N82-13145
   NASA research programs responding to workshop recommendations
DETONATION WAVES
   Effects of internal heat transfer on the structure
     of self-similar blast waves
                                            p0093 A82-32225
DEUTERIUM PLUORIDE LASERS
   IASERS
DEVELOPING NATIONS
   International market assessment of stand-alone
     photovoltaic power systems for cottage industry
     applications
     [ NASA-CR- 165287]
                                            p0 132 NB2-16494
   Application of photovoltaic electric power to the rural education/communication needs of
     developing countries [NASA-CR-167894]
                                            p0137 N82-29720
   Design description of the Tangaye Village
     photovoltaic power system [NASA-TH-82917]
                                            p0126 NB2-33828
DY LASERS
   Optically pumped high-pressure CF-CO2 transfer laser
DIAGRAMS
NT PHASE CLAGRAMS
NT S-N CLAGRAMS
 NT STRESS-STRAIN DIAGRAMS
   Adhesion and friction of single-crystal diamond in
     contact with transition metals
                                            p0103 A82-18680
DIELECTRIC MATERIALS
U ELECTRICS
DIELECTRIC PROPERTIES
   Spacecraft Charging Technology, 1980
     [ NASA-CP-2182]
                                             p0037 N82-14213
   Oblique-incidence secondary emission from charged
     dielectronis
                                            p0039 N82-14227
DIELECTRICS
 NT LOSSLESS MATERIALS
   Numerical simulation of sheath structure and
     current-voltage characteristics of a
     conductor-dielectric disk in a plasma
                                            p0040 A82-15904
   Testing of a spacecraft model in a combined
     environment simulator
                                            p0033 382-18310
   Internal breakdown of charged spacecraft dielectrics
                                            p0041 A82-18312
   Testing of a spacecraft model in a combined
     environment simulator
     F NASA-TM-827231
                                            p0037 NB2-11106
   Numerical simulation of plasma insulator
     interactions in space. consistent calculation
                                Part 1: The self
                                            p0039 NB2-14272
   Numerical simulation of plasma insulator
     interactions in space. Part 2: Dielectric
     effects
                                            p0039 N82-14273
   Development of an 1100 deg F capacitor
                                            p0083 N82-15315
   Secondary electron emission from a charged
     dielectric in the presence of normal and oblique
     electric fields
     [ NASA-CR- 168558]
                                            p0084 N82-18507
   Mapping of electrical potential distributions with
     charged particle beams [NASA-CR-168556]
                                            p0084 N82-18508
```

```
Component technology for space power systems
      [WASA-TH-82928]
                                                   p0082 N82-30474
DIRSKL BEGINES
   Lightweight diesel engine designs for commuter
      type aircraft
      [NASA-CR-165470]
                                                   p0023 #82-11068
    Fuel economy and exhaust emissions characteristics
      of diesel vehicles: Test results of a prototype fiat 131TC 2.4 liter automobile [NASA-CR-165535] p0 164 N82-180
                                                    p0 164 N82-18068
   Advanced general aviation comparative engine/airframe integration study
      [ NASA-CR-165564]
                                                    p0025 N82-22263
    Electrostatic fuel conditioning of internal
      combustion engines
      [NASA-CR-169029]
                                                    p0 106 N82-26680
DIESEL FUELS
NT LIQUID FUELS
    Deposit formation in liquid fuels. III - The
      effect of selected nitrogen compounds on diesel
    Fuel economy and exhaust emissions characteristics
      of diesel vehicles: Test results of a prototype
fiat 131TC 2.4 liter automobile
[NLSA-CR-165535] p0164 N82-180
                                                    DO164 N82-18068
DIFFERENCE EQUATIONS
    Multiple-grid acceleration of Lax-Wendroff
      algorithms
      [NASA-TM-82843]
                                                    p0 149 #82-22922
DIFFERENTIAL ALGEBRA
U TRICES (MATHEMATICS)
DIFFERENTIAL EQUATIONS
NT HELMHOLTZ VORTICITY EQUATION
Construction of solutions for some nonlinear
two-point boundary value problems

TWG-D-0-17-0-20371

p0:44 ME
      [NASA-TM-82937]
                                                    p0 144 N82-30949
DIFFERENTIAL GEORGERY
 NT TENSOR ANALYSIS
   Surface geometry of circular cut spiral bevel gears
[ASHE PAPER 81-DET-114] p0108 A82-1933
                                                    p0108 A82-19334
DIFFERENTIAL OPERATORS
 U PPERENTIAL EGUATIONS
DIFFRACTION
 NT WAVE DIFFRACTION
DIFFRACTION PATTERNS
    Diffraction by a finite strip
                                                    p0 150 A82-33605
DIFFUSE RADIATION
    Effects of internal heat transfer on the structure
      of self-similar blast waves
                                                    D0093 A82-32225
DIFFUSIOR
 NT PARTICLE DIFFUSION
 NT SURFACE DIFFUSION
    Study of controlled diffusion stator blading.
      Aerodynamic and mechanical design report [NASA-CR-165500] p0024
                                                   P0024 N82-16081
   Determination of optimum sunlight concentration
level in space for 3-4 cascade solar cells
[NASA-TM-82899] p0 126 N82-
                                                   p0 126 NB 2-32853
DIFFUSION BONDING
 U PFUSION WELDING
DIFFUSION EFFECT
 U FFUSION
DIFFUSION FLANES
    On the opening of premixed Bunsen flame tips
                                                    p0057 AB2-37570
DIFFUSION WELDING
    Metal honeycomb to porous wireform substrate
      diffusion bond evaluation
      [ NASA-TM-82793]
                                                    p0110 N82-18612
DIFLUORO COMPOUNDS
NT POLYTETRAFLUOROETHYLENE DIGITAL COMPUTERS
 NT MICROCOMPUTERS
    Development report: Automatic System Test and
Calibration (ASTAC) equipment
[NASA-CR-165403] p0129 N82
                                                    p0129 N82-13505
    Role of optical computers in aeronautical control
      applications
                                                    p0156 N82-15897
DIGITAL SIMULATION
    Numerical simulation of sheath structure and
current-voltage characteristics of a
conductor-dielectric disk in a plasma
                                                    p0040 A82-15904
    Multigrid simulation of asymptotic curved-duct
      flows using a semi-implicit numerical technique
```

. 84.00

```
p0010 A82-29003
                                                                                                DIRECTIONAL SOLIDIFICATION (CRYSTALS)
                                                                                                    Structure and creep rupture properties of directionally solidified extectio
    Advançoments in real-time engine simulation
      quancements in real-time engine simulation technology --- of digital electronic aircraft engine controls pooci A82-34995 real time Pequasus propulsion system model for VSTOL piloted simulation evaluation pool6 M82-13144 publication of interestics are interesticated.
                                                                                                        camma/gamma-prime-alpha alloy
                                                                                                                                                              p0062 182-42774
                                                                                                DIRECTIONAL STABILITY
                                                                                                  NT GYROSCOPIC STABILITY
    [NASA-TH-82770] pools W82-13144 Application of integration algorithms in a
                                                                                                 DIRICHLET PROLLER
                                                                                                     The use of a structural method to calculate the
       parallel processing environment for the
                                                                                                        electrostatic field of a magnetron
       simulation of jet engines [NASA-TH-02746]
                                                              p0 149 N82-14849
                                                                                                DISCHARGE COMPPICIONS
                                                                                                     Flow distributions and discharge coefficient
effects for jet array impingement with imitial
    Advancements in real-time engine simulation
       technology
        [ MASA-TH-82825 ]
                                                              p0 147 N82-22915
                                                                                                        crossflow
DIGITAL SYSTEMS
                                                                                                        [ASME PAPER 82-GT-156]
                                                                                                                                                               p0011 A82-35379
    A digital optical torquemeter for high rotational
                                                                                                     Bleatric thruster research
       speed applications [HASA-TH-82914]
                                                                                                        [NASA-CH-165603]
                                                                                                                                                               p0045 M82-24285
                                                                                                 DISERS
                                                              p0095 x82-31664
DIGITAL TECHNIQUES
                                                                                                U RABOLIC REPLECTORS
DISKS (SHAPES)
HT ROTATING DISKS
    Digital imaging techniques in experimental stress
       analysis
                                                                                                     Development of materials and process technology
                                                              p0097 A82-34231
                                                                                                        for dual alloy disks
[NASA-CR-165224]
    A multi-purpose method for analysis of spur quar
        tooth loading
                                                                                                                                                              p0063 N82-10370
                                                                                                Hot isostatically pressed manufacture of high strength HERL 76 disk and seal shapes [NASA-CR-165549] p0064 M87 DISLOCATIONS (MATRHIALS)
HT CRYSTAL DISLOCATIONS
        [ NASA-CR- 165 163]
    Prellminary study, analysis and design for a power switch for digital ungine actuators
[HASA-CR-159559] p0085 M82-2335
                                                                                                                                                               p0064 #82-26439
                                                              p0085 N82-23394
DILUTION
    Dilution jet hehavior in the turn section of a rayerse flow combustor
                                                                                                 DISPERSION PRECIPITATION MARDESING
                                                                                                  U ECIPITATION HARDENING
    (AIAA FAPER 82-0192) p0021 A82. Dilution tot behavior in the turn section of a
                                                                                                 DISPERSIONS
                                                                                                  NT AZROSOLS
reverse flow coebuster [NASA-TH-62778]
DIRESSORLESS SURBERS
                                                                                                 DISPLACEMENT
                                                                                                     Largo displacements and stability analysis of nonlinear propoller structures
[MASA-TH-02050] p/4112 M8
                                                              p0017 N82-19220
 NT HACH NUMPER
NT ERYNOLDS NUMBER
                                                                                                                                                               p@112 N82-31707
                                                                                                 DISPLACERENT SEASUREMENT
                                                                                                     Experimental boundary integral equation applications in spectle interferometry
DIMENSIONS
 NT FILM THICKNESS
DIODES
                                                                                                                                                               p0097 A82-36987
 NT AVALANCHE DIODES
NT CRISTAL RECTIFIERS
NT SEMICONDUCTOR DIODES
                                                                                                     Crack displacements for J/I/ testing with compact
                                                                                                        specimens
                                                                                                                                                               poli2 A82-40358
                                                                                                DISPLAY DEVICES

NT DIAG FORCE ANEMOMETERS

NT FIOS DIRECTION INDICATORS
DIOXIDES
 HT HYTROGEN PEROXIDE
 HT QUARTE
                                                                                                  NT HOT-FILM ANEHOMETERS
NT HOT-WIRE ANEMOMETERS
  NT SILICON DIOXIVE
DIRECT CURRENT
    Straight and chopped DC purformance data for a reliance BV-250AT motor with a General Electric
                                                                                                 DISPOSAL,
                                                                                                NT WASTE DISPOSAL
DISSIPATION
NT ENERGY DISSIPATION
DISSOLVED GASES
        EV-1 controller
    [ NASA-CR- [65447] p0132 N82-17608
Analysis of transistor and snubber turn-off
dynamics in high-frequency high-voltage
                                                                                                     Investigation of spray characteristics for 
flashing injection of fuels containing dissolved
        high-pover converters
                                                                                                 air and superheated fuels [NASA-CR-3563]
DISTORTION
        [ NASA-CR- 168769]
                                                              p0084 N82-22438
    Straight and chopped DC performance data for a General Electric 5BY4 36A1 DC shunt motor with a General Electric EV-1 controller
                                                                                                                                                               D0027 N82-26295
                                                                                                  NT PLOW DISTORTION
PT SIGNAL DISTORTION
        [ NASA-CR- 165507]
                                                              p0085 N82-24425
    Simplified do to do converter
[NASA-CASE-LFW-13495-1]
                                                                                                     Computer modeling of fan-exit-splitter spacing
                                                                                                COMPUTER MODELING OF TRANSCE-BRITTED OF ACTION OF PROPERTY)

PISTRIBUTION (PROPERTY)

HT ANTENNA RADIATION PATTERNS

HT CHARGE DISTRIBUTION

HT CURRENT DISTRIBUTION

HT DIPPRACTION PATTERNS
                                                              p0082 N82-24432
     Progress on advanced do and ac induction drives
                                                                                                                                                               P0025 N82-23246
    for electric vehicles
[NASA-TH-82895]
summary of electric vehicle dc motor-controller
                                                              p0163 N82-31160
        tests
        [ NASA-TH-82863]
                                                              p0082 N82-33636
DIRECT POWER GREERATORS
NT ALKALINE BATTERIES
                                                                                                  NT ELECTRON DISTRIBUTION
                                                                                                  NT PLOY DISTRIBUTION
  NT FUEL CELLS
                                                                                                  NT ION DISTRIBUTION
 NT HYDROGEN OXYGEN FUEL CELLS
NT HAGNETCHYDRODYNAMIC GENERATORS
NT NICKEL ZINC BATTERIES
NT FROSPHORIC ACID FUEL CELLS
NT FROSPHORIC FUEL CELLS
                                                                                                  NT LOAD DISTRIBUTION (FORCES)
NT SPATIAL DISTRIBUTION
NT STRESS CONCENTRATION
                                                                                                  NT TEMPERATURE DISTRIBUTION
                                                                                                 NT VELOCITY DISTRIBUTION DISTRIBUTION HORNETS
      SOLAR CELLS
  NT THERMIONIC CONVERTERS
Dayolep and test fuel call powered on-site
                                                                                                  NT MEAN
                                                                                                 DISTURBANCE THROAT
integrated total energy system. Phase 3:
full-scale power plant development
[NASA-CE-165328]
DIRECTIONAL ANTENNAS
NT ING SEFECTOR ANTENNAS
                                                                                                  U RTURBATION THEORY
                                                                                                 DIVERGENCE
                                                              p0117 N82-13490
                                                                                                  NT HAGNETIC CHARGE DENSITY
                                                                                                 DOCUMENTS
                                                                                                  NT BIBLIOGRAPHIES
DIRECTIONAL CONTROL
                                                                                                  HT USER HANUALS (COMPUTER PROGRAMS)
                                                                                                 DOMESTIC SATELLITE COMMUNICATIONS SYSTEMS
  NT THRUST VECTOR CONTROL
```

Baseband-processed S3-TDMA communication system

```
architecture and design concepts
[AIAA 82-0462]
                                                  p0079 A82-23508
   CM-VPE growth of Mg-doped Gals ---
Organometallic Vapor Phase Epitaxy
                                                  p0 159 A87 + 38411
DOPING (ADDITIVES)
U DITIVES
DOUGLAS AIRCRAFT
UT DC 9 AIRCRAFT
HT DC 10 AIRCRAFT
DOUGLAS DC-9 ATRCRAFT
    9 AIRCRAFT
   Stress evaluations under rolling/sliding contacts
      [ NASA-CR- 165561]
                                                  p0113 N82-17521
   Kevlar/PMR-15 reduced drag CC-9 reverser stang
      fairing
      F NASA-CR- 1654481
                                                  p0052 N82-31448
DRAG BIFECT
 U. A.G.
DRAG FORCE AMENOMETERS
   Miniature drag-force an emometer
                                                  p0097 A82-40132
   Extending the frequency of response of lightly damped second order systems: Application to the
      drag force anemometer
      [ NASA-TM-82927]
                                                  p0096 NB2-32662
DRAG REDUCTION
   Kevlar/PMR-15 polyimide matrix composite for a
COMPLEX Shaped DC-9 drag reduction fairing (AIAA FAPER 82-1047) p0002 ADRIFT (INSTRUMENTATION)
                                                  D0002 A82-37678
   Thin film temperature sensors, phase 3 --- for
      engine-test evaluation
      [ NASA-CR- 165476]
                                                  p0097 N82-22479
DROWE SELICOPTERS
 U LICOPTERS
DROP SIZE
   Water ingestion into jet engine axial compressors
[ATAM FAPER 82-0196] p0030 A82-17
Formation of oxides of mitrogen in menodisperse
                                                  p0030 A82-17836
      spray combustion of hydrocarbon fuels
                                                  p0057 182-37571
    Hydrodynamic and aerodynamic breakup of liquid
      sheets
                                                  p0087 N82-19494
    Venturi nozzle effects on fuel drop size and
      nitrogen oxide emissions
      [ NASA-TP-2028]
                                                  p0020 N82-31329
 NT NICKEL ZINC BATTERIES
DRY PRICTION
   Single pass rub phenomena - Analysis and experiment [ASME FAPER 81-LUB-55] p0 107 A82-1844
                                                  p0 107 A82- 18449
   Mcrphological and frictional behavior of sputtered
      MoS2 films
      [ NASA-IM-82809]
                                                  p0076 N82-22387
   The drycut region in frictionally heated sliding
      contacts
      [ NASA-IM-82796]
                                                  p0088 N82-28574
DUCT GEOMETRY
   Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
      [ NASA-TM-82750]
                                                  p0 157 N82-13908
   Mode propagation in nonuniform circular ducts with
      potential flow
      [ NASA-TH-82766]
   Application of steady state finite element and transient finite difference theory to sound propagation in a variable area duct: A comparison with experiment
      [ NASA-TM-82678]
                                                  p0 151 N82-15847
    Energy efficient engine: Turbine transition duct
      model technology report
      [ NASA-CR- 167996]
                                                  p0029 N82-33394
DUCTED BODIES
   Acoustic properties of turbofan inlets [NASA-CR-169016]
                                                  p0 153 N82-27090
DUCTED FLOW
   Acoustic transmission in lined flow ducts - A
      finite element eigenvalue problem
                                                  p0 154 A82- 17663
   Multigrid simulation of asymptotic curved-duct
   flows using a semi-implicit numerical technique
p00 10 A82-29003
Investigation of rotational transonic flows
      through ducts using a finite element scheme
      [ ATAA PAPER 82-1267]
                                                  p0012 A82-37711
                                                                               NT SHOCK LOADS
```

```
*Coriolis resonance* within a rotating duct ---
flow induced vibrations in centrifugal compressors
p0012 A82-37938
   Computational methods for internal flows with emphasis on turbomachinery
      [ NASA-TH-82764]
                                                p0003 N82-13113
   Mode propagation in nonuniform circular ducts with
      potential flow
       NASA-TH-82766]
                                                 FOIST 882-14881
   Velocity gradient method for calulating velocities
     in an axisymmetric annular duct [NASA-TP-2029]
                                                p0005 N82-29270
DUCTILITY
   Creep and rupture of an ODS alloy with high stress rupture ductility --- Oxide Dispersion
                                                 p0065 A82-40335
   Failure analysis of a tool steel torque shaft [NASA-TH-82758] p0058 N82-11184
   Composite seal for turbomachinery
     [ NASA-CASE-LEW- 12131-37
                                                p0099 N82-19540
   A study of the nature of solid particle impact and
shape on the erosion morphology of ductile metals
     [NASA-TH-82933]
                                                p0061 N82-33493
DUCTS
 NT ACOUSTIC DUCTS
 NT AIR DUCTS
 NT ANNULAR DUCTS
   Verification of an acoustic transmission matrix
      analysis of sound propagation in a variable area
      duct without flow
   p0151 N82-12891
End region and current consolidation effects upon
the performance of an MHD channel for the ETF
conceptual design
     [ NASA-TH-82744]
                                                p0157 N82-12943
   Mode propagation in nonuniform circular ducts with
      potential flow
                                                p0151 N82-14881
     ₹ NASA-TH-82766]
   Results and comparison of Hall and DW duct
     deciments
SESA-TH-82864]
                                                 p0157 N82-25961
 A ND SHEAR
DOMABILITY
   Durability, life of fiber composites in
     hydrothermomechanical environments
                                                 p0049 N82-14287
       NASA-TM-82709]
   JT9D ceramic outer air seal system refinement
      program
     [ NASA-CR-165554]
                                                p010% ¥82-18603
   Techniques for enhancing durability and
      equivalence ratio control in a rich-lean,
      three-stage ground power gas turbine combustor
[NASA-TM-82922] p0124 N82-2
   [NASA-TM-82922] p0124 N82-29717
Effect of fuel to air ratio on Mach 0.3 burner riq
     hot corrosion of ZrO2-Y2O3 thermal barrier
      coatings
     [NASA-IM-82879]
                                                 p0061 N82-30373
DYNAMIC CHARACTERISTICS
 NT AERODYNAMIC STABILITY
 NT BOUNDARY LAYER STABILITY
 NT COMBUSTION STABILITY
 NT DRAG
 NT FLAME STABILITY
 NT FLOW CHARACTERISTICS
NT FLOW DISTRIBUTION
 NT FLOW STABILITY
 NT FLOW VELOCITY
 NT GYROSCOPIC STABILITY
 NT ROTARY STABILITY
 NT TRANSIENT RESPONS
   Spherical roller bearing analysis. SKF computer program SPHERBEAN. Volume 3: Program
      correlation with full scale hardware tests
     [ NASA-CR-165205]
                                                p0 106 H82-20542
   Analysis of transistor and snubber turn-off
     dynamics in high-frequency high-voltage high-power converters
     [ NASA-CR-168760]
                                                 D0084 N82-22438
DYNAMIC CONTROL
   The effects of controls and controllable and
     storage loads on the performance of stand-alone
     photovoltaic systems
                                                p0127 A82-45027
DYNAMIC LOADS
 NT AERODYNAMIC LOADS
HT ROLLING CONTACT LOADS
```

NT THEUST LOADS	A92-27331
A multi-purpose method for analysis of spur gear tooth loading	Sociouconomic impact of photovoltaic power at
[NASA-CR- 165 163] p0 104 N82- 1040 1	Schuchuli, Arizona
NEARIC PROPERTIES U NAMIC CHARACTEPISTICS	[NASA-CR-165551] p0133 N82-19669
NAMIC BESPONSE	Performance and operational economics estimates for a coal quesification combined-cycle
HT TRANSIENT RESPONSE	codeneration powerplant
CFG jat engine performance improvement: High pressure turbine roundness	[NASA-TH-62729] p0 120 NB2-19672 Satellite-aided land mobile communications system
[NASA-CR-165555] P0024 N82-17174	implementation considerations
WHARIC STABILITY	[NASA-TM-82861] p0036 N82-25290
NT AFFOLYNAMIC STABILITY NT EOUNIARY LAYER STABILITY	Barriers to the utilization of synthetic fuels for
NT COMBUSTION STABILITY	transportation
NT FLAME STABILITY NT FLOW STABILITY	[NASA-CR-165517] F0073 N82-13243 Design description of the Tangaya Village
HT GYPOSTOPIC STABILITY	photovoltaic power system
NI FOIARN STABILITY NYNANIC SMRUCTURAL ANALYSIS	[NASA-TN-82917] p0126 N82-33828
A pad porturbation method for the dynamic	Local and national impact of aerospace research
coefficients of tilting-pad journal hearings	and technology
p0110 A82-14400 Blade loss transient dynamic aralysis of	[NASA-TH-82775] p0 162 N82-20006 BCONOBIC INPACT
turboachinery	Socioeconomic impact of photovoltaic power at
[AIAA FAPER 82-1057] p0030 A82-34982 Structural dynamics of shroudless, hollow, fan	Schuchuli, Arizona [NASA-CR-165551] p0 133 N82-19669
hlades with composite in-lays	Keviar/PHR-15 reduced drag DC-9 reversor stand
[ASME FAPER 82-GT-284] p0022 A82-35456 Aerodynamic damping measurements in a transonic	fairing
CCMILESSOL MAN SATAMANTE IN W FIGUROUSE	[NASA-CR-165448] p0052 N82-31446
(ASNE FAPER 82-GT-287) p0012 A82-35459	U RTICES
Finding dynamic analysis with general nonlinear finite element codes II - Bearing element	Boundary-layer effects in composite laminates. I -
implementation, overall numerical	Froo-udge stross singularities. II - Free-edge
characteristics and benchwarking [ASME PAPER 82-GT-292] p0 108 A82-35462	stress solutions and basic characteristics p0116 A82-46806
Sonsitivity analysis results of the effects of	EDGES
various parameters on composite design p0051 \alpha82-37101	NT LEADING EDGES Edge delamination in angle-ply composite
Forced tersional properties of FMR composites with	laminates, part 5
varying madic ester concentrations and processing histories	[NASA-CR-165439] p0 114 M82-26717 Woundary-layer effects in composite laminates:
p0051 A82-45630	Free-edge stress singularities, part 6
Structural dynamics of shroudless, hollow fan hlades with composite in-lays	[NASA-CR-165440] p0114 N82-26718
[NASA-TH-82816] p0018 N82-22266	NT COST EFFECTIVENESS
Wind turbing dynamics	BFFECTORS
[NASA-CF-2185] p0122 N82-23684 DYNAMIC TESTS	U NTBOL EQUIPMENT
Advanced superposition methods for high speed turbopump vibration analysis	NT COMBUSTION EFFICIENCY
C NASA-CP-1653791 PO 104 N82-11465	NT COMPRESSOR EFFICIENCY NT ENERGY CONVERSION EFFICIENCY
anakan katamatan <u>L</u> angan Kabupatèn Kabupatèn Kabupatèn Kabupatèn Kabupatèn Kabupatèn Kabupatèn Kabupatèn Kabupatèn	NT POWER EFFICIENCY
E	NT PROPELLER EFFICIENCY NT PROPULSIVE EFFICIENCY
GLASS	NT THERMODYNAMIC EFFICIENCY
Tribological characteristics of a composite total-surface hip replacement	NT TRANSMISSION EFFICIENCY RIGHNFUNCTIONS
[NASA-TP-1853] p0066 N82-16239	U GENVECTORS
AR A hydrodynamic model of an cuter hair cell	BIGHESTATES U GENVECTORS
[NASA-IN-82773] p0143 N82-16743	RIGENVALUES
NT MESOSPHERE	Eigenvalues of the Rayleigh-Benard and Harangoni problems
NI STRATOSPHERE	p0092 A82-13396
HT TROPOPAUSE	Acoustic transmission in lined flow ducts - A finite element eigenvalue problem
Charging of a large object in low polar Earth orbit	p0 154 A82-17663
space shuttle orbiter p0039 N82-14275	Boundary layer thermal stresses in angle-ply
Nickel-hydrogen bipolar battery systems	composite laminates, part I graphite-epoxy
[NASA-TM-82946] p0125 N82-30716	composites
NATE RESOURCES HT COAL	[NASA-CR-165412] p0113 N82-26713
NT FOSSIL FUELS	NT STELLAR HASS EJECTION
NATH SATELLITES NT ATS 5	RLASTIC CONSTANTS U ASTIC PROPERTIES
NT COMMUNICATION SATELLITES	RLASTIC REDIA
NT SCATHA SATELLITE NT SCLAF POWER SATELLITES	On a study of the /Delta T/c and C/asterisk/ integrals for fracture analysis under non-steady
NT SYNCHRONOUS SATELLITES	creep
U TERNALLY BLOWN PLAPS	PO 115 A82-36782
BULLITION	U DULUS OF BLASTICITY
U ILING KLIPSING BINABY STARS	RLASTIC PLATES
Oltraviolet observations of the 1980 eclipse of	Ultrasonic input-output for transmitting and receiving longitudinal transducers coupled to
the symbiotic star CI Cygni	same face of isotropic elastic plate

NT FEDOX CELLS

```
[ NASA-CP-3506]
                                                 p0110 M82-18613
                                                                             NT SILVER ZINC BATTERIES
PLASTIC PROPERTIES
                                                                             NT STORAGE BATTERIES
 NT AFFOEL ASTICITY
                                                                               Performance of advanced chromium electrodes for
                                                                                  the NASA Redox Energy Storage System
 NT ELASTOPIASTICITY
 NT HOCULUS OF ELASTICITY
NT THERMOVISCORLASTICITY
                                                                                  [ HASA-TH-82724]
                                                                                                                             p0118 #82-12574
                                                                           Engonation of the full-bridge series-resonant power
 NT VISCOELASTICITY
   Path-independent integrals in finite elasticity and inelasticity, with body forces, inertia, and arbitrary crack-face conditions
                                                                                  converter
                                                                                                                             p0086 A82-46385
                                                                            BLBCTRIC CHARGE
                                                 p0115 A82-32303
                                                                             MT ELECTRIC DIPOLES
   Elastic-plastic finite-elament analyses of
                                                                             NT ELECTROSTATIC CHARGE
     thermally cycled double-edge wedge specimens FNASA-TP-1973] p0111 NE
                                                                            BLECTRIC CHOPPERS
                                                                               Straight and chopped DC performance data for a reliance EV-250AT motor with a General Electric EV-1 controller
                                                p0111 NEG-20566
ELASTIC STABILITY
 U MPING
                                                                               [MASA-CR-165947] p0132 M82-17608
Chopper-controlled discharge life cycling studies
PLASTIC WAVES
 NT AEBODYNAMIC NOISE
 NT AIFCRAFT NOISE
HT DETCHATION WAVES
                                                                                  on lead-acid batteries
                                                                                  [ WASA-CR-1656 16]
 NT EPGINE NOISE
NT JOT AIRCEAFT NOISE
NT HOISE (SCUND)
NT MOTHAL SHOCK WAVES
NT FLASHA WAVES
                                                                               Straight and chopped DC performance data for a
General Electric 561436Al DC shunt motor with a
General Electric EV-1 controller
[NASA-CR-165507] p0085 N82-24
                                                                                                                             p0085 N82-24425
                                                                                Results of chopper-controlled discharge life
 NT SHOCK WAVES
NT SOUND WAVES
NT TOILMEIN-SCHLICHTING WAVES
                                                                                  cycling studies on lead acid batteries
                                                                                  [ Nasa-Tr - 2912]
                                                                                                                             p0 124 N82-30700
                                                                            BLECTRIC CIRCUITS
 HI ULTRASCHIC RADIATION
HT UNLOADING WAVES
                                                                             U RCUITS
                                                                            ELECTRIC COMDUCTORS
                                                                               Numerical simulation of sheath structure and current-voltage characteristics of a
   Ultrasonic input-output for transmitting and
     receiving longitudinal transducers coupled to
same face of isotropic elastic plate
                                                                                  conductor-dielectric disk in a plasma
      [ NASA-CR-3506 ]
                                                p0110 N82-18613
                                                                                                                             P0040 A82-15904
ELASTICITY
                                                                               SCATHA SSPM charging response: NASCAP predictions
U ASTIC PROPERTIES RLASTICIZERS
                                                                                  compared with data
                                                                                                                             p0037 N82-14251
 U ASTICIZERS
                                                                            RESCRETE CURRENT
ELASTODYNABICS
                                                                             NT ALTERNATING CURRENT
 NT ELASTOHYDRODYNAMICS
                                                                             NT ARC DISCHARGES
   Motion of a rigid punch at the boundary of an
                                                                             NT DERECT CURREST
      orthotropic viscoelastic half-rlane
                                                                             NT ELECTRIC ARCS
                                                                             NT ELECTRIC DISCHARGES
                                                        A82-26436
ELASTONYDRODYNAMICS
                                                                             NT LIGHTNING
   Alignment of fluid molecules in an EBD contact [ASLE PREPRINT 81-LC-fc-1] p0107 x82-
                                                                             NT PLASMA CURRENTS
NT RADIO PREQUENCY DISCHARGE
                                                p0 107 A82-18407
   Regimes of traction in concentrated contact
                                                                               Multijunction high voltage concentrator solar cells
      lubrication
                                                                                                                             p0043 A82-11796
                                                                               Effect of positive pulse charge waveforms on the energy efficiency of lead-acid traction cells
       ASME PAPER 81-LUB-167
                                                 p0107 A82-18431
   Effects of artificially produced defects on film
      thickness distribution in sliding ERD point
                                                                                  [ NASA-TM-82709 ]
                                                                                                                             p0118 N82-10503
      centacts
                                                                            ELECTRIC DIPOLES
      [ NASA-TH-82732]
                                                 p0099 N82-16412
                                                                               Cesiation of W/001/ - Work function lowering by multiple dipole formation
   Basic lubrication equations
     T NASA-TM-816937
                                                 p0099 N82-16413
                                                                                                                                     A82-30002
   Prictional heating due to asperity interaction of
                                                                            BLECTRIC DISCHARGES
      elastchydrodynamic line-contact surfaces
                                                                             MT ARC DISCHARGES
                                                                             NE ELECTRIC ARCS
      [ NASA-TE- 1882]
                                                 p0100 NB2-25514
   Film shape calculations on supercomputers [NASA-IM-82856] p010
                                                                             NT LIGHTNING
                                                 p0100 N82-25519
                                                                             NT RADIO PREQUENCY DISCHARGE
   The influence of surface dents and grooves on traction in stiding FHD point contacts
                                                                                Modification of spacecraft potentials by thermal
                                                                                  electron emission on ATS-5
      [ NASA-TM-82943]
                                                 p0 102 N82-32734
                                                                                                                             p0040 A82-16194
ELASTONEES
                                                                               Internal breakdown of charged spacecraft dielectrics
   Measurement of oil film thickness for application
                                                                                                                             p0041 A82-18312
     to elastomeric Stirling angine rod seals
[ASME PAPER 81-108-97 p0:07
                                                                                Voltage gradients in solar array cavities as
                                                 p0107 182-18426
                                                                                  possible breakdown sites in
BLASTOPLASTICITY
                                                                                  spacecraft-charging-induced discharges
   On finite deformation elasto-plasticity
                                                                                                                             p0038 A82-18317
                                                 p0116 A82-45869
                                                                                Voltage gradients in solar array cavities as
   Flastic-plastic finite-element analyses of
                                                                                  possible breakdown sites in
      thermally cycled single-edge wedge specimens
[MASA-TP-1982] poll1 N82
                                                                                  spacecraft-charging-induced discharges
                                                 p0111 NB2-20565
                                                                                  [NASA-TM-82710]
                                                                                                                             p0037 N82-11107
ELECTRIC ARCS
                                                                                Analytical modeling of satellites in
   Effects of arc current on the life in burner rig
                                                                                  geosynchronous environment
      thermal cycling of plasma strayed Zrosub2-
                                                                                                                             P0037 N82-14258
      Ysut20suh3
                                                                            ELECTRIC EMERGY STORAGE
      [ NASA-TN-82795]
                                                                                NASA Redox system development project status
                                                 p0087 N82-17453
                                                                                p0123 N82-25637
Chemical and electrochemical behavior of the
Cr(3)/Cr(2) half cell in the control of the
ELECTRIC AUTOHOBILES
   Progress on advanced dc and ac induction drives for electric vehicles
[ NASA-TM-82895]
BLECTRIC BATTERIES
                                                 p0163 N82-21160
                                                                                  Storage System
                                                                                  [NASA-TH-82913]
                                                                                                                             p0055 N82-33463
 NT ALKALINE BATTERIES
                                                                            ELECTRIC FIELDS
 NT LEAD ACID BATTERI, S
                                                                                The use of a structural method to calculate the
                                                                                  electrostatic field of a magnetron
 NT NICKEL CADMING BATTERIES
 NT NICKEL HYDROGEN PATTERIES
                                                                                                                                     A82-18370
 NT NICKEL ZINC PATTERIES
                                                                                Experimental simulation of biased solar arrays
```

with the space plasma

The second control of the second of the seco

Ť,

```
[ NASA-CF- 165485]
                                                    p0157 N82-10880
    Pockels-effect cell for gas-flow simulation
       [ NASA-TP- 2007 ]
                                                    p0095 N82-23515
    Electrostatic fuel conditioning of internal
       combustion engines [NASA-CR-169029]
                                                     p0106 N82-26680
    Flectric and magnetic fields
[NASA-CF-165604]
                                                     p0045 N92-28350
ELECTRIC PILTERS
INPUT filters
Input filter compensation for switching regulators
[NASA-CR-169005] p0085 N82-2548
ELECTRIC GENERATORS
NT AC GENERATORS
NT ALKALINE BATTERIES
NT DIRECT FOMER GENERATORS
                                                    p0085 N82-25444
 NT FUEL CRILS
 NT UYDROGEN OXYGEN FUFL CELLS
 NT BAGNETCHYDRODYNABIC GENERATORS
 NT RICKEL ZINC DATTERIES
NT FHESFHEFTE ACID FUEL CFLLS
NT BEGENERATIVE FUEL CELLS
 NT SOLAR CELLS
NT SOLAR GENERATORS
 NT THERMIONIC CONVERTERS
 NT TUBECGENERATORS
    Interfacing wind energy conversion equipment with
       utility systems
    The NASA Lewis large wind turbine program
    Application of photovoltaic electric power to the rural education/communication needs of developing countries
       developing countries [NASA-CR-167894]
                                                    p0137 N82-29720
    Environmental assessment of the 40 kilowatt fuel
      cell system field test operation [ ros/NASA/2701-1]
    Experience and assessment of the DOE-NASA Mod-1
2000-Kilowatt wind turbine generator at Boone
       North Carolina
      [ NASA-TM-82721]
                                                    p0125 N82-30710
    On the cause of the flat-spot phenomenon observed
       in silicon solar cells at low temperatures and
       low intensities
       [ NASA-TH-829037
                                                     p0126 N82-31777
ELECTRIC FYBRID VEHICLES
    Hybrid and electric advanced vehicle systems
       (heavy) simulation
       [ NASA-CR- 165536]
                                                    p0163 N82-16938
ELECTRIC HOTOR VEHICLES
A PWH transistor inverter for an ac electric
       vehicle drive
                                                    DCC85 A82-20744
    Design study of a continuously variable roller cone traction CVT for electric vehicles
       [ NASA-CR- 159841]
                                                    PO 105 N82-12445
    The ac propulsion system for an electric vehicle,
       phase 1
       [ NASX-CP- 165480]
                                                    p0129 N82-13506
    Hybrid and electric advanced vehicle systems
      (beavy) simulation [NASA-CP-165536]
   Straight and chopped DC performance data for a General Electric 5BY436A1 DC shunt motor with a
      General Plectric EV-1 controller
       [ NASA-CR- 165507]
                                                    p0085 N82-24425
    Rolling resistance of electric vehicle tires from
      track tests
[NASA-IM-82836]
                                                    p0124 N92-28786
    Summary of electric vehicle dc motor-controller
                                                    p0082 N82-33636
    On the road performance tests of electric test
vehicle for correlation with road load simulator [NASA-YM-82900] p0127 N82-338:
ELECTRIC MOTORS
NT SYNCHRONOUS MOTORS
                                                    p0127 N82-33829
    Hard permanent magnet development trends and their
      application to A.C. machines
                                                    p0083 A82-20745
   fast recovery, high voltage silicon diodes for AC motor controllers
                                                    p0086 A82-36926
   Straight and chopped DC performance data for a
      reliance EV-250AT motor with a General Electric
      FV-1 controller
      [ NASA-CR- 165447]
                                                    p0 132 N82-17608
```

```
Engine technology
                                                      D0001 N02-19145
    Pover systems
                                                      p0001 N82-19146
    Power systems
                                                      p0001 #82-19146
    Environmental control systems
                                                      p0001 N82-19147
    Electromechanical actuators
                                                              M82-19148
    Straight and chopped DC performance data for a
       General Blectric 581436A1 DC shunt motor with a General Electric EV-1 controller
      [ NASA-CR-165507]
                                                      p0085 N82-24425
BLECTRIC POTENTIAL
BY OPEN CIRCUIT VOLTAGE
    High- and low-resistivity silicon solar cells
                                                      p0046 A82-11762
    Modification of spacecraft potentials by thermal electron emission on ATS-5
                                                      p0040 A82-16194
    Voltage gradients in solar array cavities as possible breakdown sites in
       spacecraft-charging-induced discharges
                                                      p0038 A82-18317
    'Bootstrap' charging of surfaces composed of
      multiple materials
                                                      p0085 A82-18318
    Potentials of surfaces in space
                                                      p0165 A82-23750
    Differential charging of high-voltage spacecraft -
      The equilibrium potential of insulated surfaces
                                                      P0041 A82-35547
    Numerical simulation of plasma insulator
      interactions in space. Part 1: The self
      consistent calculation
                                                      p0039 N82-14272
    Mapping of electrical potential distributions with
      charged particle beams [NASA-CR-168556]
                                                      p0084 N82-18508
    Impact of uniform electrode current distribution
      on ETP
[NASA-TM-82875]
                                                      p0123 N82-25636
    Additional extensions to the NASCAP computer code,
      volume 3
      [ NASA-CR-167857]
                                                      p0040 NB2-26378
    Determination of optimum sunlight concentration
level in space for 3-4 cascade solar cells
[NASA-TM-82899] p0126 M82-
                                                      p0126 N82-32853
BLECTRIC POSER
    High power solar array switching regulation
                                                      p0043 A82-11736
ELECTRIC POWER CONVERSION
U ECTRIC GENERATORS
ELECTRIC POWER PLANTS
 NT PUEL CELL POWER PLANTS
Comparative analysis of CCMHD power plants ---
      Closed Cycle MHD
                                                      p0158 A82-20747
    MHD channel p Tformance for potential early commercial HHD power plants
    An assessment of alternative fuel cell designs .or
      residential and commercial cogeneration
    pOl38 A82-24695
Magnetohydrodynamics MHD Engineering Test Facility
      ETF 200 HWe power plant. Conceptual Design
Engineering Report CDEM. Volume 3: Costs and
      schedules
      [ NASA-CR-165452-VOL-3 ]
                                                      p0 128 N82-10495
   (MRDA-CR-103922-101-)
Hagnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 MWe power plant. Design
Requirements Document (DRD)
      [ NASA-TH-82705]
                                                      p0099 N82-12446
    Magnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 NWe power plant. Conceptual
Design Engineering Report (CDER). Volume 1:
   Executive summary
[NASA-CR-165452-VOL-1]
Summary and evaluation of the conceptual design
study of a potential early commercial MHD power
plant (CSPEC)
                                                     PO 129 NB 2-12570
      [NASA-TM-82734]
                                                     p0119 N82-16481
    Develop and test fuel cell powered on-site
      integrated total energy systems. Phase 3: Full-scale power plant development (NASA-CR-165455) p0131 N
                                                     p0131 N82-16483
   Maynetohydrodynamics (MHD) Engingering Test
Facility (ETF) 200 MWe power plant Conceptual
```

```
Design Engineering Report (CDER)
                                                                                              Tapedance conversion using quantum limit
   Design Engineering Report (CDER)
[MASA-CR-165452-VOL-5] p0 132 M8;
Maguetohydrodynamics (MHD) Engineering Test
Fability (ETF) 200 MWe power plant. Concept
Design Engineering Report (CDER). Volume 4;
Supplementary engineering data
[MASA-CR-165452-VOL-4] p0 133 M8;
                                                         p0 132 N82-17603
                                                                                                 nonreciprocity for superconductor mixer
                                                                                                 componention
                                                           Conceptual
                                                                                                                                                    p0 159 182-31276
                                                                                          BLECTRICAL INSULATION
                                                                                              Low temperature growth and electrical
characterization of insulators for Gals HISPETS
                                                         p0 133 N82-18688
    Performance and operational economics estimates
       for a coal qusification combined-cycle
                                                                                                 [ WASA-CR-164972]
                                                                                                                                                    p0159 N82-11959
                                                                                         ELECTRICAL LEADS
U ECTRIC CONDUCTORS
ELECTRICAL PROPRETIES
NT CHARGE DISTRIBUTION
       cogeneration powerplant [NASA-TH-82729]
                                                          p0120 N82-19672
    Hagnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 HWe power plant. Concept
Design Engineering Report (CDER), Volume 2:
                                                           Conceptual
                                                                                           NT CONTACT RESISTANCE
       Engineering. Volume 3: Costs and schedules (NASA-CR-165452-VOL-2] p0136 M82
                                                                                           NT DIELECTRIC PROPERTIES
                                                         p0 136 N82-27837
                                                                                           NT ELECTRICAL IMPEDANCE
    Development and test fuel cell powered on-site
                                                                                           NT ELECTRICAL RESISTANCE
integrated total energy systems. Prace 3:
Full-scale power plant development
[NASA-CR-167898] P0137 M.
ELECTRIC POWER SUPPLIES
NT SPACECRAFT POWER SUPPLIES
                                                                                           NT ELECTRICAL RESISTIVITY
NT PERROPLECTRICITY
                                                                                           NT PHOTOVOLTAIC EPPECT
NT PIEZOPLECTRICITY
                                                         p0 137 N82-30705
                                                                                          BLUCTRICAL RESISTANCE
    NASA preprototype redox storage system for a
                                                                                           NT CONTACT RESISTANCE
       photovoltaic stand-alone application
                                                                                              Large area low-cost space solar cell development
                                                                                                                                                    p0 126 N82-32854
                                                         p0 127 A82-11774
                                                                                                 [NASA-TH-82902]
                                                                                          BLECTRICAL RESISTIVITY
    Power system design optimization using Lagrange multiplier techniques
                                                                                              A theory of the n-i-p silicon solar cell
                                                          p0085 A82-20743
                                                                                                                                                    p3 128 A82-45055
    Modeling the full-bridge series-resonant power converter
                                                                                              Some properties of RP sputtered hafnium nitride
                                                                                                 coatings
                                                          P0086 A82-46385
                                                                                                 [NASA-TM-82826]
    International market assessment of stand-alone
                                                                                              Hethod of making a high voltage V-groove solar cell [MASA-CASE-LEW-13401-1] p0124 N82-297(C)
       photovoltaic power systems for cottage industry
       applications
                                                                                          REBCTRICITY
    Calculation of quaranteed sean power Eros wind turbine generators
                                                                                           MT ALTERNATING CURRENT
MT ATMOSPHERIC ELECTRICITY
                                                                                              Integrated gasifier combined cycle polygeneration
                                                                                                 system to produce liquid hydrogen [MASA-TM-82921]
                                                          p0 122 NB2-23699
MLECTRIC POWER TRANSMISSION
Preliminary design development of 100 KW rotary
                                                                                                                                                    p0125 N82-30713
                                                                                          BLECTRIFICATION
       power transfer device [NASA-CR-165431]
                                                                                              Market assessment of photovoltaic power systems
                                                                                                 for agricultural applications in Mexico
                                                          p0084 N82-23395
MLECTRIC PROPULSION

HT ELECTRONAGNETIC PROPULSION
                                                                                                 [ WASA-CR-165441]
                                                                                                                                                    p0 128 N82-10506
                                                                                              Socioeconomic impact of photovoltaic power at Schuchuli, Arizona [MASA-CR-165551] p0133 M82
 NT SOLAR ELECTRIC PROPULSION
    Characterization of advanced electric propulsion
                                                                                          ELECTRO-OPTICS
       systems
       [ AIAA PAPER 82-1246]
                                                                                              High temperature electronic requirements in
                                                         p0071 AB2-35083
    study of electrical and chemical propulsion
systems for auxiliary propulsion of large space
systems. Volume 1: Executive summary
[NASA-CR-165502-VOL-1] p0046 N82-11
                                                                                                 aeropropulsion systems
                                                                                                                                                    p0081 N82-15313
                                                                                                 [E-708]
                                                                                              Pockels-effect cell for gas-flow simulation
    [NASA-CR-165502-VOL-1] p0046 N82-11110
Study of electrical and chemical propulsion
                                                                                                 [ NASA-TP-2007 ]
                                                                                                                                                    p0095 NB2-23515
                                                                                          BLECTROCATALYSTS
       systems for auxiliary propulsion of large space
                                                                                              Survey on aging on electrodes and electrocatalysts
       systems, volume 2 [NASA-CR-165502-VOL-2]
                                                                                                 in phosphoric acid fuel cells
                                                                                                                                                    p012/4 N82-11545
                                                          p0044 N82-11111
                                                                                                 [ WASA-CR-165505]
    Inert gas ion thruster
[NASA-CR-165521]
                                                                                              Preparation and evaluation of advanced
                                                                                              electrocatalysts for phosphoric acid fuel cells
[NASA-CR-165519] p0129 M82-12573
Development of a high-temperature durable catalyst
                                                          p0044 H82-21252
    An insight into auxiliary propulsion requirements
       of large space systems
       [ NASA-TM-82827]
                                                                                                 for use in catalytic combustors for advanced
                                                          p0042 N82-24286
                                                                                                 automotive gas terbine engines [NASA-CR-165396]
    Characterization of advanced electric propulsion
                                                                                                                                                    p0 130 NB2-13510
                                                                                              Stabilizing platinum in phosphoric acid fuel cells
[MASA-CR-165483] p0 | 30 M82-1462
Preparation and evaluation of advanced
electrocatalysts for phosphoric acid fuel cells
[MASA-CR-165594] p0 | 132 M82-1761
       7 NASA-CR- 1678857
                                                          p0045 N82-26381
    Large Space Systems/Propulsion Interactions [NASA-TM-82904] p0042 | Electric and magnetic fields
                                                                                                                                                   p0 130 N82-14628
                                                         p0042 N82-27358
       [ NASA-CR- 165604]
                                                          p0045 N82-28350
                                                                                                                                                    p0132 N82-17615
    Integrated propulsion for hear-Earth space wissions. Volume 1: Executive summary [ NASA-CF-167889-VOL-1 ] p0045
                                                                                              Cathode catalysts for primary phosphoric acid fuel
                                                          p0045 N82-33424
                                                                                              [NASA-CR-165578] p0134 N82-2170
Cathode catalyst for primary phosphoric fuel cells
                                                                                                                                                    p0 134 N82-21709
    Integrated propulsion for near-Earth space
                                                                                              [NASA-CR-165198] p0134 N83
Non-noble catalysts and catalyst supports for phosphoric acid fuel cells
[NASA-CR-165289] p0137 N83
                                                                                                                                                   p0134 N82-22675
      missions. Volume 2: Technical [NASA-CR-167889-VOL-2]
                                                          p0046 N82-33425
ELECTRIC ROCKET ENGINES
 NT ELECTROSTATIC ENGINES
                                                                                                                                                    p0:37 N82-30722
 NT ION ENGINES
                                                                                          ELECTROCHERICAL CELLS
 NT MERCURY ION ENGINES
                                                                                           NT ALKALINE BATTERIES
NT ELECTRIC BATTERIES
ELECTRICAL CONDUCTIVITY
U ECTRICAL RESISTIVITY ELECTRICAL ENERGY
                                                                                           MT FUEL CELLS
                                                                                           NT HYDROGEN OXYGEN FUEL CELLS
NT LEAD ACID BATTERIES
NT NICKEL CADMIUM BATTERIES
NT NICKEL HYDROGEN BATTERIES
NT NICKEL ZIMC BATTERIES
U ECTRIC POWER
ELECTRICAL ENGINEERING
    Bibliography of Lewis Research Center technical publications announced in 1901
       [ NASA-IM-82838]
                                                          p0163 N82-27191
                                                                                            NT PHOSPHORIC ACID FUEL CELLS
ELECTRICAL IMPEDANCE
NT CONTACT RESISTANCE
NT ELECTRICAL RESISTANCE
                                                                                           NT REDOX CELLS
                                                                                           NT REGENERATIVE PUEL CELLS
                                                                                           NT SILVER ZINC BATTERIES
```

T NASA-CR- 1654247

p0038 NB2-14226

```
NT STORAGE BETTEPTES
                                                                                          BLECTRUMAGNATIC ACCELERATION
    Moderate temperaturo Na cella III -
                                                                                              A stall scale lunar launcher for early lunar material utilization
      Flactrochemical and structure? studies of Cr0.5VC.5S2 and its Na interestates
                                                                                                                                                     p0032 A82-35617
                                                          p0055 A82+15732
                                                                                          BLECTRONAGENTIC CONTROL
    Endurance test and evaluation of alkaline water cleetrolysis cells
                                                                                          U ECTROMAGNETS
ELECTROMAGNETIC PINLES
       [ NABA-CF- 165424]
                                                                                              On a free-electron-laser in a uniform magnetic field - A solution for arbitrarily strong electromagnetic radiation fields
                                                          DC 130 N82- 13508
    Preparation and avaluation of advanced
       electrocatalysts for phosphoric acid fuel cells
f NASA-CP-1655941 policy policy NASA-CP-1655941
                                                          p2132 N82-17615
ZLECTROCHERICAL OXIDATION
Chemical and electrochemical behavior of the
Cr(3)/Cr(2) half cell in the NASh Redox Energy
                                                                                              Three-dimensional relativistic field-electron
                                                                                                  interaction in a multicavity high-power
                                                                                          klystron. I: Basic theory
[NASA-TP-1992]
BLBCTROHAGUSTIC INTERACTIONS
HT PLASMA-BLECTEOMAGNETIC INTERACTION
       Storage System
                                                                                                                                                     DOOR | N82-22439
       | NASA-TH-829131
                                                          p0055 N82-33463
PLECTROCHERISTRY
    Moderate temperature Ha cells IV - VS2 and NbS2C12 as rechargeable cathodes in moltan NaAlC14
                                                                                          BLECTRUMAGNETIC INTERPRESECE
                                                                                           NT RADIO PREQUENCY INTERFERENCE
                                                          p0055 A82-15743
                                                                                              Brushfire arc discharge model
Synthetic hattery cycling techniques
[NASA-TH-82945] p0125 N82-30
ELECTPODE FILE BARBIERS
Cross-linked polyvinyl alcohol files as alkaline
hattery separators
                                                                                                                                                    P0038 N82-14224
                                                          p0 125 N82-30715
                                                                                          ELECTRONAGNETIC PROPERTIES
                                                                                           NT DIREPRINGENCE
NT DIELECTRIC PROPERTIES
                                                                                            NT PERROELECTRICITY
       [ NASA -IN-828021
                                                                                            NT OPTICAL PROPERTIES
                                                          p0054 N82-22327
ELECTRODEPOSITION
                                                                                            NT PHOTOVOLTAIC EFFECT
    Mechanism and models for zinc metal morphology in alkaline media [NSA-TM-82768] p0120 N82-19
                                                                                            NT REPLECTANCE
                                                                                            NT REPRACTIVITY
                                                                                          NT TRANSHITTANCE
BLECTHOHAGNETIC PROPULSION
NT HASS DRIVERS (PAYLOAD DELIVERY)
Proliminary feasibility assessment for
                                                          p0120 N82-19671
BLECTRODES
 NT ANCDES
 NT CATHODES
                                                                                                 Rarth-to-space electromagnetic (Railgun) launchers
 HT CELL CATHODES
 NT FLASHA ELECTRODES
                                                                                                 TNASA-CR-167886]
                                                                                                                                                   p0033 N82-29345
                                                                                          ELECTROHAGNETIC RADIATION
NT CENTINETER WAVES
NT FAR ULTRAVIOLET RADIATION
 NT SOLIC ELECTRODES
    Survey on aging on electrodes and electrocatalysts in phosphoric acid fuel cells
                                                                                           NT GANNA BAYS
NT INFRARED RADIATION
       [ NASA-CE- 165505]
                                                          p0 128 NB2-11545
    Performance of advanced chromium electrodes for
      the MASA Redox Energy Storage System
[FASA-TH-82724] pt
                                                                                            NT MICCOWAVE EMISSION
                                                          p0 1 18 N82- 12574
                                                                                            NT MILLIMETER WAVES
    Technology development for thesphoric acid fuel cell powerplant, phase 7
[NASA-CE-165426] p0131 N82-
                                                                                            NT POLARIZED LIGHT
                                                                                           NT SOLAR RADIO BURSTS
NT SOLAR HADIO EMISSION
NT SOLAR X-RAYS
                                                          p0131 N82-16482
    Performance mapping studies in Redox flow cells FNASA-TH-02707]
                                                                                            NT SUNLIGHT
    Method of making formulated plastic separators for soluble electrode cells [NASY-CASE-LFM-12358-2] p0054 N82-2126
                                                                                          ELECTRONAGNETIC SCATTERING
                                                                                           NT LIGHT SCATTERING
NT RAMAN SPECTER
                                                          p0054 N82-21268
    Jmproved Chronium electrodes for REDOX cells [NASA-CASE-LFW-13653-1] p0121 N
                                                                                            NT RAYLEIGH SCATTERING
                                                          p0 121 N82-22672
                                                                                          ELECTRONAGEETIC SPECTRA
    Light weight hickel battery plaque [ NASA-CASE-EEW-17349-1]
                                                                                           NT INFRARED SPECTRA
NT RAMAN SPECTRA
NT STELLAR SPECTRA
                                                          p2121 N82-22673
    Multistage depressed collector for dual mode operation --- for microwave transmitting tubes [NASA-CASE-LEW-13282-1] p0081 N82-24415
                                                                                          NT ULTRAVIOLET SPECTRA
ELECTRONAGNETIC WAVE FILTERS
    Impact of uniform electrode current distribution
                                                                                           NT ELECTRIC PILTERS
                                                                                            NT MATCHED FILTERS
       on ETF
    [NASA-TH-82875] p0123 NF
NASA Redox system development project status
                                                                                          RELECTROMAGNETIC WAYE TRANSMISSION
HT LIGHT SCATTERING
NT HICROWAVE TRANSMISSION
HT TRANSHORIZON RADIO PROPAGATION
                                                          p0123 NB2-25636
    pol23 NB2-25637

Ion beam textured graphite electrode plates ---
high efficiency electron tube devices
[NASA-CASE-LEW-12919-2] po050 NB2-26306

Pyrolytic graphite ----
                                                                                          BLECTRONAGNETICS
                                                                                           U ECTROMAGNETISM
    Pyrclytic graphite collector development program
[NASA-CF-167909] p0052 N02-3
Synthotic battery cycling techniques
                                                                                          ELECTRONAGNETISE
                                                          p0052 N82-29363
                                                                                              Conceptual design of superconducting magnet system
                                                                                                 for Magnetchydrodynamic (MHD) Engineering Test
Facility (ETF) 200 MWe power plant
[NASA-CR-165053] p0105 W82-14
       F NASA-TH-82945 1
                                                          p0 125 NB2-30715
    Nickel-hydrogen bipolar battery systems
                                                                                                                                                     p0105 N82-14520
       [ NASA-TH-82946]
                                                          p0125 N82-30716
                                                                                               Development of a dual-field heteropoplar power
ELECTRODYNAMICS
                                                                                                 convertor
    Representation and material charging response of
                                                                                                  [NASA-CR-165168]
                                                                                                                                                     D0084 NB2-24424
       quoplasma environments
                                                                                          RLECTRONAGEETS
                                                          p0039 N82-14249
                                                                                            NT SUPERCONDUCTING HAGHETS
WLECTROCEN ERATORS
                                                                                              Pormanent magnet properties of Mn-x1-C between -50 C and +150 C
 U ECTRIC GENERATORS
ELECTROLYTES
                                                                                                                                                     PG085 A82-20505
 NT ION EXCHANGE MEMERANE ELECTROLYTES
                                                                                          RESCHRONECHANICAL DEVICES
 NT HOLTEN SALT BLECTROLYTES
                                                                                               Electromochanical actuators
   Improved chromium electrodes for FEDOX cells
[NASA-CASE-LEW-13653-1] p0 121 N82-
Requirements for optimization of electrodes and
                                                                                                                                                              N82-19148
                                                          p0 12 | N82-22672
                                                                                          ELECTRON BEARS
                                                                                            ET RELATIVISTIC ELECTRON BEAMS
      electrolyte for the iron/chromium Redox flow cell [NASA-CR-165218] P0136 N82-25640
                                                                                              Electron beam induced damage in ITO coated Kapton
                                                                                                  --- Indium Tin Oride
ELECTROLYTIC CELLS
                                                                                                                                                     p0 159 482-41546
    Endurance test and evaluation of alkaline water
                                                                                              Secondary electron emission yields
       electrolysis colls
```

p0130 N82-13508

compensation

```
p0 159 A82-31276
   Secondary electron emission from a charged
      dielectric in the presence of normal and oblique
                                                                               Stationary state model for normal metal tunnel
      electric fields
                                                                                 junction phenomena
                                                                                                                             pd 159 A82-42912
      [ NASA-CR- 168558]
                                                 500E4 NB2-18507
ELECTRON BONDARDHENT
                                                                           MLECTRONIC AMPLIPIERS
   Testing of a spacecraft model in a combined
                                                                             U PLIFIERS
                                                                            RLECTRONIC CONTROL
      environment simulator
                                                 p0037 N82-11106
                                                                               A PWM transistor inverter for an an alectric
      [ N35A-TH-82723]
   Jon hear textured graphite electrode plates ---
high efficiency electron tubs devices
[NASA-CASE-LEW-12919-2] p0050 N82-
                                                                                  vehicle drive
                                                                                                                            p0085 482-20744
                                                                               Preliminary study, analysis and design for a power switch for digital engine actuators [NASA-CR-159559] p0085 M82-2335
                                                p0050 N82-26386
ELECTRON BUNCHING
                                                                                                                             p0085 #82-23394
   Three-dimensional relativistic field-electron
interaction in a multicavity high-power klystron, Part 2: Working Equations [NASA-TP-2008]
                                                                            BLECTRORIC MODIFIERT
NT AVALANCHE DIODES
                                                                             NT BIPOLAR TRANSISTORS
NT CRYSTAL RECTIPIERS
                                                 p0081 N82-23397
                                                                             NT ELECTRONIC HODULES
NT ELECTRONIC PACKAGING
   Multistage depressed collector for dual mode
      operation --- for Microwave transmitting tubes
                                                                            NT ELECTRONIC PACKAGING
NT PIELD EPPECT TRANSISTORS
NT METAL CXIDE SEMICONDUCTORS
NT MIS (SEMICONDUCTORS)
NT PHOTOVOLTAIC CELLS
NT SEMICONDUCTOR DEVICES
NT SEMICONDUCTOR DIODES
                                                 POOBI N82-24415
      [ NASA-CASE-LEW- 13282-1]
ELECTECE COLLISIONS
 U ECTECH SCATTERING
ELECTRON COMPOUNDS
U TERMETALLICS
RECTBON DISTRIBUTION
   The use of a structural method to calculate the
                                                                             NT SOLID STATE DEVICES
      electrostatic field of a magnetron
                                                                             NT TRANSISTORS
                                                        AB2-18370
                                                                            BLECTRONIC HODULES
                                                                               A remote milliwolt multiplexer and amplifier
module for wind tunnel data acquisition
 NT SECONDARY EMISSION
                                                                                                                            p0083 A82-41845
   Modification of spacecraft potentials by thermal
                                                                               Analysis and design of a standardized control module for switching regulators
      electron emission on ATS-5
                                                 p0040 A82-16194
   Spacecraft Charging Technology, 1980
                                                                                                                             p0083 A82-46388
      [ NASA-CP-2182]
                                                 p0037 N82-14213
                                                                            ELECTRONIC PACKAGING
   Secondary electron emission yields
                                                                               Proceedings of the Conference on High-temperature
                                                 p0038 N82-14226
                                                                                  Electronics
                                                                                  [ HASA-TH-84069]
                                                                                                                             D0081 H02=15311
   Cblique-incidence secondary emission from charged
                                                                            ELECTRONIC SWITCHES
U ITCHING CIRCUITS
      dielectronics
                                                 D0039 N82-14227
   Secondary electron emission from a charged
                                                                            BLECTRONS
      As lectric in the presence of normal and oblique
                                                                             NT RELATIVISTIC ELECTRON BEAMS
      Aletric fields
                                                                            BLECTROPHYSICS
                                                 p0084 N82-18507
                                                                             NT ELECTRO-OPTICS
AKARTBON GUNS
                                                                            ELECTROSEISMIC BFFECT
                                                                            U ECTRIC CURRENT
BLUCTROSTATIC CHARGE
    NASCAP simulation of laboratory charging tests
      using multiple electron duns
                                                                                Potentials of surfaces in space
                                                 D0033 A82-18319
PLECTEON INTERACTIONS
                                                                                                                             p0165 A82-23750
U ECTION SCATTERING
ELECTRON INFADIATION
                                                                                Simulation of charging response of SCATHA (P78-2)
                                                                                  satellite
                                                                                                                             p0039 N82-14250
    Internal breakdown of charged spacecraft dielectrics
                                                                                SCATHA SSPE charging response: NASCAP prediction, compared with data
                                                 p0041 A82-18312
    NASCAP simulation of laboratory charging tests
                                                                                                                             p0//37 N82-14251
      using multiple electron guns
    Spacecraft Charging Technology, 1980
[PASSA-CP-2182]
                                                                                Comparison of NASCAP modelling results with lumped
                                                                                  circuit analysis
                                                                                                                             p0037 N82-14255
 PLECTRON MICHOSCOPY
                                                                                Mapping of electrical potential distributions with
                                                                            charged particle beams
[NASA-CR-]68556]
ELECTROSTATIC ENGINES
Electric thruster research
    Preparation and evaluation of advanced
      electrocatalysts for phosphoric acid fuel cells
                                                                                                                             p0084 N82-18508
                                                 p0 129 N82- 12573
      f NASA-CR- 1655 191
    Elucidation of year mechanisms by ferrographic
                                                                                  [NASA-CR-165603]
                                                                                                                             p0045 N82-24285
      analysis
      [ NASA-TH-82737]
                                                 P0066 N82-15199
                                                                            BLECTROSTATIC FIELDS
BLECTRON PATHS
                                                                             U ECTRIC FIELDS
 U ECTRON TRAJECTORIES
                                                                            ELECTROSTATIC PLASMA
                                                                            U ASMAS (PHYSICS)
BLECTROSTATICS
 ELECTRON BADIATION
 NT ELECTRON BEAMS
NT EPLATIVISTIC ELECTRON BEAMS
                                                                                Numerical simulation of plasma insulator interactions in space. Part 1: The self consistent calculation
 ELECTRON SCATTERING
    Three-dimensional relativistic field-electron
      interaction in a multicavity high-power klystron, Part 2: Working Equations
                                                                                                                             D0039 N82-14272
                                                                                Numerical simulation of plasma insulator
      [ NASA-TP-2008]
                                                 p0081 N82-23397
                                                                                  interactions in space. Part 2: Dielectric
 ELECTRON TRAJECTORIES
                                                                                  effects
                                                                                                                             p0039 N82-14273
    Three-dimensional relativistic field-electron
      interaction in a multicavity high-power klystron. 1: Basic theory [NASA-TP-1992] p008
                                                                            RLEMENT ABUNDANCE
                                                                             U UNDANCE
                                                 p0081 N82-22439
                                                                            ELEMENTARY EXCITATIONS
 ELECTRON TUBES
                                                                             NT PLASMONS
  NT KLYSTRONS
                                                                            ELEMENTARY PARTICLE INTERACTIONS
  NT MAGNETRONS
                                                                             NT ELECTRON CAPTURE
NT TRAVELING WAVE TUBES ELECTRON TOWNSLING
                                                                            ELLIPTICAL ORBITS
                                                                             NT TRANSPER ORBITS
                                                                            BHISSION
    Impedance conversion using quantum limit
                                                                             NT CHEMILUMINESCENCE
      nonreciprocity for superconductor mixer
                                                                             NT ELECTRON EMISSION
```

NT EXHAUST EMISSION

```
NT HICRONAVE EMISSION
NT SECONDARY EMISSION
                                                                               Pree electron lasers for transmission of energy in
                                                                                  SPACE
NT SOLAR BADIC BURSTS
NT SOLAR BADIO EMISSION
                                                                                 [ NASA-CR-165520]
EMISSION SPECTRA
   Alignment of fluid molecules in an EDD contact
[ASLE FREERING 81-LC-5C>1] p0 107 A82-1840
Analysis of infrared emission from thin adsorbates
                                                p0 107 A82- 18407
                                                p0056 A82-21431
                                                                                  satellites
EMISSIBITY
   Ion beam microtexturing and enhanced surface
      diffusion
     [ NASA-CR- 1679481
                                                 p0065 M82-31509
EMITTERS
                                                                                  Closed Cycle MHD
 NT THEARICNIC EMITTERS
   High voltage power transistor development
[NASA-CR-165547] p008
                                                 p0084 N82-18506
ENCAPSULATED HICROCIRCUITS
   Stoichicmetry-controlled compensation in liquid
      encapsulated Czochralski Gals
                                                 p0158 A82-17585
ENCAPSULATING
   Undoped semi-insulating LEC GaAs - A model and a
      mechanism --- Liquid Encapsulated Czochralski
                                                 p0 159 A82- 13754
   Testing of solar cell covers and encapsulants
      conducted in a simulated space environment
      [ NASA-CR- 165475]
                                                                                  [ NASA-CR-165328]
                                                 p0 129 N82- 1257 I
    Development of a large area space solar cell
ASSESTATION (NASA-CE-167929)
                                                 p0137 N82-30706
   Turbine endwall single cylinder program [HASA-CR-169278] p0
                                                 p0091 N82-31638
EMBEGETIC PARTICLES
                                                                                 [ HASA-TH-82707]
 NT ARGON PLASMA
 NT CYLINDRICAL PLASMAS
                                                                                  technology
MT PLASMAS (PHYSICS)
Space Shuttie Orbiter charging
[AIAA PAPER 82-0119]
EMERGY ABSORPTION
                                                 p0040 A82-17793
                                                                                  gas fuels
   Analysis of crack propagation as an energy
                                                                                  [NASA-CR-165614]
      absorption mechanism in metal matrix composites
      [ NASA - CR- 16505 1 ]
                                                 p0052 N82-14288
                                                                                  gas turbine with a
EMBRGY ABSORPTION FILMS
   Thin foil silicon solar cells with coplanar back
                                                                                  [NASA-TH-82736]
                                                                            EMERGY CONVERTERS
U RECT POWER GENERATORS
      contacts
                                                 n0 127 A82-44944
                                                                            EMERGY DISSIPATION
REERGY BANDS
   A new strategy for efficient sclar energy
conversion: Parallel-processing with surface
plasmons
[HASA-TM-82867]
NMBBGY COUSERVATION
                                                 p0042 N82-29354
   Reliable aerial thermography for energy conservation
                                                 p0117 #82-14552
      [ NASA-TH-81766]
    Advanced Gas Turbine (AGT) powertrain system
      initial development report
      [ NASA-CF- 165130]
    Develop and test fuel cell powered on-site
                                                                                  [ NASA-CR-168550 ]
      integrated total energy systems: Full-scale power plant development [NASA-CF-165568]
                                               Phase 3:
                                                 p0135 N82-24648
                                                                            [NASA-TP-1882]
   The CF6 jet engine performance improvement: Low pressure turbine active clearance control [NASA-CR-165557] p0029 N82-3:
                                                                             U ERGY TRANSFER
                                                                            ENERGY LOSSES
BREEGY COMSUMPTION
                                                                             U ERGY DISSIPATION
   Collection and dissemination of thermal energy storage system information for the pulp and
                                                                            ENERGY METHODS
      paper industry
                                                                            EMERGY POLICY
                                                 p0 136 N82-24686
EMERGY CONVERSION
 NT PHOTOTHERNAL CONVERSION
 HI SATELLITY SOLAR ENERGY CONVERSION
 NT SOLAR ENERGY CONVERSION
   Conversion of acoustic energy by lossless liners
                                                                                  [ NASA-TH-82724]
                                                 p0154 A82-36195
                                                                                  transportation
    modeling the full-bridge series-resonant power
                                                                                  [NASA-CR-165517]
                                                 p0086 A82-46385
                                                                                  [ NASA-TH-82928]
    Phosphoric acid fuel cell technology status
      [ NASA-TM-82791]
                                                                            BEERGY STORAGE
                                                 PO 120 N82-19670
   Cell module and fuel conditioner development
                                                 p0134 N82-21713
      [ NASA-CP- 165620]
```

Collection and dissemination of thermal energy

paper industry

storage system information for the pulp and

```
p0098 #82-25499
BREEK CONVERSION MANICARNCY
   Optically pumped high-pressure DF-CO2 transfer laser
   Direct conversion of light to radio frequency energy --- using photoklystrons for solar power
                                                   p0138 A82-11712
   High- and low-resistivity silicon solar cells
                                                   p0046 A82-11762
   Comparative analysis of CCMND power plants ---
   p0158 A82-20747
HKD channel performance for potential early
commercial HHD power plants
                                                   p0 158 182-20750
   Effect of positive pulse charge waveforms on the
      energy officiency of lead-acid traction cells [WASA-TM-82709] p0118 N82-
                                                   p0118 N82-10503
   Evaluation of the potential of the Stirling engine
   for heavy duty application
[NASA-CR-165473] p0128
Develop and test fuel cell powered on-site
                                                   p0 128 #82-10505
      integrated total energy system. Pl
Full-scale power plant development
                                                Phase 3:
                                                   p0117 #82-13490
   Cell module and fuel conditioner development [NASA-CR-165462] p0130 N
                                                   p0130 N82-13511
   Study of multi-megawatt technology needs for photovoltaic space power systems, volume 2 [NASA-CR-165323-VOL-2] p0130 N
                                                   p0130 NB2-14637
    Performance mapping studies in Redox flow cells
                                                   p0120 N82-20668
    Energy efficient engine exhaust mixer model
   [NAST-CR-165459] p0025 N82-222(
Low NO sub x heavy fuel combustor concept program.

Phase | | Combustion technology generation coal
                                                   p0025 N82-22264
                                                    p0055 N82-22326
    Parametric performance analysis of steam-injected
      thermionic-energy-converter-lined combustor
                                                   p0121 N82-23678
    Aerodynamic performance of high turning core
      turbine vanes in a two-dimensional cascade
                                                   F0005 A82-37716
      [AIAA PAPER 82-1288]
    On the cause of the flat spot phenomenon observed
      in silicon solar cells at low temperatures and low intensities
    p0044 A82-44965
Micromechanical predictions of crack propagation
      and fracture energy in a single fiber boron/aluminum model composite
                                                   p0052 NB2 16326
    Frictional heating due to asperity interacti
      elastohydrodynamic line-contact surfaces
                                                   p0 100 N82-2,514
 NT STRAIN ENERGY METHODS
    Effect of positive pulse charge waveforms on the energy efficiency of lead-acid traction cells [NASA-TM-82709] p0118 N82-10
                                                   p0118 N82-10503
    Performance of advanced chromium electrodes for
      the NASA Redox Energy Storage System
                                                    p0118 N82-12574
    Barriers to the utilization of synthetic fuels for
                                                    p0073 N82-13243
    Component technology for space power systems
                                                    p0082 N82-30474
  NT ELECTRIC ENERGY STORAGE
 HT HEAT STORAGE
    Alkaline regenerative fuel cell systems for energy
      storage
                                                    P0042 A82-11706
   Deposit formation in liquid fuels. III - The effect of selected nitrogen compounds on diesel
```

p0 136 N82-24686

fuel	
	p0074 A82-23238
The effects of controls and control storage loads on the performance	
photovoltaic systems	or prana-atons
Banfaranae of advanced absorber of	p0 127 A82-45027
Performance of advanced chromium el the NASA Redox Energy Storage Sys	
[NASA-TH-82724]	p0118 N82-12574
Electrochemical energy storage for space station	an orbiting
[NASA-CR-165436]	p0 133 N82-17697
Performance mapping studies in Redo [NASA-TH-82707]	x flow cells p0120 N82-20668
Davelop and test fuel cell rovered	on-site
integrated total energy systems: Full-scale power plant developmen	Phase 3:
[HASA-CR-165568]	p0135 N82-24648
Requirements for optimization of el	
electrolyte for the iron/chromium [NASA-CR-165218]	p0 1 16 N82-25640
Synthetic battery cycling technique	S
[NASA-TM-82945] Nickel-hydrogen bipolar battery sys	p0125 N82-30715 tems
[NASA-TM-82946]	p0125 N82-30716
Design flexibility of Redox flow sy energy storage applications	stems lor
[NASA-IM-82854]	p0054 N82-31459
NUBRGY STORAGE DEVICES U ERGY STORAGE	
ENERGY TECHNOLOGY	
Low NO subx heavy fuel combustor co Phase 1A: Coal gas addendum	ncept program.
I NASA-CR-1655771	p0 133 N82-18690
Results and comparison of Hall and experiments	DW duct
[NASA-TM-82864]	p0 157 N82-2596 I
ENERGY TRANSFER Characteristic dynamic energy equat	ione for
Stirling cycle analysis	Tous rot
ENGINE AIRFRAME INTEGRATION	p0136 182-11816
Advanced general aviation engine/ai	rframe
integration study	
	-0005 800 00060
[NASA-CR-165565]	p0025 N82-22268
ENGINE CONTROL NT ROCKET ENGINE CONTROL	p0025 N82-22268
ENGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL	•
ENGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [ALAA PAPER 61-2634]	y p0029 182-16909
ENGINE CONTROL NT ROCKET ENGINE CONTROL NT TUREGJET ENGINE CONTROL N/STOL propulsion control technolog [AIAA PAPER 61-2634] A tensor approach to modeling of no	y p0029 182-16909
ENGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [AIAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems	y p0029 182-16909 nhomogeneous p0148 182-19064
INGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [ALAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai	y p0029 182-16909 nhomogeneous p0148 182-19064
ENGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131]	y p0029 A82-16909 nhomogeneous p0148 A82-19064 rcraft engine p0015 A82-37691
INGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [AIAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [AIAA PAPER 82-1131] Sensor failure detection system	y p0029 A82-16909 nhomogeneous p0148 A82-19064 rcraft engine p0015 A82-37691
ENGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR- 165515]	y p0029 A82-16909 nhomogeneous p0148 A82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145
NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona	y p0029 A82-16909 nhomogeneous p0148 A82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145
PRGIBE CONTROL NT ROCKET ENGINE CONTROL NT TUREGJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 N82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897
NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power
INGINE COMTROL NT ROCKET ENGINE CONTROL NT TURECJET ENGINE CONTROL N/STOL propulsion control technolog [AIAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [AIAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559]	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power
ENGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 A82-37691 for the P100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs
INGINE COMTROL NT ROCKET ENGINE CONTROL NT TURECJET ENGINE CONTROL N/STOL propulsion control technolog [AIAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [AIAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559]	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 A82-37691 for the P100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative
NT ROCKET ENGINE CONTROL NT TURBEJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 N82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 N82-11783
NT ROCKET ENGINE CONTROL NT TURBEJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 A82-11783 a jet engine
NT ROCKET ENGINE CONTROL NT TUREGJET ENGINE CONTROL N/STOL propulsion control technolog [AIAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [AIAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti Thermal expansion accommodition in frame	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 N82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 N82-11783 a jet engine p0029 N82-11999
NT ROCKET ENGINE CCNTROL NT TURBEJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR- 1655 15] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR- 159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT 101 technology - AT automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Wh	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 N82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 N82-11783 a jet engine p0029 N82-11999 ustion
MNGINE CONTROL NT ROCKET ENGINE CONTROL NT TURBOJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Proliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN NT FOCKET ENGINE DESIGN The AGT101 technology - AT automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Wh Phase I results and status	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 A82-11783 a jet engine p0029 N82-11999 ustion itney Aircraft
NT ROCKET ENGINE CCNTROL NT TURBEJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR- 1655 15] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR- 159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT 101 technology - AT automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Wh	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 N82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 N82-11783 a jet engine p0029 N82-11999 ustion itney Aircraft p0021 N82-34999
NT ROCKET ENGINE CCNTROL NT TURBEJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Wh Phase I results and status [ATAA PAPER 82-1088] Small gas turbine combustor primary [ATAA PAPER 82-1159]	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 A82-11783 a jet engine p0029 N82-11999 ustion itney Aircraft p002! A82-34999 zone development p0103 A82-35036
NT ROCKET ENGINE DESIGN TOTAL PROFITE AND THE CONTROL NT TURBEJFT ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR- 165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR- 159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Whense I results and status [AIAAA PAPER 82-1088] Small gas turbine combustor primary	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 A82-11783 a jet engine p0029 N82-11999 ustion itney Aircraft p002! A82-34999 zone development p0103 A82-35036
NT ROCKET ENGINE CENTROL NT TURBEJET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Wh Phase I results and status [AIAA PAPER 82-1088] Small gas turbine combustor primary [AIAA PAPER 82-1159] AGT10C turbomachinery for autom [AIAA PAPER 82-1207] Combustor development for automotiv	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft engine p0015 N82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 N82-11783 a jet engine p0029 N82-11999 ustion itney Aircraft p002! N82-34999 zone development p0103 N82-35036 obiles p0108 N82-35061 e gas turbines
NT ROCKET ENGINE CONTROL NT TUREGJET ENGINE CONTROL N/STOL propulsion control technolog [AIAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [AIAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Ercliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Phase I results and status [AIAA PAPER 82-1088] Small gas turbine combustor primary [AIAA PAPER 82-1159] AGT10C turbomachinery for autom [AIAA PAPER 82-1207] Combustor development for automotiv [AIAA PAPER 82-1207]	y p0029 N82-16909 nhomogeneous p0148 A82-19064 rcraft engine p0015 A82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 A82-11783 a jet engine p0029 N82-11999 ustion itney Aircraft p002! A82-35036 obiles p0108 A82-35036 e gas turbines
NT ROCKET ENGINE DESIGN THORSET ENGINE CONTROL NT TURBEJFT ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nenlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan enqine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital enqine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Whense I results and status [AIAA PAPER 82-1088] Small gas turbine combustor primary [AIAA PAPER 82-1159] AGT10C turbomachinery for autom [AIAA PAPER 82-1207] Combustor development for automotive fara PAPER 82-1208] The AGT 101 advanced automotive gas [ASME PAPER 82-67-72]	y p0029
NT ROCKET ENGINE CENTROL NT TURBACKET ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nonlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan engine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital engine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Wh Phase I results and status [AIAA PAPER 82-1088] Small gas turbine combustor primary [AIAA PAPER 82-1159] AGT10C turbomachinery for autom [AIAA PAPER 82-1207] Combustor development for automotive faIAA PAPER 82-1208] The AGT 101 advanced automotive gas [ASME PAPER 82-GT-72] Developing a scalable inert gas ion	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft enqine p0015 A82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 A82-11783 a jet enqine p0029 N82-11999 ustion itney Aircraft p0021 A82-34999 zone development p0103 A82-35036 obiles p0108 N82-35061 e qas turbines p0108 N82-35062 turbines p0108 N82-35062 turbines p0108 N82-35062
NT ROCKET ENGINE DESIGN THORSET ENGINE CONTROL NT TURBEJFT ENGINE CONTROL N/STOL propulsion control technolog [ATAA PAPER 61-2634] A tensor approach to modeling of no nenlinear systems Optical tip clearance sensor for ai controls [ATAA PAPER 82-1131] Sensor failure detection system turbofan enqine [NASA-CR-165515] Role of optical computers in aerona applications Freliminary study, analysis and des switch for digital enqine actuato [NASA-CR-159559] ENGINE DESIGN NT ROCKET ENGINE DESIGN The AGT101 technology - An automoti Thermal expansion accommodition in frame NASA Eroad Specification Fuels Comb Technology program - Pratt and Whense I results and status [AIAA PAPER 82-1088] Small gas turbine combustor primary [AIAA PAPER 82-1159] AGT10C turbomachinery for autom [AIAA PAPER 82-1207] Combustor development for automotive fara PAPER 82-1208] The AGT 101 advanced automotive gas [ASME PAPER 82-67-72]	y p0029 N82-16909 nhomogeneous p0148 N82-19064 rcraft endine p0015 N82-37691 for the F100 p0023 N82-13145 utigal control p0156 N82-15897 ign for a power rs p0085 N82-23394 ve alternative p0107 N82-11783 a jet endine p0029 N82-11999 ustion itney Aircraft p0021 N82-34999 zone development p0103 N82-35036 obiles p0108 N82-35061 e das turbine p0108 N82-35062 turbine p0108 N82-35321 thruster p0047 N82-37713

```
Propulsion study for Small Transport Aircraft
  Technology (STAT) [NASA-CR-165499]
                                              p0022 N82-10037
Propulsion study for Small Transport Aircraft
  Technology (STAT), Appendix B [KASA-CR-165499-APP-B]
                                              p0022 N82-10038
Lightweight diesel engine dasigns for commuter
  type aircraft [NASA-CR-165470]
                                              p0023 N82-11068
Integrated analysis of engine structures [WASA-TH-82713] p01
                                              p0111 182-11491
Test results and facility description for a
  40-kilowatt stirling engine
                                              p0163 M82-13013
  [NASA-TH-82620]
Interactive-graphic flowpath plotting for turbine
  engines
                                              p0017 #82-15041
  F WASA-TH-82756 1
Advanced Gas Turbine (AGT) powertrain system
  initial development report
  [NASA-CR-165130]
Advanced Gas Turbine (AGT) powertrain system
  development for automotive applications [NASA-CR-165175] p016
                                              p0163 H82-16937
Cooled variable-area radial turbine technology
  program
  [ NASA-CR-(65408]
Porward acoustic performance of a model turbofan designed for a high specific flow (QF-14) [NASA-TP-1968] p0 152 N82-2
                                              p0152 N82-21036
Cold-air performance of a 15.41-cm-tip-diameter axial-flow power turbine with variable-area stator designed for a 75-kW automotive gas
  turbine engine
  [ WASA-TH-82644]
                                              p0024 N82-21193
Energy efficient engine shroudless, hollow fan
  blade technology report
[NASA-CH-165586] p0024 NB2-21196 The role of modern control theory in the design of
  controls for aircraft turbine engines
[NASA-TM-82815] p0
                                              p0018 N82-22262
Energy efficient engine exhaust mixer model
  technology
  [NASA-CR-165459]
                                              p0025 N82-22264
Computer model of catalytic combustion/Stirling
  engine heater head
[NASA-CR-165378]
Alternatives for jet engine control
[NASA-CR-168894]
                                              p0134 N82-22666
                                              p0026 N82-23247
Study of advanced propulsion systems for Small
  Transport Aircraft Technology (STAT) program [NASA-CR-165610] p6026 N82-24202
Low NOx heavy fuel combustor concept program
                                              p0136 N82-25635
  [ NASA-CR-165367]
Propulsion opportunities for futche commuter
  aircraft
  [ NASA-TH-82915]
                                              p0019 N82-26298
Advanced stratified charge rotary aircraft engine
  design study
  [NASÁ-CR-165398]
                                              p0107 N82-27743
Automotive Stirling engine development program
[NASA-CR-167907] p0164 N82-29235
QCSEE over-the-wing engine acoustic data
[NASA-TM-82708] p00
                                              p0020 M82-29324
Assessment of a 40-kilowatt stirling engine for
  underground mining applications
  [NASA-TH-82822]
                                              p0125 N82-30714
Development of a spinning wave heat engine [NASA-CR-165611] p0028
                                              p0028 N82-31328
Advanced turboprop testbed systems study.
                                                      Volume
  1: Testbed program objectives and priorities,
drive system and aircraft design studies,
  evaluation and recommendations and wind tungel
   test plans
  [NASA-CR-167928-VOL-1]
                                              p0028 N82-32370
Low and medium heating value coal gas catalytic
  combustor characterization [NASA-CR-165560]
                                               DO 138 N82-32856
Automated procedure for developing hybrid computer simulations of turbofan engines. Part !:
   General description
  [ NASA-TP-1851]
Engine dynamic analysis with general nonlinear
  finite element codes. Part 2: Bearing element implementation overall numerical characteristics
  and benchmaking [NASA-CR-167944]
                                              p0028 M82-33390
Structural tailoring of engine blades (STAEBL)
  [ NASA-CR-167949]
                                              P0028 N82-33391
```

```
ENGINE PAILURE
    Rousable rocket engine maintenance study [NASA-CR-165569] p0044 N82-16172
    Analytical investigation of negrecoverable stall [NASA-MH-82792] pn018 NASZ-21195
    [NASA-M-82792] p0018 NE2-
Computer modeling of fan-exit-splitter sessing
effects on F100 response to distortion
       [ NASA-CF- 167979]
                                                            p0025 #82-23246
    Rotor fragment protection progress: Statistics on aircraft das turbine spine reser (allures that occurred in U.S. commercial aviation during 1978 [NASA-CR-165388] p0027 N82-27316
ENGINE INLETS
    An iterative finite element-integral technique for
    predicting sound radiation from turbofen inlets
in steady flight
[AIAA PAPER 82-0124] p0030 A82-17
A summary of Y/STCL inlet analysis methods
[NASA-TH-82725] p0003 N82-710
                                                            p0030 A82-17796
                                                            p0003 N82-91043
    Effect of a part span variable inlut quide vane on
       TF34 fan performance
       [ NASA-CR- 165458]
                                                            p0023 NB2-12075
    Prediction of sound radiation from different
    practical jet angine inlets
[NASA-CR-165120]

Effects of fan inlet temperature disturbances on
the stability of a turbofan engine
                                                            p0 153 N82- 16810
       [ NASA-TH-82699]
    V/STCL Tandew Fun transition section model test
        -- in the Lowis Research Center 10-by-10 foot
       wind tunnel
       [ NASA-CR-165587]
                                                            p0007 NB2-21158
    Energy efficient engine: Turbine transition duct
model technology report
       [ NASA-CR- 167996]
                                                            p0029 N82-33394
ENGINE MONITORING INSTRUMENTS
    high temperature electronic requirements in
       neropropulation systems
       [ #-708]
                                                            p0081 N82-15313
RNGINF MOISE

An iterative finite element-integral technique for predicting sound radiation from turbofas inluts in steady flight

[ALMA FAPER 82-0124] p0000 AB2-1779
                                                            p0030 AB2-17796
        102 in-duct combustor noise measurements with a
       tuching nozzle, volume 1 [NASA-CH-165562-VOL-1]
                                                            p0 153 NB2-21031
    YP 102 in-duct combustor noise measurements with a turbine nozzle, volume 2 [NASA-CR-165562-VOL-2] p0153 N82-210
                                                            p0153 N82-21032
     YP 102 in-duct combustor noise measurements with a
       turbine nozzle, volume 3
[NASA-CP-165562-VOL-3]
                                                            p0 155 N82-21033
    Forward acoustic performance of a model turbofan designed for a high specific flow (QP-14) [NASA-TP-1968] p0152 N82-21036 Pressure transfer function of a JT15D nozzle due
        to acoustic and convected entropy fluctuations
       [ Nash-TH-02842]
                                                            p0152 N82-22951
    OCSEE under-the-wing engine acoustic data
       [ #ASA-TM-82691]
                                                            p0019 N82-27311
    OCSEE over-the-wing engine acoustic data
       [ NASA-TH-82708]
    [NASA-TH-82708] p0020 N82-29324
Finite element-integral simulation of static and
        flight fan noise radiation from the JT150
        turkofan engine
       [ NASA-TM-82936]
                                                            p0 152 N82-31068
    nough analysis of installation effects on
       tuchorrop noise
[NASA-TM-82924]
                                                            D0152 N82-32082
ENGINE PARTS
    Progress in coramic component fabrication technology
    [ATAA EAPER 82-1211] p0071;
The AGY 101 advanced automotive gas turbine
                                                            p0071 A82-35064
    [ASME PAPER 82-GT-72] po 108 A82-3: Pabrication of turbine components and properties of Exhtered Silicon Sitride
[ASME PAPER 82-GT-252] po 071 A82-3: Progress in the development of energy afficient
                                                            p0 108 A82-35321
                                                            p0071 A82-35431
       ongine components
       FASHE PAPER 82-CT-2751
                                                            p0030 A82-35450
    Engine dynamic analysis with general nonlinear
finite element codes. II - Pearing element
       implementation, overall numerical
       characteristics and benchmarking
       TASHE PAPER 82-GT-2921
                                                            p0108 A82-35462
    Elevated temperature fatique testing of metals
       [ NASA-TH-82745]
                                                            p0111 N82-16419
```

```
Blantic-plantic finite-element analyses of
   thereally cycled double-edge wedge specimens
[MASA-T7-1973] p0111 M82-20566
Effect of oxide films on hydrogen permeability of
candidata Stirling engine heater head tube alloys
      [NASA-TH-82824]
                                                       p0060 N82-24323
    Cost/bongfit studies of advanced materials
       technologies for future aircraft turbine
      ongines: Materials for advanced turbing engines
[NASA-CR-167849] p0026 N82-25254
   Propulsion opportunities for future commuter
      aircraft
      [ NASA-TM-8 29 15]
                                                       p0019 N82-26298
   Method of protecting a surface with a silicon-slurgy/aluminide coating --- coatings
      for das turbing engine blades and vanes [NASA-CASE-LEH-13343-1] p006
                                                       p0068 N82-28441
    Evaluation of candidate stirling engine heater
      tube alloys at 820 deg and 860 deg C [NASA-TM-82837]
                                                       p0061 N82-30372
    Automotive Stirling Engine Mod | Design Review,
       volume !
      INASA-CR- 167935]
                                                       p0 164 N82-34311
   Automotive Stirling Engine Mod 1 Design Review,
volume 3 --- engineering drawings
[NASA-CR-167397] p0164 N72-
                                                       p0 164 NO2-34312
ENGINE TESTS
   Characteristics of the LeRC/Hughes J-sories 30-cm
      engineering model thruster
                                                       p0046 A82-15435
    AGT100 turbomachinery --- for automobiles
   [AIAA PAPER 82-1207] p0 108 A82-35 Combustor development for automotive que turbines
                                                       p0 108 A82-35061
    [ATAA PAPER 82-1208] p0 104 A82-
Progress in the development of energy efficient
                                                       p0 104 A82-35062
       engine components
      [ASME PAPER 82-GT-275]
                                                       p0030 A82-35450
    Propulsion study for Small Transport Aircraft
Technology (STAT), Appendix B
[NASA-CR-165499-APP-B] p0022 N8
                                                       p0022 N82-10038
    Pollution reduction technology program small jet
aircraft engines, phase 3
[NASA-CR-165386] p0023 N82-1
                                                       p0023 N82-14095
    BRBS fuul addendum: Pollution reduction
       technology program small jet aircraft engines,
      [NASA-CR-165387]
                                                       p0024 N82-14096
   Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL
    [MASA-TH-62743] p0004 M82-
Preliminary results on performance testing of a
turbocharged rotary combustion engine
                                                       p0004 N82-18178
                                                       P0017 N82-21194
       [ NASA-TH-82772]
    CF6 Jot Engine Diagnostics Program:
                                                       High pressure
       compressor clearance investigation [NASA-CR-165580]
                                                      p0025 N82-21197
    Performance deterioration due to acceptance
       tosting and flight loads; JT90 jet engine
      diagnostic program [NASA-CR-165572]
                                                       p0027 N82-27309
    Energy efficient engine: High pressure turbine
       uncooled riq technology report [NASA-CR-165149]
                                                       p0031 N82-32383
U ODUCT DEVELOPMENT
RECINES
 NT BOOSTER ROCKET ENGINES
 NT BRISTOL-SIDDELEY BS 53 ENGINE
 NT DIESEL ENGINES
 NT BLECTROSTATIC ENGINES
NT GAS TURBINE ENGINES
NT HELICOPTER ENGINES
 NT HYDROGEN OXYGEN ENGINES
NT INTERNAL COMBUSTION ENGINES
 NT ION ENGINES
 NT JET ENGINES
 NT LIQUID PROPELLANT ROCKET ENGINES
 NT MERCURY ION ENGINES
NT PISTON ENGINES
NT ROCKET ENGINES
 NT TP-34 ENGINE
 NT TURBINE ENGINES
 NT TURBOPAN ENGINES
NT TURBOJET ENGINES
 NT TURBOPROP ENGINES
 NT VARIABLE CYCLE ENGINES
NT WANKEL ENGINES
RETHALPY
    Numerical modeling of three-dimensional confined
```

ERECTION

EROSION

U NSTRUCTION

ORIGINAL PAGE IS OF POOR QUALITY

flovs [NASA-CF- 165583] p0 158 M62-24078 ENTROPY Pressure transfer function of a JT15D nozzle due to acoustic and convected entropy fluctuations [NASA-TH-82842]
ENTROPY (STATISTICS)
NI EFFICUM ENTROPY METHOD
ENVIRONMENT EFFECTS p0152 N82-22951 Environmental assessment of the 40 kilowatt fuel cell system field test operation [IOE/NASA/2701-1] p0137 M82-29 p0 137 N82-29721 ENVISORENT HODELS Environmentally induced discharges on satellites
[KASA-TH-82849] p00.38 N82-2
ENVIRONMENT PROTECTION
Advanced technology for controlling pollutant
emissions from supersonic cruise aircraft p0038 N82-23261 p0001 N81-18004 ENVISORATEST SINULATION NT ACOUSTIC SIMULATION NT SPACE ENVIRONMENT SIMULATION Agreement for HASA/OAST - USAF/AISC space interdependency on spacecraft environment interaction 00038 K82-14271 BUVIROUSENT SIMULATORS NT SCLAB SINULATORS ENVIRONMENTAL CONTROL Environmental control systems p0001 NB2-19147 ENVIRONMENTAL MONITORING LANDSAT Remote Sensing: Observations of an Appalachian mountaintop surface ccal mining and reclamation operation --- kentucky [E82- 102471 p0117 N82-24525 BRAIBONNERLY COULTA An automated system for global atmospheric sampling using E-747 airliners [NASA-CR-165264] p0 139 p0 139 N82- 13554 UT COLD WEATHER TESTS NT COFFOSION TESTS NT HIGH TEMPERATUPE TESTS NT LOW TEMPERATURE TESTS Environmental effects on defect growth in composite materials
[NASA-CR-165213] p0052
Fffects of environment on microbardness of magnesium oxide p0052 N82-20248 [NASA-TP- 2002] p0068 W82-22366 ENVIRONMENTS NT AEROSPACE FNVIRCHMENTS NT CHEOMOSPHERE NT CEEP SPACE NT HIGH TEMPERATURE FAVIRCAMENTS NT ICE ENVIRONMENTS HT INTERPLANETARY SPACE NT LCW TEMPERATURE ENVISORMENTS NT HESOSPHERE EPITAXY NT VAFOR PHASE EPITAXY EPOXY BATRIX COMPOSITES Durability/life of fiber composites in hygrothermomechanical environments [NASA-TM-82749] p0049 N82-14287 Prediction of composite hygral behavior made simple [NASA-TH-82780] p0049 N82-16181 EPONT RESINS Tribological characteristics of a composite total-surface hip replacement
[NASA-TP-1853]
EQUATIONS OF MOTION
HT FULEF FQUATIONS OF MOTION
HT HEINHOLTZ VORTICITY EQUATION p0066 N82-16239 NT NAVIER-STORES EQUATION NI FETHCLES EQUATION Basic lubrication equations [NASA-TM-81693] p0099 H82-16413 EQUILIBRIUM DIAGRAMS U ASE DIAGRAMS EQUIVALENT CIRCUITS Comparison of NASCAP modelling results with lumped circuit analysis p0037 N82-14255

A study of the nature of solid particle impact and

shape on the erosion morphology of wactile metals [MASA-TH-82933] p006 | M82-33493 P0061 N82-33493 Conversion and matched filter approximations for serial minimum-shift keyed modulation P0080 A82-26713 Effects of nadic ester concentration and processing on physical and mechanical properties of PMR/Celion 6000 composites P0051 A82-27440 Forced torsional properties of PMR composites with varying madic ester concentrations and processing histories p0051 A82-45630 Improved boundary lubrication with formulated Cethers [NASA-TH-82808] p0067 N82-20313 ESTIBATES NT COST ESTIMATES ESTIMATING NT PARAMETER IDENTIFICATION RTHERS AT POLYPHENYL ETHER Thermal and oxidative degradation studies of formulated C-ethers by gel-permention chromatography [NASA-TP-1994] p0068 N82-21: Thermal oxidative degradation reactions of linear p0068 N82-21332 perfluoroalky lethers [NASA-TK-82834] p0068 N82-26468 BUCLIDEAN GRONETRY NT ANGLE OF ATTACK NT BECTANGLES NT TANGENTS BULER EQUATIONS OF HOTION A finite element formulation of Euler equations for the solution of steady transonic flows [AIAA PAPER 82-0062] p0009 A82-17759 Application of a finite element algorithm for the solution of steady transonic Euler equations
[AIAA PAPER 82-0970] p0010 A82-315
Comparison of two and three dimensional flow computations with laser anemometer measurements in a transonic compressor gotor p0010 A82-31939 [NASA-TM-82777] P0004 N82-15020 Multiple-grid acceleration of Lax-Wendroff algorithms [NASA-TM-82843] p0 149 N82-; Relaxation solution of the full Euler equations [NASA-TM-82889] p0 149 N82-; p0149 N82-22922 p0149 #82-24859 BUTECTIC ALLOYS Patigue of Ni-Al-Mo aligned eutectics at elevated temperatures Structure and creep rupture properties of directionally solidified eutectic qamma/gamma-prime-alpha alloy p0062 A82-42774 BUTECTIC COMPOSITES High temperature composites. Status and future directions [NASA-TM-82929] p0051 N82-30336 BUTECTIC DIAGRAMS U ASE DIAGRAMS RUTECTICS NT EUTECTIC ALLOYS EVALUATION Investigation and evaluation of a computer program to minimize three-dimensional flight time tracks [NASA-CR-1684 19] p0145 N82-17879 Tribological evaluation of composite materials made from a partially fluorinated polyimide [NASA-TH-82832] p0069 N8 p0069 N82-29459 BVAPORATION NT PROPELLANT EVAPORATION EVAPORATIVE COOLING NT FILM COOLING NT SWEAT COOLING RICHARGING NT CHARGE EXCHANGE BENCUTAVE AIRCRAFT U NERAL AVIATION ATRCRAFT U SSENGER AIRCRAFT EXHAUST EMISSION Experimental study of the effects of secondary air on the emissions and stability of a lean premixed combustor [ATAA PAPER 82-1072] p0021 A82-34992

p0148 A82-13143

```
Combustom development for automotive gas turbines

[ATAN WAPER 82-1206] p0 104 A82-35

AGT-102 automotive gas turbine

[NASA-Cr-165353] p0 105 M82-12
                                                                    p0 104 A82-35062
                                                                    p0105 N82-12444
     Effect of fuel-air-ratio neanniformity on emissions of nitrogen oxides [NASA-TP-1790] p0016
                                                                    n0016 N02-13143
     Exhaust exissions survey of a turbolan engine for
        flame holder swirl type augmentors at simulated altitude flight conditions
        [ NASA-TM-82787]
                                                                    p0019 N62-25255
     Low NO mub x heavy fuel contustor concept program
    phaso 1A das tusts
[NASA-CF-167877]

LOW NOX heavy fuel combustor concept program
addendum: Low/mid heating value gaseous fuel
        ovaluation.
        T NASA-CR- 1656 151
                                                                    n0055 N82-25338
     LOW NOX heavy fuel confustor descept program [ NASA-CR-167876] #0074 N
                                                                    10074 NB2-26482
     Exhaust emissions reduction for intermittent combustion aircraft engines [NASA-CR-167914] p0029 MG
                                                                    p0029 N82-33392
EXHAUST PLOW SIMULATION
 NT PLIGHT SIMULATION
EXMAUST CASES
    Effect of vacuum exhaust pressure on the performance of MHD ducts at high B-field [AIAA PAPER 82-0396] p0157 A02-20292
     Advanced technology for controlling follutant
emissions from supersonic cruise siroraft
     ERBS fuel addendum: Pollution reduction technology program small jot mircraft engines.
        r NASA-CF-165387]
    I man-th-103101 pure 4 M2-140'
Pual oconomy and exhaust emissions characteristics of diene) vehicles: Test cosults of a prototype flat 131TC 2.4 liter automobile point M82-180(
    [NASA-CR-165535] p0164 N82-100 Exhaust emissions survey of a turbofan engine for flame holder swirl type augmentors at simulated altitude flight conditions
[NASA-TR-82707] p0019 N82-250 Low NOX heavy fuel combustor concept program [NASA-CR-165367] p0136 N82-250 Lowis pressurized, fluidized-bed combustion
                                                                    n00 19 N82-25255
                                                                    p0 136 N82-25635
        projem. Data and calculated results [NACA-TH-81767] p0
                                                                    p0124 N82-30704
     Venturi nozzle effects on fuel drop size and
        nitrogen oxide emissions
[ NASA-TP-2028]
    Richaust das measurements in a propane fueled swirl stabilized combustor [NASA-CR-169293]
EXHAUST JETS
O HAUST GASKS
RIMAUST MORELES
     Energy efficient engine exhaust mixer model
        technology
[NASA-CR-165459]
                                                                    p0025 N82-22264
     Pressure transfer function of a JT15D nozzle due
to acoustic and convected entropy fluctuations
    [NASA-TH-82801]

polsz N82-
Performanco of a 2n-cD nonaxisymmetric axhaust
nozzle on a turbojet engine at altitude
[FASA-TH-82801]

polos N82-
                                                                    p0152 N82-22951
                                                                    p0005 N02-26241
RIBAUST SYSTEMS
     Energy efficient engine exhaust mixer model
        technology
[NASA-CR-165459]
                                                                    p0025 N82-22264
     Computer modeling of fan-exit-malitier spacing effects on P100 response to distortion [NASA-CT-167879] p0025 N82
                                                                    P0025 N82-23246
BERRASION
      THERBAL EXPANSION
EXPANSION WAVES
 U ASTIC WAVES
EXPERIMENTATION
     Effect of location in an array on heat transfer to
        a cylinder in crossflow f NASA-TH-82797]
                                                                    pC087 N82-19493
EXPLODING CONDUCTOR CIRCUITS
 U RCUITS
EXPORTS
 U TERNATIONAL TRADE
EXPULSION
    Low-thrust chamical propulsion system propollant
```

expulsion and thermal conditioning study.

```
Executive summary
[NASA-CR-165622]
Low-thrust chemical propulsion system propellant
expulsion and thermal conditioning study
[NASA-CR-167841]
EXERNALLY BLOWN PLAPS
    Aeroacoustic performance of an externally blown
flap configuration with several flap noise
       suppression devices [NASA-TP-1995]
                                                            no 152 882-24942
RETIRCTION
    Lean-limit extinction of propane/air sixtures in
the stagnation-point flow
                                                            p0057 A82-28736
EXTRAPOLATION
     Acceleration of convergence of vector sequences
       [ NASA-TH-82931]
                                                            DO 149 N82-29075
EXTRATERRESTRIAL ENVIRONMENTS
  NT CHRONOSPHERE
 NT DEED SPACE
NT INTERPLANETARY SPACE
BETRATERESTRIAL NADIATION
 NT SOLAR RADIO BURSTS
NT SOLAR RADIO EMISSION
  NT SOLAR X-RAYS
  NT SUNLIGHT
RETRATBRESTRIAL RADIO WAYES
INT SOLAR RADIO BURSTS
INT SOLAR RADIO ENISSION
EXTRATERRESTEXAL RESOURCES
A small scale lunar launcher for early lunar
       matorial utilization
                                                            p0032 AU2-35617
BETREMELY HIGH PREQUENCIES
    Advanced 30/20 GHz communication satellites
                                                            p0034 AU2-12623
RYR (AMATOMY)
     Velling clare reduction methods compared for
       ophthalmic applications
PAB (PROGRAMMING LANGUAGE)
U RIBAN
PAREICATION
  NT SPACE HANUPACTURING
    Progress in ceramic component fabrication technology [AIAA PAPER 82-1211] p0071 A82-35064
                                                            p0071 A82-35064
    Het shape fabrication of Alpha Silicon Carbide
       turbino components
[ASBE PAPER 82-GT-216]
     Solar cell development for the power extension
       packaga
        [ NASA-TH-82685]
    Coll module and fuel conditioner development
[NASA-CR-165462] p0130 M82-13511
Technology development for phosphoric acid fuel
cell powerplant, phase 2
[NASA-CR-165426] p0131 N82-16482
     High voltage power translator development [NASA-CR-165507]
                                                            p0084 N02-18506
     Energy efficient augine shroudless, hollow fan
        blade technology report [NASA-CR-165586]
                                                            p0024 N82-21196
    Coll module and fuel conditioner development
[NASA-CR-165620] po 134 N82-21713
Advanced inorganic separators for alkaline batteries
[NASA-CASE-LEW-13171-1] po 124 N82-29708
     Hethod of making a high voltage V-groove solar cell
[NASA-CASK-LNW-13401-1] p0124 N82-2970
                                                            p0 124 882-29709
PACE CENTERED CUBIC LATTICES
    The influence of gamma prime on the recrystallization of an exide dispersion strongthened superalley - NA 6000E
                                                            p0062 A82-47393
     The influence of cobalt on the microstructure of
        the nickel-base superalley MAR-M247
                                                             p0063 A82-47400
PADING
NT SIGNAL FADING
  NT ENGINE PATLURE
NT STRUCTURAL FAILURE
NT SYSTEM FAILURES
PAILURE AVALUSIS
    Model degradation offects on sensor failure
```

```
Pailure analysis of a tool steel torque shaft
                                                                           Patique tests with a corrosive environment
     [ KASA-TM-82758]
                                              p0058 NA2-11184
                                                                                                                             #82-13282
FAILURE BODES
                                                                           Mechanisms of deformation and fracture in high
   Reusable rocket engine maintenance study
[NASA-CR-165569] p0044 N82-16172
                                                                             temperature low cycle fatigue of Rene 80 and IN
   [NASA-CR-165569] p0044 N82-
Failure mechanisms of thermal barrier coatings
exposed to olevated temperatures
                                                                             100
                                                                             [ NASA-CR-165498]
                                                                                                                      p0113 N82-26706
                                                                       PAULT MECHANICS
     [ NASA-TH-82905]
                                              p0061 N82-32461
                                                                         U ACTURE MECHANICS
PAIRINGS
                                                                       FAULT TOLERANCE
   Kevlar/PHR-15 polyimide matrix composite for a
                                                                           Design and verification of a multiple fault
     complex shaped DC-9 drag reduction fairing [AIAA FAPER 82-1047] p0002 A
                                                                             tolerant control system for STS applications
                                              p0002 182-37673
                                                                             using computer simulation [AIAA 81-2173]
PAN BLADES
                                                                                                                      D0035 A82-10124
   Effects of vane/blade ratio and spacing on fan noise
                                                                       PCC LATTICES
                                                                        U CE CENTEBED CUBIC LATTICES
   Three dimensional turbulent boundary layer
                                                                       PDHA
     development on a fan rotor blade
                                                                         U EQUENCY DIVISION MULTIPLE ACCESS
     [AIAA PAPER 82-1007]
                                              p0011 382-31965
                                                                        PRASIBILITY ANALYSIS
   Blade loss transient dynamic analysis of
                                                                           Peasibility of an earth-to-space rail launcher
     turbomachinery
                                                                             system --- emphasizing nuclear waste disposal
     [ AIAA PAPER 82-1057]
                                                                             application
                                              p0030 A82-34982
                                                                                                                      p0033 A82-44659
   Structural dynamics of shroudless, hollow, fan
                                                                             [IAF PAPER 82-46]
                                                                           An experimental investigation into the feasibility of a thermoelectric heat flux gage
     blades with composite in-lays [ASME PAPER 82-GT-284]
                                              p0022 A82-35456
   Thrust modulation methods for a subsonic V/STOL
                                                                             [NASA-TH-82755]
                                                                                                                      p0095 882-14494
                                                                       PEEDBACK CONTROL
     aircraft
                                              p0003 N82-13112
     [ NASA-TM-82747]
                                                                           Open-loop nanosecond-synchronization for wideband
   Structural dynamics of shroudless, hellow fan
blades with composite in-lays
                                                                             satellite communications
                                                                                                                      p0036 182-27224
                                                                           Analysis and design of a standardized control module for switching regulators
     [ NASA-TH-82816]
                                              p0018 N82-22266
   Bird impact analysis package for turbine engine
     fan blades
                                                                                                                      p0083 182-46388
     [ NASA-TM-B2831]
                                                                           Identification of multivariable high performance
                                              p0112 N82-26701
   Structural tailoring of engine tlades (STABBL) [NASA-C5-167949] p0028 N82
                                                                             turbofan engine dynamics from closed loop data
                                              p0028 N82-33391
                                                                              [ NASA-TM-82785]
                                                                                                                      p0076 N82-20339
PAR ULTRAVIOLET RADIATION
                                                                           AESOP: A computer-aided design program for linear
                                                                             multivariable control systems
[NASA-TH-82871]
   Testing of a spacecraft model in a combined environment simulator
                                                                                                                      p0148 N82-30992
                                                                       PREDIEG (SUPPLYING)
Input filter compensation for switching regulators
      [ NASA-TH-82723]
                                              p0037 N82-11106
PARE CHOPS
 NI GRAINS (FOOD)
                                                                             [ NASA-CR-169005]
                                                                                                                      p0085 N82-25442
PATIGUE (HATERIALS)
                                                                        PERROALLOYS
NT BENDING FATIGUE
NT MPTAL FATIGUE
NT THERMAL FATIGUE
                                                                         U ON ALLOYS
                                                                       PREROBLECTRICITY
                                                                           Raman study of the improper ferroelectric phase transition in iron iodine boracite
   Endurance test and evaluation of alkaline water
     electrolysis cells
                                                                                                                             182-30297
     [ NASA-CR- 165424]
                                                                           Study of the photovoltaic effect in thin film
   Interlaginar crack growth in fiber reinforced
                                                                             barium titanate
     composites during fatigue, part 3
                                                                             [ NASA-CR-165081]
                                                                                                                      p0131 N82-16479
     [ NASA-CR- 165434]
                                              p0114 N82-26715
                                                                       PERROGRAPHY
PATIGUE DIAGRAMS
                                                                           Elucidation of wear mechanisms by ferrographic
 U N DIAGRAMS
                                                                             analysis
PATIGUE LIFE
                                                                             [ NASA-TH-82737]
                                                                                                                      p0066 N82-15199
   Comparative thermal fatigue resistance of several
                                                                       FERROUS HETALS
     oxide dispersion strengthened alloys
                                                                           Priction and surface chemistry of some
                                              p0062 A82-11399
                                                                             ferrous-base metallic glasses
   Turbine blade nonlinear structural and life analysis [AIMA PAPER 82-1056] p002; A82-34981
                                                                             [ NASA-TP-1991]
                                                                                                                      p0059 N82-21701
                                                                       FET (TRANSISTORS)
   A simplified design procedure for life prediction of rocket thrust chambers
                                                                       U ELD EFFECT TRANSISTORS
FIBER COMPOSITES
      FATAA PAPER 82-12511
                                              p0043 A82-35067
                                                                         NT CARBON FIBER REINFORCED PLASTICS
   Elevated temperature fatigue testing of metals
                                                                         NT GLASS PIBER REINFORCED PLASTICS
                                              P0058 N82-13281
                                                                           Sensitivity analysis results of the effects of
   The application of probabilistic design theory to high temperature low cycle fatique
                                                                             various parameters on composite design
                                                                                                                      p0051 A82-37101
      T NASA-CR- 165486]
                                              p0112 N82-14531
                                                                           Durability/life of fiber composites in
   Elevated temperature fatigue testing of metals
                                                                             hygrothermomechanical environments
     [ NASA-TM-82745]
                                              POILI N82-16419
                                                                             [ NASA-TH-82749]
                                                                                                                      p0049 N82-14287
   Stress evaluations under rolling/sliding contacts
                                                                           Prediction of composite hygral behavior made simple
     [ NASA-CR- 165561]
                                                                             [NASA-TM-82780]
                                              p0113 N82-17521
                                                                                                                      p0049 #82-16181
   Patigue life prediction in bending from axial
                                                                           Bavironmental effects on defect growth in
      fatique information
                                                                             composite materials
                                              P0113 N82-20564
   [NASA-CR-165563] p0113 N82-20
Development of a simplified procedure for thrust
                                                                             [ NASA-CR- 1652 13 ]
                                                                                                                      p0052 N82-20248
                                                                           Compression behavior of unidirectional fibrous
   chamber life prediction
[NASA-CR-165585]

High temperature low cycle fatigue mechanisms for
                                                                             composite
                                              p0644 NB2-21253
                                                                             [NASA-TH-82833]
                                                                                                                      p0050 N82~29313
                                                                       FIBER OPTICS
      nickel base and a copper barn alloy
                                                                           The 30/20 GHz communications satellite trunking
      [NASA-CR-3543]
                                              p0064 N82-26436
                                                                             network study
   Effect of shot peening on surface fatique life of carburized and hardened NISI 9310 spur gears
                                                                             [ NASA-CR-165467]
                                                                                                                      D0078 N82-13302
                                                                           Role of optical computers in aeronautical control
      [ NASA-TP-2047]
                                              p0 102 NB2-32736
                                                                             applications
PATIGUE TESTS
                                                                           Preliminary study, analysis and design for a power switch for digital engine actuators
   Effects of ultra-clean and centrifugal filtration
     on rolling-element bearing life
      [ ASME PAPER 81-LUB-35]
                                              p0 103 A82-18436
                                                                             [ NASA-CR-159559]
                                                                                                                      p0085 N82-23394
```

P0058 N82-13281

PIBER ORIENTATION

Compression behavior of unidirectional fibrous

Elevated temperature fatique testing of metals

ORIGINAL PAGE IS OF POOR QUALITY

```
ccarositu
      [ NASA-TM-828337
                                                       p0050 N82-22313
PIBER BEINFORCED COMPOSITES
   On determination of fibre fraction in continuous
       fibre composite materials
                                                       p0051 A82-38133
   Forced torsional properties of FRE composites with varying madic ester concentrations and
       processing histories
   p0051 A82-45630
Tensile properties of SiC/alurinum filamentary
composites - Thermal degradation effects
                                                       p0053 A82-46220
    Boundary-layer effects in composite lawinates. I-
Free-edge stress singularities. II - Free-edge
stress solutions and tasic characteristics
                                                       p0116 A82-46806
    Geometrical aspects of the tribological properties
      of graphite fiber reinforced polymide composites [NASA-TM-82757] p0066 N82-151
                                                       p0066 N82-15198
    Tungsten fiber reinforced superalloy composite
       high temperature component design considerations
   [NASA-TK-82811] p0049 N82-21
Thermal degradation of the tensile properties of undirectionally reinforced FP-AI203/EZ 33 magnesium composites
                                                       p0049 N82-21259
       [ NASA-TH-82817]
                                                       p0049 N82-21260
    Designing with figer-reinforced plastics (planar
       random compositos)
    NASA-TM-82812 p0050 N82-24300 Analysis of cracks emanating from a circular hole in unidirectional fiber reinforced composites,
       [ NASA-CP- 165433]
                                                       p0114 N82-26714
    Interlaminar crack growth in fiber reinforced
       compositos during fatique, part 3
       T NASA-CR- 1654341
                                                       p0114 N82-26715
    Edge delawination in angle-ply composite laminates, part 5
[NASA-CP-165439] p01
                                                       p0114 N82-26717
    Boundary-layer effects in composite laminates:
       Pree-edge stress singularities, part 6 [NASA-CR-165440]
                                                       p0114 N82-26718
    Modulus, strength and thermal exposure studies of FF-Al203/aluminum and FF-Al203/magnesium
       composites
       [ NASA-TM-02868]
    High temperature composites. Status and future
       directions
       [ NASA-TM-82929]
                                                       p0051 N82-30336
FIBER BELEASE
    Hybridized polymer matrix composite [NASA-CE-165340]
                                                       p0051 N82-12139
FIBER STRENGTH
    Tensile propertius of SiC/aluminum filamentary composites - Thermal degradation effects
                                                       p0053 182-46220
    Indentation law for composite laminates
       [ NASA-CR- 165460]
                                                       p0052 N82-15123
    strength advantages of chemically polished boron
       fibers before and after reaction with aluminum
    [NASA-TH-02806] p0049 N82-2125
Method and apparatus for strengthening boron fibers
                                                       p0049 N82-21258
       --- high temperature oxidation
       [ NASA-CASE-LEW- 13826-11
                                                       p0050 N82-26385
PIBERGLASS
 U ASS FIBERS
PIBERS
 NT BORON FIBERS
 NT GLASS FIBERS
 NT HAIR
 NT REINFORCING PIBERS
PIELD EFFECT TRANSISTORS
Low temperature growth and electrical characterization of insulators for GaAs HISPETS [NASA-CB-164972] p0 159 N82-115
                                                       p0 159 N82-11959
    Electric and magnetic fields
[NASA-CP-165604]
                                                       p0045 N82-28350
PIGETER AIRCRAFT
NT HAGRIER AIRCRAFT
FILARBUTS (SOLAR PHYSICS)
 U LAR PROMINENCES
PILLETS
    A finite element stress analysis of spur quars including fillet radii and rim thickness effects
    [NASA-TM-82865] p0101 N82-28646
On finite element stress analysis of spur gears
[NASA-CR-167938] p0107 N82-29607
```

```
PILM COOLING
    Covering solid, film cooled surfaces with a duplex thermal barrier coating
       [ WASA-CASE-LEW- 13450-1]
                                                         p0088 N82-25463
PILE THICKNESS
    Alignment of fluid molecules in an EHD contact
[ASLE PREPRINT 8]-LC-5C-1] p0 107 A82-184
Heasurement of oil film thickness for application
to elastomeric Stirling engine rod seals
[ASME PAFER 8]-LUB-9] p0 107 A82-184
                                                        p0107 A82-18407
                                                        PO 107 A82-18426
    Effects of artificially produced defects on film
thickness distribution in sliding EHD point
       contacts
      [ NASA-TM-82732]
                                                        p0099 #82-16412
    Geometry and starvation effects in hydrodynamic
      lubrication [NASA-TM-82807]
                                                        p0042 N82-20240
    Lubrication of rigid ellipsida solids
[NASA-TH-81694]
                                                        p0100 N82-25518
PILTERIEG
 U LTRATION
PILTRATION
    Effects of ultra-clean and centrifugal filtration
      on rolling-element bearing life [ASME PAPER 81-LUB-35]
                                                         p0 103 A82-18436
PINISHES
 NT PLAZES
PINY'S DIFFERENCE THEORY
    A simple finite difference procedure for the
       vortex controlled diffuser
      [AIAA PAPER 82-0109]
                                                        p0030 A82-17788
    Bluff-body flameholder wakes - A simple numerical
       solution
    (AIAA PAPER 82-1177) p0093 A82
Numerical techniques in linear duct acoustics,
                                                         p0093 A82-35043
       1980-81 update
       [NASA-TH-82730]
    Application of steady state finite element and transient finite difference theory to sound
       propagation in a variable area duct: A comparison with experiment
    [NASA-TM-82678] p0 151 N82-15847
Turbofan forced mixer-nozzle internal flowfield.
Volume 3: A computer code for 3-D mixing in
       axisymmetric nozzles
       [ NASA-CR-3494 ]
                                                         p0091 N82-22460
PINITE ELEMENT METHOD
    Acoustic transmission in lined flow ducts - A
      finite element eigenvalue problem
                                                        p0154 A86-17663
    A finite element formulation of Euler equations
       for the solution of steady transonic flows
       [ATAA PAPER 82-0062]
                                                       p0009 AB2-17759
    An iterative finite element-integral technique for predicting sound radiation from turbofan inlets in steady flight
[AIAA PAPER 82-0124] p0030 A82-1773
                                                        p0030 A82-17796
    Application of a finite element algorithm for the
      solution of steady transonic Euler equations [AIAA PAPER 82-0970] p0010 A82
                                                        p0010 A82-31939
    Engine dynamic analysis with general nonlinear
      finite element codes. II - Bearing element implementation, overall numerical
      characteristics and benchmarking [ASME PAPER 82-GT-292]
    [ASHE PAPER 82-GT-292] p0108 A82-35462
Investigation of rotational transonic flows
      through ducts using a finite element scheme [AIAA PAPER 82-1267] p0012 A8
                                                        p0012 A82-37711
    On the automatic generation of FEM models for complex gears - A work-in-progress report
    p0109 &82-48243 A multi-purpose method for analysis of spur gear tooth loading
       [NASA-CR-165163]
                                                         p0 104 N82-10401
    Numerical techniques in linear duct acoustics, 1980-81 update
       FNASA-TM-827301
                                                         D0151 N82-12890
    Application of steady state finite element and transient finite difference theory to sound propagation in a variable area duct: A comparison with experiment
      [ NASA-TM-82678]
                                                         p0151 N82-15847
    Research and development program for non-linear
       structural modeling with advanced
       time-temperature dependent constitutive
       relationships
      [ NASA-CR-165533]
                                                         p0024 M82-16080
    Blastic-plastic finite-element analyses of
       thermally cycled double-edge wedge specimens
```

PLANE TEMPERATURE

Effects of heat loss, preferential diffusion, and

```
[ NASA-TP- 1973]
                                                 p0111 NB2-20566
                                                                                  flame stretch on flame-front instability and
   Nchlinear structural and life analyses of a
                                                                                  extinction of propane/air mixtures
      combustor liner
                                                                                                                             p0057 A82-32877
      [ NASA-TH- 82846 ]
                                                                               Buoyancy effects on the temperature field in
   A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-02865] p0101 N82-28646 Finite element-intogral simulation of static and
                                                                                  downward spreading flames
                                                                                                                             p0094 A82-41203
                                                                           PLAKES
                                                                            NT DIFFUSION PLANES
NT PREMIXED PLANES
      flight fan noise radiation from the JT15D
      turbofan engine [NASA-TM-82936]
                                                                            PLANNABILITY
                                                                               Resonance tube hazards in oxygen systems
   Targe displacements and statility analysis of
                                                                                  [NASA-TH-82801]
                                                                                                                             p0072 N82-21415
                                                                            PLANMABLE GASES

NT GASEOUS PUELS

NT LIQUEPIED NATURAL GAS
nonlinear propellor structures
[NASA-TM-82850]
FINITE VOLUME HETHOD
                                                 DO112 N82-31707
   Finite volume calculation of three-dimensional potential flow around a propeller [AIAN FAPER 82-0957] p0010 A82-
                                                                            FLAP CONTROL
                                                                             U RCRAPT CONTROL
                                                                            FLAPS (CONTROL SURFACES)
HT EXTERNALLY BLOWN FLAPS
                                                 p0010 A82-31933
PIRE PRESENTION
   An assessment of the crash fire hazard of liquid
hydrogen fueled aircraft
[NASA-CF-165526] p0013 N82-19
                                                                            PLASHBACK
                                                                           Secondary effects in combustion instabilities leading to flashback
[AIAA PAPER 82-0037] p0056 A8:
PLASHING (VAPORIZING)
                                                 p0013 N82-19196
PIRES
                                                                                                                             p0056 A82-17746
   Hybridized polymer matrix composite [HASA-CF-165340]
                                                                               Atomization and combustion properties of flashing
                                                 p0051 N82-12139
PISHTAILING
                                                                                  injectors
 11 🖫
                                                                                  [AIAA PAPER 82-0300]
FISSION
                                                                               Experimental study of external fuel vaporization [ASHE PAPER 82-GT-59] p0075 A82-3
   Evidence for Pu-244 fission tracks in hibonites
                                                                                                                             p0075 A82-35312
      from Murchison carbonaceous chondrite
                                                                               External fuel vaporization study [NASA-CR-165513]
                                                 p0166 182-29316
                                                                                                                             P0073 N82-14371
                                                                               Investigation of spray characteristics for
PIXED-WING AIRCRAFT
 T RCFAFT CONFIGURATIONS
                                                                                  flashing injection of tuels containing dissolved
PLANE PRONTS
                                                                                  air and superheated fuels
 U AME PROPAGATION
                                                                                  [ NASA-CR-3563]
                                                                                                                             p0027 N82-26295
FLARE HOLDERS
                                                                           PLAT PLATES
   Tryperimental study of the effects of secondary air on the Gwissions and stability of a lean
                                                                               Two dimensional stagnation point flow of a dusty
                                                                                  qas near an oscillating plate
      premixed combustor
                                                                                                                             p0012 A82-37535
      [ AIAA PAPER 82-1072]
                                                 p0021 A82-34992
                                                                            PLAUS
   Bluff-hody flameholder wakes - A simple numerical
                                                                             U FECTS
      sclution
                                                                            PLEXING
      [AIAA PAPER 82-1177]
                                                 p0093 A82-35043
                                                                               Thermal degradation of the tensile properties of
PLANE INTERACTION
U EMICAL REACTIONS
                                                                                  undirectionally reinforced FP-AI203/EZ 33
                                                                                  magnesium composites
[NASA-TM-82817]
 U AME PFOPAGATION
                                                                                                                             D0049 N82-21260
                                                                            PLEXURE
FLAME PEOPAGATION
   Secondary effects in combustion instabilities
                                                                             U EXING
     leading to flashback [ALAA FAPER 82-0037]
                                                                            FLIGHT CONTROL
                                                 p0056 A82-17746
                                                                             NT THRUST VECTOR CONTROL
   Numerical modelling of turbulent flow in a
                                                                               A tensor approach to modeling of nonhomogeneous
      combustion tunnel
                                                                                  nonlinear systems
   p0093 A82-27000 Flame structure in a swirl stabilized combustor
                                                                                                                             p0148 A82-19064
                                                                            PLIGHT PLANS
                                                                               The NASA MERIT program - Developing new concepts for accurate flight planning
      inferred by radiant emission measurements
                                                 p0056 A82-28694
   Numerical modeling of turbulent combustion iu
                                                                                  [AIAA PAPER 82-0340]
                                                                                                                             p0014 A82-17894
      premixed gases
                                                                               Investigation and evaluation of a computer program
   p0056 A82-28708
Effects of heat loss, preferential diffusion, and
flame stretch on flame-front instability and
                                                                                  to minimize three-dimensional flight time tracks
                                                                               [NASA-CR-168419]
Ozone and aircraft operations
                                                                                                                             p0 145 N82-17879
      extinction of probane/air mixtures
                                                                                                                             p0001 N82-21145
                                                 p0057 A82-32877
                                                                            PLIGHT SIMULATION
                                                                               A real time Pegasus propulsion system model for
VSTOL piloted simulation evaluation
   On the opening of premixed Bunsen flame tips
                                                 p0057 A82-37570
   On stability of promised flames in stagnation -
                                                                                  [AIAA PAPER 81-2663]
                                                                                                                             p0020 A82-19221
                                                                            FLIGHT SIMULATORS
      Pcint flow
                                                                               A real time Pegasus propulsion system model for
VSTOL piloted simulation evaluation
[NASA-TH-82770] p0016 #82-
                                                 p0057 AB2-37574
   Euoyancy effects on the temperature field in
      downward spreading flames
                                                                                                                             p0016 #82-13144
                                                 pC094 A82-41203
                                                                            PLICHT TESTS
PLANE STABILITY
                                                                                Measuring the spacecraft and environmental
   Flame structure in a swirl stabilized combustor
                                                                                  interactions of the 8-cm mercury ion thrusters
      inferred by radiant erission measurements
                                                                                  on the P80-1 mission
                                                 p0056 A82-28694
                                                                                                                             p0043 A82-15438
   Lean-limit extinction of propane/air mixtures in
                                                                               In-flight acoustic results from an advanced-design
                                                                                  propeller at Mach numbers to 0.8
      the stagnation-point flow
                                                                                  [ATAA PAPER 82-1120]
                                                                                                                             p0021 A82-35017
   Effects of heat loss, preferential diffusion, and
                                                                                A preliminary comparison between the SR-3
      flame stretch on flame-front instability and extinction of propane/air mixtures
                                                                                  propeller noise in flight and in a wind tunnel
                                                                                  [NASA-TM-82805]
                                                                                                                             PO 152 N82-21998
                                                 D0057 A82-32877
                                                                            FLIGHT TIME
   On stability of premixed flames in stagnation -
                                                                               Investigation and evaluation of a computer program
                                                                                  to minimize three-dimensional flight time tracks PNASA-CR-1684191 p0 145 M82-17879
                                                 p0057 182-37574
   The premixed flame in uniform straining flow
                                                                            FLOOD PREDICTIONS
                                                 p0055 A82-43194
                                                                                Dynamics of snow cover in mountain regions of the
```

Aral Sea basin, studied using satellite

photographs

p0011 A82-31964

		AR2- 27462
PLOQUET THEOREM Review of analysis methods for retati		+ 0#0
with periodic coefficients	nd sie	CORS
	p0135	N 82-23702
PLOW CHARACTERISTICS		
NT BOUNDARY LAYER STABILITY NT FLAME STABILITY		
NT FLCW DISTRIBUTION		
NT FLOW STABILITY		
NT PLOW VELOCITY Characteristics of the flow in the an	กเป็นสะ	wall
region of an axial-flow compressor		
passage		
FAINA FAPER 82-0413] Novel improved PMR polyimides	boona	182- 17933
[NASA-TH-82733]	p0049	N82-11117
Mode propagation in nonuniform circul	ar duc	ts vith
pctential flow	50 15 i	N82-14881
[NASA-TM-82766] Calculation of the flow field include		
layer effects for supersonic mixed		
inlets at angles of attack	0 0 0 0	NOO 20260
[NASA-CR-167941] FLOW CHARTS	būšūna	N82-29269
Interactive-graphic flowpath plotting	for t	urbine
engines	-0017	MOD 150#1
[NASA-TM-82756] PLOW COEFFICIENTS	90017	N82- 15041
NT DISCHARGE COEPFICIENT		
PLOW DIRECTION INDICATORS		
Miniature drag-force anemometer	20002	A82-40132
PLOW DISTORTION	ρυσογ	NU2-40132
Distorted turbulence in axisymmetric	flow	
	p0089	A82- 1607 I
The effect of inflow velocity profile	e on t	ha
performance of supersonic ejector n		
[AIAA PAPER 81-0273]	p0002	A81-32548
On the prediction of swirling flowfie	lds fo	und in
axisymmetric combustor decuetries	20029	A82-12120
Mean flowfields in axisymmetric combu		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
geometries with swirl		
[MIMA PAPER 82-0177] Three-dimensional flow calculations i		182-17824
boundary layer effects for superson	ic inl	ets at
angle of attack		
[AIAA PAPER 82-0061] Numerical analysis of confined turbul	p0005	AB2- 19778
Numerical analysis of Continen turbul		A82-24748
In-flight acoustic results from an ad		
propeller at Mach numbers to 0.8	-0021	107-35017
[ATAN PAPER 82-1120] Small gas turbine combustor primary 2		182-35017
[AIAA PAPER 82-1159]		A82-35036
Three-dimensional flow field in the t		
a compressor rotor passage. I - Mea profiles and annulus wall boundary	n velo	city
[ASME PAPER 82-GT-11]		A82-35280
Flow distributions and discharge coef	ficien	t
effects for jet array impingement w	ith in	itial
CIOSSFLOW [ASME PAPER 82-GT-156]	11000	A82-35379
Turbulence measurements in a confined	jet u	sing a
six-orientation hot-wire probe tech	nique	
[AIAA PAPER 82-1262] Interaction of upstream flow distorti	pn094	182-37710
Mach number cascades	.vua Wl	en uran
[NASA-TM- E2759]	p0003	N82-12043
		: Data
and performance report for the best configuration	. stage	
[NASA-CR- 165357]	p0023	NB2- 14092
Core compressor exit stage study. Vo	lume 5	:
Design and performance report for t	he Pot	or
C/Stator B configuration [NASA-CR-165358]	n0023	N82-14093
Investigations of flowfields found in	typic	al
combustor geometries		
[NASA-CR- 165061]		NB2-15360
Investigations of flowfields found in combustor geometries	r £AbTC	αT
[NASA-CR-168585]	p0090	N82-19495
Turbofan forced mixer-nozzle internal	flowf	ield.
Volume 1: A benchmark experimental FNASA-CR-34921		N82-22458
I 4834-CP-34761	100000	HULL BETJU

```
Turbofan forced mixer-nozzle internal flowfield.
Volume 2: Computational fluid dynamic predictions
   [NASA-CR-3493] p0091 N82-2245
Investigation of the tip clearance flow inside and
at the exit of a compressor rotor passage
                                                   p0091 #82-22459
   [NASA-CR-169004] p0
A FORTRAN program for calculating three
                                                  p0026 N82-25253
      dimensional, inviscid and rotational flows with shock waves in axial compressor blade rows:
      User's manual
      [ NASA-CR-3560]
                                                   p0008 H82-26230
    Three dimensional flow field inside compressor
      rotor, including blade boundary layers [MASA-CR-169120]
                                                   p0091 182-27686
    Turbine endwall single cylinder program
                                                  p0091 N82-31638
   [NASA-CR-169278] p009 | N8:
Investigations of flowfields found in typical
      combustor geometries [NASA-CR-169295]
                                                   p0092 N82-31643
    Development and utilization of a laser velocimeter
      system for a large transonic wind tunnel
      [ NASA-TM-82886]
                                                   p0095 N82-31663
    Propeller flow visualization techniques
                                                   p0096 N82-32672
   Ly measurements with an advanced turboprop
                                                   p0097 NB2-32690
FLOW EQUATIONS
 NT HELMHOLTZ VORTICITY EQUATION
    A finite element formulation of Euler equations
      for the solution of steady transonic flows
   ning Parks 82-0062] p0009 A82-17759
An example of a solution to transonic equations
for shock-free flow about a symmetric profile
    Development of a locally mass flux conservative
      computer code for calculating 3-D viscous flow
      in turbomachines
   p0007 N82-22214
Computer program for calculating full potential
transonic, quasi-three-3t-error
      transonic, quasi-three-dimensional flow through a rotating turbomachinery blade row
      [ NASA-TP-2030 ]
                                                   p0005 N82-28247
PLOW PIELDS
 U ON DISTRIBUTION
PLOW GEOMETRY
    Thermal and flow analysis of a convection,
      air-cooled ceramic coated porous metal concept
      for turbine vanes
      [ASME PAPER 81-HT-48]
                                                   p0020 A82-10952
   Turbulent boundary layer heat transfer experiments
- A separate effects study on a convexly-curved
      [ASME PAPER 81-HT-78]
   Plow through axially aligned sequential apertures of the orifice and Borda types
[ASME PAPER 81-HT-79] p0089 A82-109
                                                   D0089 A82-10964
   Mean flowfields in axisymmetric combustor
      geometries with swirl
      [AIAA PAPER 82-0177]
                                                   p0092 A$2-17824
    Multigrid simulation of asymptotic curved-duct
      flows using a semi-implicit numerical technique
                                                   p0010 AU2-29003
   .Bluff-body flameholder wakes - A simple numerical
      solution
      [AIAA PAPER 82-1177]
                                                   p0093 A82-35043
    A comprehensive method for preliminary design
      optimization of axial gas turbine stages
                                                  P0030 A82-35091
      [AIAA PAPER 82-1264]
    The use of optimization techniques to design
      controlled diffusion compressor blading [ASHE PAPER 82:GT-149] p002
                                                   p0022 A82-35373
   The use of optimization techniques to design controlled diffusion compressor blading
      [NASA-TM-82763]
                                                   P0016 N82-14094
    Investigations of flowfields found in typical
      combustor geometries
      [NASA-CR-165061]
FLOW MEASUREMENT
    Interaction of compressor rotor blade wake with
      wall boundary layer/vortex in the end-wall region [ASME PAPER 81-GR/GT-1] p0010 A82-1930
   [ASME PAPER 81-GR/GT-1] p0010 A82-19301
Three sensor hot wire/film technique for three
      dimensional mean and turbulence flow field
                                                   p0097 A82-30300
    Three dimensional flow field inside the passage of
      a low speed axial flow compressor rotor
```

[AIAA PAPER 82-1006]

```
Three dimensional turbulent boundary layer
      development on a fan rotor blade (AIAA PAPER 82-1007)
                                                     p0011 A82-31965
    Plow distributions and discharge coefficient
      offects for jet array impingement with initial
      crossflow
    [ASHE FAPER 82-GT-156] pool! A82-35379 Turbulence measurements in a confined jet using a
      six-orientation hot-wire probe technique [ALAN PAPER 82-1262] p0094
                                                    P0094 A82-37710
    Miniature drag-force anemometer
                                                     p0097 A82-40132
    Extending the frequency of response of lightly
      damped second order systems: Application to the
      drag force anemometer
      [ NASA-TH-82927]
                                                     p0096 N82-32662
    Status of laser anemometry in turbomachinery
      research at the Levis Research Center
                                                    p0096 N82-32686
FLOW PATTERES
 U ON DISTRIBUTION
FLOW RATE
 U ON VELOCITY
PLOW SEPARATION
 U UNDARY LAYER SEPARATION U PARATED PLOW
PLOW STABILITY
 NT FOUNCARY LAYER STABILITY
HT FLAME STABILITY
    Nonlinear Marangoni convection in bounded layers.
      I - Circular cylindrical containers, II -
      Pectangular cylindrical contriners
                                                     p0094 A82-39501
FLOW THEORY
 NT MIXING LENGTH PLCW THECRY
    Distorted turbulence in axisymmetric flow
                                                     p0089 A82-16071
    The effect of inflow velocity profiles on the performance of supersonic ejector nozzles [AIAA PAPER 81-0273] p0002 A8
                                                     p0002 A81-32548
    Plow through axially aligned sequential apertures of the orifice and Borda types
[ASME PAPER 81-HT-79] p0089 A82-10
                                                     p0089 A82-10964
    Distorted turbulence in axisymmetric flow
                                                     p0089 A82-16071
    Secondary effects in combustion instabilities
leading to flashback
[AIAA FAPER 82-0037] p0056 A8
                                                     P0056 A82-17746
    Measurement and prediction of mean velocity and
turbulence structure in the near wake of an
                                                     p0010 A82-26137
    Investigation of the tip-clearance flow inside and
   at the exit of a compressor rotor passage. I -
Mean velocity field
[ASME PAPER 82-GT-12]
The velocity field near the orifice of a Helmholtz
rescnator in grazing flow
[NASA-CR-168548]
p0153 N82-18994
    NASA Redox cell stack shunt current,
                                                    pumping
      power, and cell performance tradeoffs [NASA-TH-82686]
                                                    p0054 N82-19333
    High-speed laser anemometer system for intrarotor
      flow mapping in turbosachinery [NASA-TF-1663]
                                                     p0095 N82-19521
    Plow through aliqued sequential orifice type inlets [NASA-TP-1967]
    Performance mapping studies in Redox [NASA-TM-82707]
                                                    flow cells
                                                     p0120 N82-20668
    Numerical modeling of three-dimensional confined
      flovs
    [ NASA-CR-165583] p0158 N82-24078
Three dimensional mean velocity and turbulence characteristics in the annulus wall region of an
      axial flow compressor rotor passage
      [ NASA-CR- 169003]
                                                     p0026 N82-25252
    Acoustic properties of turbofan inlets
                                                    p0153 N82-27090
      [ NASA-Ch- 169016]
    Laser anemometer using a Fabry-Perot
interferometer for measuring mean velocity and
      turbulence intensity along the optical axis in
      turbomachinery
      [ NASA-TM-82841]
                                                     p0095 NB2-28605
    Velocity gradient method for calulating velocities
      in an axisymmetric annular duct
      [ NASA-TP-2029 ]
                                                     p0005 N82-29270
FLOW VISUALIZATION
 NT NUMERICAL FLOW VISUALIZATION
```

```
Flow through axially aliqued sequential apertures
      of the orifice and Borda types [ASME PAPER 8 |-HT-79]
                                                 p0089 182-10964
   Secondary effects in combustion instabilities leading to flashback
      TATAA PAPER 82-00371
                                                 p0056 182-17746
    Application of image processing techniques to
      fluid flow data analysis
       [ NASA-TH-82760]
                                                 p0004 #P2-16049
   Shaded computer graphic techniques for visualizing and interpreting analytic fluid flow models
    [ MASA-CR-168418] p0145 M82-
Fringe local; zation requirements for
three-dimensional flow visualization of shock
                                                 p0145 N82-17880
      waves in diffuse-illumination double-pulse
      holographic interferometry
      [ NASA-TP-1868 ]
                                                 p0095 N82-22481
    New versions of old flow visualization systems
                                                 p0096 #82-32670
    Propeller flow visualization techniques
                                                 p0096 #82-32672
    Plow visualization of shock-boundary layer
      interaction
                                                 p0096 N82+32675
PLOUMETERS
NT HOT-WIRE PLOUBETERS
PLUID BOUNDARIES
 NT LIQUID-SOLID INTERPACES
PLUID DYNAMICS
 NT AERODYNAMICS
  NT AETOTHERMODYNAMICS
 NT COMPUTATIONAL PLUID DYNAMICS
 NT CYLINDRICAL PLASMAS
 NT ELASTOHYDRODYNAMICS
NT GAS DYNAMICS
 NT HYDRODYNAMICS
  NT MAGNETOHYDRODYNAMICS
  NT BOTOR AERODYNAMICS
    Eigenvalues of the Rayleigh-Benard and Marangoni
      problems
                                                 p0092 A82-13396
    Effect of location in an array on heat transfer to
      a cylinder in crossflow [NASA-TM-82797]
                                                 p0087 NB2-19493
PLUID FILES
 NT SQUEEZE FILMS
NT SQUEEZE FILMS

Measurement of oil film thickness for application
to elastomeric Stirling engine rod seals
[ASME PAPER 81-LUB-9] p0107 A82-18426

FLUID FLOW
HT AIR FLOW
HT AIR JETS
  NT ANNULAR PLOW
 NT AXEAL FLOW
 NT AXISYMMETRIC PLOW
 NT BLASIUS PLOW
 NT BOUNDARY LAYER FLOW
NT BOUNDARY LAYER SEPARATION
 NT CAPILLARY FLOW
 NT CASCADE PLOW
 NT CAVITATION PLOW
 NT CHANNEL FLOW
 MT COAXIAL FLOW
 NT COMBUSTIBLE PLOW
 NT COMPRESSIBLE PLOW
 NT CONVECTIVE PLOW
 NT CORNER PLOW
 NT CROSS FLOW
 NT DUCTED PLOW
 NT PUEL PLOW
 NT GAS FLOW
 NT INCOMPRESSIBLE PLOW
 NT INLET PLOW
NT INVISCID PLOW
 NT JET FLOW
  MT LAHINAR PLOW
 NT LIQUID PLOW
 NT NONUNIFORM FLOW
 NT NOZZLE PLOW
 NT ORIPICE PLOW
 NT OSCILLATING PLOW
 NT PARALLEL PLOW
 NT PIPE PLOU
 MT POTENTIAL PLOW
 NT PROPELLANT TRANSFER
 NT BADIAL PLOW
 NT RECIRCULATIVE FLUID FLOW
 NT REVERSED PLOW
 NT SECONDARY PLOW
```

```
OF POOR QUALITY
  NT SEPARATED PLOW
  NT SHEAF PLOW
NT STAGNATION PLOW
  NT STEADY FLOW
NT SUESONIC FLOW
  NT SUPERCRITICAL FLOW
 NT SUPERSONIC PLOW
NT SUPERSONIC JET FLOW
NT THREE DIMENSIONAL PLOW
  RT TRANSONIC FLOW
NT TURBULENT PLOW
  NT TWO DISENSTONAL PLOW
  NT TWO PHASE FLOW
  NT CHIFORH FLOW
  HT UNSTFACY FLOW
  NT VISCOUS FLOW
  NT BALL PLOW
NI BATER FLOW
     Application of image processing techniques to
        fluid flow data analysis
        [ NASA-TM-82760 ]
                                                         p0004 NB2-16049
      hydrodynamic model of an cuter hair cell [NASA-TM-82773]
                                                         p0143 NB2-16743
    Shaded computer graphic techniques for visualizing and interpreting analytic fluid flow models
[NASA-CR-168418] p0145 NB2-1788
Investigations of flowfields found in typical
                                                         PO 145 N82- 1788A
       combustor quometries
       [ NASA-CE- 168585]
                                                         p0090 N82-19495
    Analytical investigation of nenrecoverable stall [NASA-TH-82792] p0018 N82-2
                                                         p0018 N82-21195
    Experiments on fuel heating for commercial aircraft [NASA-TM-82878] p0072 N82-2648
                                                         p0072 N82-26483
PLUID INJECTION
 NT GAS INJECTION
PLUID JETS
NT AIR JETS
NT FREE JETS
PLUID RECHANICS
NI APROPYNAMICS
  NT APROTHERMODYNAMICS
  NT COMPUTATIONAL FLUID DYNAMICS
  NT CYLINDFTCAL PLASMAS
  NT ELASTOHYDRODYNAMICS
  NT FLUID DYNAMICS
 NT GAS CYNAMICS
  NT HYDRODYNAMICS
  NT MAGNETCHYDRODYNAMICS
  NT FOTOF ARRODYNAMICS
    Modified face seal for positive film stiffness
[NASA-CASE-LEW-12989-1] p0099 N82-12442
Flows through sequential orifices with heated
       spacer reservoirs
       [ NASA-TM-82855]
                                                         p0088 N82-24455
FLUILIZED BED PROCESSORS
Lewis Research Center's coal-fired, pressurized,
fluidized-bed reactor test facility
[NASA-TM-81616] p0087 N82-1
                                                         p0087 N82-14397
    Elastic-plastic finite-element analyses of
       thermally cycled single-edge wedge specimens [NASA-TF-1982] point N82
                                                         p0111 N82-20565
    Lewis pressurized, fluidized-hed combustion
    program. Data and calculated results [NASA-TM-81767] p0124 N8: Catalytic combustion of actual low and medium
                                                         p0124 N82-30704
       heating value gases [NASA-TK-82930]
                                                         p0125 NB2-30717
PLUCBINATION
    Trihological evaluation of composite materials
       made from a partially fluorinated polyimide
[NASA-TM-82832]
PLUGBINE COMPOUNDS
NI FLUGFOPCLYNERS
                                                         p0069 N82-29459
 NT POLYTETRAFLHOROUTHYLENE
PLUOBINE ORGANIC COMPOUNDS
 AT FLUOROPCLYMERS
PLUORO COMPOUNDS
 NT FLUOROPCLYMERS
 NT FOLYTETRAPLUOROETHYLENE
PLUCEOFOLYMERS
 NT EOLYTETRAPLUOROETHYLENE
 NT TEFLON (TRADEMARK)
    Texturing polymer surfaces by transfer casting ---
cardiovascular prosthesis
[NASA-CASE-LEW-13120-1] p0068 N82-284
                                                         p0068 #82-28440
    Surface texturing of fluoropolymers [NASA-CASE-LEW-13028-1]
                                                         p0070 N82-33521
PLUTTER
```

NT TRANSONIC FLUTTER

```
Aeroelastic characteristics of a cancade of
     mistured blades in subsonic and supersonic flows [ASME PAPER 81-DET-122] pt 021 482-193
                                              pun21 482-19337
   Coupled bending-bending-torsion flutter \\ f a mistuned cascade with nonuniform blades
      [NASA-TM-82813]
                                              p0111 N82-21604
PLOTTER AVALYSIS
   Three-dimensional shock structure in a transonic
      flutter cascade
                                               p0006 A82-37937
   Solution of the unsteady subsonic thin airfoil
      problem
                                              p0012 A82-41267
FLUX (BATE)
 NT HEAT PLUX
PLUX DENSITY
 NT CURRENT DENSITY
 NT LUMINOUS INTENSITY
NT RADIANT PLUX DENSITY
PLUX HAPPING
 U PPING
PLOIMETERS
 U ASURING INSTRUMENTS
PLYING PLATFORM STABILITY
 U RODYNAMIC STABILITY
PLYMBERLS
   Development of a dual-field heteropoplar power
     converter
     [ NASA-CR-165168]
                                              p0084 N82-24424
POCUSING
   Experimental verification of a computational
      procedure for the design of TWT-refocuser-NDC
     systems --- Multistage Depressed Collectors
                                              p0082 A82-16128
   Focal surfaces of offset dual-reflector antennas
                                              p0080 A82-36265
FOG DISPERSAL
   Design of prototype charged particle fog dispersal
     unit
     [NASA-CR-3481]
                                              p0141 NB2-16659
POILS (HATERIALS)
 NT HETAL POILS
   Thin foil silicon solar cells with coplanar back
     contacts
                                              D0127 A82-44944
POKKER BOND TESTERS
 U HESION TESTS
FORCE PIELDS
U ELD THEORY (PHYSICS)
POSCED OSCILLATION
U RCED VIBRATION
FORCED VIBRATION
   The influence of Coriolis forces on gyroscepic motion of spinning blades
[ASME PAPER 82-GT-163] p0030 A82-
                                              p0030 A82-35384
   Review of analysis methods for rotating systems
     with periodic coefficients
                                              p0135 N82-23702
PORCED VIBRATORY NOTION EQUATIONS
 U RCED VIBRATION
PORECASTING
 NT PERFORMANCE PREDICTION
 NT PREDICTION ANALYSIS TECHNIQUES
NT TECHNOLOGY PORECASTING
NT WRATES FURECASTING
   Ozone and aircraft operations
                                              p0001 N82-21145
   Worldwide satellite market demand forecast
     [NASA-CR-167918]
                                              p0079 NB2-25423
FORECASTS
 U RECASTING
PORM
 U APES
FORMING TECHNIQUES
NT CASTING
NT INJECTION HOLDING
PORTRAN
   STGSTK:
             A computer code for predicting multistage
     axial flow compressor performance by a meanline
     stage stacking method
     [NASA-TP-2020]
                                              p0018 N82-25250
POSSIL FUELS
MT COAL
   Collection and dissemination of thermal energy
     storage system information for the pulp and
     paper industry
                                              p0 136 N82-24686
FOSSIL METEORITE CRATERS
```

U TEORITE CRATERS

ORIGINAL PAGE IS OF POOR QUALITY

POURDATIONS Effect of rotor configuration on guyed tower and	PREE CONVECTION p0029 A82-11999
foundation designs and entimated costs for intermediate site horizontal axis wind turbines	Bigenvalues of the Bayleigh-Demard and Marangoni problems
[NASA-TH-82804] p0121 N82-22649 FOURIER AWALYSIS	p0092 A82-13396 Natural convection with combined driving forces
NT FOCRICE SERIES	p00\\\3 A82-31445
An experimental investication of gapwise periodicity and unsteady aerodynamic response in an oscillating cascade. Volume 2: Data report. Part 1: Text and mode 1 data	PRES ELECTRON LASERS On a free-electron-laser in a uniform magnetic field - A solution for arbitrarily strong electromagnetic radiation fields
[MASA-CR-165457-VOL-2-PT-1] p0006 892-18180 FOURIER SERIES	AB2-28409 Free electron lasers for transmission of energy in
Numerical commrisons of nonlinear convergence accelerators	#PACE [NASA-CR-165520] p0098 W82-25499
PRACTICMATION P0149 A82-31438	FREE JETS Forms of three-dimensional supersonic free jets in
NT CHYMICAL FRACTICNATION PRACTICRAPHY	linear approximation A82-19196
Microstructural effects on the room and elevated	PREE OSCILLATIONS
temperature low cycle fatique tehavior of Waspaloy [NASA-CP-165497] p0113 M82-26702	U RE VIBRATION PRES VIDENTION
FRACTURE HECHANICS	Vibrations of cantilevered shallow cylindrical
On a study of the /Delta T/c and C/asterisk/ integrals for fracture analysis under non-steady	shells of rectangular planform p0115 A82-11298
creep p0115 A82-36782 Micromechanical predictions of crack propagation	Comparison of beam and shell theories for the vibrations of thin turbomachinery blades [ASHE PAPER 82-GT-223] p0 115 A82-35408
and fracture energy in a single fiber boron/aluminum model composite	Pinite-element modeling of layered, anisotropic composite plates and shells: A review of recent
[NASA-CR-168550] p0052 N82-18326 Creep crack-growth; A new path-independent T sub	research p0113 N82-19563
o and computational studies [NASA-CR-168930] p0113 N82-24503	PREQUENCIES HT EXTREMELY HIGH PREQUENCIES
Fracture mechanics criteria for turbine engine hot	NT HIGH FREQUENCIES
gection components [NASA-CF-167896] p0027 N82-25257	NT RESONANT PREQUENCIES Skiending the frequency of response of lightly
High temperature low cycle fatigue mechanisms for nickel base and a copper base alloy	damped second order systems: Application to the drag force anemometer
[NASA-CE-3543] p0064 N82-26436	[NASA-TH-82927] p0096 N82-32662
Analysis of cracks emanating from a circular hole in unidirectional fiber reinforced composites,	PREQUENCY BANDS U EQUENCIES
part 2 [NASA-CT-165433] p0114 N82-26714	PREQUENCY CONVERSION U EQUENCY CONVERTERS
Analyzis of interface cracks in adhesively bonded	FREQUENCY CONVERTERS
14) shear joints, part 4 [NASA-CP-165438] poil4 N82-26716	A 10kW series resonant converter design, transistor characterization, and base-drive
FRACTURE RESISTANCE U ACTURE STRENGTH	optimization [NASA-CR-165546] p0084 N82-17439
FRACTURE STRENGTH Strength distributions of SiC ceramics after	PREQUENCY DIVISION MULTIPLE ACCESS Baseband-processed SS-TDMA communication system
oxidation and oxidation under load [ACS PAPER 9-C-89C] p0071 A82-20143	architecture and design concepts [AIAA 82-0482] p0079 A82-23508
Work of fracture in aluminum metal-matrix composites	FREQUENCY MODULATION
p0053 A82-31339 Effects of oxidation and oxidation under load on	NT PREQUENCY SHIFT REVING Communications satellite systems capacity analysis
strength diskributions of Si3N4 [ACS PAPER 69-E-80] p0071 A82-35871	[NASA-CR-167911] p0034 N82-27331 PREQUENCY SHIFT KEYING
Extended range stress intensity factor expressions for chevron-notched short bar and short rod	Conversion and matched filter approximations for serial minimum-shift keyed modulation
fracture toughness specimens	p0080 k32-26713
On ultrasonic factors and fracture toughness	Near optimum delay-line detection filters for serial detection of MSK signals
p0116 A82-42863 Interrelation of material microstructure,	PREQUENCY TRANSLATION p0086 A82-43867
ultrasonic factors, and fracture toughness of two phase titanium alloy	U EQUENCY CONVERTERS FRICTION
[NASA-TH-82810] p0110 N82-20551 Factors influencing the thermally-induced strength	NT DRY PRICTION NT SLIDING PRICTION
degradation of B/11 composites	Application of surface analysis to solve problems
[NASA-TM-82823] p0050 N82-24297 FRACTURE TOUGHNESS	of wear [NASA-TH-82753] p0099 N82-14519
U ACTURE STRENGTH FRACTURES (MATERIALS)	Stress evaluations under rolling/sliding contacts [NASA-CR-165561] p0113 N82-17521
Croep crack-growth: A new path-independent	Tribological properties at 25 C of seven polyimide
integral (T sub c), and computational studies [NASA-CR-167897] p0114 N82-29619	films bonded to 440 C high-temperature stainless steel
PRACTUBING Environmental effects on defect growth in	[NASA-TP-1944] p0067 N82-19373 Priction and wear of iron in corrosive metal
CCmposite materials [NASA-CP-165213] p0052 N82-20248	[NASA-TP-1985] p0058 N82-20291
PRACHENTS	Priction and surface chemistry of some ferrous-base motallic glasses
Rotor fragment protection program: Statistics on aircraft gas turbine ngine rotor failures that	[NASA-TP-1991] p0059 N82-21301 Correlation of tensile and shear strengths of
occurred in U.S. commercial aviation during 1978	metals with their friction properties
PRABES	[NASA-TH-82828] p0060 N82-24325 Frictional heating due to asperity interaction of
Thermal expansion accommodation in a jet engine frame	elastohydrodynamic line-contact surfaces [NASA-TP-1882] p0100 N82-25514

ORIGINAL PAGE IS OF POOR QUALITY

```
Lubricant effects on efficiency of a helicopter
       transmission
[NASA-TM-82857]
                                                            p0 100 M82-25520
     Boundary lubrication: Fevisited [NASA-TH-82858]
                                                            p0069 N82-29458
| NADA-TH-0200 A

Refractory coatings

(NASA-CASE-LRW-)3169-2]

PRICTICN COEFFICIENT

U REFICIENT OF PRICTION
                                                            p0061 #82-30371
PRICTION FACTOR

The effect of oxygen concentration on the boundary-lubricating characteristics of a C other and a polyphenyl ether to 300 C
                                                           P0070 A82-21699
     Surface chemistry, microstructure and friction proporties of some ferrous-hase metallic glasses at temperatures to 750 C
        [ NAS4-TP-2006 ]
                                                            p0060 N82-22349
PRICTION LOSS CORPFICIENT
  II ICTICH FACTOR
PRICTION REDUCTION
     Stress evaluations under rolling/sliding contacts
        [ NASA-CR- 165561]
                                                            p0113 N82-17521
PRINCE PATTERNS
U FERACTION PATTERNS
PROUTAL AREAS (METEOBOLOGY)
U CNTS (METEOROLOGY)
PROBTS (BETEOROLOGY)
     Effects of condensation and surface motion on the
        structure of steady-state fronts
                                                                     A82-19360
FROST
     Effect of heavy rain on aircraft
                                                                     H82-21149
FUEL CELL CATALYSTS
  U ECTROCATALYSTS
FUEL CELL POWER PLANTS
     40-kW phosphoric acid fuel cell field test -
       Project plan
                                                            p0 128 382-45325
     Fhosphoric acid fuel cell technology status [NASA-TM-82791] p0120
                                                           p0 120 N82-19670
FUEL CELLS
 NT HYDROGEN OXYGEN FUEL CELLS
 NT FHESPHERIC ACID FUEL CELLS
NT REGENERATIVE FUEL CELLS
     An assessment of alternative fuel cell designs for
        residential and commercial ecgeneration
                                                           p0 138 A82-24695
     Envelop and test fuel cell powered on-site
       integrated total energy system. P
Full-scale power plant development
[NASA-CP-165328]
                                                        Phase 3:
                                                            p0117 N82-13490
    Develop and test fuel cell rowered on-site integrated total energy systems. Phase Pull scale power plant development [NASA-CR-165455] p0131
                                                         Phase 3:
                                                            p0131 N92-16483
     Proparation and evaluation of advanced
        electrocatalysts for phosphoric acid fuel cells
        [ NASA-CR- 16559#1
                                                            p0 132 292-17615
     Cell module and fuel conditioner development
        [ NASA-CF- 165620]
                                                            p0134 N82-21713
    Cathode catalyst for primary phospheric fuel cells
[NASA-CP-165198] p0134 N82-22675
     Requirements for optimization of electrodes and clectrolyte for the iron/chromium Redox flow cell [NASA-CF-165218] p0136 NB2-2564
                                                            p0136 NB2-25640
     Stabilizing platinum in phosphoric acid fuel cells [NASA-CR-165606] p0136 N82-297
                                                            p0136 N82-29718
    Development and test fuel cell provered on-site integrated total energy systems. Phase 3: Full-scale power plant development [NASA-CR-167898] p0 137 N82
     Ncn-noble catalysts and catalyst supports for phosphoric acid fuel cells
[NASA-CK-165289] p0137 N82
                                                            p0137 N82-30722
FUEL CCHBUSTION
     Symposium /International/ on Combustion, 18th,
University of Waterloo, Waterloo, Ontario,
Canada, August 17-22, 1980, Proceedings
                                                            p0056 A82-28651
     Experimental and theoretical studies of the laws
        governing condensate deposition from combustion
     NASA Broad Specification Puels Combustion
       Technology program - Fratt and Whitney Aircraft Phase I results and status
       [ NIAN FAPER 82-1088]
                                                            p0021 A82-34999
```

```
WASA/General Electric broad-specification fuels
      combustion technology program - Phase I results
      and status
    [AIAA PAPER 62-1089] p002! A Buoyancy effects on the temperature field in downward spreading flames
                                                   p0021 A62-35000
                                                   p0094 A82-41203
    Effect of fuel-air-ratio nonuniformity on
      emissions of nitrogen oxides
      I WASA-TP-1798]
                                                   p0016 M82-13143
    Catalytic combustion of residual fuels
                                                   p0118 882-13504
    [NASA-TH-82731] p0118
Demonstration of cat/Alytic combustion with
      residual fuel
      [ WASA-CR-165369]
                                                   p0131 #82-16484
    Advanced Low-Baissions Catalytic-Combustor
    Program, phase 1 --- aircraft gas turbine engines [MASA-CR-159656] p0025 M82-22265
Low NOx heavy fuel combustor concept program,
                                                   p0025 #82-22265
      phase 1
    [MASA-CR-165449] p0135 M
Low NOx heavy fuel combustor concept program
[NASA-CR-167876] p0074 M
                                                   p0135 N82-24651
                                                   p0074 N82-26482
    Electrostatic fuel conditioning of internal
    Combustion engines
[MASA-CR-169020] p0
Effect of hydrocarbon fuel type on fuel
                                                   P0106 N82-26680
                                                   p0072 N82-28460
      [ MASA-TH-8 29 161
    Low and medium heating value coal gas catalytic
      combustor characterization
[NASA-CR-165560] p0 138 )

Low NOx heavy fuel combustor concept program
[NASA-CR-165481] p0 138 )

FUEL CONSUMPTION
                                                   p0138 ¥82-32856
                                                   p0138 N82-33827
    Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL
      [AIAA PAPER 81-2637]
                                                   p0020 482-19214
    The AGT 101 advanced automotive gas turbine [ASME PAPER 82-GT-72] p0108
                                                   PO 108 A82-35321
    Progress in the development of energy efficient
    engine (components
[ASME RAPER 82-GT-275]
AGT-102 automotive gas turbine
                                                   p0030 A82-35450
      [ NASA-CR-165353]
                                                   p0105 N82-12444
    WASA research activities in aeropropulsion
      [ MASA-TH-82788]
                                                   p0017 N82-16084
    Advanced Gas Turbine (AGT) powertrain system initial development report
       [ NASA-CR-165130]
                                                   p0 132 N82-16485
    CF6 jet engine performance improvement: High pressure turbine roundness
[NASA-CR-165555] p0024 N8
                                                   p0024 N82-17174
    Advanced general aviation comparative
      engine/airframe integration study [NASA-CR-165564]
                                                   p0025 H82-22263
    Energy efficient engine exhaust mixer model
technislogy
       [ NASA-CR-1654591
                                                   p0025 N82-22264
    Straight and chopped DC performance data for a
      General Electric 58143641 DC shunt motor with a
       General Electric EV-1 controller
       [NASA-CR-165507]
    Preliminary analysis of a downsized advanced
      gas-turbine engine in a subcompact car
       [NASA-TH-82848]
                                                   p0163 N82-26051
    Cr6 jet engine performance improvement: High pressure turbine active clearance control
      [ NASA-CR-165556]
                                                   p0027 N82-28297
    Impact of advanced propeller technology on
      aircraft/mission characteristics of several
       general aviation aircraft
    p9009 N82-33347
      combustion aircraft engines
      [ NASA-CR-167914 ]
                                                   p0029 N82-33392
    Advanced ceramic coating development for industrial/utility gas turbines
       [NASA-CR-169852]
                                                   P0065 N82-33494
PURL CONTABINATION
    Deposit formation in liquid fuels. III - The effect of selected nitrogen compounds on diesel
      fuel
                                                   p0074 A82-23238
    Advanced ceramic coating development for
      industrial/utility gas turbines
      [ NASA-CR-169852]
                                                   p0065 N82-33494
PUBL PLOW
 NT PROPELLANT TRANSFER
```

```
Tube entrance heat transfer with deposit formation [AIAA PAPER 82-0918] p0093 A82-319
                                                          p0093 A82-31908
FUEL INJECTION
    Atomization and combustion properties of flashing
       injectors
       [AÍNA PAPER 82-0300]
                                                          p0092 A82-17880
    Evaluation of fuel injection configurations to control carbon and soot formation in small GT
       combustors
       [ ATAA PAPER 82-1175]
                                                          p0021 A82-35041
    Pollution reduction technology grogram small jet
       aircraft engines, phase 3 [NASA-CR-165386]
                                                          p0023 N82-14095
    External fuel vaporization study [NASA-CR-165513]
                                                          p0073 N82-14371
   [NASA-CR-165513] p0073 M02-143'

Effect of fuel injector type on performance and emissions of reverse-flow combustor [NASA-TR-1945] p0016 N02-150'

Investigation of spray characteristics for flashing injection of fuels containing dissolved air and superheated fuels
                                                          p0016 N82-15040
       [ NASA-CP-3563]
                                                          p0027 N82-26295
PUBL OILS
 NT LICUID FUELS
    Demonstration of catalytic combustion with
       residual fuel
[NASA-CA-165369]
                                                           p0131 N82-16484
Oxidation and formation of deposit precursors in hydrocarbon fuels
[NASA-CE-165534] p0073 N82-16
                                                          p0073 N82-18402
 NT LICUID FUELS
    Puel quality processing study, volume !
       [ NASA-CR- 165327-VOL- 1 ]
                                                          p0 135 N82-24649
    Fuel quality/processing study. Volume 2:
Appendix. Task ! literature survey
[NASA-CR-165327-VOL-2] p0 13
                                                          p0 135 N82-24650
FUEL SPEAYS
    formation of oxides of nitrogen in ecnodisperse spray combustion of hydrocarbon fuels
                                                          D0057 A82-37571
PUBL SYSTEMS
 NT AFFCRAFT FUEL SYSTEMS
    Demonstration of catalytic combustion with residual fuel [NASA-CR-165369] p0131
                                                          n0131 N82-16484
FUEL TANK PRESSURIZATION
    Low-thrust chemical propulsion system propellant expulsion and thermal conditioning study.
       Executive summary
       [ NASA-CR- 165622]
                                                          p0045 N82-24287
    Low-thrust chemical propulsion system propellant
expulsion and thermal conditioning study
[NASA-CP-167841] p0045 N82-24288
PUBL TARKS
 NT WING TANKS
    Additional experiments on flowability improvements of aviation fuels at low temperatures, volume 2 [NASA-CP-167912] p0074 N82-31546
FUEL TESTS
    Deposit formation in liquid fuels. II - The effect
       of selected compounds on the storage stability
       of Jet A turbine fuel
    Evaluation of Eucl injection configurations to
      control carbon and soot formation in small GT
       combustors
       [ AIAA PAPER 82-11751
                                                           p0021 A82-35041
    Deposit formation in hydrocarbon fuels
      [ ASME PAPER 82-GT-49]
                                                          p0075 A82-35307
    Experimental study of external fuel vaporization [ASME FAPER 82-GT-59] p0075 A82-3: Catalytic combustion of residual fuels
                                                          p0075 182-35312
                                                          p0118 N82-13504
       [ NASA-TM-82731]
    Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype fiat 13 TC 2.4 liter automobile
       [ NASA-CR- 165535]
                                                          p0164 N82-18068
    Testing of fuel/oxidizer-rich, high-pressure
       preturners
       | NASA-CR-1656091
                                                          p0074 N82-24353
   Characterization of an Experimental Referee
Broadened Specification (ERBS) aviation turbine
fuel and ERBS fuel blends
       [ NASA-TM-82883]
                                                          p0072 N82-32504
FUEL-AIR RATIO
    Effects of heat loss, preferential diffusion, and
       flame stretch on flame-front instability and
       extinction of propane/air mixtures
```

```
p0057 A82-32877
   On the opening of premixed funsem flame tips
                                              P0057 182-37570
   Effect of fuel-air-ratio nonuniformity on
     emissions of nitrogen oxides [NASA-TP-1798]
                                               p0016 N82-13143
   Catalytic combustion of residual fuels
   [NASA-TH-82731] p0118 NB2
Low NOx heavy fuel combustor concept program.
Phase 1: Combuston technology generation
                                              PO 118 N82-13504
      [ WASA-CR-165482]
                                              p0136 #82-24725
   Effect of fuel to air ratio on Each 0.3 burner rig
      hot corrosion of ZrO2-Y2O3 thermal barrier
      coatings
     [ NASA-TH-828791
                                               D0061 N82-30373
PURLS
 NT AIRCEAPT FUELS.
NT COAL
 NT CRYOGENIC ROCKET PROPELLANTS
 NT DIESEL PUELS
NT POSSIL PUELS
 NT FUEL OILS
NT GASEOUS FUELS
NT HYDROCARBON FUELS
 MT JET ENGINE PUELS
 NT LIQUEPIED NATURAL GAS
 MT LIQUID FUELS
 NT RP- | ROCKET PROPELLANTS
 MT SYNTHETIC PUELS
POECTIONAL ANALYSIS
NT INTEGRAL EQUATIONS
NT J INTEGRAL
PUNCTIONS (MATHEMATICS)
 NT CONFORMAL MAPPING
 NT HATHIEU PUNCTION
NT PERIODIC PUNCTIONS
 NT TANGENTS
 NT TRANSPER PUNCTIONS
FURAR RESIDS
NT KEVLAR (TRADEHARK)
                              G
 U ASURING INSTRUMENTS
CALLIUM ARSENIDES
   Gallium armenide solar cells-status and prospects
     for use in space
                                              p0043 A82-11765
   Undoped semi-insulating LEC Gals - A model and a
     mechanism --- Liquid Encapsulated Czochralski
                                               p0159 A82-13754
   Stoichiometry-controlled compensation in liquid encapsulated Czochralski Gals
                                               p0158 A82-17585
   ON-VPE growth of Mg-doped Gals ---
     OrganoMetallic-Vapor Phase Epitaxy
                                               p0 159 A82-38411
   Compensation mechanism in liquid encapsulated
     Czochralski Gals Importance of melt stoichiometry
                                               p0086 A82-40403
   Effect of melt stoichiometry on twin formation in LEC Gals --- Liquid Encapsulated Czochralski
      technique
                                               p0160 A82-46517
   Low temperature growth and electrical
     characterization of insulators for Gals HISPETS
                                               p0159 N82-11959
     [NASA-CR-164972]
   High purity low dislocation Gals single crystals
[NASA-CR-165593] p0159 N82-2:
                                               p0159 N82-23030
   Gallium arsenide solar array subsystem stud?
     [ NASA-CR-167869]
                                               p0138 M82-32855
GALLIUM COMPOUNDS
 MT GALLIUM ARSENIDES
GALVANIC CELLS
 U ECTROLYTIC CELLS
GARNA RADIATION
 U MMA RAYS
GAMMA RAYS
```

Effect of gamma irradiation on the friction and

Hethod of making a high voltage V-groove solar cell [NASA-CASE-LEW-1340V-1] p0124 N82-2970 GAS AWALYSIS

Development of CdO-graphite-Ag coatings for gas

wear of ultrahigh molecular weight polyethylene

90062 A82-10674

p0124 N82-29709

NT OZONOMETRY

```
bearings to 427 C
                                                   po 108 A82-27079
    Bearings: Technology and reeds [NASA-CR-167008]
                                                   p0 106 N82-26679
CAS DEBSITY
    CAS22 - PORTRAN program for fast design and
      analysis of shock-free airfoil cascades using
      fictitious-qus concept
      [ NASA-CR-3507]
                                                   P0006 NB2-16044
GAS DYNABICS
 NT APPODINATION
NT APPOTREMODYNAMICS
 NT FOTOR AFFODYNAMICS
   Characteristic dynamic energy equations for
      Stirling cycle analysis
                                                    P0138 A82-11816
    Effects of internal heat transfer on the structure
      of self-similar blast waves
                                                   p0093 A82-32225
CAS PLON
 NT AIR FLOW
NT FIRE FLOW
   Two dimensional stagnation point flow of a dusty gas near an oscillating plate
    High-speed motion picture camera experiments of
    cavitation in dynamically loaded journal bearings [NASA-TH-82798] p0100 N82-2054; Pcckels-effect cell for gas-flow simulation
                                                   PO 100 NB2-20543
      [ NASA-TF- 2007]
                                                   P0095 N82-23515
    Study of vapor flow into a capillary acquisition
      device --- for cryogenic rocket propellants [NASA-CF-167883] p0091 N8
                                                   p0091 N82-24452
   Covering solid, film cooled surfaces with a duplex thermal barrier coating [NASA-CASE-LEW-13450-1] p0088 N82-2546
                                                   p0088 N82-25463
GAS INJECTION
   Assessment of steam-injected qus turbine systems and their potential application
[NASA-TM-82735] p0119 N82-1
                                                   p0 | 19 N82-18694
GAS IUNIZATION
 NT AUBORAL IONIZATION
GAS LASERS
 NT CARBON CIOXIDE LASERS
 NT DF LASERS
GAS LUBRICATED BRARINGS
 U S BEARINGS
GAS MILITURES
    Numerical modeling of turbulent combustion in
      premixed gases
                                                   p0056 A82-28708
GAS PHASES
 U EOP PHARES
GAS STREAMS
   Dilution jet behavior in the turn section of a
      reverse flow combuster
      [ NASA-TM-82776]
                                                   p0017 N82-19220
GAS TURBINE ENGINES
 NT BPISTOL-SIDDELEY BS 53 ENGINE NT JPT ENGINES NT CURBOFAN PROGNES NT TUBBOJET ENGINES
 NT TURBOPROP ENGINES
    The AGT101 technology - An automotive alternative
                                                   p0 107 A82- 11783
   Thermal expansion accommodation in a jet engine
      frame
                                                   p0029 A82-11999
   High temperature durable catalyst development
                                                   p0056 A82-20739
   Blade loss transient dynamic analysis of
      turbomachinery
      [AIAA PAPER 82-1057]
                                                   p0030 A82-34982
   Fxperimental study of the effects of secondary air on the emissions and stability of a lean
   premixed combustor
[AIAA PAPER 82-1072]
Advancements in real-time engine simulation
technology --- of digital electronic aircraft
      engine controls
   [AIA FAPER 82-1075] p0021 A82-NASA/General Electric broad-specification fuels
      combustion technology program - Phase I results
      and status
      [ NIAA PAPER 82-1089]
                                                   p0021 182-35000
    Small gas turbine combustor primary zone development
    [AIAA FAPER 82-1159] p0 103 A82-35
AGT 100 automotive gas turbine system development
                                                   p0 103 A82-35036
      [ AIAA FAPER 82-1165]
                                                   P0 108 A82-35038
```

```
AGTIO1 automotive gas turbine system development [ALAA PAPER 82-1166] p0108 AB2-3
                                                   p0108 A82-35039
Evaluation of fuel injection configurations to
   control carbon and soot formation in small GT
   combustors
[ATAA PAPER 82-1175] p0021 A82-35041 AGT100 turbomachinory --- for automobiles [ATAA PAPER 82-1207] p0108 A82-35061
Combustor development for automotive que turbines
[AIAA PAPER 82-1208] p0 104.
The AGT 101 advanced automotive gas turbine
                                                    p0 104 A82-35062
  [ASHE PAPER 82-GT-72]
                                                   PO 108 A82-35321
The use of optimization techniques to design
  controlled diffusite compressor blading [ASHE PAPER 82-GT-149] p002
                                                   p0022 A82-35373
Ceramic thermal barrier coatings for gas turbing
   engines
   [ASHE PAPER 82-GT-265]
                                                    p007 | A82-35441
Progress in the development of energy efficient
   engine components
   [ASHE PAPER 82-GT-275]
                                                    p0030 A82-35450
Engine dynamic analysis with general nonlinear finite element codes. II - Bearing element implementation, overall numerical characteristics and beachmarking
  [ASHE PAPER 82-GT-292]
                                                   PO 108 A82-35462
Design and development of a ceramic radial turbine
for the AGT101
[AIAA PAPER 82-1209] p0109 A82-39
Optical tip clearance sensor for aircraft engine
                                                    PO 109 AB2-35480
   controls
   [AIAA PAPER 82-1131]
                                                    p0015 A82-37691
Applications of high-temperature powder metal
   aluminum alloys to small gas turbines
                                                    p0065 A82-48244
Development of low modulus material for use in
   ceramic gas path seal applications [NASA-CR-165469]
                                                   p0022 882-10039
Evaluation of the potential of the stirling engine
for heavy duty application
[NASA-CR-165473] p0128 N82-1056
                                                    PO 128 N82-10505
Progress in protective coatings for aircraft gas
turbines: A Review of NASA sponsored research
[NASA-TH-82740] p0058 N82-13
                                                    P0058 N82-12216
AGT-102 automotive yes constant points N82-12444 [NASA-CR-165353] points N82-12444 Low No sub x heavy fuel combustor concept program points N82-12572
AGT-102 automotive gas turbine
Gas-turbine critical research and advanced
  technology support project [NASA-TM-81708]
                                                   p0118 N82-13509
Development of a high-temperature durable catalyst
   for use in catalytic combustors for advanced
automotive gas turbine engines
[NASA-CE-165396] p0130 N
The use of optimization techniques to design
                                                   p0130 N82-13510
   controlled diffusion compressor blading
   [NASA-TM-82763]
                                                   P0016 N82-14094
ERBS fuel addendum: Pollution reduction
   technology program small jet aircraft engines,
   phase 3
   [NASA-CR-165387]
                                                    p0024 N82-14096
External fuel vaporization study
[NASA-CR-165513] p0073 N82-
Effect of fuel injector type on performance and
                                                   p0073 N82-14371
   emissions of reverse-flow combustor
   [NASA-TP-1945]
                                                   p0016 N82-15040
Research and development program for non-linear structural modeling with advanced
   time-temperature dependent constitutive
   relationships
   [NASA-CR-165333]
                                                    p0024 N82-16080
Demonstration of catalytic combustion with
   residual fuel
                                                    p0131 N82-16484
   [ WAS A-CR-165369]
Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] p0132 N82-Dilution jet behavior in the turn section of a reverse flow combuster
                                                    p0132 N82-16485
   [ WASA-TH-82776]
                                                   p0017 N82-19220
Cooled variable-area radial turbine technology
   program
   MASA-CR-165408]
Cold-air performance of a 15.41-cm-tip-diameter axial-flow power turbine with variable-area stator designed for a 75-kw automotive gas turbine engine
  [ NASA-TH-82644]
                                                    p0024 N82-21193
```

```
Experimental performance of the regenerator for
       the Chrysler upgraded automotive gas turbine
       ongine
   [NASA-TH-82671] p0120 M8:
Investigation of soot and carbon formation in
                                                            p0120 #82-21712
      small gas turbine combustors [NASA-CF-167853]
                                                            p0025 N82-22267
    Advancements in real-time ongine simulation
       technology
    [NASA-TM-82825]
Analysis of high load dampers
[NASA-CR-165503]
                                                            p0147 N82-22915
                                                            p0026 N82-23248
    Evaluation of inelastic constitutive models for nonlinear structural analysis --- for mircraft
       turbine englass
      [ NASA-TH-82845]
                                                            p0112 N82-24502
    Cost/benefit studies of advanced materials
       technologies for future aircraft turbine
      engines: Materials for advanced turbine engines [NASA-CF-167849] p0026 N82-25
   [NASA-CF-167849] p0026 N82-25254
Low NOx heavy fuel combustor concept program
addendum: Low/wid heating value gaseous fuel
       evaluation
      [ NASA-CP- 1656 15]
                                                            p0055 N82-25338
    Low NOx heavy fuel combustor concept program
      [ NASA-CR- 165367]
                                                            p0 136 N82-25635
    Preliminary analysis of a downsized advanced
       gas-turbine engine in a subcompact car
                                                            p0163 N82-26051
        NASA-TM-828481
    Multiroller traction drive speed reducer:
Evaluation for automotive gas turbine engine
                                                            p0101 N82-26678
       [ NASA-TP-2027]
   NASA-TP-2027| POINT REZ-206

Rotor fragment protection program: Statistics on

aircraft gas turbine ngine rotor failures that

occurred in U.S. commercial aviation during 1978

[NASA-CF-165388] PO027 N82-273

Techniques for enhancing durability and

equivalence ratio control in a ricb-lean,

three-stage ground power gas turbine combustor
                                                            p0027 N82-27316
       [ NASA-TM-82922]
                                                            p0 124 N82-29717
    Ceramic applications in turbine engines
       [ NASA-CF- 165 197]
                                                            p0164 N82-31158
    Active clearance control system for a turbomachine [NASA-CASE-LEW-12938-V] p0020 N82-323
                                                            p0020 N82-32366
    Low and medium heating value coal gas catalytic combustor characterization
       [ NASA-CE- 165560]
                                                            p0138 N82-32856
    Engine dynamic analysis with general nonlinear finite element codes. Part 2: Bearing element implementation overall numerical characteristics
       and benchmaking
    [NSA*CF-167944] p0028 M82-33
Energy efficient ongine: Turbine transition duct
                                                            p0028 M82-33390
       model technology report [NASA-CR-167996]
                                                            p0029 N82-33394
    Overlay metallic-cernet alloy coating systems --
       for qas turbine engines [NASA-CASE-LEW-13639-1]
                                                            p0070 N82-33522
GAS TURBTEES
    A comprehensive method for preliminary design optimization of axial qas turbine stages [AIAN PAPER 82-1264] p0030 A8
                                                            p0030 A82-35091
    Trends in high temperature qus turbine materials
      1 NASA-TM-827151
                                                            p0058 NB2-11182
    Gas turbine ceramic-coated-vane concept with
    convection-cooled porous metal core
[NASA-TP-1942] p0016 N8:
Investigations of flowfields found in typical
                                                            p0016 N82-14090
       contrastor geometries
       [ BASA-CR- 165061]
                                                            p0090 N82-15360
    Advanced Gas Turbine (AGT) powertrain system
       development for automotive applications [NASA-CR-165175] p016:
                                                            p0163 N82-16937
    [NASA-TH-81716] Progress in thermal barrier coatings for stationary gas turbines [NASA-TH-81716] pc058
                                                            p0058 N82-17335
    Evaluation of present thermal barrier coatings for
       potential service in electric utility gas turbines
                                                             p0063 N82-18368
       [ NASA-CT- 165543 ]
    Low NC subx heavy fuel combustor concept program.

Phase 1A: Coal gas addendum

[NASA-CR-165577] p0 133 N82-18
                                                             pn 133 N82-18690
    Assessment of steam-injected gas turbine systems and their potential application [NASA-TM-82735] p0119 N82-16
                                                             p0119 N82-18694
     Tailored plasma sprayed MCrAly coatings for
       aircraft das turbine applications [NASA-CF-165234]
                                                             p0064 N82-19350
```

```
Hydrodynamic and aerodynamic breakup of liquid
     [NASA-TH-82800]
                                                p0087 N82-19494
   Parametric performance analysis of steam-injected
      gas turbine with a
     thermionic-energy-converter-lined combustor [NASA-TH-82736] p0121 N8
                                                p0121 N82-23678
   Low MOx heavy fuel combustor concept program.

Phase 1: Combustion technology generation
     [ NASA-CR-165482]
                                                p0136 N82-24725
   Aerodynamic performance of high turning core
     turbine vanes in a two dimensional cascade
[NASA-TM-82894] p0004 W
                                                p0004 #82-26240
   LOW NOX heavy fuel combustor concept program [NASA-CR-167876] p0074 N
                                                p0074 N82-26482
   Solute transport during the cyclic oxidation of
      Ni-Cr-Al alloys
     [ NASA-CR-165544 ]
   Lewis pressurized, fluidized-bed combustion
     program. Data and calculated results [NASA-TH-81767] p0
                                                p0124 N82-30704
   Gas turbine critical research and advanced technology (CRT) support project
[NASA-TH-82872] p0 126
                                                 p0126 N82-31776
   Three dimensional flow measurements in a turbine
     [NASA-CR-167920]
                                                 P0009 N82-32310
   Use of fiber like materials to augment the cycle
     life of thick thermoprotective seal coatings [NASA-TM-82901] p0089 N82-
                                                 p0089 N82-32633
   Advanced ceramic coating development for industrial/utility gas turbines
      [NASA-CR-169852]
                                                 p0065 N82-33494
CAS-ION INTERACTIONS
   Inert gas ion thruster [NASA-CR-165521]
                                                 D0044 NB2-21252
GAS-BETAL INTERACTIONS
   Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of
      hot corrosion
     [NASA-CR-165029]
                                                 p0063 N82-13217
   Kethod and apparatus for coating substrates using
     lasers
      [ NASA-CASE-LEW- 13526- 1]
                                                 D0059 N82-22347
   Refractory coatings and method of producing the same [NASA-CASE-LEW-13169-1] p0060 M82-29415
GAS-SOLID INTERACTIONS
NT GAS-METAL INTERACTIONS GASHOUS CAVITATION
 U VITATION PLOW
 U S FLOW
CASROUS PUBLS
 NT LIQUID FUELS
   Low NOx heavy fuel combustor concept program
      addendum: Low/mid heating value gaseous fuel
      evaluation
      [ NASA-CR-165615]
                                                 p0055 N82-25338
   Catalytic combustion of actual low and medium
     heating value gases [NASA-TM-82930]
                                                 p0125 N82-30717
CASES
 NT ARGON PLASMA
 NT CARBON MONOXIDE
 NT CHARGED PARTICLES
 NT DISSOLVED GASES
 NT EXHAUST GASES
NT GAS MIXTURES
NT GAS STREAMS
 NT HIGH TEMPERATURE GASES
 NT HYDROGEN
 NT LIQUEPIED NATURAL GAS
 NT LIQUID HYDROGEN
 NT LIQUID OXYGEN
 NT NITROGEN
 NT NITROGEN IONS
 NT OXYGEN
 NT OZONE
 NT BARE GASES
   Catalytic combustion of actual low and medium
      heating value gases
      [ NASA-TH-82930]
                                                 p0125 N82-30717
GASIFICATION
 NT COAL GASIFICATION
CASOLINE
 NT LIQUID FUELS
CASP
 U OBAL AIR SAMPLING PROGRAM
GAUSSIAN HOISE
```

a

U NDOM NOISE

```
CRAD TRETS
                                                                             MT DUCT GEOMETRY
   Surface quometry of circular cut spiral bevel gears
[ASHE PAPER RI-DET-114] p0108 A82-19334
                                                                             MT PLOW GEOMETRY
                                                                              NT NOZZLE GEOMETRY
   Optimal tooth numbers for compact standard spur
                                                                             MT RECTANGLES
      qear sets
                                                                             MT TANGENTS
                                                 p0 103 A82-19335
                                                                             MT TEMSOR ANALYSIS
NT VECTOR ANALYSIS
      [ ASME FAUER 81-DET-115]
      multi-purpose method for analysis of spur gear
                                                                            CHOPOTRETIAL.
      tcoth loading
                                                 p0 104 N82- 10401
                                                                                Representation and material charging response of
   Anthematical models for the synthesis and optimization of spiral bevel gear tooth surfaces
                                                                                  qeoplasma environments
                                                                                                                              p0039 N82-14249
                                                                                SCATHA SSPM charging response: WASCAP predictions
       --- for helicopter transmissions
                                                 p0 106 N82-25516
      [ NASA-CR-35531
                                                                                  compared with data
                                                                                                                              p0037 NB2-14251
    Tooth profile analysiis of circular-cut,
                                                                            GEOSTATIONARY SATELLINES
      spiral-bovel gears
                                                 p0101 N82-26681
                                                                             U MCHRONOUS SATELLITES
      [ BASA-TM-82840]
   The optimal design of involute gear teeth with unequal addenda
                                                                            GROSTECHRONOUS ORBITS
                                                                                Hass driver react/on engine characteristics and
      [ NASA-TM-82866 ]
                                                 p0101 NB2-28645
                                                                                  performance in earth orbital transfer missions
                                                                                                                              p0046 A82-18199
    Procision of spiral-bevel gears
                                                                                Shuttle to GEO propulsion tradeoffs
[AIAA PAPER 82-1245] p0034 A82-35
Centaur capabilities for communications satellite
      [ NASA-TH-82888]
                                                 p0102 N82-30552
                                                                                                                              P0034 A82-35082
    Effect of shot peening on surface fatigue life of
      corburized and hardened AISI 9310 spur goars
                                                 p0102 N82-32736
      [ NASA-TP- 2047 ]
                                                                                  launches
                                                                                  [AIAA PAPER 82-0558]
CEARS
                                                                                Design practices for controlling spacecraft charging interactions
 NT BACKS (GEARS)
    On the automatic generation of FEM models for
      ccaplex gears - A work-in-progress report
                                                                                   [ NASÃ-TŇ-8278 I ]
                                                                                                                              p0038 N82-18311
                                                 p0 109 A82-48243
                                                                            GEOTHERNAL RESOURCES
    Lubricant effects on efficiency of a helicopter
                                                                             NT VOLCANOES
                                                                            GERDIEN ARC HEATERS
U ATING EQUIPMENT
      transmission
      [ NASA-TH-828571
                                                 p0 100 N62-25520
    Tooth profile analysiis of circular-cut,
                                                                            GLÄRK
      spiral-hovel gears
                                                                                Veiling glare reduction methods compared for
    [NASA-TM-82840]
Reliability model for planetary gear
                                                 p0101 N82-26681
                                                                                  ophthalmic applications
                                                                                                                              p0 143 A82-13289
      [ NASA-TM-82859]
                                                 p0101 N82-28643
                                                                            CLASS
    A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] p0101 N82-28646
                                                                              NT BOROSILICATE GLASS
                                                                             NT E GLASS
NT GLASS PIBERS
NT METALLIC GLASSES
   Cn finite element stress analysis of spur gears FNARA-CR-1679381 p0107 N82-29607
                                                                            GLASS FIBER REINFORCED PLASTICS
    Procision of spiral-bevel gears
                                                                                Winding for the wind
      [ NASA-TM-82888 ]
                                                 p0102 N82-30552
                                                                                                                              p0138 A82-37078
                                                                                Impact resistance of fiber composites
    Kinematic precision of quar trains
                                                                                                                              p0112 A82-39852
[NASA-"M-82887]
GEL PERMEATION CHRONATOGRAPHY
                                                 p0102 N82-32733
                                                                                Pabrication and wear test of a continuous
U QUIC CHRCMATOGRAPHY
GRLLED BOCKET PROPELLENTS
                                                                                   fiber/particulate composite total surface hip
                                                                                   replacement
 NT LICUID FUELS
                                                                                  [ NASA-TM-81746]
                                                                                                                              p0066 N82-11211
GENERAL AVIATION AIRCRAPT
                                                                            GLASS PIBERS
    NASA research in aircraft propulsion
                                                                                Design, evaluation, and fabrication of low-cost composite blades for intermediate-size wind
      [ASNE PAPER 82-GT-177]
                                                 p0022 A82-35389
    NASA rasearch in aircraft propulsion [NASA-TM-82771]
                                                                                  turbines
[NASA-CR-165342]
                                                 p0016 N82-13146
                                                                                                                              p0133 N82-18693
    Bibliography of NASA published reports on general aviation, 1975 to 1981
[NASA-TM-83307] p0001 N82-19
                                                                            GLAUERT CORFFICIENT
                                                                              U RODYNAMIC FORCES
                                                 p0001 N82-19132
                                                                              U CH NUMBER
    NASA/Lewis Research Center Icing Research Program
                                                                            GLAZES
                                                 p0001 N82-21148
                                                                                An experimental study of airfoil icing
    Propulsion opportunities for future commuter
                                                                                   characteristics
                                                                                [NASA-TM-82790] p0001 N82-17083
Performance of laser glazed 2r02 TBCs in cyclic
      aircraft
      [ NASA-TM-82915]
                                                 p0019 N82-26298
                                                                                  oxidation and corrosion burner test rigs
CROLOGY
                                                                                   [ NASA-TM-82830]
                                                                                                                              p0059 N82-22346
 NT VOLCANOES
                                                                            GLOBAL ATR SAMPLING PROGRAM
GEONAGNETIC FIELD
                                                                                An automated system for global atmospheric sampling using R-747 airliners [NASA-CR-165264] p0139
 U OMAGNETISM
GEORAGNETIC STORMS
                                                                                                                              p0139 N82-13554
  U GNETIC STORMS
                                                                            GOLD
CECHAGNETISE
                                                                                Tribological properties and XPS studies of ion plated gold on nickel and iron
    An attempt at magnetic-variation sounding in the
      Antarctic
                                                                                   [ NASA-TH-82814]
                                                                                                                              p0059 N82-22344
    Design practices for controlling spacecraft
                                                                             GOLD COATINGS
                                                                            Improved chromium electrodes for REDOX cells
[NASA-CASE-LEW-13653-1] p0 12 i Mi
GOLD PLATE
U LD CONTINGS
      charging interactions [NASA-TH-8278]]
                                                                                                                              p0121 N82-22672
                                                  p0038 N82-18311
GEOMETRIC RECTIFICATION (IMAGERY)
   GPID3C: Computer program for generation of C type multilevel, three dimensional and boundary conforming periodic grids
[NASA-CF-167846] p0008 N82-262:
                                                                            GRADIENTS
                                                                              NT PRESSURE GRADIENTS
                                                                              NT TEMPERATURE GRADIENTS
                                                 p0008 N82-26239
GEONETRICAL BY DRONAGNETICS
                                                                             GRAINS (FOOD)
  O GNETOHYDRODYNAMICS
                                                                                Operational performance of the
                                                                                   photovoltaic-powered grain mill and water pump
GROMETRY
  NT AUGLE OF ATTACK
NT CRACK GEGNETRY
                                                                                   at Tangaye, Upper Volta [NASA-ZZ-82767]
                                                                                                                              p0120 N82-19673
                                                                            GRANULAR MATERIALS
  NT CURVATURE
  NT CUPVES (GROMETRY)
                                                                                Recrystallization and grain growth in NiAl
                                                                                                                              p0065 A82-44529
 NT CIFFERENTIAL GECKETRY
```

	
CHAPBITE	orthotropic viscoelastic half-plane
NT FYECLYTIC GRAPHITE	182-26436
Development of CdO-graphite-Ag coatings for gas bearings to 427 C	MALIDES NT HYDROGEN CALORIDES
p0108 A82-27079	MT IRON CHLORIDES
Novel improved PMR polyimides [NASA-TM-82733] p0049 N82-11117	ET SODIUM CHLORIDES HALL ACCELERATORS
GRAPHITE-BPOXY COMPOSITES	Results and comparison of Hall and DW duct
Hybridized polymer matrix ccaposite	experiments
[NASA-CR-165340] p0051 M82-12139 Boundary layer thermal stresses in angle-ply	[NASA-TH-82864] p0157 M82-25961 MAIL CORFFICIRE
composite laminates, part ! graphite-epoxy	U LL EFFECT
composites	MALL CURRETS
[NASA-CR-165412] p0113 N82-26713 graphite-polyihide composites	U ECTRIC CURRENT U LL EFFECT
Application of a gripping system to test a	BALL SPRECT
uniaxial graphite fiber reinforced composite	Effect of vacuum exhaust pressure on the
/EMR 15/Celion 6000/ in tension at 316 C p0051 182-40796	performance of MHD ducts at high D-field [NASA-TM-82750] p0 157 N82-13908
Geometrical aspects of the tribological properties	HALOGEN COMPOUNDS
of graphite fiber reinforced polymide composites	NT FLUOROPOLYMERS
[NASA-TM-82757] p0066 N82-15198 Tribological evaluation of composite materials	NT HYDROGEN CHLORIDES NT IRON CHLORIDES
made from a partially flucrimated polyimide	NT POLYTETRAPLUOROETHYLENE
[NASA-TH-82832] p0069 N82-29459 GRAVITY GRADIENT SATELLITES	NT SODIUM CHLORIDES MALOGREATION
NT ATS 5	NT PLUORINATION
GROOVES	HANDBOOKS
NI V GROOVES The influence of surface dents and grooves on	NT USER NANUALS (COMPUTER PROGRAMS) NARDRNING (MATERIALS)
traction in sliding EHD point contacts	NT HOT PRESSING
[NASA-TH-82943] p0102 N82-32734	HT NITRIDING
GROUND TRUTH Ground-truth observations of ice-covered Worth	NT PRECIPITATION HARDENING NT SHOT PERNING
Slope Lakes imaged by radar	HLBDHESS
[NASA-IN-84127] p01f/ M82-18664	NT MICROHARDNESS WARDERS TESTS
NT CRYSTAL GROWTH	Effects of environment on microbardness of
NT CZCCBRAISKI NETHOD	magnesium oxide
NT DIRECTIONAL SOLIDIFICATION (CBYSTALS) NT VAFOR PHASE EPITAXY	[NASA-TP-2002] p0068 N82-22366
GUIDF VANES	A real time Pegasus propulsion system model for
NT JET VANES	VSTOL piloted simulation evaluation
Effect of a part span variable inlet guide vane on TF34 fan performance	[BASA-TH-82770] p0016 N82-13144
[NASA-CR-165458] p0023 N82-12075	NT HARRIER AIRCRAFT
YF 102 in-duct combustor noise measurements with a turbine nozzle, volume !	MATARDS NT AIRCRAFT HAZARDS
[NASA-CR-165562-VOL-1] p0153 N82-21031	Resonance tube hazards in oxygen systems
YF 102 in-duct combustor noise measurements with a	[NASA-TM-82801] p0072 W82-21415
turbine nozzle, volume 2 [NASA-CR-165562-VOL-2] p0153 N02-21032	MEAT NT PROCESS HEAT
YF 102 in-duct combustor noise measurements with a	MEAT CONDUCTION
turbine nozzle, volume 3 [NASA-CR-165562-VOL-3] p0155 H82-21033	U NDUCTIVE HEAT TRANSFER
[NASA-CR-165562-VOL-3] p0 155 M82-21033 Energy efficient engine: Turbine transition duct	U THALPY
model technology report	MEAT DISSIPATION
[NASA-CR-167996] p0029 N82-33394 GOW LAUNCHERS	U OLING ERAT DISSIPATION CHILLING
Hass Driver Two - A status report	U OLING
p0046 A82-18191	HEAT EFFECTS
Feasibility of an earth-to-space rail launcher system emphasizing nuclear waste disposal	U MPERATURE EFFECTS REAT EQUATIONS
arrlication	U ERHODYNAHICS
[IAF FAPER 82-46] p0033 x82-44659	HEAT EXCHANGERS A heat exchanger computational procedure for
Vibration analysis of three guyed tower designs	temperature-dependent fouling
for intermediate size wind turbines	[ASHE PAPER 81-HT-75] p0092 A82-10961
[NASA-CR-165589] p0137 N82-30709 GYROPLAWRS	External fuel vaporization study [NASA-CR-165513] p0073 N82-14371
U LICCPTERS	MHD oxidant intermediate temperature ceramic
GYBOSCOPIC DRIFT U ROSCOPIC STABILITY	heater study [MASA-CR-165453] p0131 M82-15527
GYROSCOPIC STABILITY	Experimental study of an integral catalytic
The influence of Coriolis forces on gyroscopic	combustor: Reat exchanger for Stirling engines
motion of spinning blades	[WASA-TM-82783] p0119 W82-18691
ASME PAPER 8.2=GT=163 00030 A82=45384	COMPUTER MODEL OF CATATACTE COMPUBLIOUSELESS IN
[ASME PAPER 82-GT-163] p0030 A82-35384	Computer model of catalytic combustion/Stirling engine heater head
	engine heater head [WASA-CR-165378] p0134 W82-22666
HAPPIUM COMPOUNDS	engine heater head [WASA-CR-165378] p0134 W82-22666 Development and test fuel cell powered on-site
HAPPIUM COMPOUNDS Some properties of RF spittered hafnium nitride	engine heater head [MASA-CR-165378] Development and test fuel cell powered on-site integrated total energy systems. Phase 3: Full-scale power plant development
HAPPIUM COMPOUNDS Some properties of RF spittered hafnium nitride coatings	engine heater head [MASA-CR-165376] p0134 M82-22666 Development and test fuel cell powered on-site integrated total energy systems. Phase 3: Full-scale power plant development [NASA-CR-167898] p0137 M82-30705
HAPPIUM COMPOUNDS Some properties of RF spittered hafnium nitride	engine heater head [MASA-CR-165378] Development and test fuel cell powered on-site integrated total energy systems. Phase 3: Full-scale power plant development
HAPPHIUM COMPOUNDS Some properties of RF spittered hafnium nitride coatings [NASA-TM-82826] p0067 N82-21331 BAIR A hydrodynamic model of an outer hair cell	engine heater head [MASA-CR-165378] Development and test fuel cell powered on-site integrated total energy systems. Phase 3: Full-scale power plant development [NASA-CR-167898] BEAT FLUX An experimental investigation into the feasibility of a therwoelectric heat flux gage
H **RAFBIUH COMPOUNDS** Some properties of RF spittered hafnium nitride coatings [NASA-IM-82826] p0067 N82-21331 **TAIR** A hydrodynamic model of an cuter hair cell [NASA-IM-82773] p0143 N82-16743	engine heater head [MASA-CR-165378] p0134 M82-22666 Development and test fuel cell powered on-site integrated total energy systems. Phase 3: Full-scale power plant development [NASA-CR-167898] p0137 M82-30705 BEAT FLUX An experimental investigation into the feasibility of a theracelectric heat flux gage [NASA-TM-82755] p0095 N82-14494
HAPPHIUM COMPOUNDS Some properties of RF spittered hafnium nitride coatings [NASA-TM-82826] p0067 N82-21331 BAIR A hydrodynamic model of an outer hair cell	engine heater head [MASA-CR-165378] Development and test fuel cell powered on-site integrated total energy systems. Phase 3: Full-scale power plant development [NASA-CR-167898] BEAT FLUX An experimental investigation into the feasibility of a therwoelectric heat flux gage

```
REAT OF COMBUSTION
   Low NO sub x heavy fuel combustor concept program.

Phase 1A: Combustion technology generation coal
      qas fuels
      I NASA-CF- 1656 141
                                                    p0055 N82-22326
BEAT PIPES
   High thermal power density heat transfer ---
      thermionic convertors
      [ NASA-CASE-LPK-12950-1]
                                                     p0087 N82-11399
BEAT PUMPS
    An experimental investigation into the feasibility
      of a thermoelectric heat flux gage [NASA-TH-82755]
                                                    B0095 N82-14494
   Haddetic heat pumping [NASA-CASE-LEW-12508-3]
                                                    pcces NU2-24449
BEAT REGULATION
 U MPERATURE CONTROL
HEAT RESISTANCE
U FRHAL PESISTANCE
HEAT RESISTANT ALLOYS
NT HOLYBDENUM ALLOYS
 NT UDIEST ALLOYS
 NT WASPALOY
    Effects of cobalt on structure, microchemistry and proporties of a wrought nickel-base superalloy
                                                    p0065 A82-34973
   The influence of gamma prime on the recrystallization of an oxide dispersion strengthened superalloy - MA 6000 K
   p0062 A82-47393
The influence of orientation on the stress rupture
      properties of nickel-tase superalloy single
                                                    p0062 A82-47397
    Fatique and creep-fatique deformation of several
      nickel-base superalloys at 650 C
                                                     p0062 A82=47398
   The influence of cobalt on the tensile and stress-rupture properties of the nickel-base superalloy MAR-#247
                                                     p0063 A82-47399
    The influence of cobalt on the microstructure of
       the nickel-base superalloy MAR-M247
                                                     p0063 A82-47400
    Applications of high-temperature powder metal aluminum alloys to small gas turbines
   p0065 A82-48244
Thermal fatigue and exidation data of TAZ-6A and
      M22 alloys and variations [NASA-CR-165407]
                                                     p0063 N82-10193
    Creep shear behavior of the oxide dispersion
       strengthoned superalley MA 6COCE
      [ NASA-TH-82704]
                                                     p0058 N82-10195
    Trends in high temperature gas turbine materials
      [ NASA-TH-82715]
                                                     p0058 N82-11182
      status review of NASA's CCSAM (Conservation Of Strategic Aerospace Materials) program [NASA-TH-82852] p0060 N82-2
                                                    P0060 N82-24326
    Not isostatically pressed manufacture of high
strength MERT. 76 disk and seal shapes
[NASA-CR-165549] p0064 N8
                                                    p0064 N82-26439
    Mcchanisms of deformation and fracture in high
       temporature low cycle fatigue of Rene 80 and IN
       [ NASA-CP- 1654 98]
    Solute transport during the cyclic exidation of Ni-Cr-Al alloys [NASA-CR-165544] p0064 N82-
                                                     p0064 N82-27462
    High temperature composites. Status and future
       directions
      [ NASA-TM-82929]
                                                    p0051 N82-30336
    Overlay metallic-cermet allcy coating systems ---
       for gas turbine engines
        NASA-CASE-LEW-13639-1]
                                                     p0070 N82-33522
BEAT SHIELDING
    Pyrolytic graphite collector development program p0052 N82-29363
BEAT STORAGE
    Collection and dissemination of thermal energy
       storage system information for the pulp and
       paper industry
                                                     p0 136 N82-24686
HEAT TESTS
 U GH TEMPERATURE TESTS
BRAT TRANSPER
 NT CONDUCTIVE HEAT TRANSPER
NT CONVECTIVE HEAT TRANSPER
 NT RADIATIVE HEAT TRANSFER
```

```
Thornal and flow analysis of a convection,
      air-cooled ceramic coated parous metal concept
   for turbine vanes
[ASME PAPER 81-HT-48] p0020 A02-169;
Turbulent boundary layer heat transfer experiments
- A separate effects study on a convexly-curved
                                                    p0020 A02-10952
      [ASME PAPER 81-HT-70]
    Tube entrance heat transfer with deposit formation
                                                   p0093 A82-31908
      [AIAA PAPER 82-0918]
   Effects of internal heat transfer on the structure
      of self-similar blast waves
                                                   p0093 A82-32225
   Cauchy integral method for two-dimensional solidification interface shapes
                                                    P0089 A82-39899
   Jet implugement heat transfer enhancement for the
      GPU-3 Stirling engine [NASA-TM-82727]
                                                    p0163 N82-11993
   Gas turbine coramic-coated-vane concept with
      convection-cooled porous metal core
      [ NASA-TP-1942]
                                                   p0016 N82-14090
   External fuel vaporization study [NASA-CR-165513]
Turbulent boundary layer heat transfer
                                                   p0073 N82-14371
      experiments: Convex curvature effects including
      introduction and recovery
   [NASA-CR-3510] p0090 882-174;
Effect of location in an array on heat transfer to a cylinder in crossflow
[NASA-TH-02797] p0087 882-194;
                                                   p0090 N82-17456
   [NASA-TH-02797] p0007 Nd2-19493
Low-thrust chemical propulsion system propellant
      expulsion and thermal conditioning study.
      Executive summary
   [NASA-CR-165622] p0045 882-21
Low-thrust chemical propulsion system propelliant
                                                   p0045 882-24287
      expulsion and thermal conditioning study p0045 N82-24288
    Plows through sequential orifices with heated
      spacer reservoirs
      [ NASA-TH-82855]
                                                   p0088 N82-24455
    Comparison of laser anemomoter measurements and
      theory in an annular turbine cascade with
      experimental accuracy determined by parameter
      estimation
   [NASA-TH-82860] p0005 N82-2
The dryout region in frictionally heated sliding
                                                   p0005 N82-28250
      contacts
      [NASA-TH-82796]
                                                    p0088 N82-28574
    Cooled variable nozzle radial turbine for rotor
      craft applications
[NASA-CR-165397]
HEAT THANSHISSION
                                                    p0028 N82-29323
 NT CONDUCTIVE HEAT REANSPER NT CONVECTIVE HEAT TRANSPER
 NT HEAT TRANSFER
 NT RADIATIVE HEAT TRANSPER
HEAT TREATMENT
 NT ANNEALING
 NT NITRIDING
HEATERS
   MHD oxidant intermediate temperature ceramic
      heater study
      [ NASA-CR-165453]
                                                    p0 131 N82-15527
HEATING
 NT ATMOSPHERIC HEATING
 NT RADIANT HEATING
 NT SUPERHEATING
    Experiments on fuel heating for connercial hircraft [NASA-TH-82878] p0072 N82-2648
                                                    p0072 N82-26483
HEATING EQUIPMENT
 NT VAPORIZERS
    Experimental study of fuel heating at low
      temperatures in a wing tank model, volume | p0073 NB2-11224
   [NASA-CR-165391]
Additional experiments on flowability improvements of aviation fuels at low temperatures, volume 2 [NASA-CR-167912]
BEAVY BLENBUTS
 NT PLUTONIUM 244
MELICOPTER ATTITUDE INDICATORS
 U LICOPTERS
BELICOPTER DESIGN
   NASA/HAA Advanced Rotorcraft Technology and Tilt
Rotor Morkshop. Volume 5: Propulsion Session
[NASA-TM-84207] p0015 N82-2:
                            Volume 5: Propulsion Session
p0015 N82-23241
HELICOPTER ENGINES
   TP34 Convertible Engine System Technology Program p0022 A82-40521
```

```
NASA/HAA Advanced Rotorcraft Technology and Tilt
Rotor Workshop. Volume 5: Propulsion Session
                                                                              HIGH TESTARATURE REVIRORMENTS
                                                                                  Proceedings of the Conference on High-temperature
   [NASA-TM-84207] p0015 M82-23241 Mathematical models for the synthesis and
                                                                                    Electronics
                                                                                 [NASA-TM-84069] p008! High temperature electronic requirements in aeropropulsion systems
                                                                                                                                 p0081 #82-15311
      optimization of spiral bevel gear tooth surfaces
--- for helicopter transmissions
      ( NASA -CR- 35531
                                                  p0 106 N82-25516
                                                                                                                                 p0081 N82-15313
BELICOPTER PERFORMANCE
                                                                                  Development of an 1100 deg P capacitor
   Performance degradation of propeller/rotor systems
                                                                                                                                 p0083 N82-15315
      due to rime ice accretion [AIRA PAPER 82-0286]
                                                                                  Fully plasma-sprayed compliant backed ceramic
                                                  n0014 A82-28322
                                                                                    turbine seal
BELICOPTERS
                                                                              [NASA-CASE-LEW-13268-1]
HIGH TEMPERATURE PLUIDS
                                                                                                                                 p0069 N82-29453
   Lubricant effects on efficiency of a helicopter
      transmission
                                                                               NT HIGH TEMPERATURE GASES
      [ NASA-TH- 82857 ]
                                                                              MIGH TEMPERATURE CASES
                                                  p0 100 N82-25520
                                                                              MEGH TEMPERATURE CASES

Method and apparatus for strengthening boron fibers
--- high temperature oxidation
[MASA-CASE-LEW-13826-1] p0050 M82-25385

HIGH TEMPERATURE LUBRICARTS
Thermal oxidative degradation reactions of perfluoroalkylethers
[MASA-CR-165516] p0048 M82-12135
Reliability model for planetary gear [NASA-TM-82859] BELIOMAGNETISH
                                                   p0101 N82-28643
                                                                                                                                 p0050 ¥82-24385
 U LAR MAGNETIC FIELD
EELIK TUBES
 O AVELING WAVE TUBES
BELIXES
                                                                                                                                 n0048 N82-12135
 U RVES (GECHETRY)
                                                                              HIGH TEMPERATURE MATERIALS
BELBHOLTZ VORTICITY EQUATION
                                                                               U PRACTORY MATERIALS
   The velocity field near the orifice of a Helmholtz resonator in grazing flow [NASA-CR-168548] p0153 N82-189
                                                                              HIGH TEMPERATURE TESTS
                                                                                 Development of CdO-graphite-Ag coatings for gas
bearings to 427 C
                                                  p0 153 N82-18994
BERNETIC SEALS
                                                                                                                                 P0108 A82-27079
   Anaerobic polymers as high vacuum leak sealants
                                                                                  Work of fracture in aluminum metal-matrix composites
                                                  p0 108 A82-21967
                                                                                                                                 p0053 A82-31339
ERTEROCYCLIC COMPOUNDS
                                                                                  Ceramic thermal barrier coatings for gas turbine
 NT INCOLES
                                                                                     engines
                                                                                    [ASHE PAPER 82-GT-265]
 NI PYBROLES
                                                                                                                                 p0071 A82-35441
                                                                                  Application of a gripping system to test a uniaxial graphite fiber reinforced composite /PMR 15/Celion 6000/ in tension at 316 C
   Deposit formation in liquid fuels. II - The effect of selected compounds on the storage stability
      of Jet A turbine fuel
                                                                                                                                 p0051 A82-40796
                                                   p0074 A82-22240
                                                                                  Patigue and greep-fatigue deformation of several
REXAGONAL CELLS
    Net shape fabrication of Alpha Silicon Carbide
                                                                                    nickel-base superalloys at 650 C
                                                                                                                                 p0062 A82-47398
      turbine components
[ASME FAPER 82-GT-216]
                                                   p0071 A82-35403
                                                                                  Elevated temperature fatique testing of metals
                                                                                  [NNSA-TM-82745] p0111 N82-16
High temperature low cycle fatique mechanisms for
                                                                                                                                 p0111 N82-16419
HIGH ACCELERATION
   Mass Driver Two - A status report
                                                                                    nickel base and a copper base alloy
                                                   p0046 A82-18191
BIGH ENERGY ELECTRONS
                                                                                    [NASA-CR-3543]
                                                                                                                                 p0064 N82-26436
 NT RELATIVISTIC ELECTRON BEAMS
                                                                                  Mechanisms of deformation and fracture in high
HIGH PREOUTECIES
                                                                                    temperature low cycle fatigue of Rene 80 and IN
   High-frequency high-voltage high-power DC-to-DC
                                                                                     100
                                                                                  [NASA-CR-165498] p0113 N82-26706
Failure mechanisms of thermal barrier coatings
                                                                                     [NASA-CR-165498]
      converters
                                                   p0083 N82-12347
                                                                                    exposed to elevated temperatures
BIGH MELTING COMPOUNDS
 U FRACTORY MATERIALS
                                                                                    [ NASA-TM-82905]
                                                                                                                                 p0061 N82-32461
MIGH PRESSURE
                                                                              HIGH VACUUM
   Optically pumped high-pressure DF-CO2 transfer laser
                                                                                  Anaerobic polymers as high vacuum leak sealants
                                                          AB2-10193
                                                                                                                                 p0108 A82-21967
    Some observations in high pressure theology of
                                                                              HIGH VOLTAGES
                                                                                  Space Shuttle Orbiter charging [AIAA PAPER 82-0119]
      Lubricants
      [ ASME PAPER 81-LUB-17]
                                                   p0070 A82-18432
                                                                                                                                 p0040 A82-17793
    Some observations in high pressure rheology of
                                                                                  Differential charging of high-voltage spacecraft -
                                                                                     The equilibrium potential of insulated surfaces
      [ ASHE PAPER 81-LUB-17]
                                                   p0070 A82-18432
                                                                                                                                 P0041 A82-35547
                                                                                  Fast recovery, high voltage silicon diodes for \lambda C motor controllers
    JIBD high pressure compressor performance
      improvement [NASA-CR-165531]
                                                   p0104 N82-11467
                                                                                                                                  p0086 A82-36926
   CF6 jet enqine performance improvement: High pressure turbine roundness [NASA-CF-165555] p0024 N8
                                                                                  Fabrication of multijunction high voltage concentrator solar cells by integrated circuit
                                                   D0024 N82-17174
                                                                                     technology
    Energy efficient engine: High pressure turbine
                                                                                                                                 p0 127 A82-44957
      uncooled riq technology report [NASA-CH-165149]
                                                                                  High-frequency high-voltage high-power DC-to-DC
                                                   p0031 N82-32383
                                                                                     converters
HIGH SPEED
                                                                                                                                  p0083 N82-12347
    Summary and recent results from the NASA advanced High Speed Propeller Research Program
                                                                                  High voltage power transistor development [NASA-CR-165547] p008
                                                                                                                                 p0084 N82-18506
      [ MASA-TM-82891]
                                                   p0001 N82-26219
                                                                                  High voltage V-groove solar cell
HIGH SPEED PLIGHT
                                                                                    [ NASA-CASE-LEW- 1340 1-2 ]
                                                                                                                                  p0123 NB2-24717
                                                                                  High voltage planar multijunction solar cell [NASA-CASE-LEM-13400-1] p0125 N
 U GH SPEED
HIGH TEMPERATURE
                                                                                                                                 p0125 N82-31764
    High thermal power density heat transfer ---
thermionic converters
[NASA-CASE-LEW-12950-1] p0087 N
                                                                              HINGE MOMENTS
                                                                                UROUE
                                                                               HOHNAND TRAJECTORIES
                                                   p0087 N82-11399
    Tribological properties at 25 C of seven polyimide
films bonded to 440 C high-temperature stainless
                                                                                U ANSPER ORBITS
                                                                               HOHMANN TRANSFER ORBITS
                                                                                U ANSFER ORBITS
                                                   p0067 N92-19373
      [ NA SA -TP- 1944]
                                                                               HOLDERS
    Performance of laser glazed Zr02 TBCs in cyclic
                                                                                NT FLAME HOLDERS
      Oxidation and corrosion burner test rigs
                                                                               HOLE GEORETRY (MECHANICS)
                                                  p0059 N82-22346
                                                                                  Analysis of cracks emanating from a circular hole
HIGH TEMPERATURE ALLOYS
                                                                                     in unidirectional fiber reinforced composites,
 U AT RESISTANT ALLOYS
```

part 2

p0100 N82-25518

```
p0114 W82-26714
                                                                                      HYDRAULIC ACTUATORS
       F NASA-CP-1654331
| NASA-CF-165433| DUTI'N NS2-

WOLOGRAPHIC INTERPRENEUTRY

Fringe localization requirements for

three-dimensional flow visualization of shock

waves in diffuse-illumination double-pulse
                                                                                        U TUATORS
                                                                                      MYDRAULIC PLUIDS
                                                                                          Elucidation of wear mechanisms by ferrographic
                                                                                             analysis
                                                                                      [NASA-TH-82737]
                                                                                                                                             p0066 N83-15199
       holographic interferometry
[NASA-TP-1868]
HOMOSPHERE
                                                        p0095 N82-22481
                                                                                       UMPS
                                                                                      MYDROADROMECHANICS
  NT STRATOSPHERE
BONEYCOMB STRUCTURES
                                                                                        U RODYNAMICS
    Development of a high-temperature durable catalyst
                                                                                      HYDROCARBON COMBUSTION
                                                                                          Lean-limit extinction of propane/air mixtures in
       for use in catalytic combustors for advanced
       aut:a-2ive gas turbine engines
[NASA-CR-165396]
                                                                                             the stagnation-point flow
                                                        p0 130 N82-13510
                                                                                                                                              p0057 A82-28736
                                                                                          On the opening of premixed Bunsen flame tips p0057 A82-37570
    Metal honeycomb to porous wireform substrate
       diffusion bond evaluation
[NASA-IM-82793]
                                                        p0 110 N82-18612
                                                                                          Pormation of oxides of nitrogen in monodisperse
HORIZONTAL ORIENTATION
                                                                                             spray combustion of hydrocarbon fuels
                                                                                                                                             p0057 A82-37571
    Effect of rotor configuration on guyed tower and
                                                                                          Thermodynamic and transport combustion properties of hydrocarbons with air. Part 1: Properties
       foundation designs and estimated costs for
       Intermediate site horizontal axis wind turbines
[NASA-TM-82804]
p0 12 | N82-22649
    intermediate state [NASA-TM-82804]
[NASA-TM-82804]
Whirl flutter analysis of a horizontal-axis wind turbine with a two-bladed teetering rotor p0122 NB2-23707
                                                                                             in SI units
                                                                                          [NASA-TP-1906] p0 161 N82-321/
Thermodynamic and transport combustion properties
of hydrocarbons with air. Part 2: Compositions
                                                                                                                                             p0161 N82-32186
                                                                                             corresponding to Kelvin temperature schedules in
    Comparison of upwind and downwind rotor operation
                                                                                             part 1
       of the DOE/NASA 100-k# HOD-0 wind turbine
                                                                                          [NASA-TP-1907] p0:61 N82-32
Thermodynamic and transport combustion properties
of hydrocarbons with air. Part 3: Properties
                                                                                                                                             p0161 N82-32187
                                                       p0122 N82-23710
    A review of resonance response in large herizontal-axis wind turbines
                                                        p0122 N82-23711
                                                                                             in US customary units
                                                                                             [ NASA-TP-1908]
HOT COBROSION
                                                                                          Thermodynamic and transport combustion properties
  NT TEMPERATURE DEPENDENCE
                                                                                             of hydrocarbons with air. Part 4: Compositions corresponding to Bankine temperature schedules
    Improved plasma sprayed MCrAlY coatings for
       aircraft gas turbine applications
    p0065 $\lambda 82-20742 \]
Long-term high-velocity oxidation and hot corrosion testing of several NiCr&1 and PeCr&1 base oxide dispersion strengthened alloys
                                                                                             in part 3
                                                                                      IN PART 3
[NASA-TP-1909]
HYDROCAMBOW FURLS
NT DIESEL FUELS
NT FOSSIL FUELS
                                                                                                                                             DO161 N82-32189
                                                       p0062 A82-37151
    Investigation into the role of NaCl deposited on
                                                                                        NT JET ENGINE PUELS
                                                                                        NT JET ENGINE FUELS
NT LIQUID FUELS
NT RP-1 ROCKET PROPELLANTS
Deposit formation in hydrocarbon fuels
[ASME PAPER 82-GT-49]
       oxide and metal substrates in the initiation of
       hot corresion
    [NASA-CR-165029] p0063
Gas-turbine critical research and advanced
                                                        p0063 N82-13217
                                                                                                                                             p0075 A82-35307
                                                                                          Gas-turbine critical research and advanced
       technology support project [NASA-TM-81708]
                                                                                             technology support project
                                                        p0118 N82-13509
                                                                                                                                             p0118 N82-13509
HOT GAS SYSTEMS
                                                                                             [NASA-TH-81708]
                                                                                          Oxidation and formation of deposit precursors in hydrocarbon fuels
[NASA-CR-165534] p0073 N82-1840
Deposit formation in hydrocarbon rocket fuels with an evaluation of a propane heat transfer
 U GH TEMPERATURE CASES
BOT GASES
U GH TEMPERATURE GASES
HOT JET EXHAUST
U GH TEMPERATURE GASES
U T EXHAUST
                                                                                                                                              p0073 NB2-18402
                                                                                             correlation
BOT JETS
                                                                                             [NASA-TH-82911]
                                                                                                                                              p0088 N82-26611
                                                                                          Effect of hydrocarbon fuel type on fuel
 O T PLOW
                                                                                                                                             p0072 N82-28460
HOT PRESSING
                                                                                             [NASA-TM-82916]
                                                                                          Additional experiments on flowability improvements of aviation fuels at low temperatures, volume 2 [NASA-CR-167912] p0074 N82-3154
Hot isostatically pressed manufacture of high strength MERL 76 disk and seal shapes [NASA-CR-165549] p0064 N8. HOT-FILM ANEHOMETERS
                                                        p0064 N82-26439
                                                                                                                                             p0074 N82-31546
                                                                                      HYDROCARBONS
    Three sensor hot wire/film technique for three
                                                                                        NT LIQUEFIED NATURAL GAS
       dimensional mean and turbulence flow field
                                                                                        NT METHANE
                                                                                        NT PROPANE
       measurement
                                                        p0097 182-30300
                                                                                          Quantitative separation of tetralin hydroperoxide
                                                                                             from its decomposition products by high performance liquid chromatography
HOT-WIRE ANEROMETERS
    Three sensor hot wire/film technique for three dimensional mean and turbulence flow field
                                                                                                                                              p0048 A82-15696
                                                                                          Exhaust emissions reduction for intermittent
       measurement
                                                                                             combustion aircraft engines
HOT-WIRE PLOUNETERS
                                                                                             [ NASA-CR-167914]
                                                                                                                                              p0029 NB2-33392
                                                                                      HYDRODYNABIC EQUATIONS
    Turbulence measurements in a confined jet using a
                                                                                      NT HELMHOLTZ VORTICITY EQUATION HYDRODYNAMIC STABILITY U OW STABILITY
       [AIAA PAPER 82-1262] p0094 A82 attactions of flowfields found in typical
                                                       p0094 A82-37710
       combustor geometries [NASA-CR-163585]
                                                                                      HYDRODYNAMICS
                                                        p0090 N82-19495
                                                                                        NT CYLINDRICAL PLASHAS
BOT-WIRE TURBULENCE METERS
                                                                                        NT ELASTOHYDRODYNAMICS
 U 1-WIRE FLOWMETERS
                                                                                        NT MAGNETOHYDRODY NAMICS
                                                                                          A hydrodynamic model of an outer hair cell
[NASA-TM-82773] p0143
HOUSINGS
                                                                                                                                             p0143 N82-16743
 NT COWLINGS
EYBRID COMPUTERS
                                                                                          Hydrodynamic and aerodynamic breakup of liquid
    Development report: Automatic System Test and
Calibration (ASTAC) equipment
                                                                                             sheets
                                                                                             [NASA-TM-82800]
                                                                                                                                              P0087 N82-19494
                                                                                          Geometry and starvation effects in hydrodynamic lubrication
       [ NASA-CE- 165403]
                                                        p0 129 N82-13505
    Rele of optical computers in aeronautical control
                                                                                                                                             p0042 NB2-20240
       applications
                                                                                             [NASA-TH-82807]
                                                                                          Lubrication of rigid ellipsida solids
                                                        p0156 N82-15897
```

[NASA-TH-81694]

HY DROG EX

characteristics

[NASA-TM-82790]

```
NT LICUID HYDROGEN
    The combined effects of Fe and H2 on the
                                                                                   performance
      nitridation of silicon
    Effect of oxide films on hydrogen permeability of
candidate Stirling engine heater head tube alloys
[NASA-TH-82824] p0060 N82-2432
HYDROGEN AXR FUEL CELLS
U CHOGEN OXYGEN FUEL CELLS
                                                                                   [NASA-TH-82919]
                                                  p0060 N82-24323
                                                                             ICE OBSERVATION
                                                                              U E REPORTING
                                                                             ICE PREVENTION
HYDROGEN CHLORIDES
    Effects of environment on microhardness of
# Hadresium oxide
[NASA-TP-2002]
#YDEGEN COMPOUNDS
NT HYDROGEN PEROXIDE
                                                  p0068 N82-22366
                                                                                   publications
HYDROGEN PUELS
 NT LIQUID FUELS
HYDROGEN OXYGEN ENGINES
Low-thrust Isp sensitivity study
[NASA-CF-165621] p0045 N82

HYDROGEN OXYGEN FUEL CELLS
Electrochemical energy storage for an orbiting
                                                  p0045 N82-22309
      space station [NASA-CR-165436]
                                                                             ICE REPORTING
                                                  p0 132 NB2-17607
HYDROGEN PEROXIDE
    Quantitative separation of tetralin hydroperoxide
      from its decomposition products by high
                                                                             ICING
      performance liquid chromatography
                                                                              U E FORMATION
                                                                             IDENTIFYING
HYDROLOGY
                                                                              NT PARAMETER IDENTIFICATION
    Dynamics of snow cover in mountain regions of the
                                                                             IGFET
      Aral Sea basin, studied using satellite
                                                                              U ELD EFFECT TRANSISTORS
      photographs
                                                                             IGNITION
                                                         A82-27462
BYDROBAGNETICS
                                                                                   [ NASA-TH-82801]
 U GNETOHY DRODY NAMICS
                                                                             IMAGE PROCESSING
HY DROM AGRETTSH
 U GNETOHYDFODYNAMICS
HYDROMECHANICS
 NT ELASTOHYDRODYNAMICS
 NT HYDRODYNAMICS
 NT MAGNETOHYDRODYNAMICS
HYDROX ENGINES
U CROCEN OXYGEN ENGINES
HYDROXIL COMPOUNDS
NT FOLYVINYL ALCOHOL
HYGRAL PEOPERTIES
                                                                             IMAGE RECONSTRUCTION
                                                                                   projections
                                                                             THAGERY
    Prediction of composite hygral behavior made simple
[ NASA-TM-82780 ]

EYPERGOLIC RECKET PROPELLANTS

NT LIQUID PROLS

EYPERSONIC WIED TOWNELS
                                                 p0049 N82-16181
                                                                              NT SCHLIEREN PHOTOGRAPHY
                                                                             INAGING TECHNIQUES
                                                                                   analysis
 NT CASCADY WIND TUNNELS
 NT SHOCK TUNNELS
HYPERVELOCITY CRATERING
U PERVELOCITY PROJECTILES
HYPERVELOCITY IMPACT
                                                                                   fluid flow data analysis [NASA-TH-82760]
    The development of central peaks is lunar craters
                                                         A82-14333
                                                                                   [ NASA-CR- 1684 18]
HYPERVELOCITY PROJECTILES
                                                                             IMMITTANCE
    Mass Driver Two - A status report
                                                                              U ECTRICAL IMPEDANCE
                                                  p0046 182-18191
                                                                             TMPACT
HYPERVELOCITY WIND TUNNELS
                                                                              NT ECONOMIC IMPACT
 NT CASCADE WIND TUNNELS
                                                                              NT HYPERVELOCITY IMPACT
 NT SHOCK TONNELS
                                                                              NT ION IMPACT
                                                                             IMPACT DAMAGE
ICE
 NT LAKE ICE
                                                                                   fan blades
ICE ENVIRONMENTS
                                                                                   [ NASA-TM-8283 1]
    NASA/Lewis Research Center Icing Research Program
                                                  p0001 N82-21148
ICE FORMATION
                                                                                   [NASA-TM-82933]
    *crodynamic characteristics of airfoils with ice
                                                                             THPACT RESISTANCE
      accretions
      [ AIAA PAPER 82-0282 ]
                                                 p00 to 182-22081
   Mathematical modeling of ice accretion on airfoils
[AIAA FAPER 82-0284] p0014 A82-2705
                                                 p0014 A82-27098
                                                                                   [ NASA-TM-82882]
    Performance degradation of propeller/rotor systems
      due to rime ice accretion [AIAA PAPER 82-0286]
                                                                             INPACT SENSITIVITY
                                                                              U PACT RESISTANCE
   Selected bibliography of NACA-NASA aircraft icing publications
                                                                             IMPACT TESTS
      [ NASA-TM-81651]
                                                  p0014 N82-11053
   An experimental study of airfoil icing
```

```
NASA/Levis Research Center Icing Research Program p0001 N82-21148
    Rime ice accretion and its effect on airfoil
     [NASA-CR-165599]
Aircraft icing research at NASA
                                                           p0008 N82-24166
                                                           p0013 N82-30297
    Icing tunnel tests of a composite porous leading edge for use with a liquid anti-ice system ---
Lewis icing research tunnel
    [NASA-CR-164966] p0014 N82-11
Selected bibliography of NACA-NASA aircraft icing
    publications
[NASA-TM-81651] p0014 N82-1
Numerical simulation of one-dimensional heat
transfer in composite bodies with phase change
--- wing deicing pads
[NASA-CR-165607] p0002 N82-22
                                                           p0014 N82-11053
                                                           D0002 N82-22142
    Aircraft icing research at NASA [NASA-TH-82919]
                                                           DO013 NB2-30297
    Ground-truth observations of ice-covered North Slope Lakes imaged by radar [NASA-TH-84127] FOII7 N82-
                                                           E0117 N82-18664
    Resonance tube hazards in oxygen systems
                                                           p0072 N82-21415
 HT GEOMETRIC RECTIFICATION (IMAGERY)
    Reliable aerial thermography for energy conservation [NASA-TM-81766] p0117 No 2-14552
    Application of image processing techniques to fluid flow data analysis
[NASA-TH-82760] p0004 N8
                                                           p0004 NB2-16049
    Maximum entropy image reconstruction from
                                                                    A82-11053
 NT SATELLITE-BORNE PHOTOGRAPHY
    Digital imaging techniques in experimental stress
                                                           p0097 A82-34231
    Application of image processing techniques to
                                                           p0004 N82-16049
    Shaded computer graphic techniques for visualizing and interpreting analytic fluid flow models
                                                           p0145 N82-17880
    Hybridized polymer matrix composite [NASA-CR-165340]
                                                           p0051 N87-12139
    Bird impact analysis package for turbine engine
                                                           p0112 N82-26701
    A study of the nature of solid particle impact and shape on the erosion morphology of ductile metals
                                                           p0061 N82-33493
    Impact resistance of fiber composites
                                                           p0112 \\ \alpha 2-39852
    Environmental and High-Strain Rate effects on composites for engine applications
                                                           p0051 N82-71449
Indentation law for composite laminates
[NASA-CR-|65460] p06
IMPATT DIODES
                                                           p0052 N82-15123
 U ALANCHE DIODES
```

p0001 NB2-17083

p0004 N82-24165

P0004 N82-25213

tize-temperature dependent constitutive

Evaluation of inelastic constitutive models for

ncolinear structural analysis --- for aircraft

relationships

[NASA-CR- 165533]

ORIGINAL PAGE IS OF POOR QUALITY

```
IMPEDANCE
                                                                                      turbine engines
                                                                               [NASA-TH-82845]
IMERT GASES
U RE GASES
IMERTIA
 NT CONTACT RESISTANCE
                                                                                                                                   p0112 N82-24502
NT ELECTRICAL IMPEDANCE
NT ELECTRICAL RESISTANCE
IMPELLER BLADES
 B TOR BLADES (TUPBCHACHINFRY)
                                                                                 NT INPRTIA PRINCIPLE
IMPELLERS
                                                                                IMBRTIA PRINCIPLE
                                                                                   In-plane inertial coupling in tuned and severely
    Applications of high-temperature powder metal
      aluminum alloys to small gas turbines
                                                                                      mistuned bladed disks
                                                   p0065 A82-48244
                                                                                      [ASHE PAPER 82-GT-288]
                                                                                                                                   B0012 A82-35460
THPRREECTTORS
                                                                                INERTIA WHERLS
                                                                                 U UNTER-ROTATING WHEELS
U FECTS
                                                                                IMPORMATION HAWAGEMENT
                                                                                   Applications of the DOE/NASA wind turbing engineering information system
 NT JET IMPINGEMENT
    A study of the nature of solid particle impact and
shape on the erosion morphology of ductile metals
                                                                                                                                   p0122 NB2-23696
      [ NASA-TM-829331
                                                                                IMPRARED DETECTORS
IMPLANTATION
                                                                                    Raman study of the improper ferroelectric phase
 NT ION IMPLANTATION
                                                                                      transition in iron lodine boracite
THENSTETES
                                                                                                                                           A82-30297
    Surface diffusion activation energy determination using ion beam microtexturing
                                                                                IMPRARED INSTRUMENTS
                                                                                 NT INFRARED DETECTORS
                                                                                INFRARED RADIATION
                                                   p0 159 A82-21965
    Quasi-liquid states observed on ion beam
                                                                                    Analysis of infrared emission from thin adsorbates
       microtextured surfaces
                                                                                                                                   p0056 A82-21431
                                                    p0159 A82-30335
                                                                                    Aliquaeut of fluid molecules in an EHD contact [ASLE PREPRINT 81-LC-5C-1] p0107 A82
    Material and processing needs for silicon solar cells in space
                                                                                                                                   p0 107 A82-18407
                                                                                INGESTION (ENGINES)
Water indestion into jet engine axial compressors
[AIAA PAPER 02-0196] p0030 A82-17
                                                    n0032 NB2-26336
INCOMPRESSIBLE FLOW
    A simple finite difference procedure for the vortex controlled diffuser
                                                                                                                                   p0030 A82-17836
      [ ATAA FAPER 82-01091
                                                    p0030 A82-17788
                                                                                    MC carbide structures in M(1c2) ar-M247
    Numerical analysis of confined turbulent flow
                                                                                      [NASA-CR-167892]
                                                                                                                                   p0064 N82-30374
                                                   p0093 A82-24748
                                                                                INHIBITORS
                                                                                NT WEAR INHIBITORS
INITIAL VALUE PROBLEMS
"NDENTATION
    Indentation law for composite lawinates
      [ NASA -CR- 165460]
                                                                                 U UNDARY VALUE PROBLEMS
                                                    p0052 N82-15123
    Occurrence of spherical ceramic debris in
                                                                                INJECTION
       indentation and sliding contact
                                                                                 NT FUEL INJECTION
[ NASA-TP-2048]
INDEPENDENT VARIABLES
NT LATTICE PARAMETERS
INDICATING INSTRUMENTS
                                                    p0069 N82-32491
                                                                                 NT GAS INJECTION
                                                                                INJECTION CARBURATORS
                                                                                U BL INJECTION
INJECTION HOLDING
 NT DEAG PORCE ANEMOMETERS
HT FLCW DIRECTION INDICATORS
                                                                                    Pabrication of turbine components and properties
                                                                                      of sintered silicon nitride
 NT FOT-FILM ANEMOMETERS
NT NOT-WIRE ANEMOMETERS
                                                                                      [ ASME PAPER 62-GT-252]
                                                                                    Fabrication of sinterable silicon mitride by
 NT LASER ANEMOMETERS
                                                                                      injection molding
INDIUM
    Secondary electron emission yields
                                                                                XMJECTORS
                                                    p0038 N82-14226
                                                                                    Atomization and combustion properties of flashing
THOTON COMPOUNDS
                                                                                      injectors
                                                                                    [AIAN PAPER 82-0300] p0092 A
Testing of fuel/oxidizer-rich, high-pressure
    Electron boam induced damage in ITO coated Kapton
                                                                                                                                   p0092 A82-17880
       --- Indium Tin Oxide
                                                    p0159 A82-41546
                                                                                      preburners
INDOLES
                                                                                      [ NASA-CR-165609]
                                                                                                                                   p0074 N82-24353
    Deposit formation in liquid fuels. III - The
                                                                                INLET PLOW
                                                                                    The effect of inflow velocity profiles on the performance of supersonic ejector nozzles
[AIAA PAPER 81-0273] p0002 A8
      effect of selected nitrogen compounds on diesel
                                                                                    Plow through axially aligned sequential apertures of the orifice and Borda types
[ASME PAPER 81-HT-70]
                                                    p0074 A82-23238
INDUCED PLUID PLOW
  U UID FLOW
                                                                                      [ASME PAPER 81-HT-79]
INDUCTION HOTOES
                                                                                    Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35
    A PWM transistor inverter for an ac electric
       vehicle drive
                                                                                                                                   p0005 A82-35195
                                                    p0085 A82-20744
                                                                                    Tangential blowing for control of strong normal shock - Boundary layer interactions on inlet ramps [AIAA PAPER 82-1082] p0005 A82-37684
    Progress on advanced dc and ac induction drives
       for electric vehicles
      [ NASA-TM-82895]
                                                    p0163 N82-31160
INDUCTION SYSTEMS
                                                                                    A summary of V/STOL inlet analysis methods
                                                                                                                                   p0006 A82-40921
  U TAKE SYSTEMS
                                                                                    A summary of V/STOL inlet analysis methods [NASA-TM-82725] p0003
TEDUCTORS
    Development of a dual-field heteropoplar power
                                                                                                                                   P0003 N82-11043
                                                                                    Effect of a part sp@n variable inlet quide vane on TF34 fan performance [NASA-CR-165458] p0023 N82-1207
       converter
      [ NASA-CR- 165168]
                                                    p0084 N82-24424
INDUSTRIAL WASTES

Collection and dissemination of thermal energy
                                                                                                                                   p0023 N82-12075
                                                                                    Thrust modulation methods for a subsonic V/STOL
       storage system information for the pulp and
                                                                                      aircraft
       paper industry
                                                                                      [NASA-TH-82747]
                                                                                                                                   p0003 N82-13112
                                                    p0 136 N82-24686
                                                                                    Geometry and starvation effects in hydrodynamic
INPLASTIC STRESS
                                                                                      lubrication
                                                                                    NASA-TM-82807] p0042 N82-20240
Experimental and analytical results of tangential
blowing applied to a subsonic V/STOL inlet
[NASA-TM-82847]
    Research and development program for non-linear structural modeling with advanced
```

p0024 N82-16080

[NASA-TH-82847]

[NASA-TM-82789]

Some aspects of calculating flows about

three-dimensional subsonic inlets

```
Investigation of the tip clearance flow inside and at the exit of a compressor rotor passage
                                                                               INTAKE SYSTEMS
                                                                                MT AIR INTAKES
NT ENGINE INLETS
      [ NASA-CP- 169004]
                                                   p0026 N82-25253
   Acoustic properties of turbcfan inlets [NASA-Cr-169016]
                                                                                NT INTERNAL COMPRESSION INLETS
                                                  p0153 N82-27090
                                                                                NT NOSE INLETS
                                                                                NT SUPERSONIC INLETS
Performance of single-stage axial-flow transonic
    A summary of V/STCL inlet analysis methods
      [ NASA-TH-82885]
                                                   p0005 N82-28249
    Calculation of the flow field including boundary
                                                                                     compressor with rotor and stator aspect ratios
      layer effects for supersonic mixed compression inlets at angles of attack
[NASA-CR-167941] p0009 N82-2
                                                                                     of 1.63 and 1.78, respectively, and with design pressure ratio of 1.82 [NASA-TP-1974] p0017 #82-19:
                                                   p0009 N82-29269
                                                                                                                                  p0017 N82-19222
                                                                               INTEGRAL EQUATIONS
INLET NOZZLES
   YF 102 in-duct combustor noise weasurements with a
                                                                                NT J INTEGRAL
      turbine nozzle, volume 1 [NASA-CE-165562-VOL-1]
                                                                                   Solutions of the compressible Navier-Stokes
                                                   p0153 N82-21031
                                                                                     equations using the integral method
                                                                                     [AIAA PAPER 81-0046]
   YF 172 in-duct combustor noise measurements with a
                                                                                                                                  p0093 A82-23832
      turbine nozzle, volume 2 f NASA-CR-165562-VOL-2]
                                                                                   Path-independent integrals in finite elasticity and inelasticity, with body forces, inertia, and arbitrary crack-face conditions
                                                   p0153 N82-21032
    YP 102 in-duct combustor noise measurements with a
      turbine nozzle, volume 3 [BASA-CF-165562-VOL-3]
                                                                                  On a study of the /Delta T/c and C/asterisk/
integrals for fracture analysis under non-steady
                                                   p0 155 N82-21033
    herodynamic analysis of VMCL inlets and definition
of a short, blowing-lip inlat
[NASA-CF-1656171
INLET PRESSURE
                                                   p0007 N82-22211
                                                                                                                                  p0115 A82-36782
                                                                                  Construction of solutions for some nonlinear
two-point boundary value problems
[NASA-TM-82937] p0 144 N
   Conputer modeling of fan-exit-splitter spacing effects on P100 response to distortion
                                                                                                                                  p0 144 N82-30949
      [ HASA-CR- 167879]
                                                   p0025 N82-23246
                                                                               INTEGRATED CIRCUITS
INLET TEMPERATURE
                                                                                 NT ENCAPSULATED MICROCIRCUITS
   Computer modeling of fan-exit-splitter spacing
                                                                                   Multijunction high voltage concentrator solar cells
      Affects on P100 response to distortion [MASA-CF-167879] p00
                                                                                                                                 p0043 A82-11796
                                                  p0025 X82-23246
                                                                                   Compensation mechanism in liquid encapsulated
INLETS (DEVICES)
                                                                                     Czochralski Gals Importance of melt stoichiometry
                                                                                   p0086 A82-40403
Fabrication of multijunction high voltage
concentrator solar cells by integrated circuit
INOCULATION
   Seeding considerations for an LV system in a large
      transonic wind tunnel
                                                                                     technology
                                                   p0096 N82-32689
                                                                                                                                  DO 127 A82-44957
INORGANIC CONTINGS
                                                                               INTEGRATED ENERGY SYSTEMS
NT CPEANIC COATINGS
INOUGANIC PEROXIDES
                                                                                   Develop and test fuel cell powered on-site
                                                                                     integrated total energy systems. Phase 3: Full-scale power plant development [NASA-CR-165455] p013! N
 HT HYTROGEN PEROXIDE
INORGANIC SULFIDES
 NT MCLYBDENUM SULFIDES
                                                                                   Develop and test fuel cell powered on-site
                                                                               Develop and test fuel cell powered on-site
integrated total energy systems: Phase 3:
Pull-scale power plant development
[NASA-CR-165568] p0135 N
INTEGRODIFFERENTIAL EQUATIONS
U FPERENTIAL EQUATIONS
U TEGRAL EQUATIONS
UTEGRAL EQUATIONS
INTERACTIVE GRAPHICS
   Moderate temperature Na cells III -
      Flectrochemical and structural studies of Cr0.5v0.5s2 and its Na intercalates
                                                                                                                                  p0135 NB2-24648
                                                   p0055 A82-15732
INSCUSITIVITY
 VEIVICES U
INSOLATION
    Development of a large area space solar cell
                                                                                U MPUTER GRAPHICS
      assembly
                                                                               INTERCALATION
[NASA-CR-167929]
                                                                                   Moderate temperature Na cells. III -
                                                   p9137 N82-30706
                                                                                     Alectrochemical and structural studies of
 U ARTITTY
                                                                                     Cr0.5V0.5S2 and its Na intercalates
INSTALLATION
                                                                                                                                  p0055 A82-15732
 U STALLING
                                                                               INTERPACES
INSTALLING
                                                                                NT LIQUID-SOLID INTERFACES
   Rough analysis of installation effects on
                                                                                 NT SOLID-SOLID INTERPACES
turboprop noise
[NASA-TM-82924]
INSTRUMENT COMPENSATION
                                                                                   Systems integration
                                                   p0 152 N82-32082
                                                                                                                                  p0042 NB2-27371
                                                                               INTERFACIAL EMERGY
Universal binding energy relations in metallic
    Extending the frequency of response of lightly
      damped second order systems: Application to the
                                                                                     adhesion
      drag force anemometer
                                                                                     [NASA-TM-82706]
                                                                                                                                  p0058 N82-11183
      [NASA-IM-82927]
                                                   p0096 N82-32662
                                                                               INTERPACIAL STRAIN
INSTRUBENT DRIFT
U IFT (INSTRUMENTATION)
INSULATING MATERIALS
                                                                                U TERFACIAL TENSION
                                                                               INTERPACIAL TENSION
                                                                                   Interface cracks in adhesively bounded lap-shear
 U SULATION
                                                                                      ioints
INSULATION
                                                                                                                                  p0116 A82-46109
 NT ELECTRICAL INSULATION
                                                                                   Fatique life prediction in bending from axial
    Experimental simulation of tiased sclar arrays
                                                                                     fatique information
      with the space plasma [NASA-CR-165485]
                                                                                     [NASA-CR-165563]
                                                                                                                                   p0 113 N82-20564
                                                   p0 157 N82-10880
                                                                                   Factors influencing the thermally-induced strength
INSULATORS.
                                                                                     degradation of B/Al composites
    SCATHA SSPM charging response: NASCAP predictions
                                                                                     [ NASA-TH-82823]
                                                                                                                                   p0050 N82-24297
      compared with data
                                                                               INTERFEROMETERS
                                                   p0037 N82-14251
                                                                                HT MACH-ZEHNDER INTERFEROMETERS
   Numerical simulation of plusma insulator interactions in space. Part 1: The self
                                                                               LETERFERORETRY
                                                                                 NT HOLOGRAPHIC INTERPEROMETRY
      consistent calculation
                                                                                 NT LASER INTERPEROMETRY
   p0039 N82-14272
Numerical simulation of plasma insulator
interactions in space
                                                                               INTERNETALLICS
                                                                                  Hard permanent magnet development trends and their
      interactions in space. Part 2: Dielectric
                                                                                     application to A.C. machines
      offects
                                                                                                                                  p0083 A82-20745
                                                   p0039 N82-14273
                                                                                   Recrystallization and grain growth in NiAl
```

p0065 A82-44529

Quasi-liquid states observed on ion beam

ricrotextured surfaces

```
INTERNITIENCY
                                                                                                                                   p0159 A82-30335
    Development potential of Intermittent Combustion
                                                                                   Ion-beam-induced topography and surface diffusion
                                                                                                                                   PO 160 A82-46426
       (T.C.) aircraft engines for commuter transport
      Applications
[NASA-TM-82869]
                                                                                    Ion beam textured graphite electrode plates ---
                                                                                     high efficiency electron tube devices [NASA-CASE-LEW-12919-2]
                                                   p0019 N82-26297
THREE COULATION
                                                                                                                                   p0050 N82-26386
    Computer modeling of multiplo-channel input
                                                                                   Ion been sputter deposited diamond like films
      signals and intermodulation losses caused by
                                                                                     [ NASA-TH-82873]
                                                                                                                                   P0069 #82-28445
nonlinear traveling wave tube amplifiers
[NASA-TP-1999] p0082
INTERNAL COMBUSTION ENGINES
NT BRISTOL-SIDDELEY BS 53 ENGINE
ST CLESEL ENGINES
                                                                                    Deposition of reactively ion beam sputtered
                                                   p0082 N82-25441
                                                                                      silicon nitride coatings
                                                                                      [ NASA-TH-82942]
                                                                                                                                   p0069 M82-30401
                                                                                   Ion beam microtexturing and enhanced surface
                                                                                      diffusion
                                                                               [NASA-CR-167948]
 NT GAS TURBINE ENGINES
                                                                                                                                   p0065 #82-31509
 NT HELICOPIFR ENGINES
 NT JET ENGINES
                                                                                 MT ION BEAMS
 HT TUBBOFAN ENGINES
NT TUBBOJET ENGINES
                                                                               ION DENSITY (CONCENTRATION)
NT HAGNETOSPHERIC ION DENSITY
 HT TURBOPSOP ENGINES
HT WANKEL ENGINES
                                                                                   Additional extensions to the NASCAP computer code,
                                                                                VOLUME 3
[NASA-CR-167857]
ION DISTRIBUTION
    Barriers to the utilization of synthetic fuels for transportation
                                                                                                                                   D0040 N82-26378
      [ NASA-CR- 1655 17]
                                                    p0073 N82-13243
                                                                                   The hidden ion population of the magnetosphere
    Development of a high-temperature durable catalyst
                                                                                                                                   PO 140 A82-32630
      for use in catalytic combustors for advanced
                                                                                 NT MERCURY ION ENGINES
      automotive das turbine engines [NASA-CR-165396]
                                                    p0 130 N82-13510
                                                                                   Characterization of advanced electric propulsion
    ERRS fuel addendum: Pollution reduction technology program small jet aircraft engines,
                                                                                      systems
                                                                                      [AIAA PAPER 82-1246]
                                                                                                                                   P0071 A82-35083
                                                                                   Developing a scalable inert gas ion thruster
[AIAA PAPER 82-1275] p0047 A/
      phase 3
    [NASA-CP-165387] p0024 N82-14096
Development potential of Intermittent Combustion
                                                                                                                                   P0047 A82-37713
                                                                                    Electric thruster research
                                                                                      [ NASA-CR- 165603 ]
       (I.C.) aircraft engines for commuter transport
                                                                                                                                   P0045 N82-24285
    applications
[NASA-TH-E2869] p0019 :
Electrostatic fuel conditioning of internal
                                                                                    Additional extensions to the NASCAP computer code,
                                                   p0019 N82-26297
                                                                                      Volume 3
[NASA-CR-167857]
                                                                                                                                   p0040 NB2-26378
                                                                                   Characterization of advanced electric propulsion
      combustion engines [NASA-CR-169029]
                                                   p0106 N82-26680
                                                                                      Systems
INTERNAL COMPRESSION INLETS
                                                                                      [ NASA-CR-167885]
                                                                                                                                   P0045 N82-26381
    Three-dimensional flow calculations including
                                                                                ION EXCHANGE MEMBRANE ELECTROLYTES
      boundary layer effects for supersonic inlets at angle of attack
[AINA PAPER 82-0061] p0005 A82-19
                                                                                   Method of making formulated plastic separators for
                                                                                      soluble electrode cells
                                                   p0005 A82-19778
                                                                                      [NASA-CASE-LEW-12358-2]
                                                                                                                                   D0054 N82-21268
INTERNAL STRESS
                                                                                TON THEACT
 U SIDUAL STRESS
                                                                                    Ion-beam-induced topography and surface diffusion
INTERNAL WAVES
NT PLANETARY WAVES
INTERNATIONAL TRADE
                                                                                                                                   PO 160 A82-46426
                                                                                ION IMPLANTATION
                                                                                   Undoped semi-insulating LEC GaAs - A model and a
mechanism --- Liquid Encapsulated Czochralski
    International market assessment of stand-alone
      photovoltaic power systems for cottage industry
                                                                                                                                   p0 159 A82-13754
      applications
[NASA-CH-165287]
                                                                                    Stoichiometry-controlled compensation in liquid
                                                   p0132 N82-16494
                                                                                      encapsulated Czochralski Gals
INTERPLANETARY PROPULSION
                                                                                   p0158 A82-17585
Processing of silicon solar cells by ion
 U TERPLANETARY SPACECRAPT
                                                                                      implantation and laser annealing [NASA-CR-165283]
 II CKET ENGINES
INTERPLANETARY SPACE
                                                                                                                                   P0128 N82-11546
    Potentials of surfaces in space
                                                                                   Friction wear and auger analysis of iron implanted with 1.5-MeV nitrogen ions
[NASA-TP-1989] p0059 N82-2130
                                                   p0 165 A82-23750
INTERPLANETARY SPACECRAFT
                                                                                                                                   p0059 N82-21300
    Research report: User's manual for computer program AT819005. PLANETSYS, a computer program
                                                                                   Tribological characteristics of nitrogen (N+) implanted iron
      for the steady state and transient thermal analysis of a planetary power transmission system
                                                                                      [ NASA-TM-82839]
                                                                                                                                   p0060 N82-24322
                                                                                ION MICROSCOPES
      [ NASA-CP- 165366]
                                                   p0 146 N82-31970
                                                                                    Application of surface analysis to solve problems
IN VERTERS
                                                                                      of wear
 NT STATIC INVERTERS
                                                                                      (NASA-TM-82753]
                                                                                                                                   p0099 NB 2-14519
    The ac propulsion system for an electric vehicle,
                                                                                HOTTON HOT
      phase I
                                                                                   Pield-aligned ion streams in the earth's midnight
      [ NASA-CP- 165480]
                                                    p0129 NB2-13506
                                                                                      region
INVESTIGATION
                                                                                                                                   p0 140 A82-31009
    Analytical investigation of nonrecoverable stall
                                                                                ION PLATING
[ NASA -TM-82792]
INVISCID FLOW
                                                   p0018 N82-21195
                                                                                    Tribological properties and XPS studies of ion
                                                                                plated gold on nickel and iron [NASA-TM-82814]

ION-GAS INTERACTIONS

U S-ION INTERACTIONS
     STAGNATION PLOW
                                                                                                                                   P0059 NB2-22344
    A FORMAN program for calculating three dimensional, inviscid and rotational flows with shock waves in axial compressor blade rows:
                                                                                IONIC PROPELLANTS
                                                                                 U N ENGINES
       [ NASA-CF-3560]
                                                   p0008 N82-26230
                                                                                ICHIEATION
    The design and instrumentation of the Purdue annular cascade facility with initial data acquisition and analysis
[NASA-CP-167861] p0008 No
                                                                                 NT AURORAL IONIZATION
                                                                               IONIZED GASES

NT ARGON PLASMA

NT CHARGED PARTICLES

NT PLASMA SHEATHS

NT PLASMAS (PHYSICS)
                                                    p0008 NB2-26237
ION BEAMS
    Surface diffusion activation energy determination
      using ion beam microtexturing
                                                                                IONIZED PLASMAS
                                                                                U ASMAS (PHYSICS)
IONIZING RADIATION
                                                    p0 159 A82-21965
```

NT FAR ULTRAVIOLET BADIATION

ORIGINAL PAGE IS OF POOR QUALITY

```
NT GRANA BAYS
 HT SOLAR X-RAYS
IONOSPHERIC SOUNDING
   An attempt at magnetic-variation sounding in the
     Antarctic
                                                         182-25290
IONS
 HT ANIONS
 NT NITROGEN IONS
IP (IMPACT PREDICTION)
 U HPUTREIZED SIMULATION
IRON
   The combined effects of Pe and H2 on the nitridation of silicon
                                                 p0070 A82-42924
   Surface chemistry and wear behavior of single-crystal silicon carbide sliding against
      iron at temperatures to 1500 C in vacuum
                                                 P0067 N82-19374
      [ NASA-TP- 1947]
   Friction and wear of iron in corrosive metal [NASA-TP-1985] P0058 N82-20291
   Friction wear and auger analysis of iron implanted
      with 1.5-MeV nitrogen ions
      [ NASA-TP- 1989 ]
                                                 p0059 N82-21300
   Tribological characteristics of nitrogen (N+)
implanted iron [NASA-TM-82839]
IRON ALLOYS
                                                 p0060 N82-24322
 NT STAINLESS STEELS
 NT STEELS
   Long-term high-velocity oxidation and hot corrosion testing of several NiCrAl and PeCrAl
      base cxide dispersion strengthened alloys
                                                 p0062 A82-37151
   Evaluation of candidate stirling engine heater tube alloys at 820 deg and 860 deg C [NASA-TM-82837] p0061 N82-
                                                 p0061 N82-30372
   Overlay metallic-cermet alloy coating systems ---
      for gas turbine engines
      [ NASA-CASE-LPW-13639-1]
                                                 p0070 N82-33522
IRON CHLORIDES
Improved chromium electrodes for REDOX cells [NASA-CASE-LEW-13653-1] p0 121 NI IROK COMPOUNDS
                                                 p0 121 N82- 22672
 NT IRCN CHLORIDES
   Raman study of the improper ferroelectric phase
      transition in iron lodine boracite
IRON-CHRONIUM BEDOX BATTERIES
   NASA preprototype redox storage system for a
     photovoltaic stand-alone application
                                                 D0127 A82-11774
IRRADIATION
 NT ELECTRON IRRADIATION
IRROTATIONAL PLON
 U TENTIAL FLOW
ISING HODEL
U THENATICAL MODELS
ISULATORS
 NT VIBRATION ISOLATORS
ISOSTATIC PRESSURE
   Hot isostatically pressed manufacture of high
strength HERL 76 disk and seal shapes
      [ NASA-CE- 165549]
                                                 p0064 N82-26439
ISOTOPES
 NT PLATINUM ISOTOPES
NT PLUTCHIUM 244
ISOTROPIC TURBULENCE
   Analysis of the decay of temperature fluctuations
      in isotropic turbulence
   Ultrasonic input-output for transmitting and
     receiving longitudinal transducers coupled to same face of isotropic elastic plate
      [ NASA-CP-3506]
                                                 p0110 N82-18613
ITERATION
 NT ITERATIVE SOLUTION
ITERATIVE SOLUTION
   Maximum entropy image reconstruction from -
      projections
                                                         A82-11053
   An iterative finite element-integral technique for predicting sound radiation from turbofan inlets
      in steady flight
      [AIAA PAPER 82-0124]
                                                 p0030 A82-17796
```

Self-adaptive closed constrained solution algorithms for nonlinear conduction

```
J INTEGRAL
    Crack displacements for J/I/ testing with compact
       specimens
                                                        p0112 A82-43358
JEEPS
 U TOROBILES
JET AIRCRAPT
 MT BOBING 747 AIRCRAFT
MT DC 9 AIRCRAFT
MT DC 10 AIRCRAFT
MT TURBOPROP AIRCRAFT
JET AIRCRAFT HOISE
Effect of facility variation on the acoustic
       characteristics of three single stream nozzles
       [NASA-TM-81635]
                                                        p0151 N82-19944
    Forward acoustic performance of a model turbofan designed for a high specific flow (QP-14) [MASA-TP-1968] p0152 882-2
                                                        P0152 #82-21036
    Aeroacoustic performance of an externally blown flap configuration with several flap noise
       suppression devices
       [ NASA-TP-1995]
    QCSEE under-the-wing engine acoustic data
                                                        p0019 #82-27311
      [ NASA-TE-82691]
JET DAMPING
 U MPING
JET DRIVE
 U T PROPULSION
JET REGIER FURLS
 NT LIQUID PUELS
    Deposit formation in liquid fuels, II - The effect
       of selected compounds on the storage stability
       of Jet A turbine fuel
    p0074 A82-22240
Deposit formation in liquid fuels. I = Effect of
       coal-derived Levis bases on storage stability of
       Jet A turbine fuel
    WASA/General Electric broad-specification fuels
       combustion technology program - Phase I results
       and status
    [ATAA PAPER 82-1089] p0021 A82-35000 Experimental study of fuel heating at low temperatures in a wing tank model, volume 1
       [ NASA-CR-165391]
                                                        p0073 N82-11224
    Pollution reduction technology program small jet
      aircraft engines, phase 3 [NASA-CR-165386]
                                                        P0023 N82-14095
    An assessment of the crash fire hazard of liquid hydrogen fueled aircraft [NASA-CR-165526] p0013 N82-19196 Experiments on fuel heating for commercial aircraft
                                                        p0013 N82-19196
       [NASA-TH-82878]
                                                        p0072 #82-26483
    [NASA-TR-82878] p0072 M82-26/

Effect of some nitrogen compounds thermal

stability of jet A

[NASA-TR-82908] p0072 N82-27/

Characterization of an Experimental Referee

Broadened Specification (ERBS) aviation turbine

fuel and ERBS fuel blends
                                                        p0072 N82-27519
       [NASA-TH-82883]
                                                        p0072 N82-32504
JET BEGIES
 NT BRISTOL-SIDDELEY BS 53 ENGINE
 NT TURBOFAN ENGINES
NT TURBOJET ENGINES
 MT TURROPROP ENGINES
    Thermal expansion accommodation in a jet engine
                                                        p0029 A82-11999
    Water ingestion into jet engine axial compressors [AIAA PAPER 82-0196] p0030 A82-17
                                                        p0030 A82-17836
    Pollution reduction technology program small jet
       aircraft engines, phase 3 [NASA-CR-165386]
    ERBS fuel addendum: Pollution reduction technology program small jet aircraft engines,
       phase 3
       [NASA-CR-165387]
                                                        p0024 N82-14096
    Application of integration algorithms in a
       parallel processing environment for the
    simulation of jet engines
[NASA-TH-82746] p0149 No
Prediction of sound radiation from different
                                                         p0149 N82-14849
       practical jet engine inlets
[NASA-CR-165120]
                                                        p0 153 N82-16810
    CF6 jet engine performance improvement: High
       pressure turbine roupiness
```

p0094 A82-45157

```
[ NASA-CP- 165555]
                                                        p0024 N82-17174
    CF6 Jet Engine Diagnostics Frogram:
                                                       High pressure
       compressor clearance investigation
       [ NASA -CF- 165580]
                                                        P0025 N82-21197
                                                                                      K BAND
    Alternatives for jet engine control [NASA-CE-168894] p0026 NB2-23; B747/JT9D flight loads and their effect on engine
                                                                                       U TREMELY HIGH PREQUENCIES
                                                       p0026 N82-23247
                                                                                      KA RAND
                                                                                       U TREMELY HIGH PREQUENCIES
       running clearances and perfermance deterioration; BCAC VAIL/F and WA JT9D engine
                                                                                      KALHAN PILTERS
                                                                                          Model degradation effects on sensor failure
       diagnostics programs
[NASA-CF-165573]
                                                                                             detection
                                                       p0027 N82-28296
                                                                                                                                              p0148 A82-13143
    CF6 jet engine performance improvement: High pressure turbine active clearance control [NASA-CP-165556] p0027 N83
                                                                                                     A computer-aided design program for linear
                                                                                             multivariable control systems [NASA-TH-8287]]
                                                       p0027 N82-28297
                                                                                                                                              p0148 K82-30992
    The CF6 jet engine performance improvement: pressure turbine active clearance control
                                                                                      KAPTOW (TRADEMARK)
Electron beam induced damage in ITO coated Kapton
                                                                  LOV
       [ NASA-CR- 165557]
                                                        p0029 N82-33393
                                                                                             --- Indium Tin Oxide
JET EXHAUST
                                                                                                                                              p0 159 A82-41546
   Methods for the calculation of axial wave numbers in lined ducts with mean flow
                                                                                          Secondary electron emission yields
                                                                                                                                              p0038 N82-14226
                                                       DO 153 A82-14044
                                                                                          Pirst results of material charging in the space
    Advanced technology for controlling pollutant emissions from supersonic cruise aircraft
                                                                                             environment
                                                                                             [ NASA-TH-84743]
                                                                                                                                              p0081 N82-24431
                                                                                      EMELYIE-HELEHOLTZ INSTABILITY

Generation of instability waves at a leading edge
                                                       D0001 N81-18004
JET FLAMES
U T FLOW
JET FLOW
                                                                                             [ NASA-TM-82835]
                                                                                                                                              p0087 N82-22453
                                                                                      ERMTSCKY
 NT AIR JETS
NT SUPERSONIC JET PLOY
                                                                                          LANDSAT Remote Sensing: Observations of an Appalachian mountaintop surface coal mining and reclamation operation --- kentucky
    Dilution jet behavior in the turn section of a
    reverse flow combustor
[ATTA PAPER 82-0172]
Dilution jet behavior in the turn section of a
                                                                                             [E82-10247]
                                                                                                                                              p0117 N82-24525
                                                        p0021 A82-20291
                                                                                      KEROGEN
                                                                                       NT LIQUID FUELS
      reverse flow combuster [NASA-TM-82776]
                                                                                      KEROSENE
                                                                                       NT LIQUID FUELS
                                                       p0017 N82-19220
                                                                                      KEVLAR (TRADEMARK)

KEVLAR/PHR-15 polyimide matrix composite for a

complex shaped DC-9 drag reduction fairing
[AIAA PAPER 82-1047] p0002 A82
    Mass and momentum turbulent transport experiments with confined coaxial jets
       [ NASA-CR- 165574]
                                                        p0090 N82-19496
JET FOELS
                                                                                                                                              p0002 A82-37678
 U T ENGINE FOFLS
                                                                                          Kevlar/PHR-15 reduced drag DC-9 reverser stang
JET JAPINGEMENT
    Plow distributions and discharge coefficient
                                                                                             [ NASA-CR-165448]
                                                                                                                                              p0052 N82-31448
      effects for jet array impingement with initial crossflow
                                                                                      KRYTEĞ
                                                                                       NT FREQUENCY SHIFT KEYING
       TASME PIPER 82-GT-156]
                                                        p0011 A82-35379
                                                                                      KINEHATICS
                                                                                          Tooth profile analysiis of circular-cut, spiral-bevel gears
    Jet impingement heat transfer enhancement for the
       GPU-3 Stirling engine
       [ HASA-TH-82727]
                                                        p0163 N82-11993
                                                                                             [NASA-TM-82840]
                                                                                                                                              p0101 N82-26681
JET NOISE
                                                                                          Kinematic precision of year trains
U 1 AIRCRAFT NOISE
JET PROPULSION
                                                                                      [NASA-TH-82887]
                                                                                                                                              p0102 N82-32733
                                                                                      NT HELMHOLTZ VORTICITY EQUATION RIBETIC PRICTION
    Development potential of Intermittent Combustion
       (I.C.) aircraft engines for commuter transport
                                                                                       NT SLIDING PRICTION
       applications
       [ WASA-TM-82869]
                                                        p0019 N82-26297
                                                                                      KINETIC THEORY
JET VANES
                                                                                       NT MIXING LENGTH FLOW THEORY
   Effects of vane/blade ratio and spacing on fan noise
[AIAA PAPER 91-2033] p0029 A82-10457
Aerodynamic performance of high turning core
turbine vanes in a two dimensional cascade
                                                                                      KINETICS
                                                                                        NT REACTION KINETICS
                                                                                      KIRCHHOFF-HELMHOLTZ FLOW
                                                                                       U PE PLOW
      [ NASA-TM-82894 ]
                                                       p0004 N82-26240
                                                                                      KIRCHHOFF-HUYGENS PRINCIPLE
JETA VA TORS
                                                                                       U VE PROPAGATION
U IDE VANES
JOINTS (JUNCTIONS)
NT LAE JOINTS
                                                                                      KLYSTRONS
                                                                                          Direct conversion of light to radio frequency energy
                                                                                             --- using photoklystrons for solar power
JOURNAL BEARINGS
                                                                                             satellites
    A pad perturbation method for the dynamic
                                                                                                                                              p0138 A82-11712
                                                                                          Analytic investigation of efficiency and performance limits in klystron amplifiers using multidimensional computer programs; multi-stage
       coefficients of tilting-pad journal bearings
                                                       p0110 A82-14400
    Performance of PTFF-lined composite journal bearings [ASLE FREPRINT 82-AH-1A-1] p0 104 A82-37854
                                                                                             depressed collectors; and thermionic cathode
   [NASA-TH-E2798]

[NASA-TH-E2798]
                                                                                             life studies
                                                                                                                                              p0118 N82-12553
                                                                                          Three-dimensional relativistic field-electron
                                                                                             interaction in a multicavity high-power klystron. 1: Basic theory [NASA-TP-1992] p008
                                                                                                                                              p0081 N82-22439
                                                                                          Three-dimensional relativistic field-electron
JOURNALS (SHAPTS)
U AFTS (HACHINE RLEHENTS)
JUNCTIONS
                                                                                             interaction in a multicavity high-power
                                                                                             klystron. Part 2: Working Equations [NASA-TP-2008]
                                                                                                                                              P0081 N82-23397
                                                                                      A Suppary of V/STOL inlet analysis methods [NASA-TH-82885] p0005
    Impedance conversion using quantum limit
       nonreciprocity for
       superconductor-insulator-superconductor mixer
                                                                                                                                              p0005 M82-28249
       compensation
                                                        p0 159 A82-31276
```

LABORATORIES
The aerospace technology laboratory (a

```
perspective, then and now) [NASA-TF-82754]
                                                                                 orbit transfer
                                                                               (AIAA PAPER 82-1196) p0047 A82-35056
heveloping a scalable inert gas ion thruster
                                                p0031 NB2-19229
LAGRANGE MULTIPLIERS
   Power system design optimization using Lagrange
                                                                                 [ AIAA PAPER 82-1275]
                                                                                                                            p0047 A82-37713
      pultiplier techniques
                                                                               Study of electrical and chemical propulsion
                                                                                 systems for auxiliary propulsion of large space
systems. Volume 1: Executive summary
[HASA-CR-165502-VOL-1] p00046 H82-11
                                                p0085 A82-20743
LAKE ICE
   Ground-truth observations of ice-covered North
Slope Lakes imaged by radar
[ NASA-TH-64127] p0117 N82
                                                                                                                           p0046 N82-11110
                                                                               Study of electrical and chemical propulsion systems for auxiliary propulsion of large space
                                                p0117 N82-18664
LARES
                                                                                 systems, volume 2 [NASA-CR-165502-VOL-2]
                                                                               [MASA-CR-165502-VOL-2] p0044 W82-11111 An insight into auxiliary propulsion requirements
   Ground-truth observations of ice-covered North
      Slope Lakes imaged by radar
     [ NASA-TM-84127]
                                                p0117 N82-18664
                                                                                 of large space systems
LANIBAB BOUNDARY LAYER
                                                                                 [ NASA-TH-82827]
                                                                                                                            p0042 NB2-24286
   The three-dimensional boundary layer on a retating helical blade
                                                                               Large Space Systems/Propulsion Interactions
                                                                                 [ NASA-TH-829047
                                                                                                                            p0042 N82-27358
                                                p0009 A82-15459
                                                                               Systems integration
LANINAR BOUNDARY LAYER SEPARATION
                                                                                                                            p0042 N82-27371
 " BINAR BOUNTARY LAYER
                                                                           LASER ABBNOMETERS
LAHINAR PLANES
                                                                               Comparison of two and three dimensional flow
 U MINAR PLOW
                                                                                 computations with laser anemometer measurements
LAMINAB FLOW

NT BLASIUS FLOW

A simple finite difference procedure for the vortex controlled diffuser
                                                                                 in a transonic compressor rotor
                                                                                                                            p0004 N82-15020
                                                                                 [ NASA-TH-82777]
                                                                               High-speed laser anemometer system for intrarotor flow mapping in turbomachinery [NASA-TP-1663] p0095 N82-19
     FATAA PAPER 82-01091
                                                p0030 A82-17788
                                                                                                                            D0095 N82-19521
   Numerical modeling of three-dimensional confined
                                                                               Laser anemometer measurements in an annular
                                                                                 cascade of core turbine vanes and comparison
      flovs
     [ MASA-CP- 165583]
                                                p0158 N82-24078
                                                                                 with theory
LANINAB PLOW CONTROL
                                                                                 [ NASA-TP-2018]
                                                                                                                            p0004 N82-26234
 U UNDARY LAYER CONTROL
                                                                               Laser anemometer using a Fabry-Perot
 U MINAR BOUNDARY LAYER
                                                                                 interferometer for measuring mean velocity and turbulence intensity along the optical axis in
LANINAR JETS
 U T FLOW
                                                                                 turbonachinery
 U SINAR PLCH
                                                                                 [ NASA-TH-8284 17
                                                                                                                            p0095 N82-28605
LAHIBAR WAKES
                                                                               Status of laser anemome try in turbonachinery
   Bluff-body flameholder wakes - A simple numerical
                                                                                 research at the Levis Research Center
     sclution
                                                                                                                            p0096 N82-32686
      [AZAA FAPER 82-1177]
                                                p0093 A82-35043
                                                                           LASER APPLICATIONS
LANINATED MATERIALS
                                                                               Digital imaging techniques in experimental stress
 U MINATES
                                                                                 analysis
LABINATES
                                                                                                                            p0097 A82-34231
                                                                               Performance of luser glazed Zr02 TBCs in cyclic oxidation and corrosion burner test rigs
   On determination of fibre fraction in continuous
      fibre composite materials
                                                                                                                            p0059 NB2-22346
                                                p0051 A82-38133
                                                                                 [NASA-TH-82830]
   Application of a gripping system to test a uniaxial graphite fiber reinforced composite /PMR 15/Celion 6000/ in tension at 316 C p0051 A82-40796
                                                                               Method and apparatus for coating substrates using
                                                                                 lasers
                                                                                 [NASA-CASE-LEW-13526-1]
                                                                                                                            p0059 N82-22347
                                                                               Development and utilization of a laser velocimeter system for a large transonic wind tunnel
   Boundary-layer effects in composite laminates. I -
      Free-edge stress singularities, II - Free-edge
                                                                                 [NASA-TH-82886]
                                                                                                                            p0095 NB2-31663
      stress solutions and basic characteristics
                                                                           LASER CAVITIES
                                                p0116 A82-46806
                                                                               Pree electron lasers for transmission of energy in
   Indentation law for composite lawinates [NASA-CR-165460] po
                                                                                 space
                                                p0052 N82-15123
                                                                                 [ NASA-CR- 165520 ]
                                                                                                                            p0098 N82-25499
   Ultrasonic scanning system for imaging flaw growth
                                                                           LASER DOPPLER VELOCIMETERS
      in composites
                                                                               Development of a laser velocimeter for a large transonic wind tunnel
      [ NASA-TM-82799]
                                                p0076 N82-22386
   Piezoelectric composite materials
                                                                                                                            p0096 N82-32688
     [ NASA -CASE-LEW- 12582- 1]
                                                 p0054 N82-31450
                                                                               Seeding considerations for an LV system in a large
LAMINATIONS
                                                                                  transonic wind tunnel
 U MINATES
                                                                                                                            p0096 N82-32689
LAND HOBILE SATELLITE SERVICE
                                                                               LV measurements with an advanced turboprop
   Satellite-aided land mobile communications system implementation considerations [NASA-TM-82861] p0036 N82-25
                                                                                                                            p0097 N82-32690
                                                                           LASER INTERPREDMETRY
                                                                               Experimental and theoretical studies of the laws
                                                p0036 N82-25290
LANDFO BES
                                                                                 governing condensate deposition from combustion
 NT APPALACHIAN MOUNTAINS (NORTH ABERICA)
 NT MOUNTAINS
                                                                                                                            p0057 A82-28709
 NT PEAKS (LANDFOFMS)
NT VOLCANOFS
                                                                               Experimental boundary integral equation
                                                                                 applications in speckle interferometry
LANDSCAPE
                                                                                                                            p0097 A82-36987
 II PCGPAPHY
                                                                           LASER MICROSCOPY
LANGUAGES
                                                                               Acoustic microscopy of silicon carbide materials
 NT FORTRAN
                                                                                                                            p0075 A82-33031
LAP JOINTS
    Interface cracks in adhesively bounded lap-shear
                                                                            NT CARBON DIOXIDE LASERS
      joints
                                                                             NT DF LASERS
                                                 p0116 382-46109
                                                                             NT FREE ELECTRON LASERS
   Analysis of interface cracks in adhesively bonded lap shear joints, part 4 [NASA-CP-165438] p9114 N82-26
                                                                             NT PULSED LASERS
                                                                           LATIN SQUARE METHOD
                                                                               Geometrical aspects of the tribological properties of graphite fiber reinforced polymide composites
                                                 p9 114 N82-26716
LAPLACE EQUATION
   The use of a structural method to calculate the
                                                                                 [NASA-TM-82757]
                                                                                                                            p0066 N82-15198
      "lectrostatic field of a magnetron
                                                                           LATTICE IMPERPECTIONS
                                                        A82-18370
                                                                            U YSTAL DEFECTS
LARGE SPACE STRUCTURES
                                                                           LATTICE PARAMETERS
```

The influence of orientation on the stress rupture

Propulsion system options for low-acceleration

```
properties of nickel-base superalloy single
                                                                                     reaction lined ducts
                                                                                  [AXAA PAPER 81-2014]
Conversion of acoustic energy by lossless liners
p0154 A62-36195
    p0062 A62-47397 Effects of cobalt on the microstructure of Udimet
                                                                                  Monlinear structural and life analyses of a
      [ NASA-CR- 165605]
                                                   p0064 N82-28409
                                                                                     combustor liner [NASA-TM-82846]
LAUNCH VEHICLES

NT ATLAS CENTAUR LAUNCH VEHICLE

NT CENTAUR LAUNCH VEHICLE
                                                                                                                                 PO111 N82-24501
                                                                                  Fully plasma-sprayed compliant backed ceramic
turbine seal
[NASA-CASE-LEW-13268-1] p0065 N8
LAUNCHERS
                                                                                                                                 p0069 N82-29453
 NT GUN LAUNCHERS
                                                                                  Nonlinear constitutive theory for turbine engine
 NT ROCKET LAUNCHERS
                                                                                     structural analysis
LAUNCHING
                                                                                                                                 p0112 M82-33744
 NT ORBITAL LAUNCHING
                                                                               LIQUEPIED GASES
 NT SPACECRAFT LAUNCHING
                                                                                MT LIQUEFIED NATURAL GAS
                                                                                MT LIQUID HYDROGEN
LAUS
                                                                               KT LIQUID OXYGEN
LIQUEFIED MATURAL GAS
TOWARD the use of similarity theory in two-phase
 NT CONSTRUATION LAWS
LEAD ACID BATTERIES

Effect of positive pulse charge waveforms on the onergy officiency of lead-acid traction cells [NASA-TH-82769] p0118 N82-10
                                                                                     choked flows
    [NASA-TH-82769] p0118 N02-10503
Chopper-coatrolled discharge life cycling studies
                                                                                                                                 p0089 482-16570
                                                                               PROBED VENORIA
      on lead-acid batteries
                                                                                MT LIQUID FUELS
      [ NASA-CR- 165616]
                                                  p0 134 N82-2066 1
                                                                               LIQUID BRARINGS
    Results of chopper-controlled discharge life cycling studies on lead acid batteries [NASA-TH-82912] p0124 N
                                                                               Bearings: Technology and needs
[NASA-CR-167908]
LIQUID CHROMATOGRAPHY
                                                                                                                                 p0106 N82-26679
                                                  P0124 N82-30700
LEADING MDGES
                                                                                  Quantitative separation of tetralin hydroperoxide
                                                                                     from its decomposition products by high
performance liquid chromatography
    Iding tunnol tests of a composite porous leading edge for use with a liquid anti-ice system ---
      Lewis icing research tunnel [NASA-CR-164966]
                                                                                                                                 p0048 A82-15696
| NASA-CR-164966 | p0014 N82-11052 | Goneration of instability waves at a loading edge | NASA-TM-82835 | p0087 N82-22453 | LEWIS BASE
                                                                                  Thermal and oxidative degradation studies of formulated C-ethers by gel-permeation
                                                                                     chromatography
                                                                                     [ NASA-TP-1994]
                                                                                                                                 p0068 N82-21332
    Deposit formation in liquid fuels. I - Effect of coal-derived Lewis bases on storage stability of
                                                                               LIQUID COOLING
                                                                                MT FILM COOLING
      Jet A turbine fual
                                                                               LIQUID CRYSTALS
                                                   p0074 A82-22241
                                                                                  Stoichiometry-controlled compensation in liquid
LIFE (DURABILITY)
                                                                                     encapsulated Czochralski Gals
 NT FATIGUE LIFE
NT SERVICE LIFE
                                                                                                                                  DO 158 AB2-17585
                                                                               LIQUID PLON
 NT STORAGE STABILITY
                                                                                NT WATER PLON
    Durability/life of fibor composites in
                                                                                  Nonlinear Marangoni convection in bounded layers,
      hygrothermomachanical environments
                                                                                     I - Circular cylindrical containers. II -
      [ NASA-TM-82749]
                                                   50049 NB2- 14287
                                                                                     Rectangular cylindrical containers
    Chopper-controlled discharge life cycling studies
on lead-acid batteries
[NASA-CF-1656165]
LIFE CYCLE COSTS
                                                                               LIQUID PUBLS
                                                   p0:34 NB2-20661
                                                                                  Deposit fernation in liquid fuels. I - Effect of
                                                                                     coal-derived Lewis bases on storage stability of
    Gallium arsenide solar array subsystem study [NASA-CR-167869] p0138 N82-32855
                                                                                     Jet A turbine fuel
                                                                                                                                  p0074 A82-22241
LIPETIME (DURABILITY)
                                                                               LIQUID HYDROGEN
U FE (DURABILITY)
LIGHT (VISIBLE RADIATION)
NT POLARIZED LIGHT
NT SUNLIGHT
                                                                                NT LIQUID FUELS
                                                                                  An experiment to evaluate liquid hydrogen storage
                                                                                     in space
LIGHT ALLOYS
                                                                                  An assessment of the crash fire hazard of liquid
                                                                                     hydrogen fueled aircraft [NASA-CR-165526]
 NT ALUMINUM ALLOYS
  NT MAGNESIUM ALLOYS
                                                                                                                                  p0013 NB2-19196
LIGHT EMISSION
                                                                                   Thtegrated qualifier combined cycle polygeneration
                                                                                     system to produce liquid hydrogen [NASA-TH-82921]
 NT CHEMILUMINESCENCE
LIGHT INTENSITY
U MINCOS INTENS. V
                                                                               LIQUID OXIDIXERS
                                                                                  TC, sing of fuel/oxidizer-rich, high-pressure
    Veiling glare reduction methods compared for ophthalmic applications
                                                                                     greburners
                                                                                     TNASA-CR-1656091
                                                                                                                                  p0074 N82-24353
                                                                               LIQUID OXYGEN
                                                   p0 143 A82- 13289
LIGHT TRANSMISSION
                                                                                   The supply of lunar oxygen to low earth orbit
  JT LIGHT SCATTERING
                                                                                                                                  p0032 A82-35618
LIGHTNING
                                                                                   Liquid oxygon turbopump technology
                                                                                     [ NASA-CR-165487]
    NASA research programs responding to workshop
                                                                                                                                  p0105 N82-11460
                                                                                  Low-thrust Isp sensitivity study [NASA-CR-165621]
      recommendations
                                                          NB2-21146
                                                                                                                                  p0045 N82-22309
LIGHTWING SUPPRESSION
                                                                                  Testing of fuel/oxidizer-rich, high-pressure
    Evaluation of lightning accommodation systems for
                                                                                     proburners
wind-driven turbing rotors
[NASA-TM-82784]
LIMEAR PILTERS
                                                                                     [NASA-CR-165609]
                                                                                                                                  p0074 N82-24353
                                                   p0122 NB2-23679
                                                                               LIQUID PHASES
                                                                                   Quasi-liquid states observed on ion beam
NT KALMAN PILTERS
LIBEARITY
                                                                                     microtextured surfaces
                                                                                                                                  P0159 A82-30335
    Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
                                                                               LIQUID PROPELLANT ROCKET ENGINES
                                                                                NT HYDROGEN OXYGEN ENGINES
      [ NASA-TH-82750]
                                                  p0157 N82-13908
                                                                                   Propulsion system options for low-acceleration
LIBERS
                                                                                     orbit transfer
 U NINGS
                                                                                     [AIAA PAPER 82-1196]
                                                                                                                                  p0047 A82-35056
LININGS
                                                                                   Rensable rocket engine maintenance study
    analytical and experimental investigation of the
                                                                                     [ NASA-CR-165569]
                                                                                                                                 p0044 N82-16172
```

propagation and attenuation of sound in extended

```
Low-thrust Isp sensitivity study
                                                                                 LOW TEMPERATURE ENVIRONMENTS
      [ NASA-CR- 165621]
                                                    p0045 N82-2230$
                                                                                    Experimental study of fuel heating at low temperatures in a wing tank model, volume
LIQUID BOCKET PROPELLANTS
 NT CRYOGERIC ROCKET PROPELLANTS.
                                                                                       [ NASA-CR-165391 ]
                                                                                                                                    p0073 N82-11224
 NT AIGUID PHELS
NT AP-1 BOCKET PROPELLANTS
                                                                                    On the cause of the flat-spot phenomenon observed in silicon solar cells at low temperatures and
LIQUID SURFACES
                                                                                       low intensities
    Hydrodynamic and aerodynamic breakup of liquid
                                                                                       [ NASA-TH-82903]
                                                                                                                                     p0126 N82-31777
                                                                                 LOW TEMPERATURE TESTS
      sheets
      [ NASA-TH-82900 ]
                                                                                    On the cause of the flat-spot phenomenon observed
                                                    p0087 N82-19494
LIQUID-GAS MIXTURES
NT ABROSOLS
                                                                                       in silicon solar cells at low temperatures and
                                                                                       low intensities --- in deep space environments
LIQUID-SOLID INTERPACES
                                                                                                                                    p0043 A82-39599
    Heat transfer in cooled porous region with curved
                                                                                 LOW THRUST PROPULSION
                                                                                  NT ELECTRONACHERIC PROPULSION
NT SOLAR ELECTRIC PROPULSION
Propulsion system options for low-acceleration
      boundary
                                                    D0089 A82-14848
    Cauchy integral method for two-dimensional
      solidification interface shapes
                                                                                       orbit transfer [ATAN PAPER 82-1196]
                                                    P0089 A82-39899
                                                                                                                                    p0047 182-35056
LIQUIDS
                                                                                    Low-thrust chemical propulsion system pump
 NT CRYOGENIC ROCKET PROPELLANTS
                                                                                       technology
                                                                                       [ NASA-CR-165219]
 HT HYDRAULIC FLUIDS
                                                                                                                                    p0105 N82-13427
 NT LIQUID FUELS
NT LIQUID EXDROGEN
                                                                                    Low-thrust chemical propulsion system propellant expulsion and thermal conditioning study.
 NT LICUID OXIDIZERS
NT LIQUID OXYGEN
                                                                                        Executive summary
                                                                                    [NASA-CR-165622] p0045 N62-24287
Low-thrust chemical propulsion system propellant
expulsion and thermal conditioning study
 NT RP-1 ROCKET PROPELLANTS
LIG
U QUEFIED NATURAL GAS
LOAD DISTRIBUTION (FORCES)
Strength distributions of SiC ceramics after
oxidation and oxidation under load
                                                                                                                                     p0045 M82-24268
                                                                                       [NASA-CR-167841]
                                                                                 LOW WEIGHT
                                                                                    A new approach to the minimum weight/loss design
                                                                                       of switching power converters
      [ ACS PAPER 9-C-BOC ]
                                                    p0071 A82-20143
                                                                                                                                     p0082 A82-16831
LOAD PACTORS
                                                                                 LOY (OXYGEN)
 U ACS (FORCES)
                                                                                  U QUID OXYGEN
LOAD TESTING MACHINES
                                                                                 LOX-HYDROGEN ENGINES
    Application of a gripping system to test a uniaxial graphite fiber reinforced composite /FMR 15/Celion 6000/ in tension at 316 C
                                                                                  U DROGEN OXYGEN ENGINES
                                                                                 LUBRICARTS
                                                                                  NT HIGH TEMPERATURE LUBRICANTS
NT LUBRICATING OILS
                                                    p0051 A82-40796
                                                                                  MT SOLID LUBRICANTS
Alignment of fluid molecules in an EHD contact
LOAD TESTS
    Indentation law for composite laminates
      [ NASA-CR- 165460]
                                                    p0052 NB2-15123
                                                                                       [ASLE PREPRINT 81-LC-5C-1]
                                                                                                                                    p0107 A82-18467
LOADING FORCES
                                                                                     Traction contact performance evaluation at high
U ALS (FORCES)
LOADING WAVES
U ASTIC WAVES
                                                                                       speeds
                                                                                       [ NASA-CR-165226]
                                                                                                                                     p0105 N82-16409
                                                                                    Thermal and oxidative degradation studies of formulated C-ethers by gel-permeation
U ADS (FORCES)
                                                                                       chromatography
 NT AERODYNAMIC LOADS
                                                                                       [ NASA-TP- 1994]
                                                                                                                                     p0068 ¥82-21332
 NT AXIAL COMPRESSION LOADS
                                                                                     Morphological and frictional behavior of sputtered
 NT AXIAL LOADS
                                                                                       Mos2 films
 NT COMPRESSION LOADS
                                                                                                                                     p0076 N82-22387
                                                                                       [NASA-TM-82809]
 NT DYNAMIC LOADS
                                                                                    Lubricant effects on efficiency of a helicopter
 NT EDGE LOADING
                                                                                       transmission
[NASA-TM-82857]
 NT BOLLING CONTACT LOADS
                                                                                                                                     p0100 N82-25520
 NT SHOCK LOADS
                                                                                 LUBRICATING OILS
 NT STATIC LOADS
                                                                                    Regimes of traction in concentrated contact
 NT THRUST LOADS
                                                                                       lubrication
Effect of seals on rotor systems
[NASA-TH-82786] p0099 N82-164
LOWG TERM EFFECTS
Survey on aging on electrodes and electrocatalysts
                                                                                       [ASHE PAPER BI-LUB-16]
                                                                                                                                     p0 107 A82-18431
                                                    p0099 N82-16411
                                                                                     Some observations in high pressure rheology of
                                                                                       lubricants
[ASME PAPER 81-LUB-17]
      in phosphoric acid fuel cells [NASA-CP-165505]
                                                                                     Some observations in high pressure rheology of
                                                    p0 128 N82-11545
                                                                                       1ubricants
LONG WAVES (METEOROLOGY)
U ANETARY WAVES
                                                                                       [ASME PAPER 81-LUB-17]
                                                                                                                                     p0070 A82-18432
                                                                                     Effects of ultra-clean and centrifugal filtration
                                                                                 on rolling-element bearing life [ASME PAPER 81-LUB-35]
LUBRICATION
LOSSLESS EATERIALS
    Conversion of acoustic energy by lossless liners
pf 154 A02-36195
                                                                                                                                     p0 103 A82-18436
                                                                                  NT EOUNDARY LUBRICATION
    Conversion and matched filter approximations for serial minimum-shift keyed modulation
                                                                                  NT SELF LUBRICATION
                                                                                    Application of surface analysis to solve problems
                                                    P0080 A82-26713
LOW PRESSURE
                                                                                       [NASA-TH-82753]
                                                                                                                                     p0099 N82-14519
    The CF6 jet engine performance improvement: Low pressure turbine active clearance control [NASA-CR-165557] p0029 N82-3
                                                                                     Elucidation of wear mechanisms by ferrographic
                                                                                       analysis
    [NASA-CR-165557] p0029 N82-33393
Energy efficient engine: Turbine transition duct
                                                                                    [NASA-TM-82737]
Basic lubrication equations
                                                                                                                                     p0066 N82-15199
      model technology report
                                                                                       [ NASA-TH-816931
                                                                                                                                     p0099 #82-16413
       [ HASA-CR- 167996]
                                                                                     Geometry and starvation effects in hydrodynamic
LOW TEMPERATURE
                                                                                       lubrication
    On the cause of the flat spot phenomenon observed in silicon solar cells at low temperatures and
                                                                                       [NASA-TM-82807]
                                                                                                                                     p0042 N82-20240
                                                                                     Prictional heating due to asperity interaction of
                                                                                       elastohydrodynamic line-contact surfaces
[NASA-TP-1882] p0100
       low intensities
   p0044 A82-44965
Additional experiments on flowability improvements
of aviation fuels at low temperatures, volume 2
[NASA-CR-167912] p0074 N82-31546
                                                                                    p0100 M82-25514
Lubrication of rigid ellipsida solids
[NASA-TH-81694]
```

ORIGINAL PAGE IS

File shape calculations on supercomputers [NASA-TH-82056] p0100 N82-25519 U ASTIC DEFORMATION LUMINESCENCE NT CHEMILUMINESCENCE LUBINESCENT INTENSITY

O MINOUS INTENSITY LUMINOUS PLUX DENSITY U MINOUS INTENSITY LUMINOUS INTENSITY On the cause of the flat spot phenomenon @bserved in silicon solar cells at low temperatures and low intensities p0044 A82-44965 LUMPED PARAMETER SYSTEMS
Comparison of NASCAP modelling results with lumped

circuit analysis

p0037 N82-14255

p0032 A82-35618

LUNAR CRATERS The development of central peaks in lunar craters LUBAR SCATTERING

U FEUSE RADIATION LUMAR SOIL A small scale lunar launcher for early lunar material utilization p0032 A82-35617 The supply of lunar oxygen to low earth orbit

LUMBE TRAJECTORIES NT MOCN-EARTH TRAJECTORIES

MACH MUMBER In-flight acoustic results from an advanced-design propeller at Hach numbers to C.R [AIAA FAPER 82-1120] p0021 882-35017 MACH-ZEHNDER INTERPEROMETERS New versions of old flow visualization systems p0096 N82-32670

MACHINE LIFE U RVICE LIFF BACHINE STORAGE II MPUTER STORAGE DEVICES HACHINE TOOLS

NT HILLING MACHINES MACHINERY

Precision of spiral-bevel gears [NASA-TH-82888] p0102 N82-30552

HAGNESIUM ALLOYS
Thermal degradation of the tensile properties of undirectionally reinforced PP-AI203/EZ 33 magnesium composites [NASA-TM-82817] p0049 N82-21260

Modulus, strength and thermal exposure studies of FP-Al203/aluminum and FP-Al203/magnesium composites

p0050 N82-30335

[HASA-TH- 82868]
HAGNESIUM COMPOUNDS
N# HAGNESIUM OXIDES MAGNESIUM OXIDES

Influence of mineral oil and additives on microhardness and surface chemistry of magnesium oxide (001) surface p0067 N82-20316

[NASA-TP-1986] p0067 Rffects of environment on microhardness of magnesium oxide

[NASA-TP-2002] [NASA-TP-2002] p0068 N82-22366 Influence of corrosive solutions on microhardness and chemistry of magnesium oxide /001/ surfaces [NASA-TP-2040] p0102 N82-31691

HAGNETIC AMPLIFIERS Three-dimensional relativistic field-electron

interaction in a multicavity high-power klystron. Part 2: Working Equations [NASA-TP-2008] p008 p0081 NB2-23397 MAGNETIC CHARGE DENSITY

Representation and material charging response of qeoplasma environments p0039 N82-14249

MAGNETIC DISTURBANCES

NT HAGNETIC STORMS
HAGNETIC FIELD CONFIGURATIONS

On a free-electron-laser in a uniform magnetic field - A solution for arbitrarily strong electromagnetic radiation fields

A82-28409

OF POOR QUALITY Electrostatic fuel conditioning of internal combustion engines [NASA-CR-169029] p0106 482-26680

MAGNETIC FIELDS NT GEONAGNETISM

NT SOLAR HAGNETIC FIELD Three-dimensional relativistic field-electron isteraction in a multicavity high-power klystron. 1: Basic theory [NASA-TP-1992] p008

p0081 N82-22439

Electric and magnetic fields [NASA-CR-165604]

p0045 N82-28350

MAGNETIC METALS U TALS

MAGNETIC PROPERTIES

NT GEOMAGNETISM

Permanent magnet properties of Mn-Al-C between -50 C and +150 C

p0085 A82-20505

MAGNETIC PUMPING

Magnetic heat pumping (NASA-CASE-LEW-12508-3]

n0088 N82-24449

Magnetic structure of a flaring region producing impulsive microwave and hard X-ray bursts p0 167 A82-27323

Environmentally induced discharges on satellites [NASA-TM-82849]

WAGNETIC SUBSTORMS U GNETIC STORMS WAGNETIC VARIATIONS

An attempt at magnetic-variation sounding in the Antarctic

MAGNETOGASDYNAMICS U GNETOHYDRODYNAMICS

HAGNETOGRAMS
U GNZTIC SIGNATURES
MAGNETOHYDRODYNAMIC ACCELERATION

U ASMA ACCELERATION

MAGNETOHYDRODYNAMIC GENERATORS

End region and current consolidation effects upon the performance of an MHD channel for the ETP conceptual design --- Engineering Test Facility [AIAA PAPER 82-0325] p0 157 A82-17889

Conceptual design --- Engineering Test Facility
[AIAA PAPER 82-0325]
Impact of uniform electrode current distribution
on ETF --- Engineering Test Facility MHD generator
[AIAA PAPER 82-0423]
Effect of vacuum exhaust pressure on the
performance of MHD ducts at high B-field
[AIAA PAPER 82-0396]

[Conservative adults of COMMA power blant area.

Comparative analysis of CCMHD power plants ---Closed Cycle HHD

p0158 A82-20747 MHD channel performance for potential early commercial MHD power plants

PO 158 A82-20750 Modeling parameter influences on MHD swirl

combustion nozzle design p0011 A82-31947 [AIAA PAPER 82-0984]

Flow aerodynamics modeling of an MHD swirl combustor - Calculations and experimental

verification

p0094 A82-44782 Haqnetohydrodynamics MHD Engineering Test Facility ETF 200 MWe power plant. Conceptual Design Engineering Report CDER. Volume 3: Costs and schedules p0128 N82-10495

[NASA-CR-165452-VOL-3] p0128 N8 Magnetohydrodynamics (MHD) Engineering Test Facility (ETP) 200 NWe power plant. Design Requirements Document (DRD)

[NASA-TM-82705] p0099 N82-12446

Magnetohydrodynamics (MHD) Engineering Test
Facility (ETP) 200 MWe power plant. Conceptual
Design Engineering Report (CDER). Volume 1:

Executive Summary
[NASA-CR-165452-VOL-1] p0129 H82-12570
End region and current consolidation effects upon the performance of an MHD channel for the ETF

conceptual design [NASA-TM-82744] p0157 N82-12943 Conceptual design of superconducting magnet system for Hagnetohydrodynamic (MHD) Engineering Test Facility (ETP) 200 NWe power plant [NASA-CR-165053] p0 105 N82 14

p0 105 N82 14520

heater study

ORIGINAL PAGE IS OF POOR QUALITY

SUBJECT INDEX

f. 10 m 2 m 1 d f 1 f f 1 f f 1 f 1 f 1 f 1 f 1 f 1	
[NASA-CR-165453] PO 131 NB2-15527	MAPS
Summary and evaluation of the conceptual design	NT ASTRONOMICAL MAPS
study of a potential early commercial MHD power	MADA MGONI CONANCIION
plant (CSPRC)	Nonlinear Marangoni convection in bounded layers.
[NASA-TM-82734] p0 1 19 N82- 1648 J	I - Circular cylindrical containers. II -
Magnetohydrodynamics (MHD) Engineering Test	Rectangular cylindrical containers
Facility (ETF) 200 HWe power plant Conceptual	p0094 A82-39501
nesign Engineering Report (CDER)	HARKET RESEARCE
[NASA-CP-165452-VOL-5] p0 132 N82-17603	
	Market assessment of photovoltaic power systems
Impact of uniform electrode current distribution	for agricultural applications in Mexico
on ETF	[NASA-CR-165441] p0128 N82-10506
[NASA-TM-82075] pp.123 N82-25636	Narket assessment of photovoltaic power systems
Optimization of the oxidant supply system for	for agricultural applications in Morocco
combined cycle MRD power plants	
	[NASA-CR-165477] p0 130 N82-14627
[NASA-TM-82909] p0123 N82-26790	International market assessment of stand-alone
Magnetohydrodynamics (MHD) Engineering Test	photovoltaic power systems for cottage industry
Facility (ETP) 200 MVe power plant. Conceptual	applications
Design Engineering Report (CDER). Volume 2:	[NASA-CR-165287] p0132 N82-16494
Profinering Value 2. Code and schooling	
Engineering. Volume 3: Costs and schedules	Cross-impact study of foreign satellite
TNASA-CR-165452-VOL-2] pp 136 NB2-27937	communications on NASA's 30/20 GHz program
Comparative analysis of the conceptual design	[NASA-CR-165154] p0078 N82-17420
studies of potential early commercial MHD power	Market assessment of photovoltaic power systems
plants (CSPEC)	for agricultural applications in Nigeria
[NASA-TM-82897] P0123 N82-27838	
	[NASA-CR-165511] p0 (33 N82-18698
HAGNET ON YD BODY WANIC TURBUL ENCE	Market assessment of photovoltaic power systems
NT PLASMA TURBULFNCE	for agricultural applications in Colombia
HAGNET OHYD BODY WANIC WAVES	[NASA-CR-165524] p0134 N82-22770
NT PLASMA WAVUS	Worldwide satellite market demand forecast
MAGNETOHYDRODYNAMICS	File and 1/20 to 2
	[MASA-CR-167918] p0079 N82-25423
NT CYLINDRICAL PLASMAS	MASER RESONATORS
Characterization of advanced electric propulsion	U SERS
systems	HASERS
[ATAA PAPER 82-1246] p0071 A82-35083	Investigation of a comb-type slow-wave structure
Effect of vacuum exhaust pressure on the	
	for millimeter-wave masers
performance of MHD ducts at high D-field	A82-18368
[NASA-TH-82750] p0157 N82-13908	HASS DRIVERS (PAYLOAD DELIVERY)
Magnetohydrodynamics (MHD) Engineering Test	Mass Driver Two - A status report
Facility (ETF) 200 NWe power plant. Conceptual	p0046 A82=18191
pesign Engineering Report (CDER), Volume 4:	Mass driver reaction engine characteristics and
Supplementary engineering data	performance in earth orbital transfer missions
[NASA-CF-165452-VOL-4] PO 133 N82-18688	p0046 A82-18199
Results and comparison of Hall and DW duct	Characterization of advanced electric propulsion
experiments	systems
[NA SA-TM-82864] po 157 N82-2596]	
MICHARD DATE TO DESCRIPTION TO THE STATE OF	[AIAA PAPER 82-1246] p0071 A82-35083
HAGUETOIONIC PLASMA	A small scale lunar launcher for early lunar
U ASMAS (PHYSICS)	material utilization
HAGNETOPLASHAS	p0032 x82-35617
U ASMAS (PHYSICS)	Characterization of advanced electric propulsion
BAGBETOSPHERIC ION DENSITY	
	systems
The hidden ion population of the magnetosphere	[NASA-CR-167885] p0045 N82-26381
p0 140 A82-32630	BASS FLOW RATE
HAGUETRONS	Three dimensional flow measurements in a turbine
The use of a structural method to calculate the	scroll
electrostatic field of a magnetron	[NASA-CR-167920] p0009 N82-32310
A 62- 18370	
	HASS TRANSFER
MAGNETS	Mass and womentum turbulent transport experiments
NT ELECTROMAGNETS	with confined coaxial jets
NT SUPERCONDUCTING MAGNETS	[NASA-CR-165574] p0090 N82-19496
Hard permanent magnet development trends and their	HATCHED FILTERS
application to A.C. machines	Conversion and matched filter approximations for
p0083 A82-20745	
p0003 A02-20743	serial minimum-shift keyed modulation
HAN HACHINE SYSTEMS	p0080 A82-26713
The NASA MERIT program - Developing new concepts	Near optimum delay-line detection filters for
for accurate flight planning	serial detection of MSK signals
[AIAA PAPER 82-0340] p0014 A82-17894	p0086 A82-43867
HAWAGEBERT	HATERIALS HANDLING
NT INFOGMATION MANAGEMENT	NT PROPELLANT TRANSPER
HANBUVERS	NT RENOTE HANDLING
NT AIRCRAFT MANETVERS	HATEBIALS SCIENCE
HANGANESE ALLOYS	Materials science issues encountered during the
Permanent magnet properties of Mn-A1-C between -50	development of thermochemical concepts in
C and +150 C	screening of reactions for solar energy
p0085 A82-20505	applications
HANIPOLDS	X82-10021
Active clearance control system for a turbomachine	HATHEHATICAL LOGIC
[NASA-CASE-LEW-12938-1] p0020 N82-32366	NT ALGORITHMS
MANNED SPACECRAPT	MATHEMATICAL MODELS
	NT ANALOG SIMULATION
HANUALS	NT DIGITAL SIMULATION
NT USER MANUALS (COMPUTER PROGRAMS)	Model degradation effects on sensor failure
MANUFACTURING	
	detection
NT SPACE MANUFACTURING	n0148 AR2-13143
NT SPACE MANUFACTURING	n0148 AR2-13143
NT SPACE MANUFACTURING MAPPING	p0148 A82-13143
NT SPACE MANUFACTURING MAPPING NT THEMATIC MAPPING	Bootstrap' charging of surfaces composed of
NT SPACE MANUFACTURING MAPPING NT THEMATIC MAPPING NT THEMAL MAPPING	p0148 A82-13143 Bootstrap charging of surfaces composed of multiple materials
NT SPACE MANUFACTURING HAPPING HT THEMATIC MAPPING HT THERMAL MAPPING	p0148 A82-13143 Bootstrap charging of surfaces composed of multiple materials
NT SPACE MANUFACTURING MAPPING NT THEMATIC MAPPING	p0148 A82-13143 Bootstrap charging of surfaces composed of multiple materials

in mean in precipitation series

```
Performance degradation of propeller/rotor systems
                                                                                    Laser anemometer using a Fabry-Perot
      dun to rime ice accretion
                                                                                       interferemeter for measuring mean velocity and
      [ ATAA PAPER 82-0286]
                                                   p0014 A82-28322
                                                                                       turbulence intensity along the optical axis is
                                                                                turbomachinery
[NASA-TH-82841]
MEASURE AND INTEGRATION
NT J INTEGRAL
    Numerical modeling of turbulent combustion in
                                                                                                                                    p0095 #82-28605
      premixed gases
    p0056 A82-28Mg8 Hodeling parameter influences on HHD swirl generates because
      combustion nozzle design
                                                                                 NY NUMERICAL INTEGRATION
    [AIAA PAPER 82-0904] p0011 A82-
Stationary state model for normal motal tunnel
                                                                                MEASURING INSTRUMENTS

NT DRAG FOECE AMENOMETERS

NT ENGINE HOMITORING INSTRUMENTS

NT FLOW DIRECTION INDICATORS
                                                    p0011 A82-31947
       function phonomena
                                                    p0159 A82-42912
                                                                                 NT FLOW DIRECTION INDICATORS

NT HOT-FILM AN EMOMETERS

NT HOT-WIRE AN IMMORETERS

NT HOT-WIRE FLOWMETERS

NT LASER ANEMOMETERS

NT LASER ANEMOMETERS

NT LASER DOPPLER VELOCIMETERS

NT MACH-ZSHNDER INTERFEROMETERS
    Surface-tonsion induced instabilities: Effects of
      lateral boundaries
       f NASA-CF- 1655301
                                                    p0092 N82-11390
    Integrated analysis of engine structures
                                                   p0111 N82-11491
      [ NASA-TH-82713]
    Numerical techniques in linear duct acoustics,
1980-81 update
[NASA-TH-82730] pn151 N62
                                                                                 NT OPTICAL MEASURING INSTRUMENTS
NT OPTICAL SCANNERS
                                                   pn 151 N82-12890
    A real time Pegasus propulsion system model for
      VSTOL piloted simulation evaluation
                                                                                 NT STRAIN GAGES
      [ NASA-TH-02770]
                                                   p0016 N82-13144
                                                                                 NT TORQUENETERS
    Modeling and Analysis of Power Processing Systems (MAPPS). Volume 1: Technical report [NASA-CR-165538] p0083 N82-14
                                                                                 NT ULTRASONIC DENSINETERS
                                                                                    An experimental investigation into the feasibility of a thormoolectric heat flux gage
                                                   20083 NB2-14447
    Finite-element modeling of layered, anisotropic composite plates and shells: A review of recent
                                                                                      [ NASA-TH-82755]
                                                                                                                                    00095 NB2-14494
                                                                                MECHANICAL DRVICES
                                                                                    Elucidation of wear mechanisms by ferrographic
                                                   p0113 N82-19563
                                                                                       analysis
    Identification of aultivariable high performance
                                                                                                                                    P0066 N82-15199
                                                                                       [ WASA-TA-82737]
      turbofan engine dynamics from closed loop data
[NASA-TH-82785] p0076 N82-20339
                                                                                    International market assessment of stand-alone
                                                                                       photovoltaic power systems for cottage industry
    Spherical relier bearing analysis. SKF computer program SPHFFREAN. Volume 1: Analysis
                                                                                       applications
                                                                                       [ NASA-CR-165287]
                                                                                                                                    p0 132 882-16494
                                                                                    Precision of spiral-bevel gears
      T NASA-CR- 1652031
                                                   p0 106 N82-20540
    Analytical investigation of nenrecoverable stall
                                                                                      [ MASA-TM-82888]
                                                                                                                                    p0 10 2 N82-30552
      [ NASA-TH-82792]
                                                    p00 18 N82-21195
                                                                                MECHANICAL DRIVES
    The NASA-Lord wind turbing sound prediction code
                                                                                 NT TRANSHISSIONS (MACRIME ELEMENTS)
   p0 123 N82-23730
Computer modeling of multiple-channel input
signals and intermedulation losses caused by
                                                                                    Low-thrust chemical propulsion system pump
                                                                                       technology
[NASA-CR-165219]
                                                                                                                                    p0 105 N82-13427
      nonlinear traveling wave tube amplifiers
                                                                                    The ac propulsion system for an electric vehicle,
    phase I
                                                                                       [ NASA-CR-165480]
                                                                                    Traction contact performance evaluation at high
NATHIEU EQUATION
                                                                                       apooda
                                                                                                                                    p0105 N82-16409
 U THIER PUNCTION
                                                                                       [NASA-CR-165226]
                                                                                    Advanced general aviation comparative
engine/airframe integration study
[NASA-CR-165564]
HATRIEU FUNCTION
    The influence of Coriolis forces on gyroscopic
      motion of spinning blades
[ASHE PAPER 82-GT-163]
                                                                                                                                    p0025 N82-22263
                                                                                    Kinematic precision of gear trains [NASA-TH-62887]
                                                    p0030 A82-35384
                                                                                                                                    p0102 N82-32733
MATRICES (CIRCUITS)
Dynamic switch matrix for the TDMA satellite switching system
[AIAA 92-0458] p0085 AMATRICES (MATHEMATICS)
HT FIGENVALUES
HT EIGENVECTORS
                                                                                    Automotive Stirling Engine Hod | Design Review,
                                                                                       volumo 3 --- engineering drawings [NASA-CR-167397]
                                                                                                                                    D0164 N82-34312
                                                    p0085 A82-23494
                                                                                MECHANICAL ENGINEERING
                                                                                    Bibliography of Lewis Research Center technical
                                                                                       publications announced in 1981
                                                                                       [ NASA-TH-82838]
    Verification of an acoustic transmission matrix
                                                                                                                                    p0163 N82-27191
      analysis of sound propagation in a variable area
                                                                                MECHANICAL MEASUREMENT
      duct without flow
                                                                                 NT DISPLACEMENT MEASUREMENT
[NASA-TH-82741]
HATRIX ANALYSIS
U TRICES (MATHEMATICS)
HATRIX HATERIALS
                                                                                 NT FLOW MEASUREMENT
NT PRESSURE MEASUREMENT
NT STRESS HEASUREMENT
NT VELOCITY MEASUREMENT
                                                    p0151 N82-12891
    High-temperature resins
                                                                                MECHANICAL PROPERTIES
                                                    p0051 A82-42657
                                                                                  NT ABROELASTICITY
    Modulus, strength and thermal exposure studies of
                                                                                  NT BRITTLENESS
      FF-A1203/aluminum and FF-A1203/magnesium
                                                                                  NT COMPRESSIVE STRENGTH
      composites
                                                                                 NT CREEP PROPERTIES
NT CREEP RUPTURE STRENGTH
[ NASA-TM-82868]
HAXIHUM ENTROPY RETHOD
                                                    p0050 N82-30335
                                                                                 NT DUCTILITY
NT ELASTIC PROPERTIES
    Maximum entropy image reconstruction from
                                                                                     ELASTOPLASTICITY
      projections
                                                                                  NT
                                                                                  NT FATIGUE LIFE
MAXWELL EQUATION
                                                                                  NT FIBER STRENGTH
    Simulation of charging response of SCATHA (P78-2)
                                                                                  NT FRACTURE STRENGTH
      satellito
                                                                                  NT MICROHARDNESS
                                                    p0039 N82-14250
                                                                                  NT MODULUS OF ELASTICITY
NT NOTCH STRENGTH
HCDONNELL AIRCRAFT
 NT EC 10 AERCRAPT
                                                                                  NT PIEZOBLECTRICITY
HCDONNELL DOUGLAS ATRCRATT
                                                                                  NT PLASTIC PROPERTIES
                                                                                  NT POISSON RATIO
 NT EC 9 AIRCRAFT
 NT EC 10 ATRCRAFT
                                                                                  NT SHEAR CREEP
                                                                                 NT SHEAR PROPERTIES
NT SHEAR STRENGTH
HEAN
    Illustration of a new test for detecting a shift
```

A82-13217

NT STIFFNESS

NT STRESS CYCLES

```
NT TENSILE PROPERTIES
NT TENSILE STRENGTH
NT THERMAL PRISTANCE
                                                                                                                         p0108 A82-27079
                                                                             Cesiation of W/001/ - Work function lowering by
                                                                               multiple dipole formation
                                                                                                                                 A82-30002
 NT THERMOPLASTICITY
 NT THERMOVISCOELASTICITY
                                                                             Progress in protective coatings for aircraft gas
                                                                               turbines: A Review of NASA sponsored research [NASA-TM-82740] p0058 N82-12216
 NT VISCOPLASTICITY
NT VISCOPLASTICITY
   Patique of Ni-Al-Mo aligned eutectics at elevated
                                                                             Method and apparatus for coating substrates using
     temperatures
                                                                               lasers
                                               p0052 A82-13403
                                                                               [ NASA-CASE-LEW- 13526-1]
                                                                                                                         p0059 #82-22347
   Effects of nadic ester concentration and
                                                                             Light weight nickel battery plaque
     processing on physical and mechanical properties of PMB/Celion 6000 composites
                                                                               [NASA-CASE-LEW-13349-1]
                                                                                                                         p0121 #82-22673
                                                                             Improved thermal barrier coating system
                                                                                                                         p0060 W82-26431
                                               p0051 A82-27440
                                                                         [NASA-CASE-LEW-13324-1]
   Effects of cobalt on structure, microchemistry and properties of a wrought nickel-base superalloy
                                                                          U RROSION
                                               P0065 A82-34973
                                                                          METAL CUTTING
                                                                             The orthogonal in-situ machining of single and
   Winding for the wind
                                               F1138 A82-37078
                                                                               polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] p0076 N82-24361
                                                                         [NASA-CR-168929]
   Effects of heating rate on density,
microstructure, and strength of Si3N -6 vt.%
Y203 and a beta-prime sialon
[ACS PAPER 42-B-81] p0070 &82
                                                                             Comparative thermal fatigue resistance of several oxide dispersion strengthened alloys
                                               p0070 182-42366
   Technology development for phosphoric acid fuel cell powerplant, phase 2
[NASA-CR-165426] p0131 N82-
                                                                                                                         P0062 A82-11399
                                                                             Patique and creep-fatique deformation of several
                                                                               nickel-base superalloys at 650 C
                                               DO 131 N82-16482
                                                                                                                          p0062 A82-47398
HECHANICAL RESONANCE
 U SONANT VIBRATION
                                                                             Elevated temperature fatique testing of metals
                                                                                                                         p0058 H82-13284
RECHARICAL TWINNING
   Effect of melt stoichiometry on twin formation in IFC Gahs --- Liquid Encapsulated Czochralski
                                                                             Patique tests with a corrosive environment
                                                                                                                                 NB2-13282
     technique
                                                                             Evaluation of inelastic constitutive models for
                                                                               nonlinear structural analysis --- for aircraft
                                               p0 160 A82-46517
HEDIA
                                                                                turbine engines
 NT ENISOTROPIC HEDIA
                                                                                [NASA-TH-82845]
                                                                                                                          p0112 N82-24502
 NT ELASTIC MEDIA
                                                                             High temperature low cycle fatique mechanisms for
REDICAL EQUIPMENT
                                                                               nickel base and a capper base alloy
 NT ELCOD PUMPS
NT PROSTHETIC DEVICES
                                                                             [NASA-CR-3543] p0064 N82-26436
Microstructural effects on the room and elevated,
temperature low cycle fatigue behavior of Waspaloy
                                                                                                                         p0064 N82-26436
HEDICAL SCIENCE
 NT OPHTRALMOLOGY
                                                                                [ NASA-CR-165497]
                                                                                                                         p0113 N82-26702
   Ozone and aircraft operations
                                                                             Mechanisms of deformation and fracture in high
                                               p0001 N82-21145
                                                                                temperature low cycle fatigue of Rene 80 and IN
MERTINGS
                                                                                100
 U NEEFENCES
                                                                          [NASA-CR-165498]
                                                                                                                          n0113 NB2-26706
MELTING
   Numerical simulation of one-dimensional heat
transfer in composite bodies with phase change
                                                                             Tribological properties and KPS studies of ion plated gold on nickel and iron
     --- wing deicing pads
[NASA-CR-165607]
                                                                                [ NASA-TM-82814]
                                                                                                                          p0059 N82-22344
                                               p0002 N82-22142
                                                                             Boundary lubrication: Revisited
HELTS (CRYSTAL GROWTH)
                                                                               [NASA-TH-82858]
                                                                                                                          p0069 N82-29458
                                                                          METAL FINISHING
NT SHOT PERNING
   Compensation mechanism in liquid encapsulated
     Czochralski Gals Importance of melt stoichiometry
                                                                          METAL FOILS
   p0086 A82-40403
Effect of melt stoichiometry on twin formation in
                                                                             Metal honeycomb to porous wireform substrate
     LEC Gaks --- Liquid Encapsulated Czochralski
                                                                               diffusion bond evaluation
      technique
                                                                               [NASA-TM-82793]
                                                                                                                          p0110 N82-18612
                                               p0160 A82-46517
                                                                          METAL HALIDES
                                                                          NT IRON CHLORIDES
NT SODIUM CHLORIDES
METAL INSULATOR SEMICOMOUCTORS
REBERRE ANALOGY
 U RUCTURAL LNALYSIS
SEBBRANE THEORY
 U RUCTURAL ANALYSIS
                                                                           U S (SEMICONDUCTORS)
BEBBBANES
                                                                          BETAL MATRIX COMPOSITES
 NT ION EXCHANGE MEMBRANE ELECTROLYTES
                                                                           NT EUTECTIC COMPOSITES
   Anion permselective membrane
                                                                             Work of fracture in aluminum metal-matrix composites
                                                                             p0053 182-31339
Tensile properties of SiC/aluminum filamentary
     [ NASA-CF- 167872]
                                                p0137 N82-30711
BERCURY ION ENGINES
   30-cm mercury ion thruster technology
                                                                                composites - Thermal degradation effects
                                                                                                                          p0053 A82-46220
                                               p0046 A82-15434
    Measuring the spacecraft and environmental
                                                                             Analysis of crack propagation as an energy absorption mechanism in metal matrix composites
      interactions of the 8-cm mercury ion thrusters
                                                                                                                          p0052 #82-14288
      on the P80-1 mission
                                                                                [HASA-CR-165051]
                                               p0043 A82-15438
                                                                             Tungsten fiber reinforced superalloy composite
    Retrofit and acceptance test of 30-cm ion thrusters
                                                                                high temperature component design considerations
     [ HASA-CR- 1652591
                                                                                                                          P0049 N82-21259
                                               p0044 N82-12133
                                                                                [NASA-TH-82811]
                                                                             Pactors influencing the thermally-induced strength degradation of B/Al composites [NASA-TH-82823] p0050 N82-2429
HESPET
 U FLD EFFECT TRANSISTORS
M250SP HERE
                                                                                                                          p0050 N82-24297
   Stratospheric-mesospheric midwinter disturbances -
                                                                             Method and apparatus for strengthening boron fibers
      A summary of observed characteristics
                                                                                 -- high temperature oxidation
                                                                                [ NASA-CASE-LEW- 13826- 1]
                                                                                                                          p0050 N82-26385
                                                       A82-12135
SETAL COATINGS
                                                                              High temperature composites. Status and future
 NT ALUMINUM COATINGS
                                                                                directions
                                                                          [NASA-TM-82929]
HETAL OXIDE SENICONDUCTORS
 NT GOLD COATINGS
                                                                                                                          p0051 N82-30336
   Improved plasma sprayed MCrAly coatings for
      aircraft gas turbine applications
                                                                             High voltage V-groove solar cell
[NASA-CASE-LEW-13401-2]
                                               p0065 A82-20742
                                                                                                                          p0123 N82~24717
```

METAL OXIDES

NT ALUMINUM OXIDES

Development of CdC-graphite-Ag coatings for gas

hearings to 427 C

```
NT BAGNESTUN OXIDES
 NT TIN OXIDES
NT YTRIUM CXIDES
 NT ZTROONIUM OXIDES
   Comparative thermal fatigue resistance of several
     oxide dispersion strengthened alloys
                                                  p0062 A82-11399
   Development of CdO-graphite-Ag coatings for gas
     hearings to 427 C
                                                  PO 108 A82-2,1179
   Crystallographic texture in
     oxide-dispersion-strengthened alloys
                                                  p0062 A82-40041
BETAL PARTICLES
 NT METAL FOWDER
METAL POLISHING
   Strength advantages of chemically polished boron fibers before and after reaction with aluminum [NASA-TH-82806] p0049 N82-21
                                                  p0049 N82-21258
BRTAL POWDER
   Development of materials and process technology
     for dual alloy disks
[NASA-CP-165224]
                                                  p0063 N82-18370
METAL SURFACES
   Single pass rub phenomena - Analysis and experiment
   [ ASME PAPER PI-LUB-55] P0107 A82-
Cesiation of 9/001/ - Work function lowering by
                                                 p0 107 A82-18449
      multiple dipole formation
                                                         182-30002
   Detection of a change in the oxidation state on
     aluminum surface using angular correlation of
      positron annihilation radiation
                                                          182-30374
   Stationary state model for normal metal tunnel
      junction phenomena
                                                  p0159 A82-42912
   Universal binding energy relations in metallic
      adhesion
      TNASA-TF-827067
   Investigation into the role of NaCl deposited on
      oxide and metal substrates in the initiation of
     hot corrosion
[NASA-CR-165029]
                                                  p0063 N82-13217
   Gas turbine ceramic-coated-vane concept with convection-cooled porous metal core
      [ NASA-TP- 1942]
                                                  p0016 N82-14090
   Friction and wear of iron in corrosive metal
     [ NASA-TP- 1985]
                                                  p0058 N82-2029 I
   A study of the nature of solid particle impact and shape on the erosion morphology of ductile metals [KASA-TM-82933] p006! N82-3349
                                                  p0061 N82-33493
   Overlay metallic-cermet allcy coating systems ---
     for gas turbine engines
[NASA-CASE-LEW-13639-1]
                                                  p0070 N82-33522
HETAL WHISKER BEINFORCENSHT
U ISKER COMPOSITES
   Priction and surface chemistry of some forrous-base metallic classes
   [ NASA-TP-1991] p0059 N82-21301
Surface chemistry, microstructure and friction
     T NASA-TP- 1991 ]
      properties of some ferrous-base metallic glasses at temperatures to 750 C
      [ NASA-TP- 2006]
                                                  p0060 N82-22349
ERTALLIZING
   Advances in high output voltage silicon solar cells
                                                  p0127 A82-44942
   The influence of gamma prime on the recrystallization of an oxide dispersion strengthened superalloy - HA 6000E
                                                 p0062 182-47393
   Microstructural effects on the room and elevated
     temperature low cycle fatigue behavior of Waspaloy [NASA-CR-1654971 p0113 N82-26702
METALLOIDS
NT SILICON
METALLORGANIC COMPOUNDS
 U GANCHETALLIC COMPOUNDS
BETALS
 NT ALUMINUM
 NT ALGMINUM COATINGS
 NT CESIUM
NT CHFOMIUM
 HT COBALT
```

NT FERROUS METALS

NT GOLD CONTINGS

NT GOLD

NT INCIUM

```
NT IRON
 NT METAL COATINGS
NT METAL PILMS
 NT METAL POILS
 NT METAL HATRIX COMPOSITES
 NT METAL POWDER
NT NIOBIUM
NT PLATINUM
 NT PLATINUM ISOTOPES
 NT PLUTONIUM 244
 NT TANTALUM
 NT TITANIUM
 NT TRANSITION METALS
 NT TUNGSTEN
 NT ZINC
 NT ZIRCONIUM
   Correlation of tensile and shear strengths of
      metals with their friction properties [NASA-TM-82828]
                                                 P0060 NB2-24325
METEORITE COMPRESSION TESTS
U CHANICAL PROPERTIES
METEORITE CRATERS
    The development of central peaks in lunar craters
METEORITES
 NT CARBONACEOUS CHONDRITES
METEOROID CRATERS
 U TEORITE CRATERS
METEOROLOGY
NT WEATHER FORECASTING
METERS
 U ASURING INSTRUMENTS
   Low-thrust Isp sensitivity study
[NASA-CR-165621]
METHOD OF CHARACTERISTICS
                                                  p0045 N82-22309
   Design of supercritical cascades with high solidity [NASA-CR-165600] p0007 N82-22210
MEXICO
   Market assessment of photovoltaic power systems
      for agricultural applications in Mexico
      [NASA-CR-165441]
                                                 PO 128 N82-10506
MICROCIRCUITS
 U CROELECTRONICS
MICROCOMPUTERS
   Real-time microcomputer simulation for space Shuttle/Centaur avionics
                                                 p0033 A82-48245
   Development report: Automatic System Test and Calibration (ASTAC) equipment
[NASA-CR-165403] p0129 N82-
                                                  p0129 N82-13505
MICROBLECTRONICS
   Proceedings of the Conference on High-temperature
      Electronics
      [NASA-TH-84069]
                                                  p0081 N82-15311
   Method of making a high voltage V-groove solar cell
[NASA-CASE-LEW-13401-1] p0124 N82-2970
                                                 p0124 N82-29709
HICHOHARDNESS
   Influence of mineral oil and additives on
      microhardness and surface chemistry of magnesium
   oxide (001) surface [NASA-TP-1986] p0067
Effects of environment on microhardness of
                                                  p0067 N82-20316
      magnesium oxide
[NASA-TP-2002]
   Influence of corrosive solutions on microhardness
      and chemistry of magnesium oxide /001/ surfaces
      [ NASA-TP-2040 ]
                                                 p0102 N82-31691
MICROINDENTATION
 U CROHARDNESS
MICROPROCESSORS
    Microprocessor control system for 200-kilowatt
      Hod-OA wind turbines
[NASA-TM-82711]
                                                  p0120 N82-21710
MICROSCOPES
HT ACOUSTIC MICROSCOPES
HT ION MICROSCOPES
MICROSCOPY
 NT ELECTRON MICROSCOPY
 NT LASER MICROSCOPY
MICROSTRUCTURE
   Quasi-liquid states observed on ion beam
      microtextured surfaces
                                                 p0159 A82-30335
   Effects of cobalt on structure, microchemistry and properties of a wrought nickel-base superalloy
                                                  p0065 A82-34973
   Effects of heating rate on density,
```

sicrostructure, and strength of Si3M4-6 vt. %

NT HICROWAVE EMISSION

NT MILLIMETER WAVES

```
Y203 and a beta-prime staton
[ACS PAPER 42-B-81] p0070
Structure and creep rupture properties of
                                                                                   MIDDLE ATROSPHERE
                                                     p0070 A82-42366
                                                                                    NT MESOSPHERE
NT STRATOSPHERE
      directionally solidified entectic
                                                                                   MIR SCATTERING
                                                                                    NT RAYLEIGH SCATTERING
      gamma/qumma-prime-alpha alloy
                                                     p0062 382-42774
                                                                                   MILLIMETER WAVES
                                                                                       Investigation of a comb-type slow-wave structure
   The influence of cobalt on the microstructure of
      the nickel-base superalloy MAR-M247
                                                                                          for millimeter-wave masers
                                                     60063 A82-47400
                                                                                                                                                 182-18368
    Ultrasonic velocity for estimating density of
                                                                                   MILLING MACHINES
      structural cerumics [NASA-TH-82765]
                                                                                       Operational performance of the photovoltaic-powered grain mill and water puse
                                                                                         at Tangaye, Upper Volta [NASA-TM-82767]
    Interrelation of material microstructure,
      ultrasonic factors, and fracture toughness of two phase titanium alloy
                                                                                                                                         p0120 N82-19673
                                                                                       Design description of the Tangaye Village photovoltaic power system [NASA-TH-82917] p012
   p0110 N82-20551
Surface chemistry, microstructure and friction
properties of some ferrous-base metallic glasses
at temperatures to 750 C
[NASH-TD-2065]
                                                                                                                                         p0126 N82-33828
                                                                                   MINERAL OILS
                                                                                       Influence of mineral oil and additives on
      [ NASA-TP-2006 ]
                                                                                          microhardness and surface chemistry of magnesium
                                                      p0060 N82-22349
    Microstructural effects on the rcom and elevated
                                                                                          oxide (001) surface
      temperature low cycle fatique behavior of Waspaloy [NASA-CR-165497] p0113 N82-26702
                                                                                          [ NASA-TP-1986 ]
                                                                                                                                         p0067 N82-20316
                                                                                   MINERALS
NT GRAPHITE
    Effects of cobalt on the microstructure of Udimet
                                                                                    NT QUARTZ
      [ NASA-CT- 165605]
                                                      p0064 N82-28409
                                                                                       Evidence for Pu-244 fission tracks in hibonites
    Ion beam microtoxturing and enhanced surface
                                                                                          from Murchison carbonaceous chondrite
      liffusion
                                                                                                                                         p0166 A82-29316
      [ NASA-CP-1679481
                                                      p0065 W82-31509
                                                                                   MIMES (EXCAVATIONS)
HICEOWAYE AMPLIFIERS
IMPATT power building blocks for 20 GHz spaceborne
                                                                                       LANDSAT Remote Sensing: Observations of an
                                                                                          Appalachian mountaintop surface coal mining and reclamation operation --- kentucky
      transmit amplifier [AIAA 82-0498]
                                                                                         [ E82-10247]
                                                      p0086 A82-23566
                                                                                                                                         p0117 N82-24525
MICROWAVE CIRCUITS
                                                                                   BIMIMIBATION
    Dynamic switch matrix for the TDMA satellite
                                                                                    U TIMIZATION
switching system [AIAA 82-0458] BICROWAYE BHISSION
                                                                                   MINING
                                                                                    NT STRIP MINING
Assessment of a 40-kilowatt stirling engine for
                                                      D0085 182-23494
    Magnetic structure of a flaring region producing
                                                                                          underground mining applications [MASA-TM-82822]
      impulsive microwave and hard X-ray bursts
                                                                                                                                         p0125 M82-30714
                                                                                   MIRRORS
                                                     p0167 A82-27323
HICROWAVE EQUIPMENT
                                                                                       Environmental effects on solar concentrator mirrors
 NT KLYSTRONS
 NT MAGNETRONS
                                                                                   MIS (SEMICONDUCTORS)
 NT MICROWAVE AMPLIFIERS
NT TRAVELING WAYS TUBES
                                                                                       Low temperature growth and electrical
characterization of insulators for GaAs MISPETS
[NASA-CR-164972] p0159 M82-11
    A new antenna concept for satellite communications
                                                                                                                                         DO 159 #82-11959
      [ NASA-CR- 167924]
                                                                                   MISSILE STABILIZATION
                                                     pCC79 N82-31584
BICBOWAVE FREQUENCIES
                                                                                    U ABILIZATION
NT EXTREMELY HIGH FREQUENCIES MICROWAVE SWITCHING
                                                                                   MIXING
                                                                                    NT PREMIXING
    Wideband, high speed switch matrix development for SS-TDMA applications
                                                                                    NT SIGNAL MIXING
                                                                                   NT SIGNAL GLAIGH

NT TURBULENT HIXING

BIXING LENGTH FLOW THEORY

Turbofan forced mixer-nozzle internal flowfield.

Volume 1: A benchmark experimental study

0000 N62-2
                                                      p0086 A82-43784
HICHOVAVE TRANSMISSION
    A review of transhorizon propagation phenomena
                                                                                       [NASA-CR-3492] p0090 N82-22458
Turbofan forced mixer-nozzle internal flowfield.
                                                      p0079 A82-10679
    30/20 GHz demonstration system for improving orbit
                                                                                       Tupocran forced mixer-nozzle internal flowfield.

Volume 2: Computational fluid dynamic predictions p009 N82-22459

Turbofan forced mixer-nozzle internal flowfield.

Volume 3: A computer code for 3-D mixing in axisymmetric nozzles
[NASA-CR-3494] p009 N82-22460
      utilization
                                                      p0080 A82-27189
    Microwave intersatellite links for communications
      satellites
                                                      n0036 A82-36925
    Analytic investigation of efficiency and
      performance limits in klystron amplifiers using
                                                                                   BITTURES
       multilimensional computer programs; multi-stage
                                                                                     NT APROSOLS
      depressed collectors; and thermionic cathode
                                                                                     NT AQUEOUS SOLUTIONS
                                                                                    NT EUTECTIC ALLOYS
NT GAS MIXTURES
NT METAL MATRIX COMPOSITES
      life studies
                                                      p0 1 18 N82- 12553
    The 30/20 GHz flight experiment system, phase 2. Volume !: Executive summary [NASA-CF-165409-VOL-1] p0C78 N82-2
                                                                                     NT SIALON
                                                                                       Characterization of an Experimental Referee
    The 30/20 GHz flight experiment system, phase 2. Volume 2: Experiment system description [NASA-CF-165409-VOL-2] p0078 N82-2
                                                                                          Broadened Specification (ERBS) aviation turbine
                                                                                          fuel and ERBS fuel blends
                                                     p0078 N82-20365
                                                                                          [NASA-TH-82883]
                                                                                                                                          p0072 N82-32504
    The 30/20 GHz flight experiment system, phase 2.
Volume 3: Experiment system requirement document
[NASA-CP-165409-VOL-3] p0C78 N82-2036
                                                                                    MOBILE COMMUNICATION SYSTEMS
                                                                                    NT LAND MOBILE SATELLITE SERVICE
                                                     POC78 N82-20364
                                                                                    HOBILITY
    The 30/20 GHz flight experiment system, phase 2.
                                                                                       Satellite-aided land mobile communications system
Volume 4: Experiment system development plan [NASA-CP-165409-VOL-4] p0078 N82-20365
                                                                                          implementation considerations
                                                                                          [ NASA-TH-8286 1]
                                                                                                                                          p0036 N82-25290
                                                                                    MODAL RESPONSE
 NT KLYSTRONS
NT MAGNETRONS
                                                                                       Advanced superposition methods for high speed
                                                                                   turbopump vibration analysis [NASA-CR-165379]
HODE OF VIBRATION
 NT TRAVELING WAVE TUBES
                                                                                                                                          DO104 N82-11465
BICROWAVES
 NT CENTIMETER WAVES
                                                                                    U BRATION MODE
```

HODE SHAPES

U DAL RESPONSE

```
HODELS
NT AIRCRAFT HODELS
NI AVALOG SIMULATION
NT DIGITAL STHULATION
NT ENVIRONMENT MODELS
NT HAJMHATICAL HODELS
 HT SCALE HODELS
 NT SPACICRAFT HODBLS
 HT WIND TUNNEL HODELS
HODES
 NT FAILURE MODES
NT PPCPAGATION HODES
NT VIERATION HODE
MODULATION
 KT PROUBNCY MODULATION
HT FREQUENCY SHIFT KEYING
HT INTERMODULATION
 NT FULSE DURATION HODULATICH
HODULES
NT ELECTRONIC MODULES HODULUS OF BLASTICITY
    Some observations in high pressure theology of
      lubricants
      CASME PAPER BI-LUD-171
                                                  p0070 A82-18432
    Some observations in high pressure rheology of
      lubricants
      [ ASHE PAPER 81-LUB-17]
                                                  D0070 A82-18432
   Crystallographic texture in oxide-dispersion-strongthened alloys
                                                  p0062 A82-40041
   The transmission or scattering of elastic waves by
      an inhomogenaity of simple quemetry:
      comparison of theories [NASA-CH-169034]
                                                  D0079 N82-26026
HOHB CIRCLES
 O ACTURE MECHANICS
HOISTURE
    Environmental effects on defect growth in
Confosite materials
[NASA-CF-165213]
HOISTURE CONTENT
                                                  p0052 N82-20248
    Water indestion into jet engine axial compressors
[AIAN PAPER 82-0196] p0030 A82-17836
MOLECULAR PUMPS
    Prossure pulsations above turbonclecular pumps
                                                  D0076 A82-46430
HOLECULAE SPECTRA
 HT RAMAN SPECTPA
SOLECULAR WEIGHT
    Effect of damma irradiation on the friction and woar of ultrahigh molecular weight polyethylene p0062 A82-10674
HOLIERE PORHULA
 U ATER DISTRIBUTION
HOLTEN SALT ELECTROLYTES
    Holerato temporature Na cells, IV - VS2 and
      NbS2C12 as rechargeable cathodes in molten NaALC14
                                                  n0055 N82-15743
MOLYBDENUM ALLOYS
    Structure and creep rupture properties of directionally solidified entection
      gamma/gamma-prime-alpha alloy
                                                  p0062 A82-42774
MOLYBORNUM SULFIDES
    Mcrchological and frictional behavior of sputtered
      MoS2 films
      [ NASA-TM-82809]
                                                  p0076 N82-22387
BORBUTS
 NT DENDING MOHENTS
 NT MEAN
 NT TOFQUE
BORENTUR TRANSFER
    Effacts of condensation and surface motion on the
      structure of steady-state fronts
                                                          A82-19360
    Mass and momentum turbulent transport experiments
      with confinud coaxial jets
      [ NASA-CP-165579]
                                                  P0090 N82-19496
HONOCRYSTALS
U NGLE CRYSTALS
HOMOLITHIC CIRCUITS
 U TEGRATED CIRCUITS
HONOHERS
   Oxidation and formation of deposit precursors in hydrocarbon fuels
[NASA-CR-165534] p0073 M82-#
                                                  p0073 N82-18402
HONCPROPELLANTS
 NT LICUID FUELS
```

```
MOON-MARTH TRAJECTORIES
    The supply of lunar oxygen to low earth orbit
                                                    p0032 AB2-35618
   Market assessment of photovoltaic power systems
      for agricultural applications in Horocco [NASA-CR-165477]
                                                   p0130 N82-14627
HORPHOLOGY
    Mechanism and models for zing metal morphology in
      alkaline media [NASA-TM-82768]
                                                   p0120 #82-19671
   Morphological and frictional behavior of sputtered MoS2 films
      [ NASA-TH-82809]
                                                    p0076 M82-22367
    Evaluation of left ventricular assist device pump
      bladders cast from ion-sputtered
       polytetrafluorethylene mandrels
                                                    p0142 #82-23976
[HASA-CR-167904]
 U TAL OXIDE SEMICONDUCTORS
BOSFET
 U BLD EFFECT TRANSISTORS
MOTION ROUATIONS
 U UNTIONS OF HOTION
BOTION STABILITY
 NT AERODYNAMIC STABILITY
NT BOUNDARY LAYER STABILITY
NT PLANE STABILITY
NT PLOW STABILITY
 MT GYROSCOPIC STABILITY
NT ROTARY STABILITY
BOTOR VEHICLES
 MT AUTOHOBILES
 NT ELECTRIC AUTOMOBILES
NT ELECTRIC MOTOR VEHICLES
HOTOES
 NT ELECTRIC MOTORS
 NT INDUCTION MOTORS
  NT SYNCHRONOUS MOTORS
MOUNTAINS
 NT APPALACSIAN MOUNTAINS (NORTH AMERICA)

Dynamics of snow cover in mountain regions of the Aral Sea basin, studied using satellite
       photographs
BULTICHANNEL COMMUNICATION
    A remote millivolt multiplexer and amplifier module for wind tunnel data acquisition
                                                    p0003 A82-41845
MULTILAYER STRUCTURES
U MINATES
MULTIPHASE FLOW
 NT TWO PHASE FLOW
MULTIPLE ACCESS
 HT PREQUENCY DIVISION MULTIPLE ACCESS
NT TIME DIVISION MULTIPLE ACCESS MULTIPLEX TRANSMISSION
 U LTIPLEXING
MULTIPLEXERS
 U LTIPLEXING
MOLTIPLEXING
    A remote millivolt multiplexer and amplifier
       module for wind tunnel data acquisition
                                                    p0083 A82-41845
MULTIPROPELLANTS
U CKET PROPELLANTS
MULTISTAGE COMPRESSORS
 U RBOCOMPRESSORS
MULTISTAGE ROCKET VEHICLES
NT ATLAS CENTAUR LAUNCH VEHICLE
    Fuel/oxidizer-rich high-pressure proburners ---
       staged-combustion rocket engine
       [NASA-CR-165404]
                                                    p0073 N82-10245
    Research report: User's manual for computer program AT81Y005. PLANETSYS, a computer program for the steady state and transient thermal analysis of a planetary power transmission system
       [ NASA-CH-165366]
                                                    p0146 N82-31970
MULTIVARIATE STATISTICAL ANALYSIS
 NT BIVARIATE ANALYSIS
    Identification of multivariable high performance
       turbofan engine dynamics from closed loop data
                                                    p0076 N82-20339
       F NASA-TM-827851
```

N

MACELLES

Low speed testing of the inlets designed for a tamden-fan V/STOL nacelle --- conducted in the

WICKEL ALLOYS

NT WASPALOY

NT UDIMET ALLOYS

```
Lewis 10 by 10 foot wind tunnel [NASA-TH-82728]
                                               p0003 N82-11042
   Thrust modulation methods for a subsonic V/STOL
     aircraft
     [ NASA-TH-82747]
                                               D0003 N82-13112
   Performance deterioration due to acceptance
     testing and flight loads; JT90 jet engine
     diaquostic program
     [ NASA-CR- 165572]
                                              p0027 N82-27309
   Advanced turboprop testbed systems study
                                               p0014 N82-33375
     [ NASA-CR- 167895]
HASA PROGRAMS
 MT SUPERSONIC CRUISE AIRCEAFT RESEARCH
   30/20 GHz demonstration system for improving orbit
     utilization
                                               p0080 A82-27189
   Levis Research Center's coal-fired,
                                            pressurized,
   fluidized-bed reactor test facility
[NASA-TH-81616]
Summary and recent results from the NASA advanced
High Speed Propeller Besearch Program
[NASA-TH-8289]
p0001 N82-262
                                               p0087 N82-11397
                                              p0001 NB2-26219
MASA STRUCTURAL AWALYSIS PROGRAM
U STRAN
HASTRAH
   On the automatic generation of FEM models for complex gears - A work-in-progress report
                                               p0 109 A82-48243
   Large displacements and stability analysis of
     ncnlinear propeller structures
[NASA-TH-82850]
                                               p0112 #82-31707
BATIONS
NT DEVELOPING NATIONS
NATURAL PREQUENCIES
 U SONANT PREQUENCIES
MATURAL GAS
 NT LICURPIED NATURAL GAS
NATURAL SATELY. ITES
   Potentials of surfaces in space
                                               p0165 A82=23750
WAVIER-STOKES EQUATION
   A simple finite difference procedure for the vortex controlled diffuser
   [AIAA PAPER 82-0109] p0030 A82-17788 Solutions of the compressible Navier-Stokes
     equations using the integral method [ATAA PAPER 81-0046]
                                               p0093 182-23832
   Multigrid simulation of asymptotic curved-duct flows using a semi-implicit numerical technique
                                               p0010 A82-29003
   Basic lubrication equations [NASA-TM-81693]
                                               p0099 N82-16413
   Turbulent solution of the Navier-Stokes equations
     for uniform shear flow
     [ NASA-TM-82925]
                                               p0089 N82-32634
BEAR WAKES
   Measurement and prediction of mean velocity and
     turbulence structure in the near wake of an
     airfoil
                                               p0010 A82-26137
MRTWORK AWALYSIS
   Analysis and design of a standardized control
     nodule for switching regulators
                                               D0083 A82-46388
BETWORK SYNTHESIS
   A new approach to the minimum weight/loss design
     of switching power converters
                                               p0082 A82-16831
   Power system design optimization using Lagrange
     multiplier techniques
                                               p0C85 A82-20743
   A 10-kW series resonant converter design,
      transistor characterization, and base-drive
     optimization
                                               p0086 182-36927
   Impact of uniform electrode current distribution
     on ETF
     [ NASA-TH-82875]
                                               p0 123 N82-25636
NEWTON-RAPHSON METHOD
   Self-adaptive closed constrained solution
     algorithms for nonlinear conduction
                                               p0094 A82-45157
MENTONIAN PLUIDS
   Basic lubrication equations
     [ NASA-TM-81693]
                                               p0099 NB2-16413
```

```
Comparative thermal fatigue resistuace of several
     oxide dispersion strengthened alloys
                                              P0062 A82-11399
   Fatigue of Ni-Al-No aligned eutectics at elevated
     temperatures
                                              p0052 A82-13403
   Effects of cobalt on structure, microchemistry and properties of a wrought nickel-base superalloy
                                              p0065 A82-34973
   Long-term high-velocity oxidation and hot corrosion testing of several NiCrAl and PeCrAl
     base oxide dispersion strengthened alloys
                                              p0062 A82-37151
   Crystallographic texture in oxide-dispersion-strengthened alloys
   p0062 A62-40041
Creep and rupture of an ODS alloy with high stress
     rupture ductility --- Oxide Dispersion
     Strengthener
                                              p0065 A82-40335
   Structure and creep rupture properties of directionally solidified eutectic
     qamma/qamma-prime-alpha alloy
                                              p0062 A82-42774
   The influence of gamma prime on the recrystallization of an oxide dispersion strengthened superalloy - NA 6000E
                                              p0062 A82-47393
   The influence of orientation on the stress rupture
     properties of nichel-base superalloy single
     crystals
                                              p0062 A82-47397
   Patique and creep-fatigue deformation of several
     nickel-base superalloys at 650 C
                                              p0062 A82-47398
   The influence of cobalt on the tersile and
stress-rupture properties of the nickel-base
superalloy MAN-M247
                                              p0063 A82-47399
   The influence of cobalt on the microstructure of
     the nickel-base superalloy MAR-M247
                                              p0063 A82-47400
   Thermal fatigue and oxidation data of TAZ-8A and
     M22 alloys and variations [NASA-CR-165407]
                                              p0063 N82-10193
   Development of materials and process technology
     for dual alloy disks
     [NASA-CR-165224]
                                              p0063 N82-18370
     status review of NASA's COSAM (Conservation Of
     Strategic Aerospace Materials) program
                                              p0060 N82-24326
     [ NASA-TM-82852]
   High temperature low cycle fatigue mechanisms for
     nickel base and a copper base alloy [NASA-CR-3543]
                                              p0064 N82-26436
   Bechanisms of deformation and fracture in high
     temperature low cycle fatique of Rene 80 and IN
      100
     [NASA-CR-165498]
                                              p0113 N82-26706
   Solute transport during the cyclic oxidation of
     Ni-Cr-Al alloys
[NASA-CR-165544]
                                              p0064 N82-27462
   Effects of cobalt on the microstructure of Udimet
     [ MASA-CR-165605]
                                              p0064 N82-28409
   Evaluation of candidate stirling engine heater
     tube alloys at 820 deg and 860 deg C
                                              p0061 N82-30372
     [NASA-TH-82837]
   MC carbide structures in M(1c2) ar-M247
     [NASA-CR-167892]
                                              p0064 N82-30374
   Nicral ternary alloy having improved cyclic
     oxidation resistance [NASA-CASE-LEW-13339-1]
                                              p0061 N82-31505
   Overlay metallic-cermet alloy coating systems -
     for gas turbine engines
     [ NASA-CASE-LEW-13639-1]
                                              p0070 N82-33522
WICKEL CADMIUM BATTERIES
   Synthetic battery cycling techniques [NASA-TM-82945]
                                              p0125 N82-30715
MICKEL COMPOUNDS
   Recrystallization and grain growth in NiAl
                                              p0065 A82-44529
MICKEL HYDROGEN BATTERIES
   Design of a 35-kilowatt bipolar nickel-hydrogen
     battery for low Earth orbit application
                                              p0123 #82-24647
     [ NASA-TH-82844]
   Nickel-hydrogen bipolar battery systems
     [ NASA-TH-82946]
                                              p0125 N82-30716
MICKEL PLATE
   Light weight nickel battery plaque
```

```
[ NASA-CASE-LEW-13349-1]
                                                 p7121 N82-22673
BICKEL ZINC BATTERIES
   Cevelopment of battery separator compositos
[HASA-CR-165508] p0128 1
                                                 p0 128 N82- 11547
   Cross-linked polyvinyl alcohol films as alkaline
      battery separators [NASA-TH-82802]
                                                 p0054 N82-22327
WIGHT E LAYER
IF GET SKY
WIGHT F LAYER
 U GHT SKY
HIGHT SKY
   Pield-aligned ion streams in the earth's midnight
                                                  p0140 882-31009
DICETUM
   A status review of NASA'S CCSAH (Conservation Of
Strategic Aerospace Materials) program
[NASA-TM-82852] p0060 N82-2
                                                 p0060 N82-24326
NITRIC OXIDE
   Stabilizing platinum in phosphoric acid fuel cells
   [NASA-CR-165483] p0130 N82-146
LOW NO sub x heavy fuel combustor concept program,
Phase 1A: Combustion technology generation coal
                                                 p0 130 N82-14628
      gas fuels
      ( NASA-CE- 165614]
                                                 p0055 N82-22326
PITRIDES
 NT POECH NITRIDES
 NT STLICON NITRIDES
   Some proporties of PP sputtered hafnium nitride
      coatings
      [ NASA-TH-82826]
    Refractory coatings and method of producing the same [NASA-CASE-LEW-13169-1] p0060 N82-29415
MITRIDING
   The combined effects of Fe and H2 on the nitridation of silicon
                                                 P9070 A82-42924
    Nitridation of silicon
      [ NASA-TM-82722]
                                                  p0066 NB2-15197
BITTROG PH
 NT NITFOGEN IONS
   Techniques for enhancing durability and
      equivalence ratio control in a rich-lean,
      three-stage ground power gas turbine combustor
      [ NASA-TH-82922]
                                                 p0124 M82-29717
NITROGEN COMPOUNDS
 NT BOSON NITRIDES
NT NITRIC OXIDE
 NT NITRIDES
 NT NITEOGEN OXIDES
 NT NITRCUS OXIDES
 NT FOLYIMICES
 NT QUINCLINE
 NT SILICON NITRIDES

Deposit formation in liquid fuels, II - The effect
      of selected compounds on the storage stability
      of Jet A turbine fuel
                                                  p0074 A82-22240
    Effect of some nitrogen compounds thermal
      stability of jet A
      T NASA-TM-829081
WITPOGEN IONS
   Friction wear and auger analysis of iron implanted with 1.5-MeV nitrogen ions
      [ NASA-TP- 1989]
                                                  p0059 N82-21300
MITROGEN OXIDES
 NI KITRIC OXIDE
 NT NITROUS CXIDES
   Formation of oxides of nitrogen in monodisperse
      spray combustion of hydrocarbon fuels
                                                 P0057 A82-37571
   Low NO sub x heavy fuel combustor concept program [NASA-CR-165512] p0129 N82-12572
    Effect of fuel-air-ratio nenuniformity on
      emissions of nitrogen oxides
      [ NASA-TP- 1798]
                                                 p0016 N82-13143
   Low NO subx heavy fuel combustor concept program.
Phase IA: Coal gas addendum
[NASA-CR-165577] p0133 N82-18
                                                  p0 133 N82- 18690
   Low NOx heavy fuel combustor concept program,
      phase 1
      F NASA-CR- 1654491
                                                 p0135 N82-24651
   Low NOx heavy fuel combustor concept program.
      Phase 1: Combustion technology generation
      [ NASA-CR- 165482]
                                                 p0136 N82-24725
   Low NOx heavy fuel combustor concept program [NASA-CR-167876]
                                                  P0074 NB2-26482
```

```
Computations of soot and and NO sub x emissions
      from que turbine combustors
                                                   p0 139 N82-29777
      [ NASA-CR-167930 ]
Venturi nozzle effects on fuel drop size and nitrogen oxid; emissions [NASA-TP-2028] p0020 NE
                                                   p0020 N82-31329
   Catalytic combustion of residual fuels
                                                   p0 118 N82-13504
      [ NASA-TH-82731]
    Low NO sub x heavy fuel combustor concept program
      phase IA qas tests [NASA-CR-167877]
                                                   p0055 N82-25337
   Low NOx heavy fuel combustor concept program [NASA-CR-165481] p0 138 N82-33827
MOBLE GASES
 U RE GASES
BOBLE HETALS
 NT GOLD
MOISE (SOUMD)
MT AERODYNAMIC NOISE
NT AIRCRAFT NOISE
 NT ENGINE NOISE
 NT JET AIRCRAPT NOISE
    Tooth profile analysiis of circular-cut,
      spiral-bevel qears
      [NASA-TM-82840]
                                                   p0101 N82-26681
WOISE ATTENUATION
U ISE REDUCTION
MOISE ELIMINATION
 U ISE REDUCTION
MOISE GENERATORS
    Sound generated in a cascade by three-dimensional
      disturbances convected in a subsonic flow
                                                   p0153 A82-10460
      [AIAA PAPER 81-2046]
HOISE HAZARDS
 U ZARDS
 U ISE (SOUND)
MOISE MEASUREMENT
    Noise of the SR-3 propeller model at 2 deg and 4
      deg angle of attack
      [NASA-TH-82738]
                                                   p0151 N82-16808
    Effect of facility variation on the acoustic characteristics of three single stream nozzles [NASA-TM-81635] p0151 N82-19944
    YF 102 in-duct combustor noise measurements with a turbine nozzle, volume | [NASA-CR-165562-VOL-1] p0153 NB2-2103
                                                   p0153 NB2-21031
    YF 102 in-duct combustor noise measurements with a
      turbine nozzle, volume 2 [NASA-CR-165562-VOL-2]
                                                   p0153 N82-21032
    YF 102 in-duct combustor noise measurements with a
      turbine nozzle, volume 3 [NASA-CR-165562-VOL-3]
                                                   p0155 NB2-21033
    Method for predicting impulsive noise generated by wind turbine rotors
      [NASA-TH-82794]
    A preliminary comparison between the SR-3
      propeller noise in flight and in a wind tunnel
      [NASA-TM-82805]
                                                   p0152 N82-21998
MOISE PREDICTION
    An iterative finite element-integral technique for
      predicting sound radiation from turbofan inlets
in steady flight
[AIAA PAPER 82-0124]
BOISE PREDICTION (AIRCRAFT)
   Effects of vane/blade ratio and spacing on fan noise
[AIAA PAPER 81-2033] p0029 A82-10457
A shock wave approach to the noise of supersonic
propellers
[NASA-TH-82752] p0151 N82-16809
NOISE PROPAGATION
    Method for predicting impulsive noise generated by
      wind turbine rotors
      [NASA-TH-827947
                                                   p0121 N82-21714
    Propeller flow visualization techniques
                                                    p0096 N82-32672
MOISE REDUCTION
    Maximum entropy image reconstruction from
      projections
                                                           A82-11053
    Acoustic transmission in lined flow ducts - A
      finite element eigenvalue problem
                                                    p0154 A82-17663
    NASA research activities in aeropropulsion
   POUNT N82-16084
Forward acoustic performance of a model turbofan
designed for a high specific flow (QF-14)
[MASA-TP-1968]
      [NASA-TM-82788]
```

II ZZLE FLCW

```
A high speed implementation of the random
                                                                                     BOLLLE DESIGN
                                                                                        Hodeling parameter influences on MHD swirl combustion norship design
[AIAA PAPER 82-0984] p0011 A62-3
Three dimensional flow measurements in a turbine
      decrement algorithm [NASA-TH-82853]
                                                      p0076 N82-22388
   The NASA-LeRC wind turbing sound prediction code policy N82-23730
                                                                                                                                            p0011 A82-31947
   Aeroacoustic performance of an externally blown
                                                                                            scroll
      flap configuration with several flap noise
                                                                                            [ NASA-CR- 167920 ]
                                                                                                                                            p0009 N82-32310
      suppression devices
                                                                                     BOILL PLOW
      [ NASA-TP- 1995]
                                                                                         The effect of inflow velocity profiles on the performance of supersonic ejector nozzles
                                                      p0152 N82-24942
    NASA research in supersonic propulsion: A decade
                                                                                         [ATAA PAPER 81-0273] p0002 A81-
An example of a solution to transonic equations
for shock-free flow about a symmetric profile
    of progress
[NASA-TH-02862]

CCSEE under-the-wing ongine accustic data
                                                                                                                                           p0002 A81-32548
    [NASA-TH-82691] p001
Rough analysis of installation effects on
                                                      p0019 N82-27311
                                                                                                                                                   A82-26439
                                                                                         Plow aerodynamics modeling of an MHD swirl
      turboprop noire
                                                                                            combustor - Calculations and experimental
                                                       p0152 N82-32082
                                                                                            verification
                                                                                         Turbofan forced mixer-nozzle internal flowfield.

Volume 1: A benchmark experimental study p0090 M82-22458
Turbofan forced mixer-nozzle internal flowfield.

Volume 2: Computational fluid dynamic predictions p0091 M82-22459
Turbofan forced mixer-nozzle internal flowfield.
BOISE SPECTRA
    Stationary state model for normal metal tunnel
      junction phenomena
                                                       p0159 A82-42912
HOISE SUPPRESSORS
 U ISE REDUCTION
PONINAL VALUES
U PROXIMATION
                                                                                         Turbofan forced mixer-mozzle internal flowfield.
Volume 3: A computer code for 3-D mixing in
MOWADIABATIC PROCESSES
 U AT TRANSFER
                                                                                            axisymmetric nozzles
NONCOM DUCTORS
                                                                                           [ NASA-CR-3494 ]
                                                                                                                                            p0091 N82-22460
                                                                                         Venturi nozzle effects on fuel drop size and
 U ECTRICAL INSULATION
NOMEUCLIDIAN GEOMETRY
                                                                                            nitrogen oxide emissions
                                                                                            [ NASA-TP-2028]
 U FPERENTIAL GEOMETRY
                                                                                         Three dimensional flow measurements in a turbine
HONISO TROP Y
 U TSOTROPY
                                                                                            scroll
BONLINEAR EQUATIONS
                                                                                     [NASA-CR-167920]
                                                                                                                                            p0009 NB2-32310
    Numerical comparisons of nonlinear convergence
      accelerators
                                                                                         Tests of a D vented thrust deflecting nozzle
                                                      p0149 A82-31438
                                                                                            behind a simulated turbofan engine
    Rapid approximate determination of nonlinear sclutions - Application to aerodynamic flows and design/optimization problems
                                                                                            [WASA-CH-3508]
                                                                                         Effect of facility variation on the acoustic
                                                                                            characteristics of three single stream nozzl
                                                       p0012 A82-35571
                                                                                            [ NASA-TH-81635]
                                                                                                                                            p0 15 1 N82-19944
   Construction of solutions for some nonlinear two-point boundary value problems
                                                                                         Aerodynamic analysis of VTOL inlets and definition
                                                                                            of a short, blowing-lip inlet [NASA-CR-165617]
      [ HASA-TH-82937]
                                                       p0144 NB2-30949
                                                                                                                                            p0007 #82-22211
HOULINGAR SYSTEMS
                                                                                         A summary of V/STOL inlet analysis methods
                                                                                            [ NASA-TH-82885]
                                                                                                                                            p0005 N82-28249
    A tensor approach to modeling of nonhomogeneous
      nonlinear systems
                                                                                     MOLLLE THRUST COMPPICIENTS
                                                       p0 148 A82- 19064
                                                                                         Thrust modulation methods for a subsonic V/STOL
    Nonlinear analysis of rotor-hearing systems using
                                                                                            aircraft
                                                                                            [NASA-TH-82747]
      component mode synthesis
[ASME PAPER 82-GT-303]
                                                                                                                                            p0003 N82-13112
                                                                                         Tests of a D vented thrust deflecting nozzle behind a simulated turbofan engine
                                                       p0 104 A82-35468
    Self-adaptive closed constrained solution algorithms for nonlinear conduction
                                                                                            [NASA-CR-3508]
                                                       p0094 A82-45157
                                                                                     BOZZLE WALLS
                                                                                         Core compressor exit stage study, Volume 4: Data and performance report for the best stage configuration [NASA-CR-165357] p0023 M82-140
    Ncnlinear structural and life analyses of a
      combustor liner
      [ NASA-TM-82846]
                                                       p0 1 1 1 882-2450 1
                                                                                         | NASA-CR-165357] p0023 N82-14092

Core compressor exit stage study. Volume 5:

Design and performance report for the Rotor

C/Stator B configuration

[NASA-CR-165352]
MONREFLECTION
 U ERGY ABSORPTION
MONDNI FORM FLOW
    Effect of fuel-air-ratio nonuniformity on
    emissions of nitrogen oxides
[NASA-TP-1798] p0010
Rough analysis of installation effects on
                                                                                            [NASA-CR-165358]
                                                       p0016 N82-13143
                                                                                      BOZZLES
                                                                                         Development of improved high temperature coatings
turboprop noise
[NASA-TM-82924]
WOWVISCOUS FLOW
                                                                                            for IN-792 + HP [NASA-CR-165395]
                                                       p0152 N82-32082
                                                                                                                                            p0063 NB2-14333
                                                                                      MUCLEAR AUXILIARY POWER UNITS
 U VISCID FLOW
                                                                                      NT SPACE POWER UNIT REACTORS
Tangential blowing for control of strong normal shock - Boundary layer interactions on inlet ramps
[AIAA PAPER 82-1082] p0005 A82-37684
                                                                                      MUCLEAR CAPTURE
                                                                                     NT ELECTRON CAPTURE
BUCLEAR ELECTRIC POWER GENERATION
NT SPACE POWER UNIT REACTORS
BUCLEAR INTERACTIONS
MOSE INLETS
    Thrust modulation methods for a subsonic V/STOL
                                                                                       NT ELECTRON CAPTURE
                                                                                      MUCLEAR POWER REACTORS
       aircraft
       [ NASA-TM-82747]
                                                                                      NT SPACE POWER UNIT REACTORS
NOTCH STRENGTH
                                                                                      BUCLBAR RADIATION
    A preliminary study of crack initiation and growth
                                                                                       NT GAMMA RAYS
      at stress concentration sites [NASA-CF-169358]
                                                                                      NUCLEAR REACTIONS
                                                                                       NT ELECTRON CAPTURE
NT ELECTRON SCATTERING
                                                       p0115 N82-33738
NOTCH TESTS
    Extended range stress intensity factor expressions for chevron-notched short bar and short rod
                                                                                       NT POSITRON ANNIHILATION
                                                                                      MUCLEAR REACTORS
       fracture toughness specimens
                                                                                       NT SPACE POWER UNIT REACTORS
                                                       PO 112 A82-40357
                                                                                      NUCLEAR WASTES
NOTCHED BETALS .
                                                                                       U DIOACTIVE WASTES
U ICH TESTS
HOZZLE CORFFICIENT
                                                                                      NUCLIDES
                                                                                       NT PLATINUM ISOTOPES
```

MT PLUTONIUM 244

UNBRICAL AVALYSIS	p0055 A82-15743
NT APPROXIMATION	Advances in high output voltage silicon solar cells
NT ECUNDARY INTEGRAL HETHOD	p0127 A82-44942
HT COMPUTATIONAL PLUID DYNAMICS	Pabrication of multijunction high voltage
NT CTEPERENCE EQUATIONS	concentrator solar cells by integrated circuit
NT ERROB ANALYSIS	technology
HT FINITE CIPPERENCE THEORY	p0 127 A82-44957
HT FINITE FLEMENT METHOD	OPHINGS
NT FINITE VOLUME METHOD	NT APERTURES
NT ITERATIVE SOLUTION	OPERATING SISTEMS (COMPUTERS)
NT NEWTON-RAPHSON NETHOD	Microprocessor control system for 200-kilowatt
NT BUMERICAL INTEGRATION	Mod-OA wind turbines
NT FAYLEIGH-RITZ METHOD	[NASA-TH-82711] p0120 N82-21710
NT RELAXATION METHOD (MATHEMATICS)	OPERATING TEMPERATURE
Numerical analysis and FORTPAN program for the	Research report: User's manual for computer
computation of the turbulent wakes of	program AT81y003 SHABERTH. Steady state and
turbosachinary rotor blades, isolated airfoils	transient thermal analysis of a shaft bearing
and cascade of airfoils	system including ball, cylindrical and tapered
[NASA-CR-3509] p0006 NB2-18184	roller bearings
Geometry and starvation effects in hydrodynamic	[NASA-CR-165365] p0146 N82-31969
lubrication	OPETHALHOLOGY
[NASA-TM-82807] p0042 N82-20240	Veiling glare reduction methods compared for
A new numerical approach for compressible viscous	pphthalmic applications
flows	p0 143 A82-13289
[NASA-CR- 168842] p0090 N82-22455	OPTICAL DATA PROCESSING
Boundary-layer effects in composite laminates:	Experimental boundary integral equation
Free-edge stress singularities, part 6	applications in speckle interferometry
[NASA-CR-165440] p0114 N82-26718	p0097 A82-36987
Three dimensional flow field inside compressor	Role of optical computers in aeronautical control
rotor, including blade boundary layers	applications
[NASA-CR- 169120] p0091 N82-27686	p0156 N82-15897
Turbulent solution of the Navier-Stokes equations	OPTICAL EQUIPMENT
for uniform shear flow	NT COLLINATORS
[NASA-TH-82925] p0089 N82-32634	NT LASER DOPPLER VELOCIMETERS
IUNERICAL CONTROL	NT WETICAL BEASURING INSTRUMENTS
Design study of a continuously variable roller	NT OPTICAL SCANNERS
cone traction CYT for electric vehicles	A digital optical torquemeter for high rotational
[NASA-CP- 159841] p0 105 N82-12445	speed applications
IUMERICAL PLOW VISUALIZATION	[NASA-TH-82914] p0095 N82-31664
Numerical analysis of confined turbulent flow	OPTICAL GENERATORS
p0093 A82-24748	U SER CAVITIES
Numerical modelling of turbulent flow in a	OPTICAL HEASURING INSTRUMENTS
combustion tunnel	NT OPTICAL SCANNERS
p0093 882-27000	Optical tip clearance sensor for aircraft engine
Numerical modeling of turbulent combustion in	controls
premixed gases	[AIAA PAPER 82-1131] p0015 A82-37691
p0056 A82-28708	OPTICAL PROPERTIES
UNBRICAL INTEGRATION	NT BIREPRINGENCE
Application of integration algorithms in a	NT PHOTOVOLTAIC EFFECT
parallel processing environment for the	NT REPLECTANCE
simulation of jet engines	NT REFRACTIVITY
[NASA-TH-82746] p0 149 H82-14849	NT TRANSHITTANCE
MUNERICAL STABILITY	Ion beam microtexturing and enhanced surface
Solf-adaptive closed constrained solution	diffusion
algorithms for nonlinear conduction	[NASA-CR-167948] p0065 N82-31509
p0094 AB2-45157	OPTICAL PUMPING
F2	Optically pumped high-pressure DF-CO2 transfer laser
	A82-10193
U	OPTICAL SCANNERS
D RING SHALS	Reliable aerial thermography for energy conservation
Effect of seals on rotor systems	[NASA-TH-81766] p0117 N82-14552
[NASA-TM-82786] p0099 N82-16411	OPTICAL SENSORS
DILS	U TICAL HEASURING INSTRUMENTS
NT FUFL OILS	OPTIMAL CONTROL
NT LUBRICATING O'LS	AESOP: A computer-aided design program for linear
NT MINERAL OILS	multivariable control systems
Heasurement of oil film thickness for application	[NASA-TH-82871] p0 148 H82-30992
to elastomeric Stirling engine rod seals	OPTIMIZATION
[ASME PAPER 81-108-9] p0 107 A82-18426	NT OPTIMAL CONTROL
ONBOARD DATA PROCESSING	Optimal tooth numbers for compact standard spur
Dynamic switch matrix for the TDNA satellite	gear sets
switching system	[ASHE PAPER 81-DET-115] p0 103 A82-19335
[AIAA B2-2458] p0085 A82-23494	Power system design optimization using Lagrange
Baseband-processed SS-TDMA communication system	multiplier techniques
architecture and design concepts	p0085 A82-20743
[AIAA 82-0492] P0079 A02-23508	The use of optimization techniques to design
37/27 GHz demonstration system for improving orbit	controlled diffusion compressor blading
utilization	[ASME PAPER 82-GT-149] p0022 A82-35373
p0080 182-27189	The use of optimization techniques to design
Open-loop nanosecond-synchronization for wideband	controlled diffusion compress r blading
satellite communications	[NASA-TH-82763] p0016 N82-14094
p0036 A82-27224	Mathematical models for the synthesis and
DISOTBORY	optimization of spiral bevel gear tooth surfaces
U ISOTEOPY	for helicopter transmissions
DEN CIRCUIT VOLTAGE	[NASA-CR-3553] p0106 N82-25516
Multifunction high voltage concentrator solar cells	
p0043 A82-11796	Optimization of the oxidant supply system for
Moderate temperature Na cells, IV - VS2 and	combined cycle MHD power plants
PhS2C12 as rechargeable cathodes in molten NaAlC14	[NASA-TH-82909] p0123 N82-26790
THE ALL AD LCCHOLUCGUIC COLUNCED IN MOTERN NAVICES	

```
OF POOR QUALITY
   The optimal design of involute gear teeth with
      unoqual addenda
      [ NASA-TH-82866]
                                                    p0101 N82-28645
OPTIMUM CONTROL
U TIMAL CONTROL
ORBIT CALCULATION
   Integrated propulsion for near-Earth space missions. Volume 2: Technical [NASA-CE-167889-VOL-2] p0046
                                                    p0046 N82-33425
ORBIT SPECTRUM UTILIZATION
   Planning satellite communication services and spectrum-orbit utilization
      FAIAA 82-05261
                                                    p0080 182-23538
   30/20 GHz desonstration system for improving orbit
      utilization
ORBIT TRANSFER VEHICLES
   Low-thrust chemical propulsion system pump
      technology
      T NASA-CR- 165219]
                                                    p0105 N82-13427
   Large Space Systems/Propulsion Interactions
      [ NASA-TH-82904]
                                                    p0042 N82-27358
ORBITAL ASSEMBLY
   Centaur capabilities for communications satellite
      launches
      [AIAA PAPER 82-0558]
                                                    p0034 182-36286
ORBITAL LAUNCHING
Beal-time computer simulation/emulation for
      verification of multi-fault-tclerant control of Centaur-in-Shuttle
      [ATAN 81-2283]
                                                    p0040 A82-13494
ORBITAL TRAWSPER
U ANSFER ORBITS
ORBITING SATELLITES
U TIFICIAL SATELLITES
ORBITS
 NT EASTH ORBITS
 BT GEOSYNCHEONOUS ORBITS
 NT FOLAR ORBITS
 NT SATELLITY ORBITS
 NT SPACECRAFT ORBITS
NT TRANSFER ORBITS
ORES
ORGANIC COMPOUNDS
 NT CREANIC SULPUR COMPOUNDS
 NT CUINCLINE
ORCANIC SULFUR COMPOUNDS
   Improved boundary lubrication with formulated C-
      ethers
      [ NASA-TH-82808]
                                                    p0067 N82-20313
ORGANOMETALLIC COMPOUNDS
   OM-VPE growth of Hq-doped Gals ---
      OrganoMetallic-Vapor Phase Epitaxy
                                                    p0 159 A82-38411
ORIFICE PLOW
   Flow through axially aligned sequential apertures
of the orifice and Borda types
[ASKE PAPER 81-HT-79] p0089 A82-10
                                                    D0089 A82-10964
   Flow through aligned sequential orifice type inlets
[NASA-TP-1967] p0087 N82-20467
   Flows through sequential orifices with heated
      spacer reservoirs [NASA-TM-82855]
                                                    p0088 N82-24455
ORIFICES
   The velocity field near the orifice of a Helmholtz resonator in grazing flow [NASA-CR-168548] p0153 N82-1899
                                                    p0 153 N82-18994
ORTHOTROPIC PLATES
   Motion of a rigid punch at the boundary of an
      orthotropic viscoelastic half-plane
                                                            A82-26436
OSCILLATING PLOW
   Two dimensional stagnation point flow of a dusty gas near an oscillating plate
   An experimental investigation of gapwise
     periodicity and unsteady aercdynamic response in an oscillating cascade. Volume 2: Data report. Part 1: Text and mode 1 data
[NASA-CR-165457-VOL-2-PT-1] p0006 N82-181
                                                    p0006 NB2-18180
OSCILLATIONS
 NT WING OSCILLATIONS
OSCILLATORS
NT MAGNETRONS
OTV
 U BIT TRANSFER VEHICLES
OXIDATION
 NT ELECTROCHEMICAL CXIDATION
```

```
Strength distributions of SiC deramics after oxidation and oxidation under load
    [ACS PAPER 9-C-80C] p0071 A82-
Detection of a change in the oxidation state on
aluminum surface using angular correlation of
positron annihilation radiation
                                                         p0071 A82-20143
                                                                 182-30374
    Effects of oxidation and oxidation under load on strength distributions of Si3M4
    [ACS PAPER 69-B-80] p0071 A82-35871 Thecast fatigue and oxidation data of TAZ-8A and
    H22 alloys and variations
[NASY-CP-755407] p0063
Thermal oxidative degradation reactions of perfluoroalkylethers
                                                         p0063 M82-10193
       [ NASA-CR-165516]
                                                        p0048 N82-12135
    Oxidation and formation of deposit precursors in
       hydrocarbon fuels
       [NASA-CR-165534]
    Thermal and oxidative degradation studies of formulated C-ethers by gel-permeation
       chromatography
       [ NASA-TP-1994]
                                                         p0068 N82-21332
    Method and apparatus for strengthening boron fibers
       --- high temperature oxidation [NASA-CASE-LEW-13826-1]
                                                         p0050 ¥82-26385
    Thermal oxidative degradation reactions of linear
    perfluoroalky lethers
[NASA-TH-82834] p0068 M82-
Solute transport during the cyclic oxidation of
                                                         D0068 882-26468
       Ni-Cr-Al alloys
       [ NASA-CR-165544 ]
                                                        p0064 M82-27462
    Effect of some nitrogen compounds thermal stability of jet A [WASA-TM-82908] p007
                                                         D0072 #82-27519
OXIDATION RESISTANCE
    Improved plasma sprayed MCrAlY coatings for 
aircraft gas turbine applications
                                                         p0065 A82-20742
    Inexpensive cross-linked polymeric separators made
       from water-soluble polymers --- for secondary
       alkaline nickel-zinc and silver-zinc cells
                                                         P0048 A82-23778
    Oxidation Stability of advanced reaction-bonded
       Si3#4 deterials
[ACS PAPER 52-B-80P]
                                                         p0074 A82-33030
    Ceramic thermal barrier coatings for gas turbine
       engines
       [ASHE PAPER 82-GT-265]
                                                         P007 | A82-3544 |
    Long-term high-velocity oxidation and hot
corrosion testing of several NiCrAl and PeCrAl
base oxide dispersion strengthened alloys
                                                         p0062 A82-37151
    Development of improved high temperature coatings for IN-792 + HF
       [ WASA-CR-165395]
                                                         p0063 N82-14333
    Review of NASA progress in thermal barrier
       coatings for stationary gas turbines [NASA-TH-81716]
                                                         P0058 N82-17335
    Tailored plasma sprayed MCrAlY coatings for aircraft gas turbine applications
[NASA-CR-165234] p0064 1
                                                         D0064 N82-19360
    Improved thermal barrier coating system
                                                         p0060 N82-26431
       [NASA-CASE-LEW-13324-1]
    Nicral ternary alloy having improved cyclic
       oxidation resistance [NASA-CASE-LEW-13339-1]
                                                         D0061 N82-31505
OXIDATION-PROUCTION REACTIONS
Hethod of making formulated plastic separators for
       soluble electrode cells
       [NASA-CASE-LEW- 12358-2]
                                                         p0054 N82-21268
    Chemical and electrochemical behavior of the Cr(3)/Cr(2) half cell in the NASA Redox Energy
Storage System [NASA-TM-82913]
OXIDE FILMS
                                                         p0055 N82-33463
    Oxidation stability of advanced reaction-bonded
       Si3N4 materials
       [ACS PAPER 52-B-80P]
                                                         p0074 A82-33030
    Electron beam induced damage in ITO coated Kapton --- Indium Tin Oxide
    p0159 A82-41546
Effect of oxide films on hydrogen permeability of
candidate Stirling engine heater head tube alloys
       [NASA-TH-82824]
                                                         p0060 N82-24323
OXIDES
NT ALUMINUM OXIDES
 NT CARBON MONOXIDE
NT HYDROGEN PEROXIDE
```

[NASA-CP- 167934]

```
PARALLEL PLOS
 NT MAGNESTUM OXIDES
                                                                                NT PIPE PLOW
NT THREE DIMENSIONAL PLOW
NT PETAL OXIDES
NT NITRIC OXIDE
                                                                              Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL [AIAA PAPER 81-2637] p0020 A82-19214

PARALLEL PROCESSING (COMPUTERS)

Application of integration algorithms in a
 NT NITROGEN CXIDES
 NT KITROUS OXIDES
 HT CHAPTZ
NT SILICON DIOXIDE
NT TIN OXIDES
 NT YTTRIUM OXIDES
                                                                                     parallel processing environment for the
 NT ZIECCNIUM OXIDES
Investigation into the role of MaCl deposited on
                                                                               simulation of jet engines
[NASA-TH-82746]
PARAMAGNETIC AMPLIFIERS
                                                                                                                                  p0149 N82-14849
      oxide and metal substrates in the initiation of
      hat corrosion
                                                                                U SERS
                                                                               PARAMETER IDENTIFICATION
                                                   p0063 N82-13217
      I NASA-CI- 1650291
                                                                                  Modeling parameter influences on MHD swirl combustion nozzle design
OXIDIZERS
 NT LIQUID OXIDIZERS
NT LIQUID OXYGEN
                                                                                     [ATAA PAPER 82-0984]
   Optimization of the oxidant supply system for
                                                                                   A lokw series resonant converter design,
combined cycle MHD power plants
[NASA-TH-82909]
OXYALKYLATION
                                                                                     transistor characterization, and base-drive
                                                                                     optimization [NASA-CR-165546]
                                                  p0123 N82-26790
                                                                                                                                  p0084 N82-17439
                                                                                  Shaded computer graphic techniques for visualizing and interpreting analytic fluid flow models
 U KYLATION
OXYGER
                                                                                                                                 p0145 N82-17880
                                                                                     [ NASA-CR- 1684 18 ]
 NT LIQUID CXYGEN
 NT CZCNE
                                                                                   Identification of nultivariable high performance
   The effect of oxygen concentration on the
                                                                                     turbofan engine dynamics from closed loop data
                                                                               [NASA-TH-82785]
PARAMETERIZATION
NT PARAMETER IDENTIFICATION
PARTIAL DIFFERENTIAL EQUATIONS
      boundary-lubricating characteristics of a C ether and a polyphonyl ether to 300 C
                                                                                                                                  p0076 N82-20339
                                                   p0070 A82-21699
   MHD oxidant intermediate température céramic
                                                                                NT HELMHOLTZ VORTICITY EQUATION.
      heater study
      [ NASA-CF-165453]
                                                   p0131 N82-15527
                                                                               PARTICLE BEAMS
CXYGEN PRODUCTION
                                                                                NT ELECTRON BEAMS
   Optimization of the oxidant supply system for
                                                                                NT ION BEAMS
      combined cycle MHD power plants INASA-TM-829091
                                                                                NT RELATIVISTIC ELECTRON BEAMS
                                                                                   Mapping of electrical potential distributions with
                                                   p0123 N82-26790
OXYGEN SUPPLY EQUIPMENT
                                                                                     charged particle beams
   Resonance tube hazards in oxygen systems
[NASA-TM-82801] p00
                                                                                                                                  p0084 N82-18508
                                                                               PARTICLE DESSITY (CONCENTRATION)
HT ELECTRON DISTRIBUTION
                                                   p0072 N82-21415
OXYGEN SYSTEMS
 U YGEN SUPPLY EQUIPMENT
                                                                                NT ION DENSITY (CONCENTRATION)
OZONE
                                                                                NT MAGNETOSPHERIC ION DENSITY
   An automated system for global atmospheric
sampling using B-747 airliners
[NASA-CE+165264] p0139
                                                                               PARTICLE DIPPUSION
                                                                                   Experimental and theoretical studies of the laws
                                                   n0 139 N82-13554
                                                                                     governing condensate deposition from combustion
   Ozone and aircraft operations
                                                                                     qases
                                                   p0001 N82-21145
                                                                                                                                  p0057 A82-28709
                                                                               PARTICLE BHISSION
   Ozone and aircraft operations
                                                                                NT ELECTRON EMISSION
                                                   p0001 N82-21145
                                                                                NT SECONDARY EMISSION
                                                                               PARTICLE INTERACTIONS
NT ELECTRON CAPTURE
PARTICLE HOTION
                                 P
P-I-E DIODES
                                                                                   Three-dimensional relativistic field-electron
                                                                                     interaction in a multicavity high-power klystron. 1: Basic theory
[NASA-TP-1992] p006
 U I-N JUNCTIONS
P-I-N JUNCTIONS
   A theory of the n-i-p silicon solar cell
                                                                                                                                  p0081 N82-22439
                                                   p0 128 A82- $5055
                                                                               PARTICLE TRACKS
   High voltage V-groove sclar cell [NASA-CASI-LEW-13401-2]
                                                                                  Evidence for Pu-24% fission tracks in hibonites from Hurchison carbonaceous chondrite
                                                   DO 123 N82-24717
PACKAGING
                                                                                                                                  p0166 A82-29316
 NT ELECTRONIC PACKAGING
                                                                               PARTICLE TRAJECTORIES
                                                                                NT ELECTRON TRAJECTORIES
    Development of thin wraparound junction silicon
      sclar cells
                                                                                   Mapping of electrical potential distributions with
      [ HASA-CR- 165570]
                                                   p0133 N82-18689
                                                                                     charged particle beams [NASA-CR-168556]
PACKET SHITCHING
                                                                                                                                  p0084 M82-18508
                                                                               PARTICLES
NT APROSOLS
    Widehand, high speed switch matrix development for SS-TDMA applications
                                                                                 NT ANIONS
                                                   p0086 k82-43784
                                                                                NT ARGON PLASHA
PACKET TRANSMISSION
 NT PACKET SWITCHING
                                                                                NT CHARGED PARTICLES
PAD
                                                                                NT CYLINDRICAL PLASMAS
                                                                                NT ELECTRON BEAMS
NT ENERGETIC PARTICLES
NT PLASMA SHEATHS
NT PLASMAS (PHYSICS)
NT RELATIVISTIC ELECTRON BEAMS
      pad perturbation method for the dynamic
      coefficients of tilting-pad journal bearings
                                                   p0 1 10 A82- 14400
PAPER (MATERIAL)
   Collection and dissemination of thermal energy
      storage system information for the pulp and
                                                                                NT RELATIVISTIC PARTICLES
      paper industry
                                                                                NT SOOT
                                                   p0 136 N82-24686
                                                                               PASSENGER AIRCRAFT
                                                                                NT BOEING 747 AIRCRAFT
NT DC 10 AIRCRAFT
PARABOLIC REPLECTORS
    Subsystems design and component development for
      the parabolic dish module for sclar thermal
                                                                                   Lightweight diesel engine designs for commuter
      power systems
[NASA-CR-168941]
                                                                                     type aircraft [NASA-CR-165470]
                                                   p0 135 N82-24646
                                                                                                                                  D0023 NB2-11068
   Coaxial prime focus feeds for paraboloidal reflectors
                                                                               PAYLOAD INTEGRATION PLAN
                                                                                   Cryogenic fluid management experiment
```

[NASA-CR-165495]

p0039 N82-15117

p0078 N82-31585

A62-30297

```
PAYLOADS
                                                                                Coranic applications in turbine engines
                                                                                                                              p0164 N82-31158
 NT SPACE SHUTTLE PAYLOADS
                                                                             [NASA-CR-165197]
NT SPACEBORNE EXPERIMENTS
NT SPACELAR PAYLOADS
                                                                              U FFUSION
PDM (MODULATION)
                                                                             PERIOD ECUATIONS
 U LSE DURATION MODULATION
                                                                              U RIODIC PUNCTIONS
PEARS (LANDFORMS)
                                                                             PERIODIC PUNCTIONS
   The development of central peaks in lunar craters
                                                                              NT TANGENTS
                                                         A82-14333
                                                                                Review of analysis methods for rotating systems
PREMING
                                                                                   with periodic coefficients
NT SHOT PEENING
PEGASUS ENGINE
U ISTOL-SIDDELEY US 53 ENGINE
                                                                                                                               p0135 M82-23702
                                                                             PERIODIC VARIATIONS
                                                                             HT ANNUAL VARIATIONS
PREIPHERAL EQUIPHERT (COMPUTERS)
PERCENTAGE
                                                                              NT COMPUTER STORAGE DEVICES
 II TIOS
PERPLUCRO COMPOUNDS
                                                                             PERSEABILITY
                                                                                Effoct of oxide films on hydrogen permeability of candidate Stirling engine heater head tube alloys [NASA-TH-82824] p0060 M82-2432
   Thornal exidative degradation reactions of
     perfluoroalkylethors [NASA-CP-165516]
                                                                                                                              p0060 M82-24323
                                                 pC048 N82-12135
    Thermal cxidative degradation reactions of linear
                                                                             PEROXIDES
      perfluoroalky lethors
[NASA-TM-82834]
                                                                              NT HYDROGEN PEROXIDE
                                                  p0068 N82-26468
                                                                             PERTURBATION THEORY
PERFORMANCE PREDICTION
                                                                                A pad purturbation method for the dynamic
 NT PPEDICTION ANALYSIS TECHNIQUES
                                                                                   coefficients of tilting-pad journal bearings
                                                                                                                               p0 | 10 A82-14400
   A heat exchanger computational procedure for
     temperature-dependent fouling [ASME FAPIR 01-HT-75]
                                                                                 Stationary state model for normal metal tunnel
                                                                                   junction phenomena
   On the prediction of swirling flowfields found in
                                                                                                                               p0159 A82-42912
      a misymmetric combustor quometries
                                                                             PETROLEUM PRODUCTS
                                                                              NT DIESEL FUELS
NT LUBRICATING OILS
    Measurement and prediction of mean velocity and
                                                                             PHASE DIRECTAL
      turbulence structure in the near wake of an
                                                                                 Phase stability in plasma-sprayed, partially stabilized zirconia-yttria
                                                  p0010 A82-26137
   Performance degradation of propeller/rotor systems
                                                                                                                               P0070 A82-41552
      due to rime ice accretion [AIAA PAPER B2-0286]
                                                                             PRASE TRANSFORMATIONS
                                                                               NT HOILING
                                                  p0019 A82-28322
    Small das turbine combustor primary zone development
[AIAA PAPER 82-1159] p0103 A82-35036
                                                                               NT PLASHING (VAPORIZING)
                                                                               NT MELTING
   Jet impingement heat transfer enhancement for the GFU-3 Stirling engine
                                                                               HT PROPELLANT EVAPORATION
                                                                               NT VAPORIZING
      [ NASA-TM-82727]
                                                  p0163 N82-11993
                                                                                 Raman study of the improper ferroelectric phase
    Spherical relier tearing analysis. SKF computer program SPHERNEAN. Velume 1: Analysis
                                                                                   transition in iron lodine boracite
                                                 p0106 V#$-20540
       NASA-CR- 165203]
                                                                                 Effects of cobalt on the microstructure of Udimet
    Spherical roller tearing analysis.
                                                SKF COmputer
      program SPHERBEAN, Volume 2: User's manual
FNASA-CF-165204] p0106 N82-20541
                                                                                   [ NASA-CR-165605]
                                                                                                                               p0064 N82-28409
       NASA-CF-165204]
                                                                             PRASED ARRAYS
    Nonlinear constitutive theory for turbine engine
                                                                                 NASA Adaptive Multibean Shased Array (AMPA): An
                                                                                   application study
      structural analysis
                                                  p0112 N82-33744
                                                                                   [NASA-CR-169125]
                                                                                                                               D0079 N82-28503
    Theoretical and experimental power from large
                                                                              PHOSPHORIC ACID
      horizontal-axis wind turbines
                                                                                 Develop and test fuel cell powered on-site
                                                                                   integrated total energy systems. Full-scale power plant development [NASA-CR-165455]
       NASA-TM-82944 ]
                                                  P0127 N82-33830
PERFORMANCE TESTS
                                                                                                                               p0131 N82-16483
    Experimental verification of a Gozputational procedure for the design of TWT-refocuser-MDC systems --- Multistage Depressed Collectors
                                                                                 Preparation and evaluation of advanced
                                                                                   electrocatalysts for phosphoric acid fuel cells
                                                  p0082 A82-16128
                                                                                   [NASA-CR-165594]
                                                                                                                               p0132 N82-17615
    An experiment to evaluate liquid hydrogen storage
                                                                                 Cell module and fuel conditioner development
                                                                                                                               p0134 N82-21713
                                                                                   [ NASA-CK-165620 ]
                                                                                 Cathode catalyst for primary phosphoric fuel cells [NASA-CR-165198] p0134 H82-22675
    Environmental offects on sclar concentrator mirrors
                                                                                 Stabilizing platinum in phosphoric acid fuel cells [NASA-CR-165606] p0136 N82-29718
                                                         A82-23394
    Ceramic thermal barrier coatings for gas turbine
                                                                                 Non-noble catalysts and catalyst supports for
      angines
                                                                                   phosphoric acid fuel cells [NASA-CR-165289]
      TASHE PAPER B2-GT-265]
                                                  P0071 A82-35441
    Pressure pulsations above turbomolecular pumps
                                                                                                                               p0137 N82-30722
                                                  p0076 A82-46430
                                                                              PHOSPHORIC ACID FUEL CELLS
    Effect of fuel injector type on performance and emissions of reverse-flow combustor [NASA-TP-1945]
Evaluation of wind tunnel performance testings of an advanced 45 deg swept 6-bladed propeller at Mach numbers from 0.45 to 0.85
                                                                                 40-kW phosphoric acid fuel cell field test -
                                                                                   Project plan
                                                                                                                               p0128 A82-45325
                                                                                 Survey on aging on electrodes and electrocatalysts
                                                                                    in phosphoric acid fuel cells
                                                                                   [ NAS A-CR- 165505]
                                                                                                                               PO 128 NB 2- 11545
       [ NASA-CR-3505 ]
                                                                                 Preparation and evaluation of advanced
                                                  P0007 N82-19178
                                                                                   electrocatalysts for phosphoric acid fuel cells
[NASA-CR-165519] p0129 N62-12
    Preliminary results on performance testing of a
      turbocharged rotary combustion engine [NASA-TH-82772] p0
                                                                                                                               p0129 N82-12573
                                                  p0017 NB2-21194
                                                                                 Cell module and fuel conditioner development [NASA-CR-165462] p0130 N
    Experimental performance of the regenerator for
the Chrysler upgraded automotive gas turbine
                                                                                                                               p0 130 NB2-13511
                                                                                 Stabilizing platinum in phosphoric acid fuel cells [NASA-CR-165483] p0130 N82-146
                                                                                                                               PO 130 N82-14628
      engine
                                                                                 Technology development for phosphoric acid fuel
      [ NASA-TM-82671]
                                                  p0120 N82-21712
                                                                                   cell powerplant, phase 2 [NASA-CR-165426]
    Small passenger car transmission test: Mercary
    I,ynx ATX transmission
[NASA-CR-165510] p0106 NE
Results of chopper-controlled discharge life
                                                                                                                               PO 13 1 N82-16482
                                                  p0106 N82-24496
                                                                                 Phosphoric acid fuel cell technology status
                                                                                   [ NASA-TM-82791]
                                                                                                                               P0120 N82-19670
      cycling studies on lead acid tatteries
                                                                                 Cathode catalysts for primary phosphoric acid fuel
```

cells

p0124 N82-30700

[NASA-TH-82912]

```
[ NASA-CR- 165578]
                                                       p0134 N82-21709
   [NASA-CR-165578]

Develop and test fuel cell powered on-site
integrated total energy systems: Phase 3:
Full-scale power plant development
[NASA-CR-165568]

Current legal and institutional iscues in the
commercialization of phosphoric acid fuel cells
                                                       p0 135 N82-24648
       [ NASA-CR- 167867]
                                                       p0136 N82-29719
   Environmental assessment of the 40 kilowatt fuel cell system field test operation [DOE/NASA/2701-1] p0137 M82-29
                                                       p0 137 N82-29721
    Cell module and fuel conditioner development
      [ NASA-CR- 165 193]
                                                       p0 137 N82-30712
MOSPHORUS COMPOUNDS
 NT PHOSPHORIC ACID
PHOTOCONDUCTORS
High voltage V-groove solar cell [NASA-CASE-LEW-13401-2] PHOTOCURBENTS
                                                       p0 123 N82-24717
U ECTRIC CURRENT
PROTOBLECTBIC CELLS
 NT PHOTOVOLTAIC CELLS
PHOTOELECTRICITY
   Operational performance of the photovoltaic-powered grain will and water pump at Tangaye, Upper Volta [NASA-TH-82767] p0120 N82-19
                                                       p0120 N82-19573
PHOTOELECTRON SPECTROSCOPY
    Application of surface analysis to solve problems
       of wear
[NASA-TM-82753]
PHOTOELECTHONICS
                                                       pC099 682-14519
 U CTOELECTRICITY
PHOTOBNISSIVITY
 U ISSIVITY
PHOTOGRAPHY
 NT FRACTOGRAPHY
 NT SATELLITE-BORNE PHOTOGRAPHY
NT SCHLIEBEN PHOTOGRAPHY
PHOTOR ESISTORS
 U CTOCONDUCTORS
PHOTOS ENSORS
 U CTOPLECTRICITY
PHOTOS ? HERE
    Time variability and structure of quiet sun
       sources at 6 cm wavelength
                                                       p0167 A82-26003
PHOTOTHERMAL CONVERSION
    Materials science issues encountered during the
       development of thermochemical concepts --- in
       screening of reactions for solar energy
       applications
                                                               A82-10021
PHOTOTREBHOTROPISM
 U ISOTROPY
U MPERATURE EFFECTS
PHOTOVOLTAIC CELLS
    NATA preprototype redox storage system for a
       photovoltaic stand-alone application
                                                       p0127 182-11774
    The effects of controls and controllable and
storage loads on the performance of stand-alone
photovoltaic systems
                                                       p0 127 A82-45027
    International market assessment of stand-alone
       photovoltaic power systems for cottage industry
       applications
       [ NASA-CR- 165287]
                                                       p9132 N82-16494
    Development of thin wraparound junction silicon solar cells
[NASA-CR-165570] p0133 N82-
                                                       p0133 N82-18/-89
    Market assessment of photovoltaic power systems
       for agricultural applications in Nigeria
       [ NASA-CR- 165511]
                                                       p0 133 N82- 18698
    Operational performance of the
       photovoltaic-powered grain will and water pump
    at Tangaye, Upper Volta
[NASA-TH-82767] p0120 N82-1967
Method of making a high voltage V-groove solar cell
[NASA-CASE-LEW-13401-1] p0124 N82-2970
                                                       p0120 N82-19673
                                                       p0 124 N82- 29709
    Development of a large area space solar cell
       assembly
       [ NASA-CP- 167929]
                                                        p0137 NB2-30706
    High voltage planar multijunction solar cell [NASA-CASE-LEW-13400-1] p0 125 N
                                                       p0 125 NB2-31 764
    Large area low-cost space solar cell development FNASA-TM-829027 p0126 N82-3
    Design description of the Tangaye Village photovoltaic power system
       photovoltaic power system
```

```
[ WASA-TH-82917]
                                                                   p0126 N82-33828
PROTOVOLTAIC CONVENSION
     Market assessment of photovoltaic power systems
     for agricultural applications in Mexico
[MASA-CR-165441] p0128 M82-10506
Market assessment of photovoltaic power systems
        for agricultural applications in Morocco [MASA-CR-165477]
                                                                  p0130 N82-14627
     Study of multi-magawatt technology needs for photovoltaic space power systems. Volume !:
     Executive Aummary
[NASA-CR-165323-VOL-1] p0130 No.
Study of multi-megavatt technology needs for
                                                                   p0130 N82-14636
    photovoltaic space power systems, volume 2
[NASA-CR-165323-VOL-2] p0130 N82-
Market assessment of photovoltaic power systems
for agricultural applications in Rigeria
[NASA-CR-165511] p0133 %82-
Socioeconomic impact of photovoltaic power at
                                                                  p0130 #82-14637
                                                                   p0133 #82-18698
        Schuchuli, Arizona
[NASA-CR-165551]
                                                                   p0133 N82-19669
     Operational performance of the
        photovoltaic-powered grain mill and water pump
at Tangaye, Upper Volta
[NASA-TM-82767] p0120 N82-1
                                                                   p0120 N82-19673
     Application of photovoltaic electric power to the rural education/communication needs of
developing countries
[NASA-CR-167894]
PROTOVOLTAIC RPPECT
                                                                   p0137 N82-29720
     Study of the photovoltaic effect in thin film
barium titanate
[NASA-CR-165081] p0131 N8
                                                                   p0131 N82-16479
     Market assessment of photovoltaic power systems
for agricultural applications in Colombia
                                                                  p0134 NB2-22770
         [ NASA-CR- 165524 ]
[NASA-CR-165524]
Determination of optimum sunlight concentration level in space for 3-4 cascade solar cells
[NASA-TM-82899]
PRUGOID OSCILLATIONS
U TCH (INCLINATION)
PIEZOELECTRICITY
                                                                   p0 126 N82-32853
     Piezoelectric composite materials
[NASA-CASE-LEW-12582-1]
                                                                   p0054 N82-31450
PINNACLES
 U AKS (LANDFORMS)
PIPE PLOW
     Tube entrance heat transfer with deposit formation [AIAA PAPER 82-0918] p0093 A82-319
                                                                   p0093 A82-31908
PIPES (TUBES)
Resonance tube hazards in oxygen systems
        [NASA-TM-82801]
                                                                   p0072 N82-21415
PISTON ENGINES
NT DIESEL ENGINES
     Preliminary study of temperature measurement techniques for Stirling engine reciprocating seals [NASA-CR-165479] p0 104 N82-81466 Advanced general aviation comparative
         engine/airframe integration study
         [ NASA-CR- 165564 ]
                                                                   p0025 N82-22263
     Exhaust emissions reduction for intermittent
         combustion aircraft engines
         [ NASA-CR- 1679 14 ]
                                                                   p0029 N82-33392
PITCH (INCLINATION)
Variable gain for a wind turbine pitch control
        [NASA-TM-82751]
                                                                   p0119 N82-16478
PITCH ANGLES
U TCH (INCLINATION)
PLANAR STRUCTURES
     High voltage planar multijunction solar cell
[NASA-CASE-LEW-13400-1] p0125 N
                                                                   PO 125 NB2-31764
 PLANE STRAIM
     Moving singularity creep crack growth analysis with the /Delta T/c and C/asterisk/ integrals --- path-independent vector and energy rate line
PLANETARY BOUNDARY LAYER
Effects of condensation and surface motion on the
structure of steady-state fronts
                                                                              A82-19360
PLANETARY SATELLITES
  U TURAL SATELLITES
PLANETARY SPACECRAPT
  U TERPLANETARY SPACECRAFT
 PLANETARY WAVES
     Stratospheric-mesospheric midvinter disturbances -
```

A summary of observed characteristics

A82-12135

SUBJECT INDEX

FLAUFORRS	
	Effects of arc current on the life in burner rig
NT BECTANGULAR PLANFORMS	thermal cycling of plasma sprayed ZrOsub2-
PLANT DESIGN	Tsub20sub3
Magnetohydrodynamics (MND) Engineering Test	[NASA-TH-82795] p0087 N82-17453
Facility (ETF) 200 MWe power plant. Design Requirements Document (DRD)	Tailored plasma sprayed MCrAlY coatings for aircraft gas turbine applications
[NASA-TH-82705] p0099 N82-12446	[NASA-CR-165234] p0064 N82-19360
Magnetohydrodynamics (MRD) Engineering Test	Effect of aluminum phosphate additions on
Facility (ETF) 200 HWe power plant. Conceptual	composition of three-component plasma-sprayed
Design Engineering Report (CDEE). Volume 1:	solid lubricant
Executive summary [NASA-CR-165452-VOL-1] p0129 N82-12570	[NASA-TP-1990] p0059 N82-21298
[NASA-CR-165452-VOL-1] p0129 N82-12570 Magnetohydrodynamics (MHD) Engineering Test	Fully plasma-sprayed compliant backed ceramic turbine seal
Pacility (ETF) 200 HHe power plant Conceptual	[NASA-CASE-LEN-13268-2] p0101 M82-26674
Design Engineering Report (CDER)	Fully plasma-sprayed compliant backed ceramic
[NASA-CR-165452-VOL-5] p0 132 N82-17603	turbine seal
Magnetohydrodynamics (MHD) Engineering Test	[NASA-CASE-LEW-13268-1] p0069 N82-29453
Facility (ETF) 200 MWe power plant. Conceptual Design Engineering Report (CDEF). Volume 2:	Use of fiber like materials to augment the cycle
Engineering, Volume 3: Costs and schedules	life of thick thermoprotective seal coatings [NASA-TH-82901] p0089 N82-32633
[NASA-CR-165452-VOL-2] p0136 N82-27837	Advanced ceramic coating development for
Comparative analysis of the conceptual design	industrial/utility gas turbines
studies of potential early commercial MHD power	[NASA-CR-169852] p0065 N82-33494
plants (CSPEC)	PLASMA TEMPERATURE
[NASA-TH-82897] p0123 N82-27838	Additional extensions to the NASCAP computer code,
PLASMA ACCELERATION Ploctric thruster research	volume 3 [NASA-CR-167857] p0040 N62-26378
[NASA-CR- 165603] p0045 N82- 24285	PLASMA THEORY
PLASHA CURRENTS	U ASMA PHYSICS
End region and current consclidation effects upon	PLASMA TURBULENCE
the performance of an MHD channel for the BTF	Turbulence in argon shock waves
conceptual design Engineering Test Facility	p0158 A82-11117
[AIAA PAPER 82-0325] p0157 A82-17889	PLASHA WAVES
Brushfire arc discharge model p0038 H82-14224	Turbulence in argon shock waves p0158 A82-11117
PLASHA CYLINDERS	Standing waves along a microwave generated surface
NT CYLINDRICAL PLASHAS	wave plasma
PLASHA DIAGNOSTICS	p0 158 A82-26952
Field-aligned ion streams in the earth's midnight	PLASHA-BLECTROMAGNETIC INTERACTION
region	Standing waves along a wicrowave generated surface
PLASHA BLECTRODES PO 140 A82-31009	wave plasma p0158 182-26952
Impact of uniform electrode current distribution	PLASHAS (PHYSICS)
on ETF Engineering Test Facility MHD generator	NT ARGON PLASMA
[AIAA FAPER 82-0423] p0 157 A62-17941	NT CYLINDRICAL PLASMAS
PLASHA INTERACTIONS	Representation and material charging response of
NT FLASHA-ELECTROMAGNETIC INTERACTION	geoplasma environments
Spacecraft Charging Technology, 1980 [NASA-CP-2192] p0037 N82-14213	p0039 N82-14249
[NASA-CP-2192] p0037 N82-14213 Agreement for NASA/OAST - USAF/AFSC space	PLASMASPHERE Representation and material charging response of
interdependency on spacecraft environment	geoplasma environments
interaction	p0039 #82-14249
p0038 N82-14271	Simulation of charging response of SCATHA (P78-2)
Numerical simulation of plasma insulator	satellite
interactions in space. Part 1: The self	2000 400 4000
	p0039 N82-14250
consistent calculation	SCATHA SSPM charging response: NASCAP predictions
consistent calculation p0039 N82-14272	SCATHA SSPM charging response: NASCAP predictions compared with data
consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251
consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251
consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space, Part 2: Dielectric effects p0039 N82-14273	SCATHA SSPH charging response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOUS
consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects p0039 N82-14273 FLASMA LAYERS	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASMOIDS U ASMAS (PHYSICS) PLASMOIS A new strategy for efficient solar energy
consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface
consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects p0039 N82-14273 PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASMOIDS U ASMAS (PHYSICS) PLASMOUS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons
consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface
consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased sclar arrays with the space plasma [NASA-CR-165485] p0039 N82-14273 p0039 N82-14273 p1039 N82-14273 p0039 N82-14273 p0039 N82-14273 p0039 N82-14273 p0039 N82-14273	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOUS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] p0042 N82-29354
consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] PLASMA SHEATHS PLASMA SHEATHS	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOUS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] p0124 N82-29708
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects Plasma LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] PLASMA SHEATHS PLASMA SHEATHS Numerical simulation of sheath structure and	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION
consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects p0039 N82-14273 FLASHA LAYERS NT PLASHA SHEATHS FLASHA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] PLASHA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOUS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction
Consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects p0039 N82-14273 FLASMA LAYERS NT PLASMA SHEATHS FLASMA PHYSICS Experimental simulation of biased sclar arrays with the space plasma [NASA-CR-165485] PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASHAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TH-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers
consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects p0039 N82-14273 FLASHA LAYERS NT PLASHA SHEATHS FLASHA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] PLASHA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOUS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] p0043 A82-35087
Consistent calculation P0039 N82-14272 Numerical simulation of plasma insulator interactions in space, Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] p0157 N82-10880 PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOUS I new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased sclar arrays with the space plasma [NASA-CR-165485] PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 PLASMA SOUND WAVES PLASMA SOUND WAVES PLASMA SPRAYING	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASHAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TH-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] P0076 N82-24361
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES U ASMA SPRAYING Improved plasma sprayed MCTAlY coatings for	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES PLASMA SPRAYING Improved plasma sprayed MCTALY coatings for aircraft gas turbine applications	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [ATAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] p0157 N02-10880 PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES PLASMA SPRAYING Improved plasma sprayed MCTALY coatings for aircraft gas turbine applications	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TH-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TH-82820] p0102 N82-32735
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES PLASMA SPRAYING Improved plasma sprayed MCTALY coatings for aircraft yas turbine applications p0065 A82-20742 Phase stability in plasma-sprayed, partially	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TM-828201] PLASTIC FILES
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] p0157 N82-10880 PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES PLASMA SPRAYING Improved plasma sprayed MCTANY coatings for aircraft gas turbine applications p0065 A82-20742 Phase stability in plasma-sprayed, partially stabilized zirconia-yttria	SCATHA SSPM charging response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TH-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PO124 N82-29708 PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TH-82820] p0102 N82-32735
Consistent calculation P0039 N82-14272	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASHAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TH-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PO124 N82-29354 PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TH-82820] PLASTIC FILMS U LYMERIC FILMS PLASTIC PROPERTIES NT ELASTOPLASTICITY
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] p0 157 N82-10880 PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0 040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES U ASMA WAVES PLASMA SPRAYING IMPROVED plasma sprayed MCTAlY coatings for aircraft gas turbine applications Phase stability in plasma-sprayed, partially stabilized zirconia-yttria p0 070 A82-41552 Thermal-barrier-coated turbine blade study [NASA-CP-16535!]	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TH-82820] PLASTIC FILMS U LYMERIC FILMS PLASTIC PROPRETIES NT ELASTOPLASTICITY NT THERMOPLASTICITY
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES PLASMA SPRAYING Improved plasma sprayed MCrAly coatings for aircraft gas turbine applications p0065 A82-20742 Phase stability in plasma-sprayed, partially stabilized zirconia-yttria p0070 A82-41552 Thermal-barrier-coated turbine blade study [NASA-CP-165351] p0023 N82-10040 Progress in protective coatings for aircraft gas	SCATHA SSPM charqing response: NASCAP predictions compared with data PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strategy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume ! [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TM-82820] PLASTIC FILES U LYMERIC FILES PLASTIC PROPERTIES NT ELASTOPLASTICITY NT THERMOPLASTICITY NT THERMOPLASTICITY NT VISCOPLASTICITY
Consistent calculation P0039 N82-14272	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strateqy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TM-82820] PLASTIC FILMS U LYMERIC FILMS PLASTIC PROPERTIES NT ELASTOPLASTICITY NT THERMOPLASTICITY NT VISCOPLASTICITY VISCOPLASTICITY Relastic-plastic finite-element analyses of
Consistent calculation Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects PLASMA LAYERS NT PLASMA SHEATHS PLASMA PHYSICS Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] p0 157 N82-10880 PLASMA SHEATHS Numerical simulation of sheath structure and current-voltage characteristics of a conductor-dielectric disk in a plasma p0 040 A82-15904 PLASMA SOUND WAVES U ASMA WAVES U ASMA WAVES PLASMA SPRAYING Improved plasma sprayed MCrAlY coatings for aircraft gas turbine applications Phase stability in plasma-sprayed, partially stabilized zirconia-yttria p0 070 A82-41552 Thermal-barrier-coated turbine blade study [NASA-CP-16535!] Progress in protective coatings for aircraft gas turbines: A Review of NASA spensored research [NASA-TH-82740] p0058 N82-12216	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strateqy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CH-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TH-82820] PLASTIC FILMS U LYMERIC FILMS PLASTIC PROPRETIES NT ELASTOPLASTICITY NT THERMOPLASTICITY NT THERMOPLASTICITY NT THERMOPLASTICITY NT THERMOPLASTICITY NT THERMOPLASTICITY NT USCOPLASTICITY Elastic-plastic finite-element analyses of thermally cycled double-edge wedge specimens
Consistent calculation P0039 N82-14272	SCATHA SSPM charqing response: NASCAP predictions compared with data p0037 N82-14251 PLASHOIDS U ASMAS (PHYSICS) PLASHOWS A new strateqy for efficient solar energy conversion: Parallel-processing with surface plasmons [NASA-TM-82867] PLASTIC COATINGS Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] PLASTIC DEFORMATION A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER 82-1251] The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1 [NASA-CR-168929] Plastic deformation and wear process at a surface during unlubricated sliding [NASA-TM-82820] PLASTIC FILMS U LYMERIC FILMS PLASTIC PROPERTIES NT ELASTOPLASTICITY NT THERMOPLASTICITY NT VISCOPLASTICITY VISCOPLASTICITY Relastic-plastic finite-element analyses of

ORIGINAL PAGE IS OF POOR QUALITY

PLASTICITY U ASTIC PROPERTIES PLASTICIZERS	PGLICIES NT ENERGY POLICY
Navanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] p0124 N62-29708	POLISHED NETALS U TAL POLISHING POLISHENG
FLASTICS NT CARBON FIRER REINFORCED PLASTICS	NT METAL POLISHING POLLUTION CONTROL
NT ECCXY RESINS NT KFYLAR (TRADEMARK) NT PCLYETHYLENES	Advanced technology for controlling pollutant emissions from supersonic cruise aircraft p000 NB - 8004
NT POLYIETREFLUOROETHYLENE NT POLYVINY, ALCOHOL NT TEPLON (TRADEMARK)	Pollution reduction technology program small jet aircraft engines, phase 3 [NASA-CR-165386] p0023 M92-14095
NT THERMOPIASTIC FILMS NT THERMOPIASTIC RESINS NT THERMOSETTING RESINS	ERBS fuel addendus: Pollution reduction technology program small jet aircraft engines, phase 3
MATES (STRUCTURAL MEMBERS) NT ELASTIC PLATES NT END FLATES	[NASA-CR-165387] p0024 M82-14096 Low NOx heavy fuel combustor concept program. Phase 1: Combustion technology generation
NT CRINCTROPIC PLATES Finite-element modeling of layered, anisotropic composite plates and shells: A review of recent research	[NASA-CR-165482] p0136 Nd2-24725 POLYAMIDE RESINS NT KEVLAR (THADEMARK) POLYCRYSTALS
p0113 N82-19563 Cell module and fuel conditioner development [NASA-CP-165193] p0137 N82-30712	Tribological properties of sintered polycrystalline and single crystal silicon carbide [NASA-TM-82829] p0068 N02-24343
PLATING NT ION PLÄTING NT NICKEL FLATE PLATINUM	The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume [NASA-CR-168929] p0076 NB2-24361
NT PLATINUM ISOTOPES Stabilizing platinum in phosphoric acid fuel cells [NASA-Cr-165483] p0130 N02-14620	Effect of gamma irradiation on the friction and wear of ultrahigh molecular weight polyethylene p0062 A02-10674
Stabilizing platinum in phosphoric acid fuel cells [NASA-CR-165606] p0136 N82-29718 PLATINUM ALLOYS	POLYGONS NT NECTANGLES POLYIMIDE RESINS
Proparation and evaluation of advanced electrocatalysts for phosphoric acid fuel cells [NASA-CP-165519] p0129 N82-12573	Effects of madic ester concentration and processing on physical and mechanical properties of PMR/Celion 6000 composites
PLATINUM ISOTOPES Preparation and evaluation of advanced electrocatalysts for phosphoric acid fuel cells [NASA-CP-165594] p0132 N82-17615 PLUTONIUM	p0051 A82-27440 Keviar/PRR-15 polyimide matrix composite for a complex shaped DC-9 dray reduction fairing [AIAA PAPER 82-1047] p0002 A82-37678 Righ-temperature resins
NT PLUTCHIUM 244 PLUTONIUM ISOTOPES NT PLUTONIUM 244	p0051 A82-42657 Forced torsional proporties of PMR composites with varying madic ester concentrations and
FLUTOWIUM 244 Evidence for Pu-244 fission tracks in hibonites from Murchison carbonaceous chondrite	processing histories p0051 A82-45630 Novel improved PMR polyimides
PLY ORIENTATION p0 166 A02-29316	[NASA-TM-82733] p0049 N82-11117 POLYINIDES
Eoundary layer thermal stresses in angle-ply composite laminates, part 1 graphite-epoxy composites	NT KAPTON (TRADENARK) Novel improved PMR polyimides [NASA-TK-82733] p0049 N82-11117
[NASA-CR-165412] p0113 N82-26713 Edge delamination in angle-ply composite laminates, part 5	Tribological properties at 25 C of seven polyimide films bonded to 440 C high-temperature stainless steel
[NASA-CR-165439] p0114 N82-26717 Boundary-layer effects in composite laminates: Free-edge stress singularities, part 6	[NASA-TP-1944] p0067 N82-19373 PMR polyimides-review and updato [NASA-TM-82821] p0068 N82-24342
[NARA-CP-165440] POI14 M82-26718 POCKILS EFFECT U REFFINGENCE	Tribological evaluation of composite materials made from a partially fluorinated polyimide [NASA-TH-82832] p0069 N82-29459
POINT EXPRCTS NT VACANCIES (CRYSTAL DEFECTS) POINT HATCHING HETHOD (HATTERNATICS)	POLYMER CHEMISTRY Righ-temperature resins
U UNDARY VALUE PROBLEMS POISBUILE PLOB U MINAR FLOW	p005 A82-42657 Evaluation of left ventricular assist device pump bladders cast from ion-sputtered polytetrafluorethylene mandrels
POISSON RATIO Indentation law for composite laminates [NASA-CF-165460] p0052 N82-15123	[NASA-CR-167904] p0 142 N82-23976 POLYNER MATRIX COMPOSITES Hybridized polyner matrix composite
POLAN ORBITS Charqing of a large object in low polar Earth orbit	[NASA-CR-165340] p0051 N82-12139 PMR polyimides-review and update
POLAB REGIONS p0039 N62-14275	[NASA-TH-82821] p0068 N82-24342 POLYMER PHYSICS Effects of nadic ester concentration and
NT ANTARCTIC REGIONS POLARIZATION (WAVES) NT CROSS POLARIZATION	processing on physical and mechanical properties of PMR/Celion 6000 composites p0051 A82-27440
POLARIZED ELECTROMAGNETIC RADIATION NT FOLARIZED LIGHT	POLYMERIC FILMS HT KAPTON (TRADEMARK)
Veiling glare reduction methods compared for orth almic applications p0143 A82-13289	Inexpensive cross-linked polymeric separators made from water-soluble polymers for secondary alkaline nickel-zinc and silver-zinc cells p0048 A82-23778
POLARIZED RADIATION NT POLARIZED LIGHT	Tribological properties at 25 C of seven polyimide films bonded to 440 C high-temperature stainless

ORIGINAL PAGE IS OF POOR QUALITY

SUBJECT INDEX

steel [NASA-TP-1944] pOC	57 N82-19373	POUDER NETALLURGY The combined effects of Pe and H2 on	the
Texturing polymer surfaces by transfer ca		nitridation of silicon	v
cardiovascular prosthesis			p0070 A82-42924
	58 H82-28440	Applications of high-temperature pow	der metal
PMP polyimides-review and update		aluminum alloys to small gas turbi	леs p0065 A82-48244
	58 N82-24342	Trends in high temperature gas turbi	
Anion permselective membrane		(NASA-TH-82715)	p0058 N82-11182
FNASA-CE-167872] p013	37 NB2-30711	Effect of aluminum phosphate additio composition of three-component pla	
Anaerobic polymers as high vacuum leak se	ealants	solid lubricant	deg-shrayed
	DB A82-21967	[HASA-TP-1990]	p0059 NB2-21298
FOLYPHENIL BIBER	_	Hot isostatically pressed manufactur	
The effect of oxygen concentration on the boundary-lubricating characteristics of		strength MERL 76 disk and seal sha [NASA-CR-165549]	P0064 N82-26439
ether and a polyphenyl ether to 300 C		POWDERED METALS	p. 1000 , 1000 00 100
	70 A82-21699	U TAL POWDER	
Improved boundary lubrication with formu:	lated C-	POURR AMPLIFIERS IMPART power building blocks for 20	GHz spacehorne
	67 N82-20313	transmit amplifier	one phicopoline
POLYTETRAPLUOROETHYLENE		[AIAA 82-0498]	p0086 A82-23566
Performance of PTFE-lined composite jours	nal bearings)4 182-37854	POUR COMDITIONING	u lation
Performance of PTFE-lined composite jour		High power solar array switching req	p0043 A82-11736
[NASA-TM-82779] POO	48 NB2- 17 26 3	Component technology for space power	systems
Evaluation of left ventricular assist de	wice brub	[IAP PAPER 82-408]	p0043 182-44750
bladders cast from ion-sputtered polytetrafiuorethylene wandrels		High-frequency high-voltage high-pow converters	ST DC-ED-DC
	12 N82-23976	3321 33 332	p0083 N82-12347
POLYURETHANZ FOAM		Modeling and Analysis of Power Proce	
The acoustical Structure of highly porous open-cell foams	5	(MAPPS). Volume 1: Technical rep	ort p0083 N82-14447
	54 A82-45165	Modeling and Analysis of Power Proce	
POLIVINAL VICOHOF		(MAPPS). Volume 2: Appendices	
Inexpensive cross-linked rolymeric separation water-soluble polymers for see		[NASA-CR-165539] Power systems	p0145 N82-16748
alkaline nickel-zinc and silver-zinc co		Power Systems	p0001 N82-19146
p00g	48 A82-23778	Power systems	
Cross-linked polyvinyl alcohol films as a hattery separators	alkaline	POWER CONVERTERS	p0001 N82-19146
[NASA-TM-82802] p00	54 N82-22327	Analysis of transistor and snubber t	urn-off
POROUS MATERIALS		dynamics in high-frequency high-vo	ltage
The accustical structure of highly porous open-cell foams	S	high-power converters [NASA-CR-168760]	p0084 N82-22438
	54 A82-45165	Development of a dual-field heteropo	
Development of low modulus material for		converter	
ceramic gas path seal applications	22 402-10020	[NASA-CR-165168]	p0084 N82-24424
[NASA-CR-165469] p00: Iding tunnel tests of a composite porous	22 N82-10039 Leading	POWER DENSITY (ELECTROMAGNETIC) U DIANT FLUX DENSITY	
edge for use with a liquid anti-ice sy		POWER EFFICIENCY	
Lewis icing research tunnel	10 865 11055	Shuttle to GEO propulsion tradeoffs	p0034 A82-35082
[NASA-CR-164966] p00 Castable high temperature fractory mater	14 N82-11052 ials	[AIAA PAPER 82-1245] On the cause of the flat-spot phenom	
[NASA-CASE-LEW-13080-2] p00	66 NB2-11210	in silicon solar cells at low temp	
Gas turbine ceramic-coated-vane concept	with	low intensities in deep space	
convection-cooled porous metal core [NASA-TP-1942] p00	16 N82-14090	Summary and evaluation of the concep	p0043 A82-39599
Composite seal for turbes chinery	10 1102 14030	study of a potential early commerce	
[NASA-CASE-LEW-12131-3] p00	99 NB2-19540	plant (CSPEC)	
POROUS WALLS Thermal and flow analysis of a convection		[NASA-TM-82734] Straight & Ad chopped DC performance	p0119 N82-16481
air-cooled ceramic coated porous metal		General Electric 5BY436A1 DC shunt	
for turbine vanes		General Electric EV-1 controller	
	20 A82-10952	[NASA-CR-165507]	P0085 N82-24425
Heat transfer in cooled porous region with boundary	cu carvea	POWER GAIN On a free-electron-laser in a unifor	m magnetic
p00	89 182-14848	field - A solution for arbitrarily	
POSITRON ABBIHILATION		electromagnetic radiation fields	
Detection of a change in the cxidation s aluminum surface using angular correla		Variable gain for a wind turbine pit	A82-28409
positron annihilation radiation	CLOR OF	[NASA-TM-82751]	p0119 N82-16478
	AR2-30374	POWER GENERATORS	•
POTENTIAL ENERGY NT ELECTRIC POTENTIAL		U ECTRIC GENERATORS POWER PROCESSING SYSTEMS	
NT CPEN CIRCUIT VOLTAGE		U WER CONDITIONING	
POTENTIAL FLOW		POWER SUPPLY CIRCUITS	
Finite volume calculation of three-dimen	sional	A new approach to the minimum weight	./loss design
pctential flow around a propeller [AIAA FAPER 82-0957] p00	10 A82-31933	of switching power converters	p0082 182-16831
Mode propagation in nonuniform circular		Power system design optimization usi	
potential flow	E1 200 16004	Eultiplier techniques	
[NASA-TM-82766] p01 Computer program for calculating full po	51 N82-14881 tential	High voltage DC switchgear developme	p0085 A82-20743
transonic, quasi-three-dimensional flo	w through	nulti-kW space power system: Aero	
a rotating turbomachinery blade row		technology development of three ty	pes of solid
	C5 N82-28247	state power controllers for 200-11	
POWDER (PARTICLES) NT METAL PCWDER		current ratings of 25, 50, and 80 one type utilizing an electromecha	
			·

```
CHADA-CK-165413] p0083 N82-13357
Preliminary study, analysis and design for a power
switch for digital engine actuators
[NASA-CR-1595591
                                                                                  PRESINING
                                                                                      Effect of fuel-air-ratio nonuniformity on emissions of nitrogen oxides
                                                                                         [NASA-TP-1798]
                                                                                                                                        p0016 #82-13143
POWERED LIFT AIRCRAFT
                                                                                   PREPRES
                                                                                      On determination of fibre fraction in continuous
   QCSZE over-the-wing engine acoustic data
[NASA-TM-82708] p00
                                                     p0020 N82-29324
                                                                                         fibre composite materials
PREBURKERS
                                                                                                                                        p0051 182-38133
    Fuel/oxidizer-rich high-pressure preburners ---
      staged-combustion rocket engine
                                                                                    U NTERING
      [ NASA-CR- 165404 ]
                                                     p0073 N82-10245
                                                                                   PRESSURE
                                                                                    NT HIGH PRESSURE
NT HIGH VACUUM
NT INLET PRESSURE
    Testing of Eucl/oxidizer-rich, high-pressure
preturners
[NASA-CR-165609]
PRECIPITATION (HETEOROLOGY)
                                                     p007% W82-24353
                                                                                    MT ISOSTATIC PRESSURE
                                                                                    NT LOW PRESSURE
 NT BAIN
 NT SHOW COVER
                                                                                    NT LUMINOUS INTENSITY
                                                                                  NT SOUND PRESSURE
NT ULTRAHIGH VACUUM
NT WALL PRESSURE
PRESSURE CHAMBERS
    Illustration of a new test for detecting a shift
      in mean in precipitation series
                                                             182-13217
PRECIPITATION HARDENING
    oxide dispersion strengthened alloys
                                                                                      Levis, pressurized, fluidized-bed combustion
program. Data and calculated results
[NASA-TH-81767] p0124
    p0062 A82-11399
Long-term high-velocity oxidation and hot
corrosion testing of
                                                                                                                                        p0124 N82-30704
                                                                                   PRESSURE RPFECTS
                                                                                      Effect of vacuum exhaust pressure on the performance of MHD ducts at high B-field [ATAA PAPER 82-0396] p0 157 A82-20292 Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field
       corrosion testing of several NiCral and FeCral
       base oxide dispersion strengthened alloys
                                                     p0062 A82-37151
    Crystallographic texture in oxide-dispersion-strengthened alloys
    p0062 A82-40041
Creep and rupture of an ODS alloy with high stress
                                                                                         [NASA-TM-82750]
                                                                                                                                        p0157 N82-13908
                                                                                   PRESSURE GRADIENTS
                                                                                      Real time pressure signal system for a rotary engine [NASA-CASE-LEW-13622-1] p0019 N82-26294 Comparison of experimental and analytical
       rupture ductility --- Oxide Dispersion
       Strengthened
                                                     p0065 A82-40335
Creep shear behavior of the oxide dispersion strengthened superalloy MA 5000E
[NASA-TH-82704] PREDICTION ANALYSIS TECHNIQUES
                                                                                       performance for contoured endwall stators
[NASA-TM-82877] p0019 N82-2629
Experimental study of turbulence in blade end wall
                                                                                                                                        p0019 882-26299
                                                     p0058 N82-10195
                                                                                         corner region
    Turbine blade nonlinear structural and life analysis
                                                                                         [NASA-CR-169283]
                                                                                                                                        p009 | N82-31639
                                                     p0021 A82-34981
       [ AIAA FAPER 82-1056]
                                                                                   PRESSURE HEASUREHENT
                                                                                      Plow through aligned sequential orifice type inlets
FNASA-TP-19677 p0087 N82-20467
    Blade loss transient dynamic analysis of
    turbomachinery
[AIAA PAPER 82-1057]
Prediction of composite hydral behavior and salaple
                                                                                         [NASA-TP-1967]
                                                                                   PRESSURE PROBES
U ESSURE SENSORS
                                                     p0030 A82-34982
    p0049 N82-16181
Prediction of sound radiation from different
practical let engine in the
                                                                                   PRESSURE PULSES
                                                                                       Pressure pulsations above turbomolecular pumps
      practical jet engine inlets
[NASA-CR-165120]
                                                                                                                                        P0076 A82-46430
                                                     p0 153 N82- 168 10
                                                                                   PRESSURE RATIO
    Application of an airfoil stall flutter computer
                                                                                       Performance of single-stage axial-flow transonic
                                                                                         compressor with rotor and stator aspect ratios of 1.63 and 1.78, respectively, and with design pressure ratio of 1.82
[NASA-TP-1974]
p0017 N82-19:
       prediction program to a three-dimensional wing:
       Prediction versus experiment
      [ NASA-CR- 168586]
                                                     p0007 H82-19169
    The NASA-LeRC wind turbine sound prediction code
                                                                                                                                        p0017 N82-19222
                                                     p0123 N82-23730
                                                                                       Performance of single-stage axial-flow transonic
                                                                                         compressor with rotor and stator aspect ratios of 1.63 and 1.77, respectively, and with design pressure ratio of 2.05
[NASA-12-2001] p0018 N82-22
    Large displacements and stability analysis of
      nonlinear propeller structures [NASA-TM-82850]
                                                     p0112 N82-31707
                                                                                                                                        p0018 N82-22269
PREDICTIONS
                                                                                   PRESSURE REDUCTION
 NT FLCCD PREDICTIONS
NT NOISE PREDICTION
                                                                                       Thermal and flow analysis of a convection,
 NT NOISE PREDICTION (AIRCRAFT)
                                                                                         air-cooled ceramic coated porous metal concept
 NT PERFORMANCE PREDICTION
                                                                                         for turbine vanes
                                                                                         [ASME PAPER 81-HT-48]
                                                                                                                                        p0020 A82-10952
PREHEATERS
 U ATTNG EQUIPMENT
                                                                                   PRESSURE SENSORS
                                                                                   Real time pressure signal system for a rotary engine [NESA-CASE-LEW-13622-1] p0019 N82-26294 PRESSURE TRANSDUCERS
PREHEATING
 UATING
PREMIXED FLAMES
    Time resolved density measurements in premixed
                                                                                    U ESSURE SENSORS
                                                                                   PRESSURE VESSELS
       turbulent flames
       FATAN PAPER 82-0036]
                                                     p0036 A82-22033
                                                                                    NT PREBURNERS
                                                                                   PRESSURE WAVES
U ASTIC WAVES
    Flame structure in a swirl stabilized combustor
       inferred by radiant emission measurements
                                                     p0056 A82-28694
                                                                                   PRESSURE WELDING
    Lean-limit extinction of propane/air mixtures in the stagnation-point flow
                                                                                    NT DIFFUSION WELDING
                                                                                   PRESSURIZING
                                                     p0057 A82-28736
                                                                                    HT FUEL TANK PRESSURIZATION
    Experimental study of the effects of secondary air
                                                                                   PRETWISTING
      on the emissions and stability of a lean
                                                                                    U ISTING
       premixed combustor
                                                                                   PREVENTION
       [ AIAA PAPER 82-1072]
                                                     p0021 A82-34992
                                                                                    NT CORROSION PREVENTION
    Or the opening of premixed Bunsen flame tips
p0057 A82-37570
                                                                                    NT FIRE PREVENTION
                                                                                   NT ICE PREVENTION
PRIMARY BATTERIES
    On stability of premixed flames in stagnation -
                                                                                    NT ALKALINE BATTERIES
       Point flow
                                                                                     NT NICKEL ZINC BATTERIES
                                                     P0057 A82-37574
                                                                                   PRIVATE AIRCRAFT
    The premixed flame in uniform straining flow
                                                     p0055 A82-43194
                                                                                    U NERAL AVIATION AIRCRAFT
```

Alexandria de la companya della companya della companya de la companya della comp

ORIGINAL PAGE IS OF POOR QUALITY

```
PROBABILITY
 U OBJETTITY THEORY
PROBABILITY THEORY
    The application of probabilistic design theory to
      high temperature low cycle fatigue
                                                     n0112 N82-14531
      [ NASA-CR- 165488]
PROBLEM SOLVING
NT ITERATIVE SOLUTION
    Multiple-grid acceleration of Lax-Wendroff
      algorithms
      T NÁSA-TH-828431
                                                     p0149 NB2-22922
    Construction of solutions for some nonlinear
      two-point boundary value problems [NASA-TM-82937]
                                                     n0 144 N82-30949
PROCEDURES
 NT BOUNCARY INTEGRAL METHOD
 NT FINITE PLEMENT METHOD
NT FINITE VOLUME METHOD
PROCESS CONTROL (INDUSTRY)
   Fuel quality processing study, volume 1 [NASA-CR-165327-VOL-1] p0
                                                    p0135 N82-24649
    Ruel quality/processing study Tolume
Appendix: Task | literature survey
[NASA-CR-|65327-VOL-2]
                                              Volume 2:
                                                     n0135 N82-24650
PROCESS REAT
    Collection and dissemination of thermal energy
      storage system information for the pulp and
      paper industry
                                                     p0136 N82-24686
PRODUCT DEVELOPMENT
AGT 100 automotive gas turbine system development
[AIAA FAPER 82-1165] p0108 A82-35
    [ AIAA FAPER 82-1165] p0108 A82-35038
AGT 101 automotive gas turbing system development
      [ AIAA PAPER 82-1166]
                                                     p0 108 A82-35039
   Integrated analysis of engine structures [NASA-TM-82713] p01
                                                     p0111 N82-11491
    Solar cell development for the power extension
      package
      [ NASA-TM-82685]
                                                     p0118 N82-11551
    Cooled variable-area radial turbine technology
      program
      [ NASA-CR- 165408]
                                                     p0024 N82-19221
    Local and national impact of aerospace research
    Incal and mactions and technology [NASA-TH-82775] p0162 N82-
Energy efficient engine shroudless, hollow fan blade technology report
                                                     p0162 N82-20006
      T NASA -CR- 165586 1
                                                     p0024 N82-21196
    Pyrolytic graphite collector development program
                                                     p0052 N82-29363
      [ NASA-CR- 167909]
    Current legal and institutional issues in the
      commercialization of phosphoric acid fuel cells
      [ NASA-CR- 167867]
                                                     p0136 N82-29719
   Component technology for space power systems p0082 N82-30474
PRODUCTION COSTS
    Comparative analysis of the conceptual design
      studies of potential early consercial MHD power
plants (CSPEC)
[NASA-TM-82897]
PRODUCTION ENGINEERING
                                                     DO 123 N82-27838
    Technology development for phosphoric acid fuel
      cell powerplant, phase 2 [NASA-CR-165426]
                                                     p0131 N82-16482
PRODUCTION METHODS
 U ODUCTION ENGINEERING
PRODUCTS
 NT REACTION PRODUCTS
NT REACTION PRODUCTS

PROGRAM VERIFICATION (COMPUTERS)

Experimental verification of a computational procedure for the design of TWT-refocuser-MDC systems --- Hultistage Degressed Collectors
                                                     p0082 182-16128
   Spherical roller bearing analysis. SKF computer program SPHERBEAN. Volume 3: Program correlation with full scale hardware tests
[NASA-CR-165205] p0106 N82-20542
    Additional extensions to the NASCAP computer code,
      volume 2
      [ NASA-CR-167856]
                                                     p0040 N82-26377
    A generalized memory test algorithm
[ NASA-TM-82874]
PROGRAMMING LANGUAGES
                                                     p0 146 N82-31971
 NT FORTRAN
PROGRAMS
 NT NASA PROGRAMS
 NT SUPERSONIC CRUISE AIRCRAFT RESEARCH
```

NT HYPERVELOCITY PROJECTILES

```
PROBLEMENCES
 MT SOLAR PROMINENCES
PROP-PAN TECHNOLOGY
   Advanced turboprop testbed systems study.
      1: Testbed program objectives and priorities,
      drive system and aircraft design studies,
      evaluation and recommendations and wind tunnel
      test plans [NACL-CR-167928-VOL-1]
                                                  p0028 N82-32370
    Advanced turboprop testbed systems study
      [ NASA-CR-167895]
                                                  p0014 #82-33375
PROPAGATION (EXTENSION)
NT CRACK PROPAGATION
NT PLANE PROPAGATION
PROPAGATION HODES
   Analytical and experimental investigation of the
      propagation and attenuation of sound in extended reaction lined ducts
[AIAA PAPER 81-2014] p0153 A82-1045
                                                  p0153 A82-10454
   Mode propagation in nonuniform circular ducts with
      potential flow
                                                  p0 15 | N82-14881
      [ NASA-TH-82766]
PROPAGATION VELOCITY

Buoyancy effects on the temperature field in
      downward spreading flames
                                                  p0094 A82-41203
   Lean-limit extinction of propane/air mixtures in
      the stagnation-point flow
                                                  p0057 A82-28736
   Effects of heat loss, preferential diffusion, and flame stretch on flame-front instability and extinction of propane/air mixtures
                                                  p0057 A82-32877
   Deposit formation in hydrocarbon fuels
[ASME PAPER 82-GT-49]
p
                                                  p0075 A82-35307
   Deposit formation in hydrocarbon rocket fuels with
      an evaluation of a propane heat transfer
      correlation [NASA-TM-82911]
                                                  p0088 N82-26611
PROPELLANT COMBUSTION
 NT SOLID PROPELLANT CONBUSTION
PROPELLANT DECOMPOSITION
Deposit formation in hydrocarbon fuels
[ASME PAPER 82-GT-49] P
PROPELLANT EVAPORATION
                                                  p0075 A82-35307
   Study of vapor flow into a capillary acquisition device --- for cryogenic rocket propellants
      [NASA-CR-167883]
                                                  p009 | N82-24452
PROPELLANT PROPERTIES
   NASA/General Electric broad-specification fuels
      combustion technology program - Phase I results
      and status
      [AIAA PAPER 82-1089]
                                                  D0021 A82-35000
   Characterization of an Experimental Referee
Broadened Specification (ERBS) aviation turbine
fuel and ERBS fuel blends
[NASA-TM-82883]
PROPELLAR STORAGE
                                                   p0072 N82-32504
    Cryogenic fluid management experiment
                                                   p0039 N82-15117
      [ NASA-CR-165495 ]
PROPELLANT TANKS
Cryogenic fluid management experiment
      [ NASA-CR-165495]
                                                   p0039 #82-15117
PROPELLANT TRANSPER
    Cryogenic fluid management experiment
      [NASA-CR-165495]
                                                   p0039 N82-15117
PROPELLANTS
 NT CRYOGENIC ROCKET PROPELLANTS
 NT ROCKET PROPELLANTS
 NT RP-1 ROCKET PROPELLANTS
BT STORABLE PROPELLANTS
PROPELLER BLADES
    Tensile buckling of udvanced turboprops
      [NASA-TM-82896]
                                                  p0112 N82-31708
    Impact of advanced propeller technology on
      aircraft/mission characteristics of several
      general aviation aircraft [NASA-CR-167984]
                                                   p0009 N82-33347
PROPELLER EFFICIENCY
    Performance degradation of propeller/rotor systems
      due to rime ice accretion [AIAA PAPER 82-0286]
                                                  p0014 A82-28322
    Evaluation of wind tunnel performance testings of
an advanced 45 deg swept 8-bladed propeller at
Mach numbers from 0.45 to 0.85
      [ NASA-CR-3505 ]
                                                   p0007 N82-19178
PROPELLER PANS
    In-flight acoustic results from an advanced-design
```

Manager Towns of the Control of the

```
propeller at Mach numbers to 0.8
      [ ATAN PAPER 82-1120]
                                                         p0021 A82-35017
PROPELLER SLIPSTREAMS
    Propeller tip vortex - A possible contributor to
      aircraft cabin noise
                                                          p0152 A82-17603
   Fast generation of three-dimensional computational boundary-conforming periodic grids of C-type --- for turbine blades and propellers
      [ NASA-CR- 165596]
                                                          p0C09 N82-28253
PROPELLERS
 NT PROPELLER FANS
    Finite volume calculation of three-dimensional
    potential flow around a propeller p0010 A82-3
Noise of the SP-3 propeller model at 2 deg and 4
                                                          p0010 A82-31933
      deg angle of attack
      [ NASA-TH-82738]
    A shock wave approach to the noise of supersonic
      propellers
      [ NASA -TH-82752 ]
                                                          p0151 N82-16809
   p0151 N82-16/
Evaluation of wind tunnel performance testings of
an advanced 45 dog swept 8-bladed propellor at
Mach numbers from 0.45 to 0.85
[NASA-CR-3505] p0007 N82-19
                                                          p0007 N82-19178
    A preliminary comparison between the SR-3
      propeller noise in flight and in a wind tunnel [NASA-TM-82805] polss N82-2
                                                          p0 152 N82-21998
    Future propulsion opportunities for commuter
      airplanes
      [ NASA-TH-82880 ]
                                                          p0018 N82-24203
    Summary and recent results from the NASA advanced
High Speed Propeller Research Program
[NASA-TM-82891] p0001 N82-26
                                                          p0001 N82-26219
    Propulsion opportunities for future commuter
       aircraft
       [ NASA-TH-82915]
                                                          p0019 N82-26298
    Large displacements and statility analysis of
      nonlinear propeller structures
      [ NASA-TH-82850]
                                                          p0112 N82-31707
    Rough analysis of installation effects on
    turboprop noise
[NASA-TM-82924]
Propeller flow visualization techniques
                                                          p0152 N82-32082
                                                          p0096 N82-32672
    Development of a laser velocimeter for a large
       transonic wind tennel
                                                          p0096 N82-32688
    LV measurements with an advanced turboprop
                                                          p0097 N82-32690
PROPULSION
 HT AUXILIARY PROPULSION
 NT CHEMICAL PROPULSION
NT ELECTRIC PROPULSION
 NT ELFCTROMAGNETIC PROPULSION
 NT JET PROPULSION
NT LOW THRUST PROPULSION
 NT MASS DRIVERS (PAYLOAD DELIVERY)
NT SOLAR ELECTRIC PROPULSION
NT SPACECRAFT PROPULSION
    NASA research activities in aeropropulsion
FNASA-TM-82788] p0017
                                                         p0017 N82-16084
    A piecewise linear state variable technique for
       real time propulsion system simulation [NASA-TM-82851] p00
                                                          p0018 N82-24201
PROPULSION SYSTEM CONFIGURATIONS

NASA research in aircraft propulsion

[ASME FAPER 82-GT-177] p0022 A87

Computational methods for internal flows with
                                                          p0022 A82-35389
      emphasis on turbomachinery
[NASA-TM-82764]
                                                          p0003 N82-13113
    NASA research in aircraft propulsion [NASA-TH-82771]
    [NASA-TH-8277]] p0016 N82-13146
The role of modern control theory in the design of
      controls for aircraft turbine engines [NASA-TM-82815] p0
                                                          p0018 N82-22262
    Future propulsion opportunities for commuter airplanes
       [ NASA-TH-82880]
                                                          p0018 N82-24203
   [ NASA-TR-82880 ]
Integrated propulsion for near-Earth space missions, Volume 1: Executive summary [ NASA-CR-167889-VOL-1 ] p0045
Integrated propulsion for near-Earth space missions, Volume 2: Technical [ NASA-CR-167889-VOL-2 ] p0046
                                                          p0045 N82-33424
                                                          p0046 N82-33425
PROPULSION SYSTEM PERFORMANCE
    30-cm mercury ion thruster technology
                                                          p0046 A82-15434
```

```
Characteristics of the LeRC/Hughes J-series 30-cm
      engineering model thruster
   Measuring the spacecraft and environmental
      interactions of the 8-cm mercury ion thrusters on the P80-1 mission
                                                   p0043 A82-15438
   Y/STOL propulsion control technology
      [AIAA PAPER 81-2634]
                                                   p0029 A82-16909
    A real time Pegasus propulsion system model for
      VSTOL piloted simulation evaluation [AIAA PAPER 81-2663]
                                                   p0020 A82-19221
   Characterization of advanced electric propulsion
     svstens
    FAINA PAPER 82-1246] p007
JT8D bigh pressure compressor performance
                                                    p0071 A82-35083
      improvement
      [ NASA-CR-165531]
                                                    p0104 N82-11467
    The ac propulsion system for an electric vehicle,
      phase |
[NASA-CR-165480]
                                                    p0129 N82-13506
   Advanced Gas Turbine (AGT) powertrain system development for automotive applications
      [ NASA-CR-165175]
                                                    p0 163 N82-16937
    Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL
       [ NASA-TH-82743]
                                                    p0004 N82-18178
    NASA/HAA Advanced Rotorcraft Technology and Tilt
Rotor Workshop. Volume 5: Propulsion Session
      Rotor Workshop.
[NASA-TM-84207]
                                                   D0015 N82-23241
    A piecewise linear state variable technique for
      real time propulsion system simulation [NASA-TM-82851] p00
                                                    p0018 N82-24201
    Summary and recent results from the NASA advanced
      High Speed Propeller Research Program [NASA-TM-82891] p0
                                                    p0001 N82-26219
    Propulsion opportunities for future commuter
      aircraft
      [ NASA-TM-829151
                                                    p0019 N82-26298
    Systems integration
                                                    p0042 N82-27371
    On the road performance tests of electric test
      vehicle for correlation with road load simulator
                                                    p0127 N82-33829
      [NASA-TH-82900]
PROPULSIVE EPPICIENCY
 NT PROPELLER EFFICIENCY
   Propulsion study for Small Transport Aircraft
Technology (STAT), Appendix B
[NASA-CR-165499-APP-B] p0022 N8
                                                    p0022 N82-10038
    Small passenger car transmission test: Chevrolet Malibu 200C transmission with lockup
[NASA-CR-165182]
PROSTRETIC DEVICES
                                                    p0105 N82-16410
   Pabrication and wear test of a continuous fiber/particulate composite total surface hip
      replacement
      [ NASA-TM-81746]
                                                    p0066 N82-11211
    Texturing polymer surfaces by transfer casting --
      cardiovascular prosthesis
[NASA-CASE-LEW-13120-1]
                                                    p0068 N82-28440
PROTECTION
 NT CORROSION PREVENTION
 NT ENVIRONMENT PROTECTION
 NT THERMAL PROTECTION
PROTECTIVE COATINGS
HT CERAMIC COATINGS
HT REPRACTORY COATINGS
    Thermal-barrier-coated turbine blade study
                                                    p0023 N82-10040
      [NASA-CR-165351]
    Pabrication and wear test of a continuous
      fiber/particulate composite total surface hip
      replacement
                                                    p0066 N82-11211
      [NASA-TM-81746]
    Progress in protective coatings for aircraft gas
turbines: A Review of NASA sponsored research
[NASA-TM-82740] p0058 N82-12216
    Tailored plasma sprayed MCrAlY coatings for aircraft gas turbine applications
[NASA-CR-165234] p0064
                                                    p0064 N82-19360
    Sputtered silicon mitride coatings for wear
      protection
      [NASA-TH-82819]
                                                    p0067 N82-20314
    Effect of aluminum phosphate additions on composition of three-component plasma-sprayed
      solid lubricant
    [NASA-TP-1990] p0059 N82-Some properties of RF sputtered hafnium nitride
                                                    D0059 N82-21298
      coatings
      [ NASA-TH-82826]
                                                    p0067 N82-21331
```

```
Covering solid, film cooled surfaces with a duplex
                                                                                quality assurance method for wind turbines
                                                                              [NASA-TH-82803] p0110 M82-19550
Fuel quality processing study, volume 1
[NASA-CB-165327-VOL-1] p0135 N82-24649
     thermal barrier coating [NASA-CASE-LEW-13450-1]
                                                p0088 N82-25463
   Method of protecting a surface with a
                                                                              Twel quality/processing study. Yelume 2: Appendix. Task I literature survey
     silicon-slurry/aluminide coating --- coatings
     for gas turbine ongine blades and vanes [NASA-CASE-18M-13343-1] p006
                                                                                                                           p0135 N82-24650
                                                P0068 N82-28441
                                                                                 [ NASA-CR-165327-VOL-2]
   Advanced ceramic coating development for industrial/utility gas turbines
                                                                           OBSERTES
                                                                            U MES (EXCAVATIONS)
     [ NASA-CF- 169852]
                                                p0065 NB2-33494
                                                                           STEADO
   Overlay metallic-cernet alloy coating systems ---
                                                                              First results of material charging in the space
     for que turbine engines [NASA-CASE-LEW-13639-1]
                                                                                environment
                                                p0070 N82-33522
                                                                                 [ NASA-TH-84743]
                                                                                                                           p0081 N82-24431
PULSATING FLOW
                                                                           CALMOTINE
                                                                              Deposit formation in liquid fuels. III - The
 U STEADY FLCK
PULSE CHARGING
                                                                                affect of selected nitrogen compounds on diesel
   Effect of positive pulse charge waveforms on the energy efficiency of lead-acid traction cells
                                                                                 fuel
                                                                                                                           p0074 A82-23238
     [ NASA-TM-82709]
                                                p0118 W82-10503
PULSE DURATION HODULATION
   A PWM transistor inverter for an ac electric
     vehicle drive
                                                                           BACKS (GEARS)
                                                                              Optimal tooth numbers for compact standard spur
                                                p0085 A82-20744
PULSE HODULATION
                                                                                genr sets
[ASME PAPER 81-DET-115]
 NT PULSE DURATION MCDULATION
                                                                                                                           p0103 A82-19335
PULSE TIME HODULATION
                                                                           BADIAL FLOW
 NT PULSE DUFATION MODULATION
                                                                              Design and development of a ceramic radial turbine
FULSE WIDTH HODULATICH
                                                                                 for the AGT101
                                                                               (ATAA PAPER 82-1209] p0109 A82-
*Coriolis resonance* within a rotating duct ---
U LSF DURATION HODULATION PULSED LASERS
                                                                                                                           p0109 A82-35480
                                                                                flow induced vibrations in centrifugal compressors p0012 182-37938
   Optically pumped high-pressure DF-CO2 transfer laser
                                                       A82-10193
                                                                              Cooled variable nozzle radial turbine for rotor
PULSES
 NT PPESSURE PULSES
                                                                                 craft applications
PUMPS
                                                                                 [ KASA-CR-165397]
                                                                                                                           p0028 N82-29323
                                                                              Three dimensional flow measurements in a turbine
 NT BLCGD PHHPS
 NT CENTRIFUGAL PUMPS
                                                                                 scroll
                                                                           [NASA-CR-167920]
BADIANT PLUX DENSITY
NT LUMINOUS INTENSITY
                                                                                                                           p0009 W82-32310
 NT MOLECULAR PUMPS
 NY TURRING PUMPS
   Low-thrust chemical propulsion system pump
     technology
[NASA-CP-165219]
                                                                              Calculation of quaranteed mean power from wind
                                                p0105 N82-13427
                                                                                 turbine generators
    NASA Redox cell stack shunt current, pumping
     power, and cell performance tradeoffs
                                                                           RADIANT HEATING
      [ NASA-TM-82686 ]
                                                p0054 N82-19333
                                                                              High thermal power density heat transfer ---
   Operational performance of the
                                                                                 thermionic converters
     photovoltaic-powered grain will and water pump
at Tangaye, Upper Volta
[NASA-TM-82767] p0120 N82-19
                                                                           [NASA-CASE-LEH-12950-1] MADIANT INTENSITY
                                                                                                                           p0087 N82-11399
                                                                            U DIANT FLUX DENSITY
                                                p0 120 NB2-19673
   Dosign description of the Tangaye Village
                                                                           RADIATION ABSORPTION
     photovoltaic power system
                                                                            NT ATMOSPHERIC ATTENUATION
      T NASA-TM-829171
                                                                           RADIATION DAMAGE
                                                p0126 N82-33828
PUBCHES
                                                                               Electron beam induced damage in ITO coated Kapton
   Motion of a rigid punch at the boundary of an
                                                                                 --- Indium Tin Oxide
                                                                                                                           DO 159 A 82-41546
      orthotropic viscoelastic half-plane
                                                       A82-26436
                                                                               Solar cell development for the power extension
PWH (HODULATION)
U LSE DURATION MODULATION
                                                                                 package
                                                                                                                           p0118 N82-11551
                                                                                 [NASA-TM-82685]
PYREX (TRADEMARK)
                                                                               Effects of processing and dopant on radiation
 U ROTILICATE GLASS
                                                                                 damage removal in silicon solar cells
PY BOGR APHALLOY
                                                                                 [NASA-TH-82892]
                                                                                                                           p0042 NB2-31443
U MPOSITE MAMPRIALS
U ROLYTIC GRAPHIME
U FRACTORY MATERIALS
PYROLYTIC GRAPHITE
                                                                           RADIATION DISTRIBUTION
NT ANTENNA RADIATION PATTERNS
NT DIFFRACTION PATTERNS
                                                                           RADIATION EFFECTS
   Ion beam textured graphite electrode plates ---
high efficiency electron tube devices
[NASA-CASE-LEW-12919-2] p0050 N82-
                                                                            NT RADIATION DANAGE
                                                                               Effect of gamma irradiation on the friction and
                                                p0050 N82-26386
                                                                                 wear of ultrahigh molecular weight polyethylene
   Pyrclytic graphite collector develorment program [NACA-CF-167009] p0052 N82-29363
                                                                                                                           p0062 A82-10674
                                                                               NASCAP simulation of laboratory charging tests
PYROLYTIC HATERIALS
                                                                                 using multiple electron guns
 NT PYFOLYTIC GRAPHITE
                                                                                                                           p0033 A82-18319
                                                                               Testing of solar cell covers and encapsulants
 U MPERATURE MEASUREMENT
                                                                                 conducted in a simulated space environment
PYRROLES.
                                                                                 [ NASA-CR-165475 ]
                                                                                                                           p0129 N82-12571
 NT INCOLES
                                                                           RADIATION HEATING
                                                                            U DIANT HEATING
    Deposit formation in liquid fuels. JII - The
                                                                           RADIATION INTENSITY
U DIANT FLUX DENSITY
RADIATION HEASURING INSTRUMENTS
      effect of selected nitrogen compounds on diesel
      fue1
                                                p0074 302-23238
P76-2 SATELLITE
                                                                            NT INFRARED DETECTORS
                                                                           RADIATION PRESSURE
 U ATHA SATELLITE
                                                                            NT LUMINOUS INTENSITY
                                                                           NT SOUND PRESSURE
PADIATION RESISTANCE
                                                                           U DIATION TOLERANCE RADIATION SPECTRA
QUALITY
 NT ENVIRONMENTAL QUALITY
                                                                            NT EMISSION SPECTRA
NT INFRARED SPECTRA
QUALITY CONTROL
```

Experience with modified aerospace reliability and

```
NT BAHAN SPECTRA
AT GARAN SPICITIAN
AT STELLAR SPECTRA
AT ULTRAVIOLET SPECTRA

RADIATION TOLERANCE
Processing of silicon solar cells by ion
implantation and laser annealing
      [ NASA-GP-165283]
                                                    p0 128 M82-11546
RADIATIVE BEAT TRANSFER
   Conguter sodel of catalytic combustion/Stirling
      ungine heater head
[NASA-CR-165378]
                                                    p0 134 N82- 22666
   Computations of soot and and NC sub x emissions
      from que turbine combustors [NASA-CR-167930]
                                                    p0139 N82-29777
RADIATIVE TRANSFER
 NT FADIATIVE HEAT TRANSFER
Numerical comparisons of nonlinear convergence
      accelerators
                                                    p0 149 A82-31438
RADIO ASTRONOMY
    VLA observations of solar active regions at 6 cm
      wavelength
                                                    p0 167 A82-10 156
RADIO BURSTS
 NT SOLAR BADIO BURSTS
RADIO COMMUNICATION
 NT TIME DIVISION MULTIPLE ACCESS
Satellite-mided land mobile communications system
implementation considerations
      [ NASA-TM-82861]
                                                    p0036 N82-25290
RADIO PHISSION
 NI SOLAF RAPIO BURSTS
NI SOLAR FADIO EMISSION
RADIO EQUIPMENT
 NT SPACECRAFT ANTENNAS
NT TRANSPONDERS
RADIO PREQUERCIES
 HT EXTREMELY HIGH FREQUENCIES
 NT BIGH PREQUENCIES
RADIO YEBQUENCY DISCHARGE
   Standing vaves along a microvave generated surface
      wave plasma
                                                    p0 158 A82-26952
   Three-dimensional relativistic field-electron interaction in a multicavity high-power
      Flystrom. Part 2: Working Equations
      [ NASA-TP-2008]
                                                    p0081 N82-23397
BADIO PREQUENCY INTERPERENCE
   A review of transhorizon propagation phenomena
                                                    P0079 A82-10679
RADIO INTERPERENCE
U DTO FREQUENCY INTERFERENCE
PADIO RELAY SYSTEMS
 NT TIME DIVISION MULTIPLE ACCESS
RADIO TRANSHISSION
 NT MICROWAYF TRANSMISSION
NT TRANSMICRIZON PADTO PROPAGATION
RADIO WAVES
HT CENTINETER WAVES
 NT HICPOWAVE BHISSION
 NT MILLIMETER WAVES
 NT SOLAR RADIO BURSTS
 NT SOLAF RADIO BYISSION
RADIOACTIVE ISOTOPES
 NT PLUTONIUM 244
RADIOACTIVE WASTES
    Feasibility of an earth-to-space rail launcher system --- emphasizing nuclear waste disposal
      application
      TAF FAPER 82-46]
                                                    p0033 A82-44659
BADION ETERS
NT INFRAREC DETECTORS RADIOSENSITIVITY
 U CIATION TOLERANCE
RAILGUM ACCELEBATORS
    Characterization of advanced electric propulsion
      aystems
                                                    p1071 A82-35083
      [ AIAA FAPER 82-1246]
    Feasibility of an earth-to-space rail launcher aystem --- emphasizing nuclear waste disposal
      application
    [IAF PAPER 82-46] p0033 A82-46
Characterization of advanced electric propulsion
                                                    p0033 A82-44659
      systems
      F NASA -C9- 1678851
                                                    D0045 N82-26381
    Preliminary feasibility assessment for
      Earth-to-space electromagnetic (Railgun) launchers [NASA-CP-167886] p0073 N82-29345
```

```
Adaptive rain fade compensation
                                                  p0080 A82-27178
BATHSTORMS
 NT THUNDERSTORMS
    Effect of heavy rain on mircraft
                                                          N82-21149
BANAN EFFECT
 U MAN SPECTRA
RAMAN SCATTERING
 U MAN SPECTRA
BANAN SPECTRA
   Raman study of the improper ferroelectric phase transition in iron iodine boracite
RANDOM MOISE
    A high speed implementation of the random
      decrement algorithm
[NASA-TH-82853] p0076 N8:

RAPID QUENCHING (HETALLUNGY)

Applications of high-temperature powder metal aluminum alloys to small gas turbines
                                                  p0076 N82-22388
                                                  p0065 A82-48244
    Developing a scalable inert gas ion thruster
      [AIAA PAPER 82-1275]
                                                 p0047 A82-37713
    Inert qas ion thruster [NASA-CH-165521]
                                                  p0044 N82-21252
BARRYACTION WAVES
 U ASTIC WAVES
BASERS
BATE HETERS
 U ASURING INSTRUMENTS
BATES (PER TIME)
HT ACOUSTIC VELOCITY
HT BURNING RATE
HT CURRENT DENSITY
 NT FLOW VELOCITY
NT HEAT PLUX
 NT HIGH ACCELERATION
 NT HIGH SPEED
HT LUNINOUS INTENSITY
 NT MASS FLOW BATE
HT PLASMA ACCELERATION
  NT PROPAGATION VELOCITY
 NT RADIANT FLUX DENSITY
 NT ROTOR SPEED
 NT STRAIN RATE
NT SUBSONIC SPEED
NT SUPERSONIC SPEEDS
 NT TIP SPEED
 NT WIND VELOCITY
RATIOS
 NT ASPECT RATIO
 NT FUEL-AIR BATIO
NT HACH NUMBER
 NT POISSON RATIO
NT PRESSURE RATIO
 NT REYNOLDS NUMBER
 NT SCALE (RATIO)
 NT SIGNAL TO NOISE RATIOS

The transmission or scattering of elastic waves by
      an inhomogeneity of simple quometry: A
      comparison of theories
      [ NASA-CR-169034 ]
                                                  D0079 N82-26526
RAY TRACING
    Pocal surfaces of offset dual-reflector antennass
                                                  p0080 A82-36265
RAYLEIGH SCATTERING
    Time resolved density measurements in premixed
      turbulent flames
[AIAA PAPER 82-0036]
                                                  p0056 A82-22033
RAYLEIGH-BENARD CONVECTION
 NT BENARD CELLS
RAYLEIGH-RITZ METHOD
    Vibrations of cantilevered shallow cylindrical
      shells of rectangular planform
                                                  p0115 A82-11298
REACTION BONDING
    Oxidation stability of advanced reaction-bonded
      Si3N4 materials
[ACS PAPER 52-8-80P]
                                                  p0074 A82-33030
REACTION CONTROL
    Mass driver reaction engine characteristics and
      performance in earth orbital transfer missions
                                                  p0046 A82-18199
```

REACTION JETS U T FLOW

p0073 482-29345

[E82-10247]

```
REACTION KINETICS
                                                                                RECRYSTALLISATION
   Symposium /International/ on Combustion, 18th,
University of Waterloo, Waterloo, Ontario,
Canada, August 17-22, 1980, Proceedings
                                                                                   Recrystallization and grain growth in Nikl
                                                                                                                                   p0065 A82-44529
                                                                                   The influence of quana prime on the recrystallization of an oxide dispersion
   p0056 A02-28651
Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of hot corrected.
                                                                                      strengthened superalloy - MA-6000E
                                                                                                                                   p0062 A82-47393
      hot corrosion
                                                                                BECTANGLES
      [ NASA-CR- 165029]
                                                                                   Surface-tension induced instabilities: Effects of
   Thermodynamics and kinetics of the sulfation of
                                                                                      lateral boundaries
      porous calcium silicate
                                                                                      [NASA-CR-165530]
                                                                                                                                   D0092 N82-11390
                                                                               RECTANGULAR BEAMS

Fatigue life prediction in bending from axial fatigue information
[HASA-CR-165563] p0113 N8
      NASA-TH-82769]
                                                   p0048 N82-15119
REACTION PRODUCTS
   Quantitative separation of tetralin hydroperoxide
from its decomposition products by high
                                                                                                                                   p0113 N82-20564
      performance liquid chromatography
                                                                                RECTAEGULAR PLANFORMS
                                                   p0048 X82-15696
                                                                                   Vibrations of cantilevered shallow cylindrical
   Oxidation and formation of deposit precursors in
                                                                                      shells of rectangular planform
      hydrocarbon fuels
                                                                                                                                   p0 115 A82-11298
      [ NASA-CR- 165534]
                                                   p0073 N82-18402
                                                                                RECTIFICATION
BEACTION RATE
U ACTION KINETICS
BEACTOR MATERIALS
                                                                                 NT GEOMETRIC RECTIFICATION (IMAGERY)
                                                                                BECTIFIERS
                                                                                 NT AVALANCHE DIODES
                                                                                 NT CRYSTAL RECTIPIERS
   Materials science issues encountered during the
      development of thermochemical concepts --
                                                                                RECUPERATORS
      screening of reactions for sclar energy
                                                                                 U GENERATORS
      applications
                                                                                REDOX CELLS
                                                           AB2-10021
                                                                                   Performance of advanced chromium electrodes for
REAL TIME OPERATION
                                                                                      the NASA Redox Energy Storage System
   A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[AIAA PAPER 81-2663] p0020 A82-19221
Advancements in real-time engine simulation technology --- of digital electronic aircraft
                                                                                      [ NASA-TM-82724]
                                                                                                                                   p0118 N82-12574
                                                                                   WASA Redox cell stack shunt current, pumping
                                                                                      power, and cell performance tradeoffs [NASA-TH-82686] p0
                                                                                   [NASA-TH-82686] p0054 #82-19333
Performance mapping studies in Redox flow cells
[NASA-TH-82707] p0120 M82-20668
Improved chromium electrodes for PROV
   engine controls
[AIAA PAPER 82-1075]

Feal-time microcomputer simulation for space
Shuttle/Centaur avionics
                                                   p0021 A82-34995
                                                                                   Improved chromium electrodes for REDOX cells [WASA-CASE-LEW-13653-1] p0 12 1 N
                                                                                   | WASA-CASE-LEW-13653-1] p0 12 1 N82-22672
NASA Redox system development project status
                                                   p0033 A82-48245
                                                                                      [ NASA-TH-82665]
                                                                                                                                   p0123 N82-25637
   A real time Pegasus propulsion system model for
                                                                                   Requirements for optimization of electrodes and
      VSTOL riloted simulation evaluation
                                                                                      electrolyte for the iron/chromium Redox flow cell
      [ NASA-TH-62770]
                                                   p0016 N82-13144
                                                                                      [ NASA-CR-165218]
                                                                                                                                   p0136 N82-25640
   Advancements in real-time engine simulation
                                                                                   Anion permselective membrane
                                                                                   [NASA-CR-167872] p0 137 182-36
Design flexibility of Redox flow systems --- for
      technology
[NASA-TM-82825]
                                                                                                                                   p0 137 #82-30711
                                                   p0147 N82-22915
   A piecewise linear state variable technique for real time propulsion system simulation
                                                                                      energy storage applications
                                                                                      [NASA-TH-82854]
                                                                                                                                   p0054 N82-31459
      [ NASA-TM-82851]
                                                   p0018 N82-24201
                                                                                   Chemical and electrochemical behavior of the
                                                                                      Cr(3)/Cr(2) half cell in the NASA Redox Energy
   Real time pressure signal system for a rotary engine
      [ NASA-CASE-LEW-13622-17
                                                   p0019 N82-26294
                                                                                      Storage System
                                                                               [NASA-TM-82913]

REDUCTION (CHEMISTRY)

NT DEOXIDIZING
BRAL VARIABLES
                                                                                                                                   p0055 N82-33463
 NT CIFFERENTIAL EQUATIONS
 NT FOURIER SERIES
 HT HELMHOLTZ VORTICITY FOUNTION
                                                                               REDUCTION (MATHEMATICS)
 NT J INTEGRAL
                                                                                 U TIMIZATION
 NT NONLINEAR EQUATIONS NT NUMERICAL INTEGRATION
                                                                                REFINING
                                                                                   Fuel quality processing study, volume 1 [NASA-CR-165327-VOL-1] p0
                                                                                                                                  p0135 N82-24649
 NT PERIODIC FUNCTIONS
                                                                                   Fuel quality/processing study. Volume 2:
Appendix. Task | literature survey
[NASA-CR-165327-VOL-2] p013
 NT TANGENTS
 NT VECTOR ANALYSIS
REARWARD PACING STEPS
 U CKWARD FACING STEPS
                                                                                   Environmental effects on solar concentrator mirrors
 U LATIVISTIC ELECTRON BEAMS
                                                                                                                                          A82-23394
RECEIVERS
                                                                               REPLECTION CORPFICIENT
   Subsystems design and component development for
                                                                                U PLECTANCE
      the parabolic dish modula for solar thermal
power systems
[NASA-CE-168941] p0:135 N82
                                                                               REFLECTIVITY
                                                                                U PLECTANCE
                                                   p0 135 N82-24646
                                                                                REFLECTORS
RECEIVING SYSTEMS
                                                                                 NT PARABOLIC REPLECTORS
 U CEIVERS
                                                                                 NT SOLAR COLLECTORS
                                                                                 NT SOLAR REPLECTORS
RECIPROCATING ENGINES
 U STON PHGINES
                                                                                BEFRACTION
RECIRCULATIVE PLUID PLOW
                                                                                NT BIREFRINGENCE
   On the prediction of swirling flowfields found in
                                                                               REPRACTIVE INDEX
      axisymmetric combustor geometries
                                                                                U FRACTIVITY
                                                                               REFRACTIVITY
                                                   P0029 A82-12120
   Plane structure in a swirl stabilized combustor
                                                                                   Some properties of RP sputtered hafnium nitride
      inferred by radiant emission measurements
                                                                                      coatings
                                                   p0056 A82-28694
                                                                                      [ NASA-TM-82826]
                                                                                                                                   P0067 N82-21331
                                                                                   Pockels-effect cell for gas-flow simulation [NASA-TP-2007]
   Bluff-body flameholder wakes - A simple numerical
                                                                                                                                   p0095 N82-23515
      solution
                                                                                REFRACTORY COATINGS
      [ ALMA PAPER 82-1177]
                                                   p0093 A82-35043
                                                                                   RACTORY COATINGS and method of producing the same [NASA-CASE-LEW-13169-1] p0060 W82-29415
RECLAMATION
   LANDSAT Remote Sensing: Observations of an
      Appalachian mountaintop surface coal mining and reclamation operation --- kentucky
                                                                                   Refractory coatings
                                                                                      [NASA-CASE-LEW-13169-2]
                                                                                                                                   p0061 H82-30371
```

p0117 N82-24525

REFRACTORY NATERIALS

NT CHRONIUM

```
NT MOLYBDENUM ALLOYS
                                                                                     RELIABILITY CONTROL
                                                                                      U ALITY CONTROL
U LIABILITY ENGINEERING
 HT NICBIUM
 NT TANTALUM
 HT TONGSTEN
                                                                                     BELIABILITY REGISERRING
                                                                                        Design and verification of a multiple fault
tolerant confrol system for STS applications
   Trends in high temperature gas turbine materials [NASA-TM-82715] p0058 NB2-1
                                                       P0058 N82-11182
    Castable high temperature fractory materials [NASA-CASE-LFW-13080-2] p0066 NO Carbide structures in N(1c2) ar-M247
                                                                                           using computer simulation [AIAA 81-2173]
                                                       pCC66 N82-11210
                                                                                                                                            p0035 A82-10124
                                                                                         Liquid oxygen turbopump technology
[NASA-CR-165487]
      [ NASA-CP- 1678921
                                                       p2064 NB2-30374
                                                                                                                                           p0105 882-11469
REPRACTORY METAL ALLOYS
                                                                                     REMELTING
 NT ECLYBORNIH ALT.OYS
                                                                                      U LTING
BEFRACTORY METALS
                                                                                     REMOTE HANDLING
 HT CHECKIUM
                                                                                         A remote millivolt multiplexer and amplifier
                                                                                           modulu for wind tunnel data acquisition
 RT TANTALUM
                                                                                                                                           p0083 A82-41845
 NT TUNGSTEN
                                                                                     RESOTE REGIONS
REPRASIL (TRADEMARK)
U LICCH DIOXIDE
                                                                                      MT AHTARCTIC REGIONS
                                                                                     RESEARCH
REPRIGERATING
                                                                                      NT MARKET RESEARCH
REFRIGERATING

Magnetic heat pumping
[NASA-CASE-LEW-12508-3] p0088 N82-24

REGENERATION (ENGINEERING)

New features and applications of PRESTO, a
computer code for the performance of
regenerative, superheated steam turbing cycles
[NASA-MP-1050-3]
                                                                                         Aircraft icing research at NASA
                                                       p0088 N82-24449
                                                                                           [ NASA-TH-829191
                                                                                                                                            P0013 N82-30297
                                                                                     EESEARCH AND DEVELOPMENT
Gallium arsenide solar cells-status and prospects
                                                                                           for use in space
                                                                                                                                            P0043 A82-11765
      [ NASA-TP- 1954]
                                                                                         NASA/General Electric broad-specification fuels
REGENERATIVE CYCLES
                                                                                           combustion technology program - Phase I results
U GENERATION (ENGINEERING)
BEGENERATIVE POEL CELLS
                                                                                            and status
                                                                                     [ATAA PAPER 82-1089]
BESBARCH FACILITIES
                                                                                                                                            p0021 A82-35000
    Alkaline regenerative fuel cell systems for energy
                                                                                         The aerospace technology laboratory (a perspective, then and now) [NASA-TH-82754] p
       storage
                                                       p0042 A82-11706
    Electrochemical energy storage for an orbiting
                                                                                                                                            P0031 N62-19229
      space station
[NASA-CP-165436]
                                                                                     RESIDENTIAL ENERGY
                                                       p2 132 N82-17607
                                                                                         An assessment of alternative fuel cell designs for
REGENERA TORS
                                                                                            residential and commercial cogeneration
    Experimental performance of the regenerator for the Chrysler upgraded automotive gas turbine
                                                                                                                                           p0138 A82-24695
                                                                                     RESTDUAL STRESS
                                                                                         IDUAL STRESS

Effect of shot peening on surface Eatique life of
carburized and hardened AlSI 9310 spur gears
[NASK-TP-2047]

p0 10 2 N82-32736
       engine
       [ NASA-TE-8267 17
                                                       p0120 N82-21712
    Magnetic heat pumping [NASA-CASE-IEW-12508-3]
                                                       p1088 N82-24449
                                                                                     BESIB MATRIX COMPOSITES
REGIONS
                                                                                         High-temperature resins
 NT ANTARCTIC REGIONS
                                                                                                                                            p0051 A82-42657
                                                                                         Design, evaluation, and fabrication of low-cost composite blades for intermediate-size wind
REGULA TOBS
 NT CURRENT FEGULATORS
HT VOLTAGE FRGULATORS
                                                                                            turbines
    Analysis and design of a standardized control
                                                                                            [ NASA-CR- 165342 ]
                                                                                                                                            p0133 N82-18693
       rodule for switching regulators
                                                                                     RESIES
                                                       p0083 A82-46388
                                                                                      NT EPOXY RESINS
REBEATING
                                                                                      HT KEVLAR (TRADEMARK)
NT POLYIMIDE RESINS
H ATING
REIGHTION
                                                                                      NT THERMOPLASTIC FILMS
NT THERMOPLASTIC RESINS
 U NITION
REIMPORCED MATERIALS
                                                                                      NT THERMOSETTING RESINS
 U MPOSITE MATERIALS
                                                                                     RESISTIVITY
BEINFORCED PLASTICS
                                                                                      U ECTRICAL RESISTIVITY
NT GLASS FIRER REINFORCED PLASTICS REINFORCED SHELLS
                                                                                     RESONANCE
                                                                                      NT RESONANT VIBRATION
    Fabrication and wear test of a continuous fiber/particulate composite total surface hip
                                                                                        Resonance tube hazards in oxygen systems [NASA-TM-62801] p00
                                                                                                                                            p0072 N82-21415
                                                                                         A review of resonance response in large
       replacement
       [ HASA-TM-81746]
                                                       p0066 N82-11211
                                                                                            horizontal-axis wind turbines
REINFORCING PIBERS
                                                                                                                                            p0122 N82-23711
HT COFON FIRERS

Hybridized polymer matrix composite

[NASA-CF-165340]

RELATIVISTIC ELECTION BEAMS
                                                                                     RESONANCE TESTING
                                                                                         In-plane inertial coupling in tuned and severely
                                                       p0051 NB2-12139
                                                                                            mistuned bladed disks
                                                                                     [ASHE PAPER 82-GT-288]
BESOURT CAVITIES
                                                                                                                                            D0012 382-35460
    Three-dimensional relativistic field-electron
       interaction in a multicavity high-power klystron. Part 2: Working Equations pools
                                                                                      U VITY RESONATORS
                                                                                     RESONANT PREQUENCIES
                                                       p0081 N82-23397
                                                                                         A 10-kW series resonant converter design,
BELATIVISTIC PARTICLES

NT RELATIVISTIC ELECTPON BEAMS

Three-dimensional relativistic field-electron
                                                                                            transistor characterization, and base-drive
                                                                                            optimization
                                                                                                                                            p0086 A82-36927
       interaction in a multicavity high-power klystron. 1: Basic theory [NASA-TP-1992] p008
                                                                                         A 10kW series resonant converter design,
transistor characterization, and base-drive
                                                       p0081 N82-22439
                                                                                            optimization
RELAXATION HETHOD (HATHEMATICS)
Relaxation solution of the full Euler equations
                                                                                            [ NASA-CR-165546]
                                                                                                                                            p0084 N82-17439
                                                                                         A review of resonance response in large
       [ NASA-TM-82889 ]
                                                       p0 149 N82-24859
                                                                                            horizoncal-axis wind turbines
RELEASING
 NT FIRER RELEASE
                                                                                     BRSOWANT VIBRATION
                                                                                          'Coriolis resonance' within a rotating duct ---
RELIABILITY
 NT COMPONENT RELIABILITY
                                                                                            flow induced vibrations in centrifugal compressors p0012 A82-37938
    Experience with modified aerospace reliability and quality assurance method for wind turbines [NASA-TM-82803] p0110 N82-1955
```

p0 110 N82-19550

RESONATORS

HT CAVITY RESONATORS

```
The velocity field near the orifice of a Helmholtz resonator in grazing flow [NASA-CE-168548] p0 153 N82-1899
                                                                                              [NASA-CR-165585] p0044 M82-21253
Characterization of advanced electric propulsion
                                                          p0153 N82-18994
                                                                                                 systems
                                                                                          [NASA-CR-167885] p0045 M82-26381

BOCKET LAUNCEES

Preliminary feasibility assessment for
Earth-to-space electromagnetic (Railqun) launchers
[NASA-CR-167886] p0033 M82-29345
BESOURCES
 NT COAL
NT EXTRATERFESTRIAL BEROUFCES
 NT FOSSIL FUELS
BESPON DENS
 U ANSECHDERS
                                                                                          BOCKET LAUNCHING
                                                                                          NT ORBITAL LAUNCHING
ROCKET PROPELLANT TANKS
RESPONSES
 NT DYNAMIC ESSPONSE
NT HODAL RESPONSE
HT TRANSITHT RESPONSE
BETERDERS (DEVICES)
Thrust roverser for a long duct fan engine --- for
                                                                                          U OPELLANT TANKS
MOCKET PROPELLANTS
MT CRYOGENIC ROCKET PROPELLANTS
                                                                                            NT LIQUID FUELS
                                                                                            NT RP-1 ROCKET PROPELLANTS
Deposit formation in hydrocarbon rocket fuels with
       turbofan engines
      [ NASA - CASE-LEH- 13199- 1]
RETROFITTING
                                                                                                 an evaluation of a propane heat transfer
Petrofit and acceptance test of 30-cm ion thrusters [NASA-CP-165259] p0044 N82-1213:

EXVERSE FIELD PINCH
NT CYLINDRICAL PLASHAS
                                                                                                 correlation
                                                                                          [ NASA-TH-82911] p0088 N82-26

BOCKET THRUST
Primary propulsion/large space system interaction
                                                          P0044 N82-12133
                                                                                                                                                     p0088 N82-26611
BEVERSED FLOW
                                                                                                 study
    Comparison of two parallel/series flow turbofan
                                                                                                 [ NASA-CR-165277]
                                                                                                                                                     p0044 N82-18315
      Propulsion concepts for supersonic V/STOL p0020 A82-19214
                                                                                          ROCKET VEHICLES

NT ATLAS CENTAUR LAUNCH VEHICLE

NT CENTAUR LAUNCH VEHICLE
    [AXAA PAPER 61-2637] p0020 A82:
Dilution jet behavior in the turn section of a
roverse flow combustor
                                                                                            NT MULTISTAGE ROCKET VEHICLES
       TATAA PAPER 82-01921
                                                          p0021 A82-20291
                                                                                          HOCKS
    Small qas turbine combustor primary zone development [AIAA PAPER 82-1159] p0103 A82-35036 Dilution jet behavior in the turn section of a
                                                                                            NT COAL
                                                                                          BOD5
                                                                                              Extended range stress intensity factor expressions for chevron-notched short bar and short rod
       reverse flow combuster
[NASA-TH-82776]
RETHOLDS EQUATION
Basic lubrication equations
[NASA-TH-81693]
                                                           p0017 N82-19220
                                                                                                  fracture toughness specimens
                                                                                                                                                     p0 112 X82-40357
                                                                                               Spherical roller bearing analysis. SKY computer program SPHERBEAN. Volume 1: Analysis
                                                          p0099 N82-16413
REYNOLDS LAW
 U YNOLDS EQUATION
                                                                                                                                                    PO 106 N82-20540
                                                                                                  [ NASA-CR-165203]
REYNOLDS MUMBER
                                                                                               Spherical roller bearing analysis.
                                                                                                                                                    SKF computer
    A new numerical approach for compressible viscous
                                                                                                  program SPHERBEAN. Volume 2: User's manual
                                                                                              program SPHERBEAN. Volume 2: User's manu p0106 M Spherical roller bearing analysis. SKF comp program SPHERBEAN. Volume 3: Program correlation with full scale hardware tests [NASA-CR-165205] p0106 M Development of high-speed rolling-element hearings. A historical and technical pers
       flows
                                                                                                                                                     p0106 P23-20541
       [ NASA-CR- 168842]
                                                          p0090 N82-22455
                                                                                                                                                   SKF corpliter
    Turbulent solution of the Navier-Stokes equations for uniform shear flow
                                                                                                                                                    p0 106 NB2-20542
       [ NA SA-TM-82975]
                                                          p0089 N82-32634
BHEOLOGY
                                                                                                  bearings. A historical and technical perspective [NASA-TM-82884] p0100 NASA-C49
    Some observations in high pressure rheology of
      lubricants
                                                                                                                                                     p0100 Na 2497
       TASHE PAPER 81-100-171
                                                                                               Bearings: Technology and needs [NASA-CB-167908]
                                                          p0070 A82- 18432
    Some observations in high pressure rheology of
                                                                                                                                                     p0 106 N82-26679
      lubricants
                                                                                               Advances in high-speed rolling-element bearings
                                                                                               [NASA-TM-82910] p0101 N82-28644
High speed cylindrical roller bearing analysis.
SKF computer program CYBEAN. Volume 2: User's
      [ ASME EAPER 81-108-17]
                                                          p0070 A82-18432
    Traction contact performance evaluation at high
[ NASA-CR- 165226]
BICHARDSON-DUSHNAN EQUATION
UMPPRATURE EFFFCTS
                                                                                                  manual
                                                           PO 105 NB2-16403
                                                                                                  [NASA-CR-165364]
                                                                                              Research report: User's manual for computer program AT81y003 SHABERTH. Steady state and transient thermal analysis of a shaft bearing system including ball, cylindrical and tapered roller bearings
RIMS
    A finite element stress analysis of spur gears including fillet radii and ris thickness effects
      [ NASA-TM-82965]
                                                          p0101 N82-28646
    On finite element stress analysis of spur gears p0 107 N82-29607
                                                                                                 [NASA-CR-165365]
                                                                                          POLLERS
RISK
                                                                                          Design study of a continuously variable roller cone traction CVT for electric vehicles [NASA-CR-159841] p0105 N82-ROLLING CONTACT LOADS
    Automotive Stirling Engine Fod | Design Peview,
       volume 1
                                                                                                                                                     p0105 NB2-12445
      [ NASA-CP- 167935 ]
                                                          p0164 NB2-34311
NOCKET BOOSTERS
                                                                                               Regimes of traction in concentrated contact lubrication
 U OSTER ROCKET ENGINES
ROCKET CHAMBERS
U RUST CHAMBERS
                                                                                                  FASME PAPER 81-LUB-167
                                                                                                                                                     p0107 A82-18431
                                                                                               Effect of tangential traction and roughness on
BOCKER ENGINE CONTROL
                                                                                                  crack initiation/propagation during rolling
    Mass driver reaction engine characteristics and
                                                                                                  contact
       performance in earth orbital transfer missions
                                                          p0046 A82-18199
                                                                                               On the road performance tests of electric test
BOCKET ENGINE DESIGN
                                                                                                  vehicle for correlation with road load simulator
    Characteristics of the LeRC/Hughes J-secies 30-cm
                                                                                                  [NASA-TH-82900]
                                                                                                                                                     p0127 N82-33829
      angineering model thruster
                                                                                           ROLLUP SOLAR ARRAYS
                                                                                          U LAR ARRAYS
ROSSBY WAVES
U AMETARY WAVES
                                                          p0046 A82-15435
ROCKET ENGINES
 NT BOCSTER ROCKET ENGINES
 NT ELECTROSTATIC ENGINES
                                                                                           BOTARY DRIVES
 NT HYDROGEN OXYGEN ENGINES
                                                                                            U CHANICAL DRIVES
 NT ION ENGINES
NT LIQUID PROPELLANT ROCKET ENGINES
NT MARCURY ION ENGINES
                                                                                           ROTARY STABILITY
                                                                                            NT GYROSCOPIC STABILITY
                                                                                               Review of analysis methods for rotating systems
    Development of a simplified procedure for thrust chamber life prediction
                                                                                                  with periodic coefficients
                                                                                                                                                     p0 135 N82-23702
```

```
BOTARY WING AIRCRAFT
 NT HYLICOPTESS
POTARY WINGS
ROTATIFE BODIES
AT COMPRESSOR ROTORS
 NT FLYWHEFLS
NT INFELLERS
  NT FOTATING CYLINDERS
 NT BOTATING DISK'S
 NT COTORS
 PT TILTING ECTORS
NT TUBBINE WHIPELS
    Vibrations of twisted rotating blades
[ASME FAPER 81-DET-127]
                                                               p0115 A82-19341
BOTATING CYLINDERS
     Research report:
                               User's manual for computer
       program AT8/9003 SHABFRTH. Steady state and transient thermal analysis of a shaft bearing system including ball, cylindrical and tapered coller bearings
[NASA-CR-165365] p0/46 N82-3
                                                               n0 146 W82-31969
ROTATING DISKS
In-plane inertial coupling in tuned and sovorely mintuned bladed disks
[ASME PAPER 82-GT-208] p0012 A82-3
                                                               p0012 A82-35460
    Preliminary design development of 100 KW rotary power transfer device [NASA-GP-1654311 p0084 M82-
                                                               p0084 N82-23395
ROTATING PLUIDS
     Investigation of rotational transonic flows through ducts using a finite element scheme
     ROTATING GENERATORS
  NT AC GENERATORS
  NT TURBOGENERATORS
BOTATING SHAFTS
 NT SHAFTS (MACHINE FLEMENTS)
A digital optical torquemeter for high rotational
       speed applications [NASA-TM-82914]
                                                               p0095 N82-31664
ROTATING VEHICLES
  U TATING PODIES
BOTATIONAL FLOW
  u uin Flow
  U BTICES
 FOTOR ARRODYWANICS
     Three dimensional turbulent boundary layer
       Anvelopment on a fan rotor blade [AIAA FAPER B2-1007]
                                                               p0011 A82-31965
     [ATAN EAPER 82-1007] POULL AUX-31905
Acrodynamic performance of high turning core
turbino vanos in a two-dimensional cascado
[ATAN PAPER 82-1288] POU05 A82-37716
Study of controlled diffusion stator blading. 1.
Acrodynamic and mechanical design report
[NASA-CP-16550) POU24 N82-16081
     Numerical analysis and FORTRAN program for the computation of the turbulent wakes of turbomachinery rotor blades, isolated airfoils and cascade of airfoils
        [ NASA-CF-3509]
                                                               00006 N82-18184
     Wind turbine dynamics
     [NASA-CP-2105] p012
Applications of the POS/NASA wind turbine
                                                               po 122 N82-23684
        ungino ring information system
     An experimental investigation of gapwise
        periodicity and unsteady aerodynamic response in
an oscillating cascade. I: Experimental and
theoretical results --- turbine blades
        [NASA-GP-3513]
                                                               p0008 N82-26229
 BOTOR BLADES
     The three-dimensional boundary layer on a rotating
        holical blade
                                                               p0009 A82-15459
     Characteristics of the flow in the annulus-wall region of an axial-flow compressor rotor blade
        passage
     TAXAA FAPER #2-74131 p0009 A82-17933 Interaction of compressor rotor blade wake with
       wall boundary layer/vertex in the end-wall region [ASME PAPER 81-GR/GT-1] p00 10 A82-1930
                                                               p00 10 A82- 1930 I
     In-plane inertial coupling in tuned and severely
        mistured bladed disks
       TASHE PAPER 92-07-288]
                                                               pn012 A82-35460
```

```
Rotor tip clearance effects on overall and
        blade-element performance of axial-flow
transonic fan stage
                                                             00020 M82-33389
        [ NASA-TP-2049 ]
motor BLADES (TURBOMACHIMERY)

Effects of vane/blade ratio and spacing on fan noise
[ATAA PAPER 81-2033] p0029 A82-10457

A rtudy of viscous flow in stator and rotor passages
                                                            P0011 A82-35427
       [ASHE PAPER 02-GT-248]
     Thrust modulation methods for a subsonic V/STOL
        aircraft
     [NASA-TH-82747] p0003 N8
Computational methods for internal flows with
emphasis on turbomachinery
[NASA-TH-82764] p0003 N8
                                                             p0003 NB2-13112
                                                             p0003 NB2-13113
     Aluminum blade development for the Mod-OA
        200-kilowatt wind turbine
                                                             p0119 N82-14633
        [ NASA-TH-82594]
     Study of controlled diffusion stator blading.
Aurodynamic and mechanical design report
     Numerical analysis and FORTRAN program for the computation of the turbulent wakes of turbomachinery rotor blades, isolated airfoils and cascade of airfoils
                                                            P0024 NB2-16081
     [NASA-CR-3509] p0006 NB2-18184
Design, evaluation, and fabrication of low-cost
composite blades for intermedial size wind
        turbinos
        [ NASA-CR-165342]
     Coupled bending-bending-tersion flutter of a
        mistured cascade with nonuniform blades
        [ NASA-TH-82813]
                                                            p0111 N82-21604
     Method for predicting impulsive noise generated by
wind turbing rotors
[NASA-TM-82794] p0121 N82-217
     Performance of single-stage trial-flow transonic compressor with rotor and stator aspect ratios
        of 1.63 and 1.77, respectively, and with design pressure ratio of 2.05
[NASA-TP-2001] p0018 N82-22
                                                             p0018 N82-22269
     Evaluation of lightning accommodation systems for wind-driven turbino rotors
     [NASA-TH-82784] p0 122 N82-23
Comparison of upwind and downwind rotor operation
                                                             p0 122 N82-23679
        of the DOE/NASA 100-kw MOD-0 wind turbine
                                                             p0122 N82-23710
     Rotor fragment protection program:
                                                           Statistics on
 aircraft gas turbine ngine rotor failures that occurred in U.S. commercial aviation during 1978 [NASA-CR-165388] 80027 N62-27316
  U RBINE WHEELS
 BOTOR BUBS
  U TORS
 BOTOR SPEED
     Effects of blade loading and rotation on
        compressor rotor wake in end wall regions
 [AIAA PAPER 82-0193]
                                                             p0010 A82-22063
     NASA/Levis Research Center Icing Research Program
                                                             p0001 N82-21148
     Cooled variable nozzle radial turbine for rotor
        craft applications [NASA-CR-165397]
                                                             p0028 N82-29373
 POTORS
  NT COMPRESSOR ROTORS
   NT IMPELLERS
   NT TILTING ROTORS
  NT TURBINE WHEELS
     Nonlinear analysis of rotor-bearing systems using
     component mode synthesis
[ASME PAPER 82-GT-303]
Effect of seals on rotor systems
                                                             n0104 A82-35468
        [ NASA-TH-82786]
                                                             p0099 N82-16411
      Effect of rotor configuration on guyed tower and
        foundation designs and estimated costs for
        intermediate site horizontal axis wind turbines [NASA-TM-82804] p0121 N82-22649
      Development of a dual-field heteropoplar power
        converter
     Converter
[NASA-CR-165168] p0084 N82-2448
Rotor fragment protection program: Statistics on aircraft gas turbine ngine rotor failures that occurred in U.S. commercial aviation during 1978
[NASA-CR-165388] p0027 N82-273
                                                             p0084 N82-24424
                                                             p0027 N82-27316
     Engine dynamic analysis with general nonlinear finite element codes. Part 2: Bearing element
```

```
implementation overall numerical characteristics
                                                                           Satellite-aided land mobile communications system
     and benchmaking
                                                                             implementation considerations
     [ NASA-CR- 167934]
                                              p0028 N82-33390
                                                                             [ NASA-TM-8286 | ]
                                                                                                                      p0036 K82-2520
   Theoretical and experimental power from large
                                                                        SATELLITE-BORNE PHOTOGRAPHY
                                                                           Dynamics of snow cover in wountain regions of the
Aral Sea basin, studied using matellite
     horizontal-axis wind turbines
     [ NASA-TH-82944 ]
                                              p0127 N82-33830
BOUGHT ESS
                                                                             photographs
NT SURFACE POUGHVESS
BP-1 BOCKET PROPELLANTS
                                                                                                                             A82-27462
                                                                        SATELLITES
 NT LIQUID FUELS
                                                                         NT ARTIPICIAL SATELLITES
   Deposit formation in hydrocarbon fuels
                                                                         NT ATS 5
     TASME PAPER 82-GT-497
                                              p0075 AF3-35307
                                                                         NT COMMUNICATION SATELLITES
   Low-thrust Isp sensitivity study [NASA-CR-165621]
                                                                         NT NATURAL SATELLITES
                                              p0045 N82-22309
                                                                         NT SCATHA SATELLITE
BUBBER
                                                                         NT SOLAR POWER SATELLITES
NT SYNCHRONOGS SATELLITES
 NT ELASTOMERS
BURAL ARRAS
                                                                           Environmentally induced discharges on satellites [NASA-TH-82849] p0038 N82-2
   Design description of the Tangaye Village
                                                                                                                      p0038 N82-23261
     photovoltaic power system
                                                                        SCALAR HAGNETIC CHARGE
     [NASA-TH-82917]
                                              p0126 N82-33820
                                                                         U GNETIC CHARGE DENSITY
                                                                        SCALE (RATIO)
                                                                           Universal binding energy relations in metallic
                                                                             adhesion
S-E DIAGRAMS
                                                                             [NASA-TH-82706]
                                                                                                                      p0058 N82-11183
   The application of probabilistic design theory to
high temperature low cycle fatigue
                                                                        SCALE MODELS
                                                                           Testing of a spacecraft model in a combined
     [ NASA-CR- 165488]
                                              p0112 N82-14531
                                                                             environment simulator
SAPETY
                                                                                                                      p0033 A82-18310
   Experience with modified aerospace reliability and quality assurance method for wind turbines
                                                                         NT OPTICAL SCANNERS
     [ N2 5A-TH-82803]
                                              p0110 N82-19550
                                                                       SCAMBING LASER ACOUSTIC MICROSCOPE (SLAM)
U OUSTIC MICROSCOPES
SAPETY FACTORS
   Automotive Stirling Engine Mod | Design Review.
                                                                        SCAR PROGRAM
     volume I
                                                                         U PERSONIC CRUISE AIRCRAFT RESEARCH
     [ NASA-CR- 167935]
                                              p0164 N82-34311
                                                                        SCARS (GEOLOGY)
SATELLITE ANTENNAS
                                                                         U OSION
   30/20 GHz communications satellite multibeam antenna
                                                                        SCATEL SATELLITE
     [ AIAA 82-0449]
                                                                           Validation of the NASCAP model using spaceflight
                                              p0079 A82-23486
SATELLITE COMMUNICATION
                                                                             data
U ACECRAPT COMMUNICATION
                                                                           [ATLA PAPER 82-0269] p0038 A82-17
Representation and material charging response of
                                                                                                                      p0038 A82-17872
SATELLITE DESIGN
   Advanced 30/20 GHz communication satellites
                                                                             qeoplasma environments
                                              p0034 A82-12623
                                                                                                                      p0039 N82-14249
   Use of charging control guidelines for geosynchronous satellite design studies
                                                                           Simulation of charging response of SCATHA (P78-2)
                                                                             satellite
                                              p0037 N82-14263
                                                                                                                      P0039 N82-14250
   Design practices for controlling spacecraft
                                                                           SCATHA SSPM charging response: NASCAP predictions
     charging interactions [NASA-TM-82781]
                                                                             compared with data
                                                                                                                      p0037 N82-14251
                                              p0038 N82-18311
SATELLITE LAUNCHING
U ACECEAFT LAUNCHING
SATELLITE NETWORKS
                                                                           Comparison of NASCAP modelling results with lumped
                                                                             circuit analysis
                                                                                                                      p0037 #82-14255
   Advanced 30/20 GHz communication satellites
                                                                        SCATTERING
                                              p0034 A82-12623
                                                                        NT ELECTRON SCATTERING
NT LIGHT SCATTERING
   Planning satellite communication services and
     spectrum-orbit utilization [NIAA 8?-0526]
                                                                         NT RAHAN SPECTRA
                                              P0080 A82-23538
                                                                         NT RAYLEIGH SCATTERING
   Microwave intersatellite links for communications
                                                                         NT TROPOSPHERIC SCATTERING
     satellites
                                                                         NT WAVE SCATTERING
                                              p0036 A82-36925
                                                                        SCHEDULES
SATELLITE ORBIT CALCULATION
                                                                           Magnetohydrodynamics MHD Engineering Test Pacility
 U FIT CALCULATION
                                                                             ETF 200 MWe power plant. Conceptual Design
Engineering Report CDER. Volume 3: Costs and
SATELLITE ORBITS
 NT GEOSYNCHRONOUS ORBITS
                                                                             schedules
 NT FOLAR CREITS
                                                                             [ NASA-CR-165452-VOL-3 ]
                                                                                                                      p0128 NB2-10495
   Mass driver reaction engine characteristics and
                                                                        SCHEDULING
     performance in earth orbital transfer missions
                                                                        NT PREDICTION ANALYSIS TECHNIQUES
                                              p0046 A82-18199
                                                                       SCHLIEREN PHOTOGRAPHY
SATELLITE SCLAR ENERGY CONVERSION
                                                                          New versions of old flow visualization systems
   Alkaline regenerative fuel cell systems for energy
                                                                                                                      p0096 N82-32670
     storage
                                                                       SCHOTTKY EFFECT
                                                                        U RK FUNCTIONS
                                              p0042 A82-11706
   Gallium arsenide solar array subsystem study
[NASA-CR-167869] p0138 N
                                                                        SCIENTIFIC SATELLITES
                                              p0 138 N82-32855
                                                                        NT ATS 5
SATELLITE SOLAR POWER STATIONS
                                                                       SEALS (STOPPERS)
   Component technology for space power systems
                                                                         NT HERMETIC SEALS
     [ NA SA -IM-82928]
                                              P0082 N82-30474
                                                                         NT O RING SEALS
SATELLITE SOUNDING
                                                                          Measurement of oil film thickness for application
   Field-aligned ion streams in the earth's midnight
                                                                             to elastomeric Stirling engine rod seals
[ASME PAPER 81-LUB-9] p0 107
     region
                                                                                                                     p0 107 A82-18426
                                              p0 140 A82-31009
                                                                           Anaerobic polymers as high vacuum leak sealants
SATELLITE TRANSMISSION
                                                                                                                     p0108 A82-21967
   IMPATT power building blocks for 20 GHz spaceborne
                                                                           Development of low modulus material for use in
     transmit amplifier [ NIAA 82-0498]
                                                                             ceramic gas path seal applications [NASA-CR-165469]
                                              p0086 182-23566
                                                                                                                      p0022 #82-10039
                                                                          Preliminary study of temperature measurement
techniques for Stirling engine reciprocating seals
   Simulation of charging response of SCATHA (P78-2)
     satellite
```

[NASA-CR-165479]

P0 104 N82-11466

p0039 N82-14250

p0058 N82-10195

ORIGINAL PAGE IS OF POOR QUALITY

```
Modified face seal for positive film stiffness
f NASA-CASE-LEW-12989-11
                                                                                                                                      SENSE ORGANS
      [NASA-CASE-LEW-12989-1] pC099 N82-12442
J19D ceramic outer air seal system refinement
                                                                                                                                        NT EAR
                                                                                                                                        HT EYE (ANAT ...
          program
                                                                                                                                      SEESIBILITY
          I NASA-CR- 1655547
                                                                                      n0 106 N82- 1860 3
                                                                                                                                        U NSITIVITY
     Composite seal for turborachinery
[NASA-CASE-LEW-12131-3]
                                                                                                                                      SEMSING
                                                                                      p0099 N82-19540
                                                                                                                                        U TECTION
      Flow through aligned segmential orifice type inlets [NASA-TP-1967]
                                                                                                                                      SENSITIVITY
                                                                                                                                        NT IMPACT RESISTANCE
      Fully plasma-sprayed compliant backed ceramic
                                                                                                                                        NT RADIATION TOLERANCE
          turbine seal
      rease-case-LEW-13268-2] p0101 N82-26674 Pully plasma-sprayed compliant tacked ceramic turbing seal
                                                                                                                                      SEPARATED FLOW
          [ NASA-CASE-LEW- 13268-1]
                                                                                                                                         NT BOUNDARY LAYER SEPARATION
                                                                                      p0069 N82-29453
SEASONAL VARIATIONS
U NUAL VARIATIONS
SECONDARY BATTERIES
U ORAGE BATTERIES
                                                                                                                                                [NASA-TP-1967]
                                                                                                                                      SEPARATORS.
SECONDARY EMISSION
      Numerical simulation of plasma insulator
interactions in space. Part 2: Dielectric
                                                                                      p0039 N82-14273
SECONDARY PLOY
      Experimental study of the effects of secondary air on the emissions and stability of a lean premixed combustor
           [ AIAA PAPER 82-1072]
                                                                                                                                                 battery separators
                                                                                      p0021 A82-34992
SECULAR PERTURBATION
                                                                                                                                                 [ NASA-TM-82802]
  U NG TERM EFFECTS
SEDIBENTARY ROCKS
                                                                                                                                      SERIES (MATHRATICS)
NT FOURIER SERIES
SERVICE LIFE
  NT COAL
SEEDING (INOCULATION)
U OCULATION
SELF DEPLOYING SPACE STATIONS
  U ACE STATIONS
SELF INDOCED VIBRATION
  NT TRANSONIC FLUTTER
SELF LUBRICATING MATERIALS
      Performance of PTFE-lined composite policy p
                                                                                                                                                 Ysub20sub3
                                                                                                                                                 [ NASA-TH-82795]
                                                                                                                                                 section components
SELF LUBBICATION
                                                                                                                                                 [ NASA-CR-167896]
       Effect of aluminum phosphate additions on
          composition of three-component plasma-sprayed
                                                                                                                                      [NASA-TH-82912]
SHADOWGBAPH PHOTOGRAPHY
           solid lubricant
                                                                                      p0059 N82-21298
           [ NASA-TE- 1990 ]
SELF REGULATING
U TOMATIC CONTROL
                                                                                                                                       NT SCHLIEREN PHOTOGRAPHY
SHAPTS (HACHIEE ELEMENTS)
SENICONDUCTOR DEVICES
NT AVALANCEF DIODES
  NT EIFOLAE TRANSISTORS
 NT ELECTAR TRANSLITORS
NT FIFLD EFFECT TRANSISTOFS
HT METAL OXIDE SEMICONDUCTORS
NT HIS (SEMICONDUCTORS)
NT PHCTOVOLTAIC CELLS
  NT TRANSISTORS
                                                                                                                                                 [NASA-CR-1653651
       Proceedings of the Conference on High-temperature
                                                                                                                                       SHALLOW SHELLS
           Electronics
           [ NASA-TM-84069 ]
                                                                                      p0081 N82-15311
       High temperature electronic requirements in
           aeropropulsion systems
                                                                                                                                       SHAPES
                                                                                                                                         NT CONVEXITY
           [E-708]
                                                                                      p0081 N82-15313
       Component technology for space power systems
                                                                                                                                       [NASA-TH-82856]
SHEAR CREEP
          F NASA-TM-829281
                                                                                      p0082 N82-30474
SENICONDUCTOR DIODES
NT AVALANCEE DIODES
       High-frequency high-voltage high-power DC-to-DC
           converters
                                                                                       p0083 N82-12347
                                                                                                                                       SHEAR PATIGUE
SENICONDUCTOR JUNCTIONS
NT P-I-N JUNCTIONS
                                                                                                                                      U EAR STRESS
SHEAR FLOW
  NT SILICON JUNCTIONS
      Pabrication of multijunction high voltage
           concentrator solar cells by integrated circuit
                                                                                                                                                 for uniform shear flow [NASA-TM-82925]
                                                                                      p0127 A82-44957
Figh voltage planar multijunction sclar cell
[NASA-CASE-LEW-13400-1] p0 125 N82-31764
SEHICOMOUCTORS (HATERIALS)
NT METAL OXIDE SEMICONDUCTORS
                                                                                                                                       SHEAR PROPERTIES
NT SHEAR STRENGTH
        HIS (SEMICONDUCTORS)
  NT PHCTCCONDUCTORS
                                                                                                                                       SHEAR STRENGTH
       Undoped semi-insulating LEC Gals - A model and a
           mechanism --- Liquid Encapsulated Czochralski
```

```
Sensitivity analysis results of the effects of
   various parameters on composite design
                                                D0051 A82-37101
Plow through aliqued sequential orifice type inlets
                                                D0087 N82-20467
Inexpensive cross-linked polymeric separators made
from water-soluble polymers --- for secondary
alkaline nickel-zinc and silver-zinc cells
                                                P0048 A82-23778
Development of battery separator composites
[NASA-CASE-LEW-12358-2] p0054 N82-2126
Cross-linked polyvinyl alcohol films as alkaline
                                                p0128 N82-11547
                                                D0054 N82-21268
                                                P0054 N82-22327
Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-[3171-1] p0124 N82-29708
Effects of ultra-clean and centrifugal filtration
  on rolling-element bearing life [ASME PAPER 81-LUB-35]
Effects of arc current on the life in burner riq
thermal cycling of plasma sprayed ZrOsub2-
                                                p0087 N82-17453
Practure mechanics criteria for turbine engine hot
                                                p0027 N82-25257
Results of chopper-controlled discharge life
  cycling studies on lead acid batteries
                                                p0124 N82-30700
Failure analysis of a tool steel torque shaft
[NASA-TM-82758] p0058 N82-
Research report: User's manual for computer
program AT81y003 SHABERTH. Steady state and
transient thermal analysis of a shaft bearing
                                                p0058 N82-11184
  system including ball, cylindrical and tapered roller bearings
                                                D0146 N82-31969
Vibrations of cantilevered shallow cylindrical.
   shells of rectangular planform
                                                DO 115 A82-11298
Pilm shape calculations on supercomputers
                                                p0100 N82-25519
Motion of a rigid punch at the boundary of an
   orthotropic viscoelastic half-plane
                                                        182-26436
Alignment of fluid molecules in an EHD contact
  [ASLE PREPRINT 81-LC-5C-1]
                                               p0 107 A82-18407
Turbulent solution of the Navier-Stokes equations
                                                D0089 N82-32634
Analysis of interface cracks in adhesively bonded
lap shear joints, part 4
[NASA-CR-165438] p0114 N82-26
                                                p0114 N82-26716
Creep shear behavior of the oxide dispersion
   strengthened superalloy MA 6000E
```

[NASA-TH-82704]

p0159 A82-13754

```
Correlation of tensile and shear strengths of metals with their friction properties [NASA-TM-82928] p0060 N8
                                                                            SECRY WAVE RADIATION
                                                                             MT CENTIMETER WAVES
NT MICROWAVE EMISSION
                                                00060 N82-24325
SHEAR STRESS
                                                                             NT MILLIMETER WAVES
 NT TOBSIONAL STRESS
                                                                            SHOT PREMING
                                                                               Effect of shot peening on surface fatigue life of carburized and hardened AISI 9310 sput years
   Some observations in high pressure rheology of
     lubricants
     [ASME PAPER 81-LUB-17]
                                                p0070 A82-18432
                                                                                  [ NASA-TP-2047]
                                                                                                                             p0 102 N82-32736
   Some observations in high pressure theology of
                                                                            SEBOUDED BODIES
     lubricants
                                                                             U ROUDS
      [ASER PAPER 81-LUB-17]
                                                P0070 A82-18432
                                                                            SEROUDS
SHEARING STRESS
                                                                               Composite seal for turbonachinery
                                                                                 [NASA-CASE-LEN- 12131-3]
 U EAR STRESS
                                                                                                                             p0099 #82-19540
SHEATHS
                                                                               Active clearance control system for a turbomachize [NASA-CASE-LEW-12938-1] p0020 M82-323
 NT PLASMA SHEATHS
                                                                                                                             P0020 NB2-32366
SHELL THEORY
                                                                            SEUETS
   Vibrations of twisted rotating blades
[ASME PAPER 81-DET-127] PO 115 A82
Comparison of beam and shell theorees for the
                                                                             U PASSES
                                                p0 115 A82-19341
                                                                             U RCUITS
                                                                            SEUTTLE ORBITERS
vibrations of thin turbomachinery blades
[ASME PAPER 82-GT-223] p0115
SHELLS (STRUCTURAL FORMS)
NT CYLINDRICAL SHELLS
NT FEINFORCED SHELLS
                                                                             U ACE SHUTTLE ORBITERS
                                                p0 115 A82-35408
                                                                            STALOR
                                                                               Effects of heating rate on density,
                                                                                  microstructure, and strength of Si3M4-6 wt. % Y2O3 and a beta-prime sialon [ACS PAPER 42-B-81] p0070 A82-
 NT SHALLOW SHELLS
                                                                                                                             p0070 A82-42366
   Pinite-element modeling of layered, anisotropic composite plates and shells: A review of recent
                                                                            SIGNAL DETECTION
                                                                                mear optimum delay-line detection filters for
                                                                                  serial detection of MSK signals
                                                p0113 NB2-19563
                                                                                                                             D0086 A82-43867
SHIELDING
                                                                            SIGNAL DISTORTION
                                                                               Computer modeling of multiple-channel input
signals and intermodulation losses caused by
nonlinear traveling wave tube amplifiers
 NT HEAT SHIELDING
 NT SPACECRAFT SHIELDING
SHOCK DIFFUSERS
 U OCK WAVE ATTENUATION
                                                                                  [ NASA-TP-1999]
                                                                                                                             p0082 #82-25441
SHOCK LOADS
                                                                            SIGNAL PADEOUT
   Plow visualization of shock-boundary layer
                                                                             U GNAL PADING
     interaction
                                                                            SIGHAL PADING
                                                p0096 N82-32675
                                                                               Adaptive rain fade compensation
SHOCK BESISTANCE
                                                                                                                             D0080 A82-27178
 NT IMPACT RESISTANCE
                                                                            SIGNAL GENERATORS
                                                                               Real time pressure signal system for a rotary engine [NASA~CASE-LEW-13622-1] p0019 N82-26294
SHOCK TUBES
 NT SHOCK TUNNELS
   Turbulence in argon shock waves
                                                                            SIGNAL MIXING
                                                 p0158 A82-11117
                                                                                Impedance conversion using quantum limit
                                                                                 nonreciprocity for superconductor mixer
   Flow visualization of shock-houndary layer
      interaction
                                                                                  compensation
                                                 p0096 N82-32675
                                                                                                                             p0159 A82-31276
SHOCK WAVE ATTENUATION
                                                                            SIGNAL PROCESSING
   CAS22 - FORTRAN program for fast design and
                                                                                A high speed implementation of the random
      analysis of shock-free airfoil cascades using
                                                                                  decrement algorithm
      fictitious-qas concept
                                                                                  [NASA-TM-82853]
                                                                                                                             p0076 N82-22388
      [ NASA-CP-3507]
                                                                            SIGNAL RECEPTION
                                                 p0006 N82-16044
SHOCK HAVE CONTROL
                                                                                A review of transhorizon propagation phenomena
   An example of a solution to transonic equations
                                                                                                                             p0079 A82-10679
      for shock-free flow about a symmetric profile
                                                                            SIGNAL TO BOISE RATIOS
                                                                               Conversion and matched filter approximations for
                                                        A82-26439
SHOCK WAVE GENERATORS
                                                                                  serial minimum-shift keyed modulation
 NT SHOCK TUBES
NT SHOCK TUNNELS
                                                                                                                             p0080 A82-26713
                                                                                Near optimum delay-line detection filters for
SHOCK WAVE INTERACTION
                                                                                  serial detection of MSK signals
   Turbulence in argon shock waves
                                                                                                                             p0086 A82-43867
                                                 p0158 A82-11117
                                                                            SIGNAL TRANSMISSION
                                                                             NT PREQUENCY DIVISION MULTIPLE ACCESS
   Three-dimensional shock structure in a transonic
                                                                             NT MICROWAVE TRANSMISSION
      flutter cascade
                                                                             NT SATELLITE TRANSMISSION
                                                 p0006 A82-37937
                                                                             NT TRANSHORIZON RADIO PROPAGATION
SHOCK WAVE PROPAGATION
                                                                            SIGNAT RES
NT MAGNETIC SIGNATURES
   The development of central peaks in lunar craters
                                                                            SILICA
   Three-dimensional shock structure in a transonic
                                                                             U LICON DIOXIDE
                                                                            SILICATES
      flutter cascade
                                                                             NT CALCIUM SILICATES
                                                                            SILICON
SHOCK WAVES
 NT DETONATION WAVES
                                                                                Past recovery, high voltage silicon diodes for AC
 NT NORMAL SHOCK WAVES
                                                                                  motor controllers
   A shock wave approach to the noise of supersonic
                                                                                                                             p0086 A82-36926
      propellers
                                                                                Nitridation of silicon [NASA-IM-82722]
                                                 p0151 N82-16809
      [NASA-TH-82752]
                                                                                                                             p0066 N82-15197
   Pringe localization requirements for three-dimensional flow visualization of shock waves in diffuse-illustration double-pulse holographic interferometry
[NASA-TP-1868]
                                                                                Material and processing needs for silicon solar
                                                                                  cells in space
                                                                                                                             p0032 N82-26336
                                                                                Method of protecting a surface with a
                                                 p0095 N82-22481
                                                                                  silicon-slurry/aluminide coating --- coatings
SHORT HAUL AIRCRAFT
                                                                                  for gas turbine engine blades and vanes [NASA-CASE-LEW-13343-1] p0066
   Propulsion study for Small Transport Aircraft
Technology (STAT)
[NASA-CR-165499] p0022 N82
                                                                                                                             P0068 N82-28441
                                                                                Development of a large area space solar cell
```

assembly [NASA-CR-167929]

p0 137 N82-30706

p0022 N82-10037

```
Effects of processing and dopant on radiation damage removal in silicon solar cells
                                                p0042 N82-31443
     [ NASA-TM-82892]
   Large area low-cost space solar cell development
     [ NASA-TM-82902]
                                                p0 126 N82-32854
SILICON CARBIDES
   Strength distributions of SiC ceramics after
     oxidation and oxidation under load [ACS PAPER 9-C-80C]
                                                p0071 A82-20143
   Acoustic microscopy of silicon carbide materials
                                                p0075 182-33031
   Progress in ceramic component fabrication technology [AIAA PAPER 82-12;1] p0071 A82-35064
   Net shape fabrication of Alpha Silicon Carbide
     turbine components
[ASME PAPER 82-GT-216]
                                                P007! A82-35403
   Design and development of a ceramic radial turbine
     for the AGT 101
     [ AIAA PAPER 82-1209 ]
                                                p0 109 A82-35480
   Tensile properties of SiC/aluminum filamentary
     composites - Thermal degradation effects
                                                p0053 A82-46220
   Ultrasonic velocity for estimating density of
     structural ceramics [NASA-TM-82765]
                                                p0066 N82-14359
   Surface chemistry and wear behavior of single-crystal silicon carbide sliding against
     iron at temperatures to 1500 C in vacuum
      [ NASA-TP- 1947]
                                               p0067 N82-19374
   Tribological properties of sintered
     polycrystalline and single crystal silicon carbide
     f NASA-TM-828291
                                                p0068 W82-24343
   Occurrence of spherical ceramic debris in
     indentation and sliding contact
      [ NASA-TP-2048]
                                                p0069 N82-32491
SILICON COMPOUNDS
 NT CALCIUM SILICATES
 NT QUARTZ
 NT SILICON CARBIDES
NT SILICON DIOXIDE
NT SILICON NITRIDES
SILICON DICTIDE
 NT QUARTZ
   Castable high temperature fractory materials
                                                p0066 N82-11210
     [ NASA-CASE-LEW- 13080-2]
SILICON FILMS
   Study of the photovoltaic effect in thin film
barium titanate
[NASA-CR-165081] p0131 N8
                                                p0131 N82-16479
   Development of thin wraparound junction silicon
     solar cells
     [ NASA-CP-165570]
                                                p0133 N82-18689
   Sputtered silicon nitride coatings for wear
     protection [NASA-TM-82819]
                                                p0067 N82-20314
SILICON JUNCTIONS
   Advances in high output voltage silicon solar cells
                                                p0127 A82-44942
SILICON NITRIDES
   Oxidation stability of advanced reaction-bonded
   Si3N4 materials
[ACS PAPER 52-B-80P]
Pabrication of turbine components and properties
of sintered silicon nitride
                                                p0074 A82-33030
     FASME PAPER 62-GT-252]
                                                p0071 282-35431
   Design and development of a ceramic radial turbine
     for the AGT101
   [AIIAA PAPER 82-1209] poing A82-3:
Reflects of oxidation and oxidation under load on
strength distributions of Si3N4
                                                p0 109 A82-35480
     [ ACS PAPER 69-E-80]
                                                p0071 A82-35871
   Fabrication of sinterable silicon nitride by
     injection molding
                                                p0071 A82~37015
   Effects of heating rate on density,
     microstructure, and strength of Si3N4-6 vt.%
Y2O3 and a beta-prime sialon
[ACS FAPEB 42-B-81] p0070 A82
                                                p0070 A82-42366
   The combined effects of Fe and H2 on the
     nitridation of silicon
                                                p0070 A82-42924
   Nitridation of silicon
     [ NASA-TH-82722]
                                                p0066 N82-15197
   Sputtered silicon nitride coatings for wear
     protection [NASA-TM-E2819]
                                                p0067 N82-20314
   Deposition of reactively ion beam sputtered
     silicon nitride coatings
     [ NASA-TM-82942]
                                                p0069 N82-3040 I
```

```
SILICON OXIDES
NT QUARTZ
NT SILICON DIOXIDE
SILICON RECTIFIERS
 U YSTAL RECTIPIERS
SILICON SOLAR CELLS
U LAR CELLS
SILVER OXIDE ZINC BATTERIES
U LVER ZINC BATTERIES
SILVER ZINC BATTERIES
   Development of battery separator composites
                                                    p0128 N82-11547
      [ NASA-CR-155508]
SIMULATION
 NT ACOUSTIC SIMULATION
 NT ANALOG SIMULATION
NT COMPUTERIZED SIMULATION
 NT CONTROL SIMULATION
NT DIGITAL SIMULATION
 NT ENVIRONMENT SIMULATION
 NT PLIGHT SIMULATION
 MT SPACE ENVIRONMENT SIMULATION
 NT SYSTEMS SIMULATION
   A piecewise linear state variable technique for
      real time propulsion system simulation [NASA-TM-82851] p00
                                                   P0018 #82-24201
SIMULATORS
 NT CONTROL SIMULATION
 NT FLIGHT SIMULATORS
 NT SOLAR SIMULATORS
   Real-time microcomputer simulation for space
      Shattle/Centaur avionics
                                                    p0033 A82-48245
SINGLE CRYSTALS
   Adhesion and friction of single-crystal diamond in
      contact with transition metals
                                                    p0 103 A82-18680
   The influence of orientation on the stress rupture
      properties of nickel-base superalloy single
      crystals
                                                    p0062 A82-47397
   Surface chemistry and wear behavior of single-crystal silicon carbide sliding against
      iron at temperatures to 1500 C in vacuum
                                                    P0067 N82-19374
      [ NASA-TP-1947 ]
   High purity low dislocation Gals single crystals [NASA-CR-165593] p0 759 N82-2
                                                    p0 159 N82-23030
   Tribological properties of sintered polycrystalline and single crystal silicon carbide
   [NASA-TM-82829] p0068 N82-
The orthogonal in-situ machining of single and
                                                    p0068 N82-24343
      polycrystalline aluminum and copper, volume 1
[NASA-CR-168929] p0076 w82-24361
[NASA-CR-168929]
SINGULARITY (MATHEMATICS)
   Moving singularity creep crack growth analysis with the /Delta T/c and C/asterisk/ integrals --- path-independent vector and energy rate line
      integrals
                                                    p0116 A82-40066
SINTERING
   Fabrication of turbine components and properties
      of sintered silicon nitride [ASME PAPER 82-GT-252]
                                                    p0071 AJ2-35431
   Pabrication of sinterable silicon nitride by injection molding
                                                    p0071 A82-37015
   Stabilizing platinum in phosphoric acid fuel cells [NASA-CR-165483] p0130 N82-146
                                                    p0130 N82-14628
   Nitridation of silicon [NASA-TM-82722]
                                                    p0066 N82-15197
   Tribological properties of sintered polycrystalline and single crystal silicon carbide
      [NASA-TM-82829]
                                                    P0068 N82-24343
   Stabilizing platinum in phosphoric acid fuel cells [NASA-CR-165606] p0136 N82-297
                                                    p0136 N82-29718
SIZE (DIMENSIONS)
   The optimal design of involute year teeth with
      unequal addenda
      [ NASA-TM-82866]
                                                    p0101 N82-28645
SKY
 NT NIGHT SKY
SLIDING
   Priction and wear of iron in corrosive metal
      [ NASA-TP-1985]
                                                    p0058 N82-20291
SLIDING CONTACT
   Single pass rub phenomena - Analysis and experiment [ASME PAPER 81-LUB-55] p0107 A82-1844
                                                    p0107 A82-18449
SLIDING PRICTION
   Effect of gamma irradiation on the friction and wear of ultrahigh molecular weight polyethylene
```

```
p0062 A82-10674
Adhesion and friction of single-crystal diamond in
      contact with transition metals
                                                    p0103 A82-18680
   Geometrical aspects of the tribological properties of graphite fiber reinforced polymide composites [NASA-TH-82757] p0066 M82-1519
                                                    p0066 N82-15198
   Effects of artificially produced defects on film
thickness distribution in sliding MHD point
      contacts
     [ NASA-TM-82732]
                                                    p0099 N82-16412
   Surface chemistry and wear behavior of single-crystal silicon carbide sliding against
      iron at temperatures to 1500 C in vacuum
[NASA-TP-1947] p0067 N82-19374
      [ NASA-TP- 1947]
   Friction wear and auger analysis of iron implanted with 1.5-MeV nitrogen ions
[NASA-TP-1989] p0059 N82-2130
                                                    p0059 N82-21300
   Surface chemistry, microstructure and friction
      properties of some ferrous-base metallic glasses
      at temperatures to 750 C
                                                    p0060 N82-22349
       NASA-TP-20067
   Tribological characteristics of nitrogen (N+)
      implanted iron
      [ NASA-TM-82839]
                                                    p0060 N82-24322
   The dryout region in frictionally heated sliding
      contacts
      [ NA SA-TM-82796]
                                                    p0088 N82-28574
   Occurrence of spherical ceramic debris in
      indentation and sliding contact
   [NASA-TP-2048] p0069 N82
The influence of surface dents and grooves on
                                                    p0069 N82-32491
      traction in sliding EHD point contacts
      [ NASA-TM-82943]
                                                    p0102 N82-32734
   Plastic deformation and wear process at a surface
during unlubricated sliding
[HASA-TH-82820] p0102 N82-32
                                                    p0102 N82-32735
   Wear mechanism based on adhesion [NASA-TP-2037]
                                                    p0103 N82-32737
SLIPSTREAMS
 NT PROPELLER SLIPSTREAMS
SLUBBY PROPELLANTS
 NT LIQUID FUELS
SHOW COVER
   Dynamics of snow cover in mountain regions of the Aral Sea basin, studied using satellite
      photographs
SOCIAL FACTORS
   Socioeconomic impact of photovoltaic power at
   Schuchuli, Arizona
[NASA-CR-16555]

Current legal and institutional issues in the
commercialization of phosphoric acid fuel cells
                                                    p0 133 N82-19669
      [ NASA-CR- 167867]
                                                    p0 136 N82-29719
SOCIOLOGY
 NT SOCIAL FACTORS
SODIUM CHLORIDES
   Investigation into the role of NaCl deposited on oxide and metal substrates in the initiation of
      hot corrosion
      T NASA-CR- 1650291
                                                    p0063 N82-13217
SODIUM COMPOUNDS
 NT SOCIUM CFLORIDES
   Moderate temperature Na cells. III -
      Electrochemical and structural studies of Cr0.5V0.5S2 and its Na intercalates
                                                    p0055 A82-15732
SOFTWARE (COMPUTERS)
 U MEUTER PROGRAMS
SOILS
 NT LUNAR SCIL
SOLAR ACTIVITY
 NT SOLAR FLARES
NT SCLAR PROMINENCES
    VLA observations of solar active regions at 6 cm
      wavelength
                                                    p0167 A82-10156
SCLAR ARRAYS
   High power solar array switching regulation
                                                    p0043 A82-11736
   Voltage gradients in solar array cavities as nossible breakdows sites in
      spacecraft-charging-induced discharges
                                                    p0038 A82-18317
   Component technology for space power systems
                                                    p0043 A82-44750
      [ IAF PAPER 82-408]
   Experimental simulation of biased sclar arrays
```

with the space plasma

```
[NASA-CR-165485] p0157 No
Voltage gradients in solar array cavities as
                                              p0157 N82-10880
     possible breakdown sites in
     spacecraft-charging-induced discharges
                                             P0037 N82-11107
     [ WASA-TH-82710 ]
   Solar cell development for the power extension
     package
     NASA-TH-82685]
                                              DOILS N82-11551
   Study of multi-megawatt technology needs for
     photovoltaic space power systems.
                                             Volume i:
     Executive summary
     [ NASA-CR-165323-VOL-1 ]
                                              p0130 N82-14636
   Large area low-cost space solar cell development
     [ NASA-TM-82902]
                                             p0126 N82-32854
   Gallium arsenide solar array subsystem study
                                             p0 138 N32-32855
     [NASA-CR-167869]
SOLAR CELLS
   High- and low-resistivity silicon solar cells
                                             p0046 A82-11762
   Gallium arsenide solar cells-status and prospects
     for use in space
                                              p0043 A82-11765
   Multijunction high voltage concentrator solar cells
                                              p0043 A82-11796
   Shuttle to GEO propulsion tradeoffs
   [ATAA PAPER 82-1245] p0034 A82-35
On the cause of the flat-spot phenomenon observed
                                             p0034 A82-35082
     in silicon solar cells at low temperatures and
     low intensities --- in deep space environments
                                             p0043 A82-39599
   Advances in high output voltage silicon solar cells
                                             p0 127 A82-44942
   Thin foil silicon solar cells with coplanar back
                                              p0 127 A82-44944
   Pabrication of multijunction high voltage
     concentrator solar cells by integrated circuit
     technology
                                             p0 127 A82-44957
   On the cause of the flat spot phenomenon observed
     in silicon solar cells at low temperatures and
     low intensities
                                              p0044 A82-44965
   A theory of the n-i-p silicon solar cell
                                              p0 128 A82-45055
   Processing of silicon solar cells by ion
     implantation and laser annealing
     [ NASA-CR-165283 ]
                                              p0128 N82-11546
   Solar cell development for the power extension
     package
     [ NASA-TH-82685]
                                              p0118 N82-11551
   Testing of solar cell covers and encapsulants conducted in a simulated space environment
      NASA-CR-165475]
                                             p0129 N82-12571
   Study of multi-megawatt technology needs for
     photovoltaic space power systems.
                                             Volume 1:
     Executive summary [NASA-CR-165323-VOL-1]
                                              p0130 N82-14636
   Development of thin wraparound junction silicon
     solar cells
     [NASA-CR-165570]
                                              p0 133 N82-18689
   High purity low dislocation Gals single crystals [NASA-CR-165593] p0159 N82-23030
   High voltage V-groove solar cell [NASA-CASE-LEW-13401-2]
                                              p0123 N82-24717
   Material and processing needs for silicon solar cells in space
                                              p0032 N82-26336
   Method of making a high voltage V-groove solar cell
[NASA-CASE-LEW-13401-1] p0124 N82-2976
                                             p0124 N82-29709
   Development of a large area space solar cell
     assembly
     [NASA-CR-167929]
                                             p0137 N82-30706
   Effects of processing and dopant on radiation damage removal in silicon solar cells
     [NASA-TH-82892]
                                             p0042 N82-31443
   High voltage planar multijunction solar cell [WASA-CASE=1,EW-13400-1] p0 125 N
                                             p0 125 N82-31764
   On the cause of the flat-spot phenomenon observed
     in silicon solar cells at low temperatures and low intensities
     [NASA-TH-82903]
                                              p0 126 N82-31777
   Determination of optimum sunlight concentration level in space for 3-4 cascade solar cells
     [NASA-TM-82899]
                                             p0 126 N82-32853
   Large area low-cost space solar cell development
                                              p0126 N82-32854
     [NASA-TH-82902]
SOLAR COLLECTORS
NT SOLAR REPLECTORS
```

p0167 A82-27323

p0071 182-2074!

Pabrication of multijunction high voltage concentrator sclar cells by integrated circuit p0127 A82-44957 SOLAR CONVERTERS U LAR GENERATORS SOLAR BLECTRIC PROPULSION Shuttle to GEO propulsion tradeoffs
[AIAA FAPER 82-1245] p0034 A82-35082 SOLAR BURRGY Study of multi-negavatt technology needs for photovoltaic space power systems. Volume 1: Executive summary
[NASA-CF-165323-VOL-1]

Study of multi-megawatt technology meds for photovoltaic space power systems, volume 2
[NASA-CF-165323-VOL-2]

p0130 NE p0 130 N82-14636 p0130 N82-14637 NASA Redox system development project status [NASA-TM-82665] p0 123 N82-25637 SOLAR ENERGY CONVERSION Materials science issues encountered during the development of thermochemical concepts --- in screening of reactions for sclar energy applications A82-10021 Market assessment of photovoltaic power systems for agricultural applications in Morocco [NASA-CR- 165477] p0130 N82-14627 | NASA-CR-1634/7| P0/130 N82-14
| Market assessment of photovoltaic power systems for agricultural applications in Nigeria [NASA-CR-165511] P0/133 N82-14
| Operational performance of the photovoltaic-powered grain will and water pump p0133 N82-18698 at Tangaye, Upper Volta [NASA-TM-82767] p0 120 N82-19673 A new strategy for efficient sclar energy conversion: Parallel-processing with surface plasmons [NASA-TM-828671 p0042 N82-29354 Design description of the Tangaye Village photovcltaic power system [NASA-TM-82917] p0125 N82-33828 SOLAR PLANES Magnetic structure of a flaring region producing impulsive microwave and hard X-ray bursts p0167 A82-27323 SOLAR GENERATORS NI SOLAR CELLS Secioeconomic impact of photovoltaic power at Schuchuli, Arizona
[NASA-CP-16555] p6 133 N82-19
SOLAR HAGNETIC FIELD
VIA observations of solar active regions at 6 cm p# 133 N82-19669 wavelength p0 167 A82-10 156 Time variability and structure of quiet sun scurces at 6 cm wavelength p0 167 A82-26003 SOLAR HOISE U LAR RADIO EMISSION SOLAR POWER GENERATION U LAR GENERATORS SOLAH POWER SATELLITES Direct conversion of light to radio frequency energy --- using photoklystrons for solar power p0138 A82-11712 Study of multi-megawatt technology needs for photovoltaic space power systems. Tolume 1: Executive summary [NASA-CR- 165323-VOL-1] p0 130 N82-14636 Study of multi-negawatt technology needs for photovoltaic space power systems, volume 2 [NASA-CR- 165323-VOL-2] SOLAR POWER SOURCES p0 130 NB2- 14637 U LAR CENERATORS SOLAR PROMINENCES VLA observations of solar active regions at 6 cm wavelength p0167 A82-10156 SOLAR PROPULSION

NT SOLAR ELECTRIC PROPULSION SOLAR BADIATION

Magnetic structure of a flaring region producing

NT SOLAR RADIO BURSTS
NT SCLAR RADIO EMISSION
NT SOLAR X-EAYS

NT SUNLIGHT

SOLAR RADIO BURSTS

SOLAR RADIO EMISSIÓN NT SOLAR RADIO BURSTS VLA observations of solar active regions at 6 cm wavelength Time variability and structure of quiet sun sources at 6 cm wavelength p0167 A82-26003 SOLER RADIO WAVES U LAR RADIO RHISSION SOLAR RECEIVERS U LAR COLLECTORS SOLAR REPLECTORS Environmental effects on solar concentrator mirrors A82-23394 Subsystems design and component development for the parabolic dish module for solar thermal power systems [NASA-CR-168941] p0135 N82-24646 SOLAR SIMULATORS Development of a large area space solar cell assembly [NASA-CR-167929] p0 137 N82-30706 SOLAR X-RAYS Magnetic structure of a flaring region producing impulsive microwave and hard X-ray bursts p0 167 A82-27323 SOLEHOIDS Preliminary study, analysis and design for a power switch for digital engine actuators
[NASA-CR-159559] p0085 982-233 p0085 982-23394 SOLID BLECTRODES Moderate temperature Na cells. IV - VS2 and MoS2C12 as rechargeable cathodes in molten MaxIC14 p0055 A82-15743 SOLID LUBRICANTS Development of CdO-graphite-Ag coatings for gas bearings to 427 C p0108 A82-27079 Tribological properties at 25 C of seven polyimide films bunded to 440 C high-temperature stainless steel FNASA-TP-19441 p0067 NB2-19373 SOLID PROPELLANT COMBUSTION Symposium /International/ on Combustion, 18th, University of Waterloo, Waterloo, Ontario, Canada, August 17-22, 1980, Proceedings p0056 A82-28651 SOLID ROCKET PROPELLANTS NT LIQUID FUELS SOLID ROTATION U TATING BODIES SOLID STATE DEVICES NT AVALANCHE DIODES NT BIPOLAR TRANSISWORS NT CRYSTAL RECTIFIERS NT FIELD EFFECT TRANSISTORS
NT METAL OXIDE SEMICOMOUCTORS
NT MIS (SEMICOMOUCTORS)
NT PHOTOVOLTAIC CELLS NT SEMICONDUCTOR DEVICES NT TRANSISTORS High voltage DC switchgear development for multi-kW space power system: Aerospace technology development of three types of solid state power controllers for 200-1100VDC with current ratings of 25, 50, and 80 amperes with one type utilizing an electromechanical device [NASA-CR- 1654 13] p0083 N82-13357 SOLID STATE PHYSICS Ion-beam-induced topography and surface diffusion p0 160 A82-46426 SOLID SURFACES NT CRYSTAL SURFACES
Application of surface analysis to solve problems of wear [NASA-TM-82753] p0099 N82-14519 SOLID-SOLID INTERPACES Single pass rub phenomena - Analysis and experiment [ASME PAPER 81-LUB-55] p0 107 A82-1844 Adhesion and friction of single-crystal diamond in p0 107 A82-18449 contact with transition metals p0103 182-18680 Analytical and experimental evaluation of biaxial contact stress

impulsive migrovave and hard X-ray bursts

1-99

```
Interface cracks in adhesively bounded lap-shear
      joints
                                                 p0116 A82-46109
SOLIDIFICATION
   Cauchy integral method for two-dimensional solidification interface shapes
                                                 p0089 A82-39899
SOLUTIONS
 NT AQUECUS SOLUTIONS
 NT GAS MIXTURES
SONIC FLOW
U ANSCHIC FLOW
SONIC SPEED
 U OUSTIC VELOCITY
SOOT
   Evaluation of fuel injection configurations to
      centrol carbon and soot fermation in small GT
      combustors
   [AIRA EAPER 82-1175] p0021 A82
Investigation of soot and carbon formation in small gas turbine combusters
[NASA-CP-167853] p0025 N82
                                                 p0021 A82-35041
                                                 p0025 N82-22267
   Computations of sout and and NO sub x emissions
      from que turbine combustors [NASA-CP-167930]
                                                 p0139 N82-29777
SORRENTS
 NT ADSORBENTS
SOURD
 U QUSTICS
SOURD ABSORPTION
 U UND TRANSMISSION
SOUND PARRIER
 U OUSTIC VELOCITY
SOUND FIELDS
   An iterative finite element-integral technique for
      predicting sound radiation from turbofan inlets
      in steady flight
      [ ATAA PAPER 82-0124]
                                                 p0030 A82-17796
SOUND MEASUREMENT
 U CUSTIC MEASUREMENT
SOUND PRESSURE
   Propeller tip vortex - A possible contributor to aircraft cabin noise
                                                 p0152 382~17603
   Analytical and experimental investigation of the
      propagation and attenuation of sound in extended
      reaction lined ducts
[ATAA PAPER 81-2014]
                                                 p0153 A82-10454
   Methods for the calculation of axial wave numbers in lined ducts with mean flow
                                                 p0153 A82-14044
   Numerical techniques in linear duct acoustics.
      1980-81 update
      [ NASA-TM-82730 ]
   Verification of an acoustic transmission matrix analysis of sound propagation in a variable area
     duct without flow [NASA-TM-82741]
                                                 p0151 N82-12891
   Application of steady state finite element and transient finite difference theory to sound
      propagation in a variable area duct: A
      comparison with experiment
      [ NASA-TM-82678]
                                                 p0151 N82-15847
   Pressure transfer function of a JT15D nozzle due
      tc acoustic and convected entropy fluctuations
      [ NASA-TM-82842]
                                                 p0 152 N82-22951
SOUND TRANSMISSION
   Verification of an acoustic transmission matrix
      analysis of sound propagation in a variable area
duct without flow [NASA-TH-82741]
SOUND WELOCITY
                                                 p0 151 N82- 1289 I
 U OUSTIC VELOCITY
SOURD WAVES
 NT AEGOLYNAMIC NOISE
 NT AIFCRAFT NOISE
 NT ENGINE NOISE
 NT JET AIRCRAFT NOISE
 NT NOISE (SOUND)
   Development of a spinning wave heat engine [NASA-CR-165611] p0028
                                                 p0028 N82-31328
SOUNDING
 NT ATEOSPHERIC SOUNDING NT ICHOSPHERIC SOUNDING
 NT SATELLITE SOUNDING
SOUTHERN BEHISPHERE
```

NT ANTARCTIC REGIONS

```
SPACE COMMUNICATION
 NT SPACECRAPT COMMUNICATION
SPACE ENVIRONMENT
 U ROSPACE ENVIRONMENTS
SPACE BUVIRONMENT SINULATION
   Validation of the NASCAP model using spaceflight
      data
      [ATAA PAPER 82-0269]
                                                p0038 A82-17872
   Testing of a spacecraft model in a combined
      environment simulator
                                                P0033 A82-18310
   NASCAP simulation of laboratory charging tests
      using aultiple electron guns
                                                p0033 A82-18319
   Spacecraft Charging Technology, 1980
     [ NASA-CP-2182]
                                                p0037 N82-14213
SPACE INDUSTRIALIZATION
   The supply of lunar oxygen to low earth orbit
                                                p0032 A82-35618
SPACE HANUPACTURING
   A small scale lunar launcher for early lunar material utilization
                                                p0032 A82-35617
   Study of multi-megawatt technology needs for
      photovoltaic space power systems, volume 2 [NASA-CR-165323-VOL-2] p0130
                                                p0130 N82-14637
SPACE PLASMAS
   Pield-aligned ion streams in the earth's midnight
     region
                                                p0140 A82-31009
   Experimental simulation of biased solar arrays
      with the space plasma [NASA-CR-165485]
                                                p0157 NCC-10880
    Agreement for NASA/OAST - USAP/AFSC space
      interdependency on spacecraft environment
      interaction
                                                p0038 N82-14271
   Design practices for controlling spacecraft charging interactions
[NASA-TH-82781] p0038 1
                                                p0038 N82-18311
SPACE PLATFORMS
   Large Space Systems/Propulsion Interactions
     [NASA-TH-82904]
                                                p0042 #82-27358
SPACE POWER REACTORS
NT SPACE POWER UNIT REACTORS
SPACE POWER UNIT REACTORS
   Electrochemical energy storage for an orbiting
     space station
     [ NASA-CR-165436]
                                                p0 13 2 N8 2-17607
SPACE SHUTTLE ORBITERS
   Space Shuttle Orbiter charging
     [AIAA PAPER 82-0119]
                                                p0040 A82-17793
   Shuttle to GEO propulsion tradeoffs
[AIAA PAPER 82-1245]
                                                p0034 A82-35082
   Real-time microcomputer simulation for space
      Shuttle/Centaur avionics
                                                p0033 A82-48245
   Charging of a large object in low polar Earth orbit
        - space shuttle orbiter
                                                p0039 N82-14275
   Cryoqenic fluid management experiment
                                                p0039 N82-15117
[NASA-CR-165495]
SPACE SHOTTLE PAYLONDS
 NT SPACEBORNE EXPERIMENTS
   Real-time computer simulation/emulation for
      verification of multi-fault-tolerant control of
      Centaur-in-Shuttle
     [AIAA 81-2283]
                                                p0040 A82-13494
   Cryogenic fluid management experiment
     [ NASA-CR- | 65495]
                                                p0039 N82-15117
   The 30/20 GHz flight experiment system, phase 2.
      Volume 1: Executive summary
     [ NASA-CR-165409-VOL-1]
                                                p0078 N82-20362
   The 30/20 GHz flight experiment system, phase 2. Volume 2: Experiment system description [NASA-CR-165409-VOL-2] p0078 NB2-2
                                                p0078 N82-20363
   The 30/20 GHz flight experiment system, phase 2.

Volume 3: Experiment system requirement document
[NASA-CR-165409-VoL-3] p0078 N82-20364
   The 30/20 GHz flight experiment system, phase 2.

Volume 4: Experiment system development plan
[NASA-CR-165409-VOL-4] p0078 N82-2
                                                p0078 N82-20365
SPACE STATIONS
   Large Space Systems/Propulsion Interactions [NASN-TH-82904] p0042
                                                p0042 N82-27358
SPACE STORAGE
   An experiment to evaluate liquid hydrogen storage
```

A82-20748

interdependency on spacecraft environment

interaction

```
SPACE SYSTEMS ENGINEERING
                                                                         Charging of a large object in low polar Earth orbit
 U ROSPACE ENGINEERING
                                                                             -- space shuttle orbiter
SPACE TRANSPORTATION
                                                                                                                   p0039 #82-14275
NT SPACE SHUTTLE ORBITERS
                                                                         Design practices for controlling spacecraft charging interactions
 HT SPACE TRANSPORTATION SYSTEM
SPACE TRANSPORTATION SYSTEM
                                                                           [ MASA-TH-8278 17
                                                                                                                   p0038 N82-18311
NT SPACE SHUTTLE ORBITERS

Design and verification of a multiple fault tolerant control system for STS applications
                                                                         Environmentally induced discharges on satellites
                                                                           [ NASA-TM-82849]
                                                                                                                   p0038 N82-23261
                                                                         First results of material charging in the space
     using computer simulation [AIAA 81-2173]
                                                                           environment
                                             p0035 A82-10124
                                                                           [ NASA-TH-84743]
                                                                                                                   p0081 W82-24431
   Large Space Systems/Propulsion Interactions
                                                                         Additional extensions to the NASCAP computer code,
     I NASA-TH-829041
                                             p0042 N82-27358
                                                                           volume 1
   Systems integration
                                                                           [ NASA-CR-167855]
                                                                                                                   p0 146 N82-25810
                                             p0042 NB2-27371
                                                                         Additional extensions to the MASCAP computer code,
SPACE VEHICLE CONTROL
                                                                           volume 2
                                                                           [ NASA-CR-167856 ]
 U ACECRAFT CONTROL
                                                                                                                   p0040 N82-26377
SPACEBORNE EXPERIMENTS
Pield-aligned ion streams in the earth's midnight
                                                                         Additional extensions to the NASCAP computer code,
                                                                           volume 3
                                                                           [ NASA-CR-167857]
     region
                                                                                                                   p0040 #82-26378
                                             p0 140 A82-31009
                                                                      SPACECRAFT CONMUNICATION
   Cryogenic fluid management experiment
                                                                         Advanced 30/20 GHz communication satellites
                                             p0039 N82-15117
[ NASA-CR-165495]
SPACEBORNE PHOTOGRAPHY
                                                                                                                   p0034 A82-12623
                                                                         Microwave intersatellite links for communications
 NT SATELLITF-BORNE PHOTOGRAPHY
                                                                            satellites
SPACECRAFT ANTENNAS
                                                                                                                   p0036 A82-36925
                                                                         The 30/20 GHz flight experiment system, phase 2.
   A new antenna concept for satellite communications
     [NASA-CR- 167924]
                                             p0079 N82-31584
                                                                            Volume 1: Executive summary
SPACECRAPT CHARGING
                                                                           [ NASA-CR-165409-VOL-1]
                                                                                                                   p0078 ¥82-20362
                                                                         The 30/20 GHz flight experiment system, phase 2.
   Numerical simulation of sheath structure and
                                                                         Volume 2: Experiment system description [NASA-CR-165409-VOL-2] p0078 M82-2
The 30/20 GHz flight experiment system, phase 2.
     current-voltage characteristics of a
     conductor-dielectric disk in a plasma
                                                                                                                   p0078 N82-20363
                                             p0040 A82-15904
   Modification of spacecraft potentials by thermal electron emission on ATS-5
                                                                           Volume 3: Experiment system requirement document [NASA-CR-165409-VOL-3] p0078 N82-20364
                                                                         The 30/20 GHz flight experiment system, phase 2.
Volume 4: Experiment system development plan
[NASA-CR-165409-VOL-4] p0078 N82-20365
   Space Shuttle Orbiter charging
     FAIAA PAPER 82-0119]
                                             p0040 A82-17793
   Validation of the NASCAP model using spaceflight
                                                                         A new antenna concept for satellite communications [NASA-CR-167924] p0079 M82-315
     data
                                                                                                                   p0079 #82-31584
                                                                      SPACECRAFT COMPONENTS
     [AIAA PAPER 82-0269]
                                             p0038 A82-17872
   Testing of a spacecraft model in a combined
                                                                         Internal breakdown of charged spacecraft dielectrics
     environment simulator
                                                                         p0041 A82-18312
Component technology for space power systems
                                             p0033 A82-18310
   Internal breakdown of charged spacecraft dielectrics
                                                                           [ IAF PAPER 82-408]
                                                                                                                   p0043 A82-44750
                                             p0041 A82-18312
                                                                      SPACECRAFT CONTROL
   Voltage gradients in solar array cavities as
                                                                         Design and verification of a multiple fault
     possible breakdown sites in
                                                                           tolerant control system for STS applications
     spacecraft-charging-induced discharges
                                                                           using computer simulation
                                             p0038 A82-18317
                                                                      [AIAA 81-2173]
SPACECRAFT DESIGN
                                                                                                                   p0035 A82-10124
   'Bootstrap' charging of surfaces composed of
     multiple materials
                                                                       NT SATELLITE DESIGN
                                             p0065 A82-18318
                                                                         Spacecraft Charging Technology, 1980
   NASCAP simulation of laboratory charging tests
                                                                           [ NASA-CP-2182]
                                                                                                                   p0037 NB2-14213
     using multiple electron guns
                                                                      SPACECRAPT LAUNCHING
                                             p0033 A82-18319
                                                                         Centaur capabilities for communications satellite
   Differential charging of high-voltage spacecraft -
                                                                           launches
                                                                      [AIAA PAPER 82-0558]
SPACECRAPT MODELS
     The equilibrium potential of insulated surfaces
                                                                                                                   p0034 A82-36286
                                             p0041 A82-35547
   Testing of a spacecraft model in a combined
                                                                         Testing of a spacecraft model in a combined
   environment simulator
[NASA-TM-82723]
POLTAGE gradients in solar array cavities as
                                                                           environment simulator
                                             p0037 N82-11106
                                                                           [ NASA-TM-82723]
                                                                                                                   p0037 N82-11106
                                                                         Brushfire arc discharge model
     possible breakdown sites in
                                                                                                                   p0038 #82-14224
     spacecraft-charging-induced discharges
                                                                      SPACECRAFT ORBITAL ASSEMBLY
     F NASA-TM-827101
                                             p0037 N82-11107
                                                                       U BITAL ASSEMBLY
   Spacecraft Charging Technology, 1980
                                                                      SPACECRAPT ORBITS
     [ NASA-CP-2182]
                                             p0037 NB2-14213
                                                                       NT GEOSYNCHRONOUS ORBITS
   Brushfire arc discharge model
                                                                       NT POLAR ORBITS
                                             p0038 N82-14224
                                                                       NT SATELLITE ORBITS
   Secondary electron emission yields
                                                                       NT TRANSPER ORBITS
                                             00038 N82-14226
                                                                         Integrated propulsion for near Earth space
   Oblique-incidence secondary emission from charged
                                                                           missions. Volume 1: Executave summary [NASA-CR-167889-VOL-1] p004
     dielectronics
                                                                                                                   p0045 N82-33424
                                             p0039 N82-14227
                                                                         Integrated propulsion for near-Barth space
   Comparison of NASCAP modelling results with lumged
                                                                           missions. Volume 2: Technical [NASA-CR-167889-VOL-2]
     circuit analysis
                                                                                                                   p0046 N82-33425
                                             p0037 N82-14255
                                                                      SPACECRAPT POWER SUPPLIES
   Analytical modeling of satellites in
                                                                         High power solar array switching regulation
     geosynchronous environment
                                                                                                                   p0043 A82-11736
                                             p0037 N82-14258
                                                                         High- and low-resistivity silicon solar cells
   Use of charging control quidelines for geosynchronous satellite design studies
                                                                                                                   p0046 A82-11762
                                                                         Gallium arsenide solar cells-status and prospects
                                             p0037 N82-14263
                                                                           for use in space
   Agreement for NASA/OAST - USAF/AFSC space
                                                                                                                   p0043 182-11765
```

P0038 N82-14271

Multijunction high voltage concentrator solar cells

A 10-kW series resonant converter design, transistor characterization, and base-drive

p0043 A02-11796

NT EAXIEUM ENTROPY METHOD

```
octimization
                                                                             SPEED
                                                 p0086 A82-36927
                                                                              U LOCITY
   Component technology for space rower systems [IMF PAPER 82-408] p0043 M
                                                                             SPEED CONTROL
                                                 p0043 A82-44750
                                                                                Multiroller traction drive speed reducer:
   Processing of silicon sclar cells by ion
                                                                                   Evaluation for automotive gas turbine engine
                                                                             [NASA-TP-2027]
SPEED INDICATORS
      implantation and laser annealing
                                                                                                                              p0101 N82-26678
      [ NASA-CR- 165283]
                                                 p0128 N82-11546
   Overview study of Space Power Technologies for the advanced enorgetics program --- spacecraft [NASA-CP-165269] p0132 N82-1760
                                                                              NT DRAG FORCE AMEMOMETERS
NT HOT-FILM AMEMOMETERS
NT HOT-WIRE AMEMOMETERS
                                                 p0 132 882- 17606
   Design of a 35-kilowatt bipclar nickel-hydrogen
                                                                              NT LASER ANEMOMETERS
      battery for low Earth orbit application
                                                                             SPEED REGULATION
                                                 p0123 N82-24647
      [ NASA-TM-82844]
                                                                              U BED CONTROL
( MASA-TH-B2844 )
SPACECRAPT PROPULSION
HT FLECTROHAGNETIC PROPULSION
HT MASS DRIVERS (PAYLOAD DELIVERY)
HT SOLAR FLECTRIC PROPULSION
                                                                             SPHERES
                                                                                Distorted turbulence in axisymmetric flow
                                                                                                                              p0089 A82-16071
   30-cm mercury ion thruster technology
                                                                              MT ELECTRON CAPTURE
                                                 p0046 A82-15434
                                                                             SPIN-ORBIT INTERACTIONS
   Characteristics of the LeRC/Hughes J-series 30-cm
                                                                              MT ELECTRON CAPTURE
      engineering model thruster
                                                                             SPIRAL WRAPPING
                                                  p0046 X82-15435
                                                                                Mathematical models for the synthesis and
    Propulsion system options for low-acceleration
                                                                                   optimization of spiral bevel quar tooth surfaces --- for helicopter transmissions
      orbit transfer [AIAA PAPER 82-1196]
                                                                                   [ NASA-CR-3553]
                                                                                                                              p0106 M82-25516
    Ceveloping a scalable inert gas ion thruster
                                                                             SPRAY CHARACTERISTICS
      [AIAA PAPER 82-1275]
                                                 p0047 A82-37713
                                                                                 Atomization and combustion properties of flashing
   Primary propulsion/large space system interaction
                                                                                   injectors
      study
                                                                                   [AIAA PAPER 82-0300]
                                                                                                                              p0092 A82-17880
                                                                                Venturi nozzle effects on fuel drop size and nitrogen oxide emissions
      [ NASA-CR- 165277]
                                                  p0044 N82-18315
    Large Space Systems/Propulsion Interactions
      Inge Space 3720007.
[NASA-TH-82904]
POUR STANDARD FOR COMPUTER PROPERTY A COMPUTER P.
                                                                                   [ NASA-TP-2028]
                                                 p0042 N82-27358
                                                                                                                              p0020 N82-31329
    Research report:
                                                                             SPRAY MOZZLES
      program AT01Y005. PLANETSYS, a computer program for the steady state and transient thermal analysis of a planetary power transmission system (NASA-CR-165366) p0146 N82-3197
                                                                                 Hydrodynamic and aerodynamic breakup of liquid
                                                                                   sheets
                                                                                   [NASA-TM-82800]
                                                                                                                               D0087 N82-19494
   | MASA-GR-165366] p0146 M82-31970
Integrated propulsion for near-Earth space
                                                                             SPRAYED COATINGS
                                                                                Improved plasma sprayed MCrall coatings for aircraft gas turbine applications
      missions. Volume 1: I
[NASA-CR-167889-VOL-1]
                   Volume 1: Executive sunmary
                                                 p0045 N82-33424
                                                                                                                              p0065 A82-20742
    Integrated propulsion for near-Earth space
                                                                                Phase stability in plasma-sprayed, partially stabilized zirconia-yttria
      missions Volume 2: Technical [NASA-CR-167889-VOL-2]
                                                                                                                              p0070 A82-41552
                                                  p0046 N82-33425
SPACICBART SHIELDING
                                                                                 Evaluation of present thermal barrier coatings for
    Secondary electron emission vields
                                                                                   potential service in electric utility gas turbines [NASA-CR-165545] p0063 N82-18368
                                                  p0038 N82-14226
                                                                                 JT9D ceramic outer air seal system refinement
SPACECRAFT TRAJECTORIES
 NT MOON-EARTH TRAJECTORIES
                                                                                   program
SPACELAB PAYLOADS
                                                                                   [ NASA-CR-165554 ]
                                                                                                                              p0106 N82-18603
   Cryogenic fluid management experiment [NASA-CR-165495]
                                                                                 Sputtered silicon nitride coatings for wear
                                                  p0039 N82-15117
                                                                                   protection
                                                                             (NASA-TH-828191
SPRAYED PROTECTIVE CORTINGS
SPARWISE BLOWING
                                                                                                                              p0067 N82-20314
 NT BLOWING
                                                                              U OTECTIVE COATINGS
SPATIAL DISTRIBUTION
    Representation and material charging response of
                                                                              U RAYED COATINGS
      georlasma environments
                                                                             SPRAYING
                                                  p0039 NB2-14249
                                                                              NT PLASMA SPRAYING
SPATIAL ISOTROPY
                                                                             SPUR (REACTORS)
U ATIAL DISTRIBUTION
SPECIFIC GRAVITY
U NSITY (MASS/VOLUME)
SPECIFIC IMPULSE
                                                                              U ACE POWER UNIT REACTORS
                                                                             SPUTTERING
                                                                                 Surface diffusion activation energy determination
                                                                                   using ion beam microtexturing
    Propulsion system options for low-acceleration
                                                                                                                               p0159 A82-21965
orbit transfer [AIAA PAPER 82-1196]
SPECKLE PATTERNS
                                                                                 Quasi-liquid states observed on ion beam
                                                  D0047 A82-35056
                                                                                   microtextured surfaces
                                                                                                                               p0159 A82-30335
    Digital imaging techniques in experimental stress
                                                                                 Sputtered silicon nitride coatings for wear
      analysis
                                                                                   protection [NASA-TM-82819]
                                                  p0097 A82-34231
                                                                                                                               p0067 N82-20314
    Experimental boundary integral equation
                                                                                 Some properties of RF sputtered hafnium nitride
      applications in speckle interferometry
                                                                                   coatings
                                                  p0097 182-36987
                                                                                   [ NASA-TM-82826]
                                                                                                                               p0067 N82-21331
 SPECTRA
                                                                                 Morphological and frictional behavior of sputtered
 NT EMISSION SPECTRA
NT INFRARED SPECTRA
                                                                                   MoS2 films
                                                                                                                               p0076 N82-22387
                                                                                   [ NASA-TH-82809]
 NT NOISE SPECTRA
NT BAMAN SPECTRA
                                                                                 Ion beam textured graphite electrode plates ---
                                                                                   high efficiency electron tube devices
[NASA-CASE-LEW-12919-2]
p0
  NT STELLAR SPECTRA
                                                                                                                              p0059 N82-26386
  NT ULTRAVIOLET SPECTRA
                                                                                 Ion beam sputter deposited diamond like films
 SPECTROSCOPIC ANALYSIS
                                                                                   [NASA-TM-82873]
                                                                                                                              p0069 N82-28445
                                                                                 Refractory coatings and method of producing the same [NASA-CASE-LEW-13169-1] p0060 N82-29415
    Analysis of infrared emission from thin adsorbates
                                                                                 [NASA-CASE-LEW-13169-1] p0060 Perposition of reactively ion beam sputtered silicon mitride coatings
                                                 p0056 A82-21431
 SPECTROSCOPY
 NT AUGER SPECTROSCOPY
  NT PHOTOELECTRON SPECTROSCOPY
                                                                                   [NASA-TH-82942]
                                                                                                                               p0069 N82-30401
  NT SPECTROSCOPIC ANALYSIS
                                                                                 Ion beam microtexturing and enhanced surface
  NT X FAY SPECTROSCOPY
                                                                                   diffusion
 PECTRUM ANALYSIS
                                                                                   [ NASA-CR- 167948]
                                                                                                                               p0065 N82-31509
```

SQUEEZE FILES Engine dynamic analysis with general nonlinear	STATIC LOADS
finite element codes. II - Rearing element	A multi-purpose method for analysis of spur gear tooth loading
implementation, overall numerical	[NASA-CR-165163] p0104 N82-10401
characteristics and benchwarking	Endurance test and evaluation of alkaline water
[ASHE FAPER 82-GT-292] p0 108 A82-35462	electrolysis cells
STABILITY	[NASA-CR-165424] p0130 N87-13508
HT AEFOLYNAMIC STABILITY	STATICS
NT BOUNDARY LAYER STABILITY	NT ELECTROSTATICS
NT COMBUSTION STABILITY NT PLANE STABILITY	STATIONS NT SPACE STATIONS
NT FLCW STABILITY	STATISTICAL AVALYSIS
HT GYROSCOPIC STABILITY	NT BIVARIATE ANALYSIS
NT DOTARY STABILITY	MT MULTIVARIATE STATISTICAL ANALYSIS
NT STORAGE STABILITY	NT STATISTICAL TESTS
NT THERMAL STABILITY	Durability/life of fiber compositos in
Effects of fan inlet temperature disturbances on	hydrothermomechanical environments [NASA-TH-82749] p0049 N62-14287
the stability of a turbofan engine [NASA-TM-82699] p0017 N82-18222	[WASA-TH-82749] p0949 N82-14287 Applications of the DOE/NASA wind turbine
STABILIZATION	engineering information system
Iffect of seals on rotor systems	p0122 N82-23696
[NASA-TH-82786] P0099 N82-16411	Rotor fragment protection program: Statistics on
STACKING PAULTS	aircraft gas turbing ngine rotor failures that
U YSTAL DEFECTS	occurred in U.S. commercial aviation during 1978
STACKS	[NASA-CR-165388] p0027 NB2-27316
Cell module and fuel conditioner development	STATISTICAL PROBABILITY
[NASA-CR-165462] P0130 N82-13511 MASA Redox cell stack shunt current, pumping	U OBABILITY THEORY STATISTICAL TESTS
power, and cell performance tradeoffs	Illustration of a new test for detecting a shift
[NASA-TM-82686] P0054 N82-19333	in mean in precipitation series
Cell module and fuel conditioner development	A82-13217
[NASA-CP-165193] p0137 N82-30712	STATOR BLADES
STAGBATION FLOW	A study of viscous flow in stator and rotor passages
Lean-limit extinction of propane/air mixtures in	[ASHE PAPER 82-GT-248] p0011 A82-35427
the stagnation-point flow	Analytic investigation of effect of end-wall
p0057 A82-28736 Effects of heat loss, preferential diffusion, and	contouring on stator performance [NASA-TP-1943] p0003 N82-14051
flame stretch on flame-front instability and	Performance of single-stage axial-flow transonic
extinction of propane/air mixtures	compressor with rotor and stator aspect ratios
p0057 A82-32877	of 1.63 and 1.78, respectively, and with design
Two dimensional stagnation point flow of a dusty	pressure ratio of 1.82
gas near an oscillating plate	[WASA-TP-1974] p0017 N82-19222
p0012 A82-37535	Laser an emometer measurements in an annular
On stability of premixed flames in stagnation - Print flow	cascade of core turbine vanes and comparison with theory
p0057 A82-37574	[NASA-TP-2018] p0004 N82-26234
STAGRATION POINT	Engine dynamic analysis with general monlinear
Some aspects of calculating flows about	finite element codes. Part 2: Bearing element
three-dimensional subsonic inlets	implementation overall numerical characteristics
[NASA-TH-8278 } p0004 N82-25213	and benchmaking
STAGENTION REGION U AGNATION POINT	[NASA-CR-167944] p0028 N82-33390 STATORS
STRIBLESS STEELS	Analytic investigation of effect of end-wall
Geometrical aspects of the tribological properties	contouring on stator performance
of graphite fiber reinforced polymide composites	[NASA-TP-1943] p0003 N82-14051
[NASA-TH-82757] p0066 N82-15198	Cold-air performance of a 15.41-cm-tip-diameter
Tribological properties at 25 C of seven polyimide	axial-flow power turbine with variable-area
films bonded to 440 C high-temperature stainless steel	stator designed for a 75-kW automotive gas
[NASA-TP-1944] p0067 N82-19373	turbine engine [NASA-TM-82644] p0024 M82-21193
Sputtered silicon nitride coatings for wear	Comparison of experimental and analytical
protection	performance for contoured endwall stators
[NASA-TM-82819] p0067 N82-20314	[NASA-MM-82877] p0019 M82-26299
Plastic-plastic finite-element analyses of	Flow visualization study of the horseshoe vortex
thermally cycled single-edge wedge specimens	in a turbine stator cascade
[NASA-TP-1982] p0111 N82-20565	[NASA-TP-1884] p0088 N82-30498
Effect of oxide films on hydrogen permeability of candidate Stirling engine heater head tube alloys	Small agial turbine stator technology program [NASA-CR-165602] p0028 W82-32367
[NASA-TH-82824] p0060 N82-24323	Status of laser anemometry in turbomachinery
Creep crack-growth: A new path-independent T sub	research at the Lewis Research Center
o and computational studies	p0096 N82-32686
[NASA-CR-168930] p0113 N82-24503	STAYS
Plastic deformation and wear process at a surface during unlubricated sliding	U Y WIRES STRADY PLOW
[NASA-TH-82820] p0 102 N82-32735	A finite element formulation of Euler equations
STANDING WAVES	for the solution of steady transonic flows
Standing waves along a microwave gamerated surface	[AIAA PAPER 82-0062] p0009 A82-17759
wave plasma	Application of a finite element algorithm for the
p0 158 A82-26952	solution of steady transonic Ruler equations
Verification of an acoustic transmission matrix	[AIAA PAPER 82-0970] p0010 A82-31939
analysis of sound propagation in a variable area duct without flow	STRADY STATE Transient catalytic combustor model
[NASA-TH-82741] p0 151 N82-12891	#NASA-CR-165324] p0129 N82-13507
STARS	Creep crack-growth: A new path-independent T sub
NT ECLIPSING BINARY STARS	o and computational studies
STATIC INVESTBES	[NASA-CR-168930] p0113 M82-24503
A PWN transistor inverter for an ac electric vehicle drive	Research report: User's manual for computer program AT8;y003 SHABERTH. Steady state and
p0085 A82-20744	transient thermal analysis of a shaft bearing

and the second second second second

```
system including ball, cylindrical and tapered
                                                                                                                 Assessment of a 40-kilowatt stirling engine for
        reller bearings
                                                                                                                     underground mining applications
        [ NASA-CR- 165365]
                                                                                                                     [ HASA-TH-82822]
                                                                                                                                                                                   p0125 M82-30714
STRAB
                                                                                                                  Automotive Stirling Engine Hod ! Design Review,
     Techniques for enhancing durability and
                                                                                                                     volume 1
        equivalence ratio control in a rich-lean, three-stage ground power gas turbine combustor
                                                                                                                     [NASA-CR-167935]
                                                                                                                                                                                  p0164 N82-34311
                                                                                                                  Automotive Stirling Engine Hod ! Design Review,
wolume 3 --- engineering drawings
        [ NASA-TH-82922]
                                                                      p0 124 N82-29717
STRAP TURBINES
                                                                                                                     [ NASA-CR-167397]
                                                                                                                                                                                   p0164 NB2-34312
     New features and applications of PRESTO, a computer code for the performance of
                                                                                                            STOICHTONETRY
                                                                                                                  Stoichiometry-controlled compensation in liquid
        regonerative, superheated steam turbine cycles [NASA-TP-1954] p0119 N82-1
                                                                                                                     encapsulated Czochralski Gals
                                                                      p0119 N82-16477
                                                                                                                                                                                   D0158 A82-17585
     Assessment of atem-injected gas turbine systems
                                                                                                                  Compensation mechanism in liquid encapsulated
Czochrulski Gals Importance of melt stoichiometry
        and their potential application
        [ NASA-TH- E2735]
                                                                                                                  p0086 A32-40403
Effect of melt stoichiometry on twin formation in
                                                                      DO119 N82-18694
    Parametric performance analysis of steam-injected gas turkine with a
                                                                                                                     LEC GaAs --- Liquid Encapsulated Czochralski
        thermionic-energy-converter-lined combustor
                                                                                                                     technique
        [ NASA-TH-82736]
                                                                      p0121 #82-23678
                                                                                                                                                                                   PO 160 A82-45517
STEELS
                                                                                                            STORY BETRORITES
                                                                                                              NT CARBONACEOUS CHONDRITES
  NT STAINLESS STEELS
    Pailure Analysis of a tool steel torque shaft
[NASA-TH-82758] 00058 NB
                                                                                                             STORABLE PROPELLANTS
                                                                      p0058 N82-11184
                                                                                                               NT AIRCRAFT FUELS
STEEP GRADIENT AIRCRAFT
                                                                                                               NT RP-1 BOCKET PROPELLANTS
U STOL AIRCRAFT
STEILAR ATHOSPHERES
                                                                                                                  Propulsion system options for low-acceleration
                                                                                                                     orbit transfer [AIAA PAPER 82-1196]
 NT CHECMOSPHERE
                                                                                                                                                                                   D0047 A82-35056
STELLAR PLARES
                                                                                                            STORAGE BATTERIES
  NT SOLAE PLAKES
                                                                                                              MT LEAD ACID BATTERIES
STRLLAR MAGNETIC FIELDS
                                                                                                               NT NICKEL CADMIUM BATTERIES
 NT SOLAF MAGNETIC FIELD
                                                                                                              NT NICKEL HYDROGEN BATTERIES
STRILLE MASS EJECTION
                                                                                                              NT NICKEL ZINC BATTERIES
     Ultraviolet observations of the 1980 eclipse of
                                                                                                               NT SILVER ZINC BATTERIES
        the symbiotic star CI Cygni
                                                                                                                  WASA preprototype redox storage system for a
                                                                                 182=27331
                                                                                                                     photovoltaic stand-alone application
STELLAR SPECTRA
                                                                                                                                                                                  PO 127 A82-11774
     Ultraviolet observations of the 1980 eclipse of
                                                                                                                  Moderate temperature Na cells. IV - VS2 and
        the symbiotic star CI Cyqni
                                                                                                                      NbS2C12 as rechargeable cathodes in molten NaAlC14
                                                                                                                                                                                   P0055 182-15743
                                                                                 A82-27331
STELLAR STRUCTURE
                                                                                                                  Inexpensive cross-linked polymeric separators made
                                                                                                                     from water-soluble polymers --- for secondary alkaline nickel-zinc and silver-zinc cells
     Time variability and structure of quiet sun
        sources at 6 cm wavelength
                                                                                                                                                                                  p0048 A82-23778
                                                                      p0167 A82- 6003
                                                                                                                  Chopper-controlled discharge life cycling studies
STERILIZATION EFFECTS
 NT THERMAL DEGRADATION
                                                                                                                     on lead-acid batteries
STIFFEESS
                                                                                                                     [ NASA-CR- 1656 16 ]
                                                                                                                                                                                  p0134 N82-20661
     Modified face seal for positive file stiffness [NASA-CASE-LEW-12989-1] p0099 N82
                                                                                                                  Requirements for optimization of electrodes and
                                                                                                            electrolyte for the iron/chromium Redox flow cell [NASA-CR-165218] p0136 N82-2564 STORAGE STABILITY
                                                                      p0099 N82~12442
STINULATED BHISSION DEVICES
ANT CARBON DIOXIDE LASERS
                                                                                                                                                                                   p0136 N82-25640
 NT DF LASERS
                                                                                                                  Deposit formation in liquid fuels. II - The effect of selected compounds on the storage stability
 INT FREE ELECTRON LASERS
  HT MASERS
                                                                                                                     of Jet A turbine fuel
  NT FULSED LASERS
                                                                                                                  p0074 A82-22240 Deposit formation in liquid fuels. I - Effect of
STIRLING CYCLE
     Characteristic dynamic énergy equations for
                                                                                                                      coal-derived Levis bases on storage stability of
        Stirling cycle analysis
                                                                                                                      Jet A turbine fuel
     p0138 A32-11816
Hoasurgment of oil film thickness for application
                                                                                                                                                                                   D0074 A82-22241
                                                                                                             STORES
     to elastoweric Stirling engine rod seals
[ASME FAPER 81-LUR-9] p0107 A82-184;
Evaluation of the potential of the Stirling engine
                                                                                                               NT MAGNETIC STORMS
                                                                      p0 107 A82-18426
                                                                                                               NT RAINSTORMS
                                                                                                               NT THUNDERSTORMS
        for heavy duty application [NASA-CP-165473]
                                                                                                             STORMS (METEOROLOGY)
NT RAINSTORMS
                                                                      pn 128 NH2-10505
     recliminary study of temperature measurement techniques for Stirling engine reciprocating seals [NASA-CR-165479] p0104 N82-11466
                                                                                                               NT THUNDERSTORMS
                                                                                                             STRAIN AGING
U ECIPITATION HARDENING
     Jet impingement heat transfer enhancement for the
                                                                                                             STRAIN DISTRIBUTION
        GFU-3 Stirling engine
                                                                                                               U RESS CONCENTRATION
        [ NASA-TM-82727]
                                                                                                             STRAIN BEERGY METHODS
                                                                      p0163 N82-11993
     Test results and facility description for a 40-kilovatt stirling engine [NASA-TM-82620] p0163 t
                                                                                                                  Moving singularity creep crack growth analysis with the /Delta T/c and C/asterisk/ integrals --- path-independent vector and energy rate line
                                                                      P0163 W82-13013
     | IMASA-IT-02020|
| Experimental study of an integral catalytic
| C(Whitstor: Heat exchanger for Stirling engines
| FNASA-IM-82783] | p0119 M82-48691
                                                                                                                     integrals
                                                                                                                                                                                   p0116 A82-40066
                                                                                                             STRAIR FATIGUE
     Computer model or cataly, and include the state of the st
     Computer model of catalytic combustion/Stirling
                                                                                                               U TIGUE (MATERIALS)
                                                                                                             STRAIN GAGES
                                                                                                                  Miniature drag-force anemometer
                                                                                                                                                                                   p0097 A82-40132
                                                                                                             STRAID RATE
                                                                                                                  On finite deformation elasto-plasticity
     Automotive Stirling engine development frogram
[NASA-CR-167907] p0164 N82-29235
Evaluation of candidate stirling engine beater
                                                                                                                                                                                   p0116 A82-45869
                                                                                                                  Indentation law for composite laminates
                                                                                                                     [NASA-CR-165460]
                                                                                                                                                                                   p0052 #82-15123
```

p0061 N82-30372

STRAIR SOPTERING

U ASTIC DEFORMATION

tube alloys at 820 deg and 860 deg C

TWASA-TH-82037]

```
STRATA
                                                                                  STRESS CONCENTRATION
 NT SUBSTRATES
                                                                                     Elevated temperature fatigue testing of metals p0058 #82-13281
STRATIFICATION
                                                                                     A preliminary study of crack initiation and growth
NT INTERCALATION
STRATOSPERE
                                                                                        at stress concentration sites [NASA-CR-169358]
    Stratospheric-mesospheric midwinter disturbances -
                                                                                                                                      p0 115 #82-33738
      A summary of observed characteristics
                                                                                  STRESS CORROSION
                                                                                   NT STRESS CORROSION CRACKING
STREAM FUNCTIONS (FLUXDS)
Computational methods for internal flows with
                                                                                  STRESS CORROSION CRACKING
                                                                                     Patique tests with a corrosive environment
      emphasis on turbomachinery [NASA-TM-82764]
                                                                                                                                              #82-13282
                                                    p0003 W82-13113
                                                                                  STRESS CYCLES
STREAMLINE PLOW
                                                                                     Stress evaluations under rolling/sliding contacts
[MASA-CR-165561] p0113 N82-17521
                                                                                        [ HASA-CR-165561]
 U MINAR PLOW
STREAMLINED BODIES
                                                                                  STRESS DESTRIBUTION
 NT FAIRINGS
                                                                                  U RESS CONCENTRATION
STREAMS
                                                                                  STRESS INTRESITY FACTORS
NT GAS STREAMS
STREEGTH OF NATERIALS
U CHARICAL PROPERTIES
                                                                                     Extended range stress intensity factor expressions
                                                                                        for chevron-notched short bar and short rod
                                                                                        fracture toughness specimens
STRESS ABALTSIS
                                                                                                                                      p0 112 A82-40357
    Turbine blade nonlinear structural and life analysis
                                                                                     Interface cracks in adhesively bounded lap-shear
      [ ALAA FAPER 82-1056]
                                                    P0021 A82-34981
                                                                                        doints
      simplified design procedure for life prediction of tocket thrust chambers
                                                                                                                                      p0 116 A82-46109
                                                                                  STRESS MEASUREMENT
   [AIAA PAPER A2-1251] p0043 A82-35
Effects of oxidation and oxidation under load on strength distributions of Si3N4
[ACS PAPER 69-8-80] p0071 A82-35
Experimental boundary integral equation
                                                     p0043 182-35087
                                                                                     Digital imaging techniques in experimental stress
                                                                                        analysis
                                                                                                                                      p0097 A82-34231
                                                     P0071 A82-35871
                                                                                     On finite deformation elasto-plasticity
                                                                                                                                      PO 116 A82-45869
       applications in speckle interfarametry
                                                                                  STRESS HUPTURE STREEGTH
                                                     p0097 A82-36987
                                                                                   U EEP RUPTURE STRENGTH
    On the solution of creep induced buckling in
                                                                                  STRESS-STRAIN DIAGRAMS
                                                                                     Impact resistance of fiber composites
      general structure
                                                    P0115 A82-39514
                                                                                                                                      p0112 A82-39852
    Forced torsional properties of FMR composites with varying madic ester concentrations and
                                                                                  STRESS-STRAIN DISTRIBUTION
                                                                                   U RESS CONCENTRATION
       processing histories
                                                                                  STRESS-STRAIR PRIATIONSHIPS
                                                                                     Elastic-plastic finite-element analyses of
thermally cycled single-edge wedge specimens
[NASA-TP-1982] p0111 N82-
                                                     P0051 A82-45630
    Boundary-layer effects in composite laminates. I .
      Pree-edge stress singularities. II - Free-edge
                                                                                                                                      p0111 N82-20565
      stress solutions and basic characteristics
                                                                                      Blastic-plastic finite-element analyses of
   thermally cycled double-edge wedge specimens [NASA-TP-1973] p0111 N82-2 Wonlinear constitutive theory for turbine engine
                                                                                                                                      p0111 N82-20566
                                                                                        structural analysis
    Elastic-plastic finite-element analyses of
                                                                                                                                      p0112 N82-33744
      thermaily cycled double-edge wedge specimens [NASA-TP-1973] p0111 N82
                                                                                  STRESSES
                                                    P0111 N82-20566
                                                                                   NT AXIAL STRESS
    Levelopment of a simplified procedure for thrust chamber life prediction [NASA-CR-165525] p0044 N82-2 Tooth profile analysis of circular-cut,
                                                                                   NT RESIDUAL STRESS
                                                                                   NT SHEAR STRESS
                                                     D0084 N82-21253
                                                                                   NT TENSILE STRESS
NT THERMAL STRESSES
      spiral-bevel gears
[NASA-TH-02840]
                                                                                   NT TORSIONAL STRESS
                                                    P0101 N82-26681
                                                                                  STRIP MINING
    Boundary layer thermal strosses in angle-ply
                                                                                     LANDSAT Remote Sensing: Observations of an
      composite laminates, part ! --- graphite-epoxy
                                                                                        Appalachian mountaintop surface coal mining and
       composites
                                                                                        reclamation operation --- kentucky
    [ NASA-CF- 165412] p0113 N82-26
Analysis of cracks emanating from a circular hole
in unidirectional fiber reinforced composites,
                                                                                 [BE2-10257]
STRUCTURAL AMALYSIS
NT DYNAMIC STRUCTURAL ANALYSIS
NT FLUTTER ANALYSIS
                                                                                                                                      p0117 N82-24525
                                                     P0113 N82-26713
       part 2
       F NASA-CR- 1654337
                                                                                   NT STRAIN ENERGY METHODS
                                                     p0114 NB2-26714
    Interlaginar crack growth in fiber reinforced compositos during fatigue, part 3
                                                                                     On the solution of creep induced buckling in
                                                                                        general structure
    [NASA-CF-165438] polity NB2-26

Randysis of interface cracks in adhesively bonded
Lap shear joints, part 4
[NASA-CF-165438] polity NB2-26
                                                     p0114 NB2-26715
                                                                                                                                      p0115 A82-39514
                                                                                     On the automatic generation of FEN models for
                                                                                        complex gears - A work-in-progress report
                                                     p0114 N82-26716
                                                                                                                                      p0109 A82-48243
    Edge delamination in angle-ply composite laminates, part 5
[NASA-CR-165439] p01
                                                                                     Integrated analysis of engine structures [NASA-TM-82713] p01
                                                                                                                                      p0111 N82-11491
                                                                                     Research and development program for non-linear structural modeling with advanced
                                                     p0114 N82-26717
    Boundary-layer effects in composite laminates:
      Free-edge stress singularities, part 6 [NASA-CF-165440] pol
                                                                                        time-temperature dependent constitutive
                                                    p0114 N82-26718
                                                                                        relationships
    The optimal design of involute quar teeth with
                                                                                        [ NASA-CR- 165533 ]
                                                                                                                                      p0024 N82-16080
      unequal addenda
[NASA-TM-82866]
finite element stress analysis of spur gears
including fillet radii and rim thickness effects
[NASA-TM-82965]
[NASA-TM-82965]
[NASA-TM-82965]
[NASA-TM-82965]
[NASA-TM-82965]
[NASA-TM-82965]
                                                                                     Development of a simplified procedure for thrust chamber life prediction
[NASA-CR-16F585] p0044 N82-2
                                                     p0101 N82-28645
                                                                                                                                      p0044 N82-21253
                                                                                      Evaluation of inelastic constitutive models for
                                                     p0 10 1 N82-28646
                                                                                        nonlinear structural analysis --- for aircraft
   On finite element stress analysis of spur gears
[NASA-CF-167938] p0107 N82-29607
Environmental and High-Strain Rate effects on
                                                                                        turbine engines
                                                                                                                                      p0112 N82-24502
                                                                                        [NASA-TH-82845]
                                                                                      Bird impact analysis package for turbine engine
      composites for engine applications
[NASA-TH-82082]
                                                                                        fan blades
                                                     p0051 N82-31449
                                                                                        [ NASA-TH-8283 1 ]
                                                                                                                                      p0112 N82-26701
STRESS CALCULATIONS
                                                                                     Cooled variable nozzle radial turbine for rotor
 U RESS ANALYSIS
                                                                                        craft applications
                                                                                        [NASA-CR-165397]
                                                                                                                                      p0028 N82-29323
```

```
MC carbide structures in M(lc2)ar-M247
[NASA-CR-167892] p0064 NB2-30374
Environmental and High-Strain Bate effects on
      composites for engine applications
      [ NASA-TM-82882]
                                                     p0051 N82-31449
    Monlinear constitutive theory for turbine engine
      structural analysis
                                                     p0112 N82-33744
STRUCTURAL BEARS
U ARS (SUPPORTS)
STRUCTURAL DESIGN
Optimal tooth numbers for compact standard spur
      gear sets
      [ ASME PAPER 81-DET-115]
                                                     p0 103 A82-19335
    Winding for the win1
                                                     p0138 A82-37078
    The application of probabilistic design theory to
      high temperature low cycle fatigue [NASA-CR-165488]
                                                     DO112 N82-14531
STRUCTURAL DESIGN CRITERIA
    Sensitivity analysis results of the effects of
      various parameters on composite design
                                                     P0051 A82-37101
    Magnetohydrodynamics MHD Engineering Test Facility
      ETF 200 NWe power plant, Conceptual Design
Engineering Report CDER, Volume 3: Costs and
      schedules
      [ NASA-CR- 165452-VOL-3 ]
                                                     p0128 N82-10495
    Magnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 MWe power plant. Design
      Requirements Document (DRD)
      [ NASA-TM-82705]
   Hagnetohydrodynamics (MHD) Engineering Test
Pacility (ETF) 200 MWe power plant. Conceptual
Design Engineering Report (CDER). Volume 2:
Engineering. Volume 3: Costs and schedules
[ NASA-CR-165452-VOL-2 ] p0 136 N82-27
                                                     p0 136 N82-27837
STRUCTURAL DYNAMICS
 U NAMIC STRUCTURAL ANALYSIS
STRUCTURAL FAILURE
Turbine blade nonlinear structural and life analysis
[AIAA FAPER 82-1056] p0021 A82-34981
STRUCTURAL FAILURE
U TIQUE (MATEBIALS)
STRUCTURAL POUNDATIONS
 U UNDATIONS
STRUCTURAL MEMBERS
 NT BEAMS (SUPPORTS)
NT CANTILEVER BEAMS
NT FLASTIC PLATES
 NT END PLATES
 NT FLAT PLATES
 NT ORTHOTROPIC PLATES
 NT PLATES (STRUCTURAL MEMBERS)
NT BECTANGULAR BEAMS
 NT STRUTS
NT TRUSSES
STRUCTURAL VIBRATION
 NT BENDING VIBRATION
 NT FLOTTER
 NT TRANSONIC FLUTTER
    Vibrations of cantilevered shallow cylindrical
      shells of rectangular planform
                                                     p0 115 A82-11298
STRUCTURAL WEIGHT
    Performance deterioration due to acceptance
      testing and flight loads; JT90 jet engine
      diagnostic program
      r NASA-CR- 165572]
                                                     p0027 N82-27309
STRUTS
    Energy efficient engine: Turhine transition duct
model technology report
[NASA-CR-167996] p0029 N82-33
                                                     n0029 N82-33394
STS
 U ACE TRANSPORTATION SYSTEM
STUDIES
 U VESTIGATION
SUBCIRCUITS
 U RCUITS
SUBLAYERS
 U BSTRATES
SUBBEFLECTORS
    Focal suffaces of offset dual-reflector antennas
                                                     p0080 A82-36265
    Sound generated in a cascade by three-dimensional
      disturbances convected in a subsonic flow
                                                     p0153 A82-10460
      [ ATAA PAPER 81-2046]
```

```
Aeroelastic characteristics of a cascade of
   mistured blades in subsonic and supersonic flows
[ASME PAPER 81-DET-122] p002! A82-19337
Solutions of the compressible Navier-Stokes
equations using the integral method
[AIAA PAPER 81-0046] p0093 A82-23832
Three dimensional flow field inside the passage of
a low speed axial flow compressor rotor
[AIAA PAPER 82-1006] p0091 A82-31964
      [AIAA PAPER 82-1006]
                                                     p0011 A82-31964
    Solution of the unsteady subsonic thin airfoil
      problem
                                                     p0012 A82-41267
    Some aspects of calculating flows about
      three-dimensional subsonic inlets
      [ NASA-TM-82789]
                                                     p0004 M82-25213
SUBSONIC SPEED
    Thrust modulation methods for a subsonic V/STOL
      aircraft
      [ NASA-TH-82747]
                                                     p0003 N82-13112
SUBSTRATES
   Transient catalytic combustor model [NASA-CR-165324]
                                                     p0 129 N82-13507
    Refractory coatings
[NASA-CASE-LEW-13169-2]
                                                     p0061 #82-30371
    Ion beam microtexturing and enhanced surface
      diffusion
      [NASA-CR-167948]
                                                     p0065 N82-31509
SULPATES
   Aircraft sampling of the sulfate layer near the tropopause following the eruption of Kount St.
                                                     p0 140 A82-37450
SULFATION
   Thermodynamics and kinetics of the sulfation of
      porous calcium silicate
      [HASA-TH-82769]
                                                     p0048 M82-15119
SULFIDES
 NT INORGANIC SULFIDES
 NT HOLYBDENUM SULFIDES
SULFUR COMPOUNDS
 NT INORGANIC SULFIDES
 NT HOLYBDENUM SULFIDES
 NT ORGANIC SULPUR COMPOUNDS
 NT SULPATES
SUBLIGHT
   Determination of optimum sunlight concentration
      level in space for 3-4 cascade solar cells
      [NASA-TM-82899]
                                                    p0126 N82-32853
SUPERALLOYS
 U AT RESISTANT ALLOYS
SUPERCHARGERS
   Preliminary results on performance testing of a
      turbocharged rotary combustion engine
      [ NASA-TH-82772]
                                                    p0017 N82-21194
    Advanced stratified charge rotary aircraft engine
      design study
      [ HASA-CR-165398]
                                                     p0107 NB2-27743
SUPERCHARGING
 U PERCHARGERS
SUPERCONDUCTING MAGNETS
   Conceptual design of superconducting magnet system
      for Magnetohydrodynamic (MHD) Engineering Test
      Pacility (ETF) 200 MWe power plant [NASA-CR-165053]
                                                     p0 105 #82-14520
SUPERCONDUCTORS
   Impedance conversion using quantum limit
      nonreciprocity for superconductor mixer
      compensation
                                                     p0 159 A82-31276
SUPERCRITICAL PLOY
   Design of supercritical cascades with high solidity [NASA-CR-165600] p0007 NB2-22210
SUPERHEATING
   Investigation of spray characteristics for
flashing injection of fuels containing dissolved
air and superheated fuels
      [ NASA-CR-3563 ]
                                                    p0027 N82-26295
SUPERHYBRID MATERIALS
HT GRAPHITE-EPOXY COMPOSITES SUFFESORIC AIRCRAFT
   V/STOL propulsion control technology
[AIAA PAPER 81-2634]

CORPARISON Of two parallel/series flow turbofan
propulsion concepts for supersonic V/STOL
[AIAA PAPER 81-2637]

p0020 A82-
                                                    p0029 A82-16909
                                                    p0020 A82-19214
    WASA research in supersonic propulsion: A decade
      of progress
      [NASA-TM-82862]
                                                     P0019 N82-26300
```

SUPERSORIC CONBUSTION	NT SURFACE DEPECTS
Effect of vacuum exhaust pressure on the	MT SUBFACE ENERGY
performance of MHD ducts at high D-field	NT SURPACE ROUGHNESS
[NA SA - TH- 82750] PO 157 N82- 13908	NT SURFACE TEMPERATURE NT WALL TEMPERATURE
SUPERSONIC CRUISE AIRCRAFT RESEARCE Advanced technology for controlling pollutant	Potentials of surfaces in space
emissions from supersonic cruise aircraft	p0 165 A82-23750
p0001 N81-18004	Quasi-liquid states observed on ion beam
SUPERSONIC FLOW	microtextured surfaces
Aeroclastic characteristics of a cascade of mistured blades in subsonic and supersonic flows	Differential charging of high-voltage spacecraft -
[ASME PAPER 81-DET-122] p0021 182-19337	The equilibrium potential of insulated surfaces
A shock wave approach to the noise of supersonic	p0041 A82-35547
propellers	Simulation of charging response of SCATHA (P78-2)
[NASA-TH-82752] p0151 NO2-16809	satellite p0039 N82-14250
A FCRIRAN program for calculating three	Surface chemistry and wear behavior of
dimensional, inviscid and rotational flows with shock waves in axial compressor blade rows:	single-crystal silicon carbide sliding against
User's manual	iron at temperatures to 1500 C in vacuum
[NASA-CR-3560] p0008 N82-26230	[NASA-TP-1947] p0067 N82-19374
Calculation of the flow field including boundary	Boundary lubrication: Revisited p0069 N82-29458
layer effects for supersonic mixed compression	[NASA-TH-82858] p0069 882-29458 Influence of corrosive solutions on microhardness
inlets at angles of attack [NASA-CR-167941] p0009 N82-29269	and chemistry of magnesium oxide /001/ surfaces
SUPERSONIC FLOW INLETS	[NASA-TP-2040] p0102 882-31691
U PERSONIC INLETS	SURFACE REACTIONS
SUPERSONIC INLETS	Universal binding energy relations in metallic
Three-dimensional flow calculations including	adhesion [WASA-TM-82706] p0058 N82-11183
houndary layer effects for supersonic inlets at angle of attack	Influence of mineral oil and additives on
[AIAA PAPER 82-0061] p0005 A82-19778	microhardness and surface chemistry of magnesium
Calculation of the flow field including boundary	oxide (001) surface
layer effects for supersonic wired compression	[NASA-TP-1986] p0067 N82-20316
inlets at angles of attack	Tribological properties of sintered
[NASA-CP-167941] p0009 N82-29269 SUPERSONIC JET PLOW	polycrystalline and single crystal silicon carbide [NASA-TH-82829] p0068 N82-24343
Forms of three-dimensional supersonic free jets in	SCRPACE ROUGHESS
linear approximation	Effect of tangential traction and roughness on
A82-19196	crack initiation/propagation during rolling
SUPERSONIC MOZZLES	contact p0 103 A82-30022
The effect of inflow velocity profiles on the performance of supersonic ejector nozzles	The effect of rotor blade thickness and surface
[ATAA PAPER 81-02731 p0002 A81-32548	finish on the performance of a small axial flow
SUPERSCUIC SPEEDS	turbine
Noise of the SR-3 propeller model at 2 deg and 4	[ASME PAPER 82-GT-222] p0022 A82-35409
deg angle of attack	The effect of rotor blade thickness and surface
[NASA-TM-82738] p0151 N82-16808	finish on the performance of a small axial flow turbine
SUPERSONIC WIND TUNNELS Flow visualization of shock-boundary layer	[NASA-TH-82726] p0003 N82-13114
interaction	Evaluation of left ventricular assist device pump
p0096 N82-32675	bladders cast from ion-sputtered
LV measurements with an advanced turboprop	polytetrafluorethylene mandrels
pCO97 N82-32690	[NASA-CR-167904] p0142 N82-23976 Prictional heating due to asperity interaction of
Acoustic microscopy of silicon carbide materials	elastohydrodynamic line-contact surfaces
p0075 A82-33031	[NASA-TP-1882] p0100 N82-25514
Effects of artificially produced defects on film	Ion beam textured graphite electrode plates
thickness distribution in sliding EHD point	high efficiency electron tube devices [NASA-CASE-LEW-12919-2] p0050 N82-26386
contacts p0099 N82-16412	[NASA-CASE-LEW-12919-2] p0050 N82-26386 Texturing polymer surfaces by transfer casting
Eoundary lubrication: Fevisited	cardiovascular prosthesis
[NASA-TH-82858] p0069 N82-29458	[NASA-CASE-LEW-13120-1] [2068 N82-28440
SURFACE DIFFUSION	The influence of surface dents and grooves on
Surface diffusion, activation energy determination	traction in sliding EHD point contacts [NASA-TM-82943] p0 10 2 N82-32734
using ion beam microtexturing p0 159 A82-21965	[NASA-TH-82943] p0 10 2 N82-32734 SORPACE TEMPERATURE
Ion-beam-induced topography and surface diffusion	NT WALL TEMPERATURE
p0160 A82-46426	Single pass rub phenomena - Analysis and experiment
SURFACE EMERGY	[ASHE PAPER 81-LUB-55] p0107 A82-18449
Universal hinding energy relations in metallic	Preliminary study of temperature measurement techniques for Stirling engine reciprocating seals
adhesion [NASA-TM-82706] p0058 N82-11183	[NASA-CR-165479] po 104 M82-11466
SURFACE FINISHING	SUMPACE TENSION
Small axial turbine stator technology program	U TERFACIAL TENSION
[NASA-CR-165602] p0028 N82-32367	SURFACE TREATMENT
Surface texturing of fluoropolymers [NASA-CASE-LEW-13028-1] p0070 N82-33521	U RFACE PINISHING SURPACE VEHICLES
[NASA-CASE-LEW-13028-1] p0070 N82-33521 SUBFACE GEOMETRY	NT AUTONOBILES
Surface geometry of circular cut spiral bevel gears	NT ELECTRIC AUTOMOBILES
[ASME PAPER 8 1-DET-114] p0 108 A82-19334	NT ELECTRIC HYBRID VEHICLES
Geometrical aspects of the tribological properties	NT ELECTRIC HOTOR VEHICLES
of graphite fiber reinforced polymide composites	SUPPLE WAYES
[NASA-TH-82757] p0066 N82-15198	Standing waves along a microwave generated surface wave plasma
SURFACE INTERACTIONS U BFACE REACTIONS	p0 158 182-26952
SURPACE PROPERTIES	SURVEYING
NT ADHESICN	U RVEYS
NT COPFFICIENT OF FRICTION	SURVEYS
NT INTERPACIAL TENSION	Fuel quality/processing study. Volume 2:

```
Task ! literature survey p0135 N82-24650
     Appendix. Task | liter | NASA-CR-165327-VOL-21
SWEAT COOLING
   Heat transfer in cooled porcus region with curved
     boundary
                                              p0089 A82-14848
SWELLING.
   Prediction of composite hydral behavior made simple [NASA-TM-82780] p0049 N82-16181
SWIBLING
   Mean flowfields in axisymmetric combustor
     geometries with swirl
     CAIAA PAPER 82-01771
                                              p0092 A82-17824
   Modeling parameter influences on MHD swirl combustion nozzle design
[AIAA FAPER 82-0984]
SWIBLING WAKES
                                              p0011 A82-31947
U REVIENT WAKES
SWITCHES
 NT SWITCHING CIRCUITS
SWITCHING
 NT MICROWAVE SWITCHING
 NT FACKET SWITCHING
Input filter compensation for switching regulators
[NASA-CR-169005] p0085 N82-254
                                              p0085 N82-25442
SWITCHING CIRCUITS
   Righ power solar array switching regulation
                                              p0043 A82-11736
   A new approach to the minimum weight/loss design
     of switching power converters
                                              p0082 A82-16831
   Dynamic switch matrix for the TDMA satellite
   switching system
[AIAA 82-0458] p008
A 10-kW series resonant converter design,
                                               p0085 A82-23494
     transistor characterization, and base-drive
     optimization
                                               p0086 A82-36927
   Wideband, high speed switch matrix development for SS-IDMA applications
                                               p0086 A82-43784
   Modeling the full-bridge series-resonant power
     converter
                                               p0086 A82-46385
   Analysis and design of a standardized control
     module for switching regulators
                                               p0083 #82-46388
   A loky series resonant converter design.
     transistor characterization, and base-drive
     optimization
     [ NASA -CP- 165546 ]
                                              p0084 N82-17%39
   Analysis of transistor and snubber turn-off
     dynamics in high-frequency high-voltage
     high-power converters
[NASA-CR-168760]
                                              p0084 NB2-22438
SWITCHING ELEMENTS
 U ITCHING CIRCUITS
SYMBETBICAL BODIES
 NT AXISYMMETRIC BODIES
 NT CYLINDRICAL BODIES
 NT FAIRINGS
 NT FOTATING CYLINDERS
 NT SPERRES
SYNCBRCHISM
 NT BIT SYNCHRONIZATION
SYNCHRONOUS HOTORS
   Mass Driver Two - A status report
                                               p0046 A82-18191
SYNCHRONOUS SATELLITES
   Voltage gradients in solar array cavities as
     possible breakdown sites in
      spacecraft-charging-induced discharges
                                               p0038 A82-18317
   Planning satellite communication services and
     spectrum-orbit utilization
   [AIAA 82-0526]
Analytical modeling of satellites in geosynchronous environment
                                               p0080 A82-23538
                                              p0037 NB2-14258
   Use of charging control guidelines for
      geosynchronous satellite design studies
                                              p0037 N82-14263
   Communications satellite systems capacity analysis [NASA-CR-167911] p0034 N82-27331
SYNTHETIC FIBERS
NT GLASS FIBERS
SYNTHETIC PUELS
 NO LIQUID FURLS
```

```
Low NO sub x heavy fuel combustor concept program
                                                        p0129 N82-12572
      [ NASA-CR- 1655 12 ]
    Barriers to the utilization of synthetic fuels for
       transportation
                                                        p0073 N82-13243
      [NASA-CR-165517]
   Puel quality processing study, volume 1
[NASA-CR-165327-VOL-1] p013
Fuel quality/processing study. Volume 2:
Appendix. Task 1 literature survey
[NASA-CR-165327-VOL-2] p013
                                                        p0135 N82-24649
                                                        p0135 N82-24650
    Low NOx heavy fuel combustor concept program
[NASA-CR-165367] p0 136 N
                                                        p0 136 N82-25635
    Techniques for enhancing durability and
      equivalence ratio control in a rich-lean,
three-stage ground power gas turbine combustor
[NASA-TM-82922] p0124 N82-2
                                                        p0124 #82-29717
SYNTHETIC RESINS
NT EPOXY RESINS
NT KEVLAR (TRADEHARK)
 NT THERMOPLASTIC PILMS
 NT THERMOPLASTIC RESINS
 NT THERMOSETTING RESINS
SYSTRETIC RUBBERS
NT ELASTONERS
SYSTEM PAILURES
    Model degradation effects on sensor failure
                                                        p0148 A82-13143
    Sensor failure detection system --- for the P100
      turbofan engine
[NASA-CR-165515]
                                                        p0023 N82-13145
SYSTEMS DESIGN
 U STEMS ENGINEERING
SYSTEMS ENGINEERING
    Magnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 MWe power plant. Design
      Reguirements Document (DRD)
[NASA-TK-82705]
                                                        p0099 N82-12446
    Nagnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 MWe power plant. Conceptual
Design Engineering Report (CDFR). Volume 4:
Supplementary engineering data
[NASA-CR-165452-VOL-4] p0 133 N82-186
                                                         p0133 N82-18688
SYSTEMS INTEGRATION
    Systems integration
                                                         D0042 N82-27371
SYSTEMS STRULATION
    Design and verification of a nultiple fault
       tolerant control system for STS applications
       using computer simulation
       [AIAA B1-2173]
                                                         p0035 A82-10124
    A tensor approach to modeling of nonhomogeneous
      nonlinear systems
                                                        p0 148 A82-19064
    Modeling the full-bridge series-resonant power
       converter
                                                         p0086 A82-46385
```

```
Т
TAILORING
TANGENTS
   Experimental and analytical results of tangential
      blowing applied to a subsonic V/STOL inlet
[AIAA PAPER 82-1084] p0005 A
                                                    p0005 A82-35195
   Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet [NASA-TM-82847] p0004 M82-24
                                                     p0004 M82-24165
TANKS (CONTAINERS)
NT FUEL TANKS
 NT PROPELLANT TANKS
 NT WING TANKS
TANTALUM
   A status review of NASA's COSAM (Conservation Of
      Strategic Aerospace Materials) program
[NASA-TM-82852] p000
                                                     p0060 N82-24326
TDHA
 U ME DIVISION MULTIPLE ACCESS
TECHNOLOGICAL FORECASTING
    Propulsion study for Small Transport Aircraft
    Technology (STAT)
[NASA-CR-165499]
Overview study of Space Power Technologies for the
                                                     p0022 N82-10037
      advanced energetics program --- spacecraft [NASA-CR-165269] po 132 No
                                                     p0 132 N82-17606
TECHNOLOGIES
 NT BIOTECHNOLOGY
```

NT ENERGY TECHNOLOGY

A heat exchanger computational procedure for

ORIGINAL PAGE IS OF POOR QUALITY

```
temperature-dependent fouling [ASME PAPER 81-HT-75]
TEMPERATURE DIFFERENCES
TECHNOLOGY ASSESSMENT
    The ASTID; technology - An automotive alternative p0107 A82-11783
                                                                                                                                       D0092 A82-10961
                                                                                   U MPERATURE GRADIENTS
    30-cm mercury ion thruster technology
   p0046 A82-15434
Comparative analysis of CCMHD power plants ---
                                                                                 TEMPERATURE DISTRIBUTION
                                                                                     Analysis of the decay of temperature fluctuations
      Closed Cycle MHD
                                                                                        in isotropic turbulence
                                                                                     p0089 A82-40781
Buoyancy effects on the temperature field in
downward spreading flames
                                                    p0158 A82-20747
    An assessment of alternative fuel cell designs for
      residential and commercial cogeneration
                                                    p0 138 A82- 24695
    Component technology for space power systems [IAF FAPER 82-408] p0043 A
                                                                                 TEMPERATURE REFECTS
                                                                                     Permanent magnet properties of Mn-Al-C between -50 C and +150 C
                                                    p0043 A82-44750
    Numerical techniques in linear duct acoustics,
      1980-81 update
[NASA-TM-82730]
                                                                                                                                       p0085 A82-20505
                                                    p0 151 N82-12890
                                                                                     On the solution of creep induced buckling in
    Study of multi-megawatt technology needs for photovoltaic space power systems. Volume
                                                                                        general structure
                                                    Volume !:
                                                                                                                                       p0115 A82-39514
                                                                                     Creep and rupture of an ODS alloy with high stress rupture ductility --- Oxide Dispersion
      Frecutive summary
      [ NASA-CR- 165323-VOL-1 ]
                                                     p0 130 N32-14636
    Study of multi-megawatt technology needs for
                                                                                        Strengthened
    photovoltaic space power systems, volume 2
[NASA-CR-165323-VOL-2] p0130 N82-1463
Overview study of Space Power Technologies for the
                                                                                                                                       p0065 A82~40335
                                                                                     Effects of heating rate on density,
microstructure, and strength of Si3N4-6 wt. %
Y203 and a beta-prime sialon
[ACS PAPER 42-B-81] p0070 £82-42
Effects of fan inlet temperature disturbances on
                                                    p0130 N82-14637
      advanced energetics program --- spacecraft [NASA-CR-165269] p0 132 N
                                                    p0 132 N82-17606
                                                                                                                                       D0070 482-42366
    Cell module and fuel conditioner development
                                                                                        the stability of a turbofan engine [NASA-TM-82699]
      [ NASA-CR- 165620]
                                                    p0 134 N82-21713
                                                                                                                                       p0017 N82-18222
    PER polyimides-review and update
                                                                                      Environmental effects on defect growth in
      [ NASA-TM-82921]
                                                     p0068 N82-24342
    Cost/henefit studies of advanced materials
                                                                                        composite materials [NASA-CR-165213]
      technologies for future aircraft turbine engines: Materials for advanced turbine engines [NASA-CR-167849] p0026 N82-25
                                                                                                                                       p0052 N82-20248
                                                                                  TEMPERATURE PIELDS
                                                     p0026 NB2-25254
                                                                                   U MPERATURE DISTRIBUTION
TECHNOLOGY TRANSFER
                                                                                  TEMPERATURE CRADIENTS
                                                                                     Prictional heating due to asperity interaction of elastohydrodynamic line-gentact surfaces
    Local and national impact of aerospace research
      and technology
                                                                                                                                      PO 100 N82-25514
[NASA-IM-82775]
TECHNOLOGY UTILIZATION
                                                    p0162 N82-20006
                                                                                        [ NASA-TP-1882]
                                                                                     tise of fiber like materials to augment the cycle
life of thick thermoprotective seal coatings
    Market assessment of photovoltaic power systems
for agricultural applications in Mexico
                                                                                        [ NASA-TM-8290 1 7
                                                                                                                                       D0089 882-32633
      [ NASA-CR-165441]
                                                    p0 128 N82-10506
                                                                                  TEMPERATURE INVERSIONS
                                                                                 NT INTERFACIAL TENSION
TEMPERATURE MEASUREMENT
TEETERING
    Whirl flutter analysis of a horizontal-axis wind
                                                                                     Dilution jet behavior in the turn section of a
      turbine with a two-bladed teetering rotor
                                                                                     reverse flow combustor
[AIAA PAPER 82-0192] p0021 182-20291
Preliminary study of temperature measurement
techniques for Stirling engine reciprocating seals
                                                     DO 122 N82-23707
TEPLOW (TRADEMARK)
    Secondary electron emission yields
                                                     p0038 N82-14226
    Oblique-incidence secondary emission from charged
                                                                                        [ NASA-CR-165479]
                                                                                                                                       DO 104 N82-11466
                                                                                  TEMPERATURE SENSORS
                                                     p0039 N82-14227
                                                                                     Thin film temperature sensors, phase 3 --- for engine-test evaluation [NASA-CR-165476] p0097 M82
    Secondary electron emission from a charged
      dielectric in the presence of normal and oblique
                                                                                                                                       p0097 #82-22479
      electric fields
[NASA-CR-168558]
                                                                                  TENSILE PROPERTIES
    [NASA-CR-168558] p0084 N82-18507
First results of material charging in the space
                                                                                      On determination of fibre fraction in continuous
                                                                                        fibre composite materials
      environment
                                                                                      Tensile properties of SiC/aluminum filamentary
      [ NASA-TM-847437
                                                     P0081 N82-24431
                                                                                        composites - Thermal degradation effects
TELECHIRICS
                                                                                                                                      p0053 182-46220
 U MCTF HANDLING
                                                                                     The influence of cobalt on the tensile and
stress-rupture properties of the nickel-base
superalloy MAR-M247
TELECOMMUNICATION
 NT FEGUENCY DIVISION MULTIPLE ACCESS NT BULTICHANNEL COMMUNICATION
 NT FACIO COMMUNICATION
                                                                                                                                       p0063 A82-47399
 NT FACTO COGRAMMATION
NT SPACECRAPT ANTENNAS
NT SPACECRAPT COMMUNICATION
NT TIME DIVISION MULTIPLE ACCESS
NT WIDEBAND COMMUNICATION
                                                                                  TRESILE STRENGTH
                                                                                      Strength advantages of chemically polished boron
                                                                                        fibers before and after reaction with aluminum
                                                                                        [ NASA-TM-82806]
                                                                                                                                      p0049 N82-21258
    Worldwide satellite market demand forecast
                                                                                     Thermal degradation of the tensile properties of undirectionally reinforced FP-AI203/EZ 33 magnesium composites
      [ NASA-CR- 1679 181
                                                     p0079 N82-25423
TELLEGEN THEORY
 U TWORK ANALYSIS
                                                                                        [NASA-TM-82817]
                                                                                                                                       p0049 #82-21260
 U TWORK SYNTHESIS
                                                                                      Correlation of tensile and shear strengths of
TEMPERATURE
                                                                                         metals with their friction properties
 NT ATBOSPHERIC TEMPERATURE
                                                                                        [NASA-TM-82828]
                                                                                                                                       p0060 882-24375
 NT FLAME TEMPERATURE
                                                                                      Method and apparatus for strengthening bothy fibers
 NT HIGH TEMPERATURE
NT INLET TEMPERATURE
                                                                                        --- high temperature oxidation [NASA-CASE-LEW-13826-1]
                                                                                                                                       D0050 N82-26385
 NT LOW TEMPERATURE
                                                                                  TERSILE STRESS
 NT OPERATING TEMPERATURE
                                                                                      Ultrasonic scanning system for imaging flaw growth
 NT PLASMA TEMPERATURE
                                                                                        in composites
 NT SURFACE TEMPERATURE
                                                                                        [NASA-TM-82799]
 NT WALL TEMPPRATURE
                                                                                      Tensile buckling of advanced turboprops
TEMPERATURE CONTROL
                                                                                        [NASA-TM-82896]
                                                                                                                                       p0112 N82-31708
   Magnetic heat pumping [NASA-CASE-LEW-12508-3]
                                                                                  TRESILE TESTS
                                                     P0088 N82-24449
                                                                                     Impact resistance of fiber composites
TEMPERATURE DEPRNDESCE
                                                                                                                                       P0112 A82-39852
```

```
Application of a gripping system to test a uniaxial graphite fiber reinforced composite
       /FMR 15/Celion 6000/ in tension at 316 C
                                                      p0051 A82-40796
TRUSOR AWALYSIS
    A tensor approach to modeling of nonhomogeneous
      nculinear systems
                                                      p0 148 A82- 19064
    Alternatives for jet engine control [NASA-CR-168894]
                                                      p0026 N82-23247
TERRIRY ALLOYS
    Hard permanent magnet development trends and their
      application to A.C. machines
                                                      p0083 A82-20745
TERMARY SYSTEMS
    Micral ternary alloy having improved cyclic
       oxidation resistance
       [ NASA-CASE-LEW- 13339-1]
                                                      p0061 N82-31505
TERRARY SYSTEMS (DIGITAL)
U GITAL SYSTEMS
TERRESTRIAL MAGNETISM
 U CHAGNETISM
TEST BEDS
U ST EQUIPMENT
TEST CHAMBERS
 NT PRESSURE CHAMBERS
TEST EQUIPMENT
    Advanced turboprop testbed systems study. Volume

    Testbed program objectives and priorities,
drive system and mircraft design studies,

       evaluation and recommendations and wind tunnel
       test plans
                                                      D0028 N82-32370
       [ NASA-CR- 167928-VOL-1 ]
TEST PACILITIES
 NT CASCADE WIND TUNNELS
NT COMBUSTION WIND TUNNELS
  NT SHOCK TUNNELS
  NT SUPERSONIC WIND TUNNELS
  NT TRANSONIC WIND TUNNELS
    End region and current consolidation effects upon
       the performance of an MHD channel for the ETF conceptual design --- Engineering Test Pacility
    Conceptual design --- Engineering Test Facility
[AIAA PAPER 82-0325] p0157 A82-17889
Impact of uniform electrode current distribution
on ETF --- Engineerin; Test Facility MHD generator
[AIAA FAPER 82-0423] p0157 A82-17941
    Magnetohydrodynamics MMD Engineering Test Facility
       ETF 200 NWe power plant. Conceptual Design Engineering Report CDFR. Volume 3: Costs and
       schedules
       [ NASA-CR-165452-VOL-3 ]
                                                      p0 128 N82-10495
    Levis Research Center's coal-fired, pressurized, fluidized-bed reactor test facility
                                                      p0087 N82-11397
       [ NASA-TM-81616]
    Magnetohydrodynamics (MHD) Engineering Test
Pacility (ETF) 200 MWe power plant. Design
       Requirements Document (DRD)
[NASA-TM-82705]
                                                      p0099 N82-12446
     Magnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 MWe power plant Conceptual
       Design Engineering Report (CDER)
       [ NASA-CR- 165452-VOL-5]
                                                      p0 132 N82- 17603
    Magnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 MWe power plant. Conce
                                                        Conceptual
       Design Engineering Report (CDER). Volume 4:
       Supplementary engineering data [NASA-CR-165452-VOL-4]
                                                      p0 133 N82- 18688
     The aerospace technology laboratory (a
       perspective, then and now)
       [ NASA-TM-82754]
                                                      p0631 N82-19229
     Magnetohydrodynamics (MHD) Engineering Test
       Facility (ETF) 200 MWe power plant. Concept Design Engineering Report (CDER). Volume 2:
                                                        Conceptual
                         Volume 3: Costs and schedules
       Engineering. Volume 3: [NASA-CR-165452-VOL-2]
                                                      p0 136 N82-27857
 TESTERS
  O ST EQUIPMENT
 TESTING MACHINES
  U ST ROULPMENT
 PETRAGONS
  NI RECLANGLES
 TEXTORES
    Crystallographic texture in
       oxide-dispersion-strengthened alloys
                                                       p0062 A82-40041
     Texturing polymer surfaces by transfer casting ---
       cardiovascular prosthesis
[NASA-CASE-LEW-13120-1]
                                                       p0068 N82-28440
```

```
Ion beam microtexturing and enhanced surface
     diffusion
     [ NASA-CR-167948]
                                             p0065 N82-31509
   Surface texturing of fluoropolymers
[MASA-CASE-LEW-13028-1]
                                             p0070 N82-33521
TF-34 ENGINE
   TF34 Convertible Engine System Technology Program
   Effect of a part span variable inlet guide vane on TF34 fan performance [NASA-CR-165458] pnn23 Mp2-12075
THANING
 U LTING
THREATIC HAPPING
   LANDSAT Remote Sensing: Observations of an
     Appalachian mountaintop surface coal mining and reclamation operation --- kentucky
                                             p0117 ¥82-24525
     FE82-102471
THEOREMS
 MT PLOQUET THEOREM
TEBREAL CONDUCTIVITY
   Self-adaptive closed constrained solution algorithms for nonlinear conduction
                                             p0094 A82-45157
   Gas-turbine critical research and advanced
     technology support project [NASA-TM-81708]
                                              p0118 N82-13509
TERREAL CONTROL CONTINGS
   Ceramic thermal barrier coatings for gas turbine
     engines
                                             p0071 A82-35441
     [ASHE PAPER 82-GT-265]
   Development of improved high temperature coatings for IN-792 + HP
     [ NASA-CR-165395]
                                             p0063 N82-14333
   Review of NASA progress in thermal barrier
coatings for stationary gas turbines
     [ NASA-TH-81716]
                                             p0058 N82-17335
   Effects of arc current on the life in burner rig
     thermal cycling of plasma sprayed ZrOsub2-
      Ysub20sub3
                                             p0087 N82-17453
     [NASA-TM-82795]
   Evaluation of present thermal barrier coatings for
      potential service in electric utility gas turbines
     [ NASA-CR-165545]
                                             p0063 N82-18368
   Performance of laser glazed ZrO2 TBCs in cyclic
     oxidation and corrosion burner test rigs
                                             p0059 N82-22346
      [NASA-TM-82830]
   First results of material charging in the space
      environment
      [NASA-TM-84743]
                                              p0081 N82-24431
   Improved thermal barrier coating system
                                             p0060 N82-26431
     [ NASA-CASE-LEW- 13324-1]
    Effect of fuel to air ratio on Mach 0.3 burner rig
      hot corrosion of ZrO2-Y2O3 thermal barrier
      coatings
      [ NASA-TM-82879]
                                              p0061 N82-30373
   Failure mechanisms of thermal barrier coatings
      exposed to elevated temperatures
      [ NASA-TM-82905]
                                              D006 | N82-32461
THERMAL CONVECTION
 U EE CONVECTION
THERMAL CURRENTS
 U NVECTIVE PLOW
THERMAL CYCLING TESTS
   High temperature durable catalyst development
                                              p0056 182-20739
    Anaerobic polymers as high vacuum leak sealants
                                              p0108 A82-21967
    Work of fracture in aluminum metal-matrix composites
                                              p0053 A82-31339
    A simplified design procedure for life prediction
    of rocket thrust chambers
[AIAN PAPER 82-1251] p0043 A82-3:
Thermal fatigue and oxidation data of TAZ-8A and
                                              p0043 182-35087
      M22 alloys and variations
      [ NASA-CR-165407]
                                              p0063 N82-10193
    Effects of arc current on the life in burner rig
      thermal cycling of plasma sprayed ZrOsub2-
      Ysub20sub3
    [NASA-TH-82795] p0087
Elasti, plastic finite-element analyses of
                                              p0087 N82-17453
      thermally cycled single-edge wedge specimens
[NASA-TP-1982] point N82
                                             p0111 N82-20565
    Elastic-plastic finite-element analyses of
      thermally cycled double-edge wedge specimens
      [ NASA-TP-1973 ]
                                              p0 111 N82-20566
    High temperature low cycle fatigue mechanisms for
      nickel base and a copper base alloy
                                              p0064 N82-26436
      [NASA-CR-3543]
```

ORIGINAL PAGE IS OF POOR QUALITY

```
Microstructural effects on the rcom and elevated
temperature low cycle fatigue behavior of Waspaloy
[NASA-CR-165497] p0113 N82-26702
                                                p0113 H82-26702
   Failure mechanisms of thermal tarrier coatings
     exposed to elevated temperatures
[NASA-7M-82905]
   Use of fiber like materials to augment the cycle life of thick thermoprotective seal coatings [NASA-TH-82901]
THERMAL DECOMPOSITION
   Deposit formation in hydrocarbon fuels
      [ASME PAPER 82-GT-49]
                                                 p0075 A82-35307
THEREAL DEGRADATION
   Tensile properties of SiC/aluminum filamentary
      composites - Thermal degradation effects
                                                 p0053 A82-46220
   Thermal oxidative degradation reactions of
      perfluoroalkylethers
[NASA-CR-165516]
                                                 p0048 N82-12135
   Thermal degradation of the tensile properties of
      undirectionally reinforced PP-AT203/EZ 33
      magnesium composites
                                                 p0049 N82-21260
      [ NASA-TH-82817]
   Thermal and oxidative degradation studies of formulated C-ethers by gel-permeation
      chromatography
      [ NASA -TP- 1994]
                                                 p0.068 N82-21332
   Thermal oxidative degradation reactions of linear
      perfluoroalky lethers
[NASA-TM-82834]
                                                 p0068 #82-26468
THEBUAL EFFECTS
 U MPERATURE EFFECTS
THEREAL EFFICIENCY
U ERNODYNAMIC EPPIGIFNCY
THERMAL EMERGY STORAGE
 U AI STORAGE
THERMAL EXPANSION
   Thermal expansion accommodation in a jet engine
      frage
                                                 p0029 A82-11999
THERMAL PATIGUE
   Comparative thermal fatigue resistance of several
      oxide dispersion strengthened alloys
                                                 p0062 182-11399
   Thermal expansion accommodation in a jet engine
                                                 pC029 A82-11999
   Patigue of Ni-Al-Mo aligned extectics at elevated
      temperatures
                                                 p0052 A82-13403
   Thermal fatigue and oxidation data of TAZ-8A and
      M22 alloys and variations
      [ NASA-CF- 1654071
                                                 p0063 N82-10193
   Development of improved high temperature coatings
for IN-792 + HF
      [ NASA-CR- 165395]
                                                 p0063 N82-14333
THERMAL MAPPING
   Reliable aerial thermography for energy conservation
f NASA-TM-817661 p0:117 N82-14552
THEBBAL POWER
 U REOGENERATORS
THEBBAL PROPERTIES
U ERMODYNARIC PROPERTIES
THERMAL PROTECTION
   Progress in protective coatings for aircraft gas
turbines: A Review of NASA spensored research
                  A Review of NASA spensored research
      [ NASA-TM-82740]
                                                 p0058 N82-12216
   Covering solid, film cooled surfaces with a duplex thermal barrier coating [NASA-CASE-LEW-13450-1] p0088 N82-2546
                                                 p0088 N82-25463
   Use of fiber like materials to augment the cycle life of thick thermoprotective seal coatings
[NASA-TH-82901] p0089 N82-32
                                                 p0089 N82-32633
THERMAL RESISTANCE
   A heat exchanger computational procedure for
      temperature-dependent fouling
      [ASME PAPER 81-HT-75]
                                                 p0092 A82-10961
   Thermal-barrier-coated turbine blade study p0023 N82-10040
THERMAL SHIELDING
 U AT SHIELDING
THEBHAL STABILITY
 NT TEMPERATURE DEPENDENCE
   Deposit formation in liquid fuels. I - Effect of
      coal-derived Lewis bases on storage stability of
      Jet A turbine fuel
                                                 p0074 A82-22241
   Oxidation stability of advanced reaction-bonded
      Si3N4 materials
```

```
p0074 A82-33030
       [ACS PAPER 52-B-80P1
    Phase stability in plasma-sprayed, partially stabilized zirconia-yttria
                                                         p0070 A82-41552
    Thermal oxidative degradation reactions of perfluoroalkylethers [NASA-CR-165516] p0048
                                                        p0048 NB2-12135
    Effect of some nitrogen compounds thermal
       stability of jet A
       [ NASA-TH-82908]
                                                        p0072 N82-27519
    Effect of hydrocarbon fuel type on fuel
[NASA-TH-82916]
                                                        p0072 N82-28460
    The application of probabilistic design theory to
high temperature low cycle fatique
       [ NASA-CR-165488]
                                                        p0112 882-14531
    Factors influencing the thermally-induced strongth degradation of B/Al composites
    [NASA-TH-82023] p0050 N8
Fully, plasma-sprayed compliant backed ceramic
                                                         p0050 N82-24297
       turbine seal
       [ NASA-CASE-LEW- 13268-2 ]
                                                        p0 10 1 N82-26674
    Boundary layer thermal stresses in ande-ply composite laminates, part | --- graphite-epoky
       composites
       [NASA-CR-165412]
                                                        p0113 N82-26713
    Modulus, strength and thermal exposure studies of PP-A1203/aluminum and FP-A1203/magnesium
       composites
       [ NASA-TM-82868]
                                                         p0050 N82-30335
THERMIONIC CONVERTERS
    High thermal power density heat transfer ---
thermionic converters
[NASA-CASE-LEW-12950-1] p0087 N
                                                         p0087 N82-11399
    Parametric performance analysis of steam-injected qas turbine with a
       thermionic-energy-converter-lined combustor
      [ NASA-TH-827361
THERMIONIC EMITTERS
    Modification of spacecraft potentials by thermal
       electron emission on ATS-5
                                                         p0040 A82-16194
THERMIONIC REACTORS
 U N ENGINES
THERMOCSENICAL PROPERTIES
 NT HEAT OF COMBUSTION
THERMOCHEMISTRY
    Materials science issues encountered during the
       development of thermochemical concepts --
screening of reactions for solar energy
       applications
THERMOCOUPLES
    Thin film temperature sensors, phase 3 --- for
engine-test evaluation
[NASA-CR-165476]
THERMODYNAMIC CYCLES
                                                        p0097 N82-22479
 NT STIRLING CYCLE
    Evaluation of the potential of the Stirling engine for heavy duty application [NASA-CR-165473] p0 128 N82-1050
    New features and applications of PRESTO, a
       computer code for the performance of
       regenerative, superheated steam turbine cycles
    [NASA-TP-1954] p0119 N82-10
Evaluation of inelastic constitutive models for nonlinear structural analysis --- for aircraft
                                                       p0119 N82-16477
       turbine engines
       [NASA-TM-82845]
                                                         p0112 N82-24502
THERMODYNAMIC EFFICIENCY
    End region and current consolidation effects upon
    the performance of an MHD channel for the ETF conceptual design --- Engineering Test Facility [AIAA PAPER 82-0325] p0157 A82-17889 Evaluation of the potential of the Stirling engine
      for heavy duty application [NASA-CR-165473]
    [NASA-CR-165473] p0128 N82-10505
Bud region and current consolidation effects upon
       the performance of an MHD channel for the ETF
       conceptual design
    [NASA-TH-82744] p0 157 N82-129
Summary and evaluation of the conceptual design study of a potential early commercial MHD power plant (CSPEC)
[NASA-TH-82734] p0 119 N82-16
                                                        p0157 N82-12943
                                                        D0119 NB2-16481
    Development of thin wraparound junction silicon
      solar cells
[NASA-CR-165570]
                                                        p0133 N82-18689
```

i.

THERMOPHYSICS
U ELMCDYNAMICS

Control of the second of the s

```
TERRODYNABIC PROPERTIES
 NT EMISSIVITY
 NT ENTHALPY
 NT ENTROPY
 NT HEAT OF COMBUSTION
NT SUBFACE ENERGY
 NT THERMAL CONDUCTIVITY
 NT THERMAL EXPANSION
NT THERMAL STABILITY
  NT THERMOPHYSICAL PROPERTIES
    Experimental study of external fuel vaporization [ASME FAVER 82-GT-59] p0075 A82-35312 Thermodynamics and kinetics of the sulfation of
       porous calcium silicate
[NASA-TM-02769]
                                                             p0048 N82-15119
    Designing with figer-reinforced plastics (planar
       random composites)
       [ NASA-TM-82812]
                                                             P0050 N82-24300
    Research report: User's manual for computer program ATB!Y005. PLANETSYS, a computer program for the steady state and transient thermal analysis of a planetary power transmission system [NASA-CR-165366] p0:146 N82-31970
    Thermodynamic and transport combustion properties
        of hydrocarbons with air. Part 1: Properties
       in SI units [NASA-TP-1906]
                                                             p0161 N82-32186
    Thermcdynamic and transport combustion properties of hydrocarbons with air. Part 2: Compositions corresponding to Kelvin temperature schedules in
       part 1
        NASA-TP-1907]
                                                             p0161 N82-32187
    Thermodynamic and transport combustion properties of hydrocarbons with air. Part 3: Properties
       in US customary units
                                                             p0161 N82-32188
    Thermodynamic and transport combustion properties of hydrocarbons with air. Part 4: Compositions
       corresponding to Rankine temperature schedules
        in part 3
       [ NASA-TP- 1909]
                                                             p0 161 N82-32 189
Large area low-cost space solar cell development [NASA-TH-82902] p0 126 N82-32 出版版のDYNAMICS
                                                             p0 126 N82-32854
 NY ARROTHERMODYNAMICS
 RT COMBUSTION PHYSICS
    Materials science issues encountered during the
       development of thermochemical concepts --- in
        screening of reactions for solar energy
       applications
                                                                      A82-10021
    Computational methods for internal flows with emphasis on turbomachinery [NASA-TH-82764] p0003 N82
                                                             p0003 N82-13113
    Effect of location in an array on heat transfer to
       a cylinder in crossflow [NASA-TM-82797]
                                                             p0087 N82-19493
    Spherical roller bearing analysis. SKF computer program SPHERBEAN. Volume !: Analysis
    [NASA-CE-165203] p0 106 N82-20540
Spherical roller bearing analysis. SKF computer
program SPHERBEAN. Volume 2: User's manual
        | NASA-CE-165204]
                                                            p0106 N82-20541
    Spherical roller bearing analysis. SKF computer
       program SPHERBEAN. Volume 3: Program correlation with full scale hardware tests [NASA-CR-165205] p0106 N6
    [NASA-CR-165205] p0 106 N82-20 542
Low-thrust chemical propulsion system propellant
expulsion and thermal conditioning study,
        Executive summary
                                                             p0045 N82-24287
        [ NASA-CP- 165622]
    Low-thrust chemical propulsion system propellant expulsion and thermal conditioning study
[NASA-CR-167841] p0045 N82-24288
THERMOMECHANICS
 U EFMODYNAMICS
THREMOMETRY
  U MPEFATURE MEASUREMENT
THEREOPHYSICAL PROPERTIES
  NT EMISSIVITY
 NT TEMPERATURE DEPENDENCE
 NT THERMAL CONDUCTIVITY
NT THERMAL STABILITY
    Toward the use of similarity theory in two-phase
        choked flows
                                                             p0089 182-16570
```

```
THREMOPLASTIC FILES
   Advanced inorganic separators for alkaline batteries [NASA-CASE-LEW-13171-1] p0124 N82-29708
                                                p0124 N82-29708
THERMOPLASTIC RESIDS
NT THERMOPLASTIC FILMS
Hethod of making formulated plastic separators for
      soluble electrode cells
      [ NASA-CASE-LEW-12358-2]
                                                p0054 N82-21268
   Designing with figer-reinforced plastics (planar
      random composites)
      [NASA-TM-82812]
                                                p0050 N82-24300
   Advanced inorganic separators for alkaline batteries
[NASA-CASE-LEW-1317]-1] p0124 N82-29708
THEREOPLASTICITY
    Wonlinear structural and life analyses of a
      combustor liner
[NASA-TH-82846]
THERMOSETTING RESINS
                                                p0111 N82-24501
 NT EPOXY RESINS
NT KEYLAR (TRADEMARK)
   random composites)
      [ NASA-TH-82812]
                                                p0050 #82-24300
THERMOSTABILITY
U ERMAL STABILITY
 U ISOTROPY
 U MPERATURE EFFECTS
THERMOVISCORLASTICITY
   Research and development program for non-linear structural modeling with advanced
      time-temperature dependent constitutive
      relationships
      [ NASA-CR- 165533 ]
                                                D0024 N82-16080
THICKNESS
   The effect of rotor blade thickness and surface
      finish on the performance of a small axial flow
      turbine
      [ASME PAPER 82-GT-222]
    The effect of rotor blade thickness and surface
      finish on the performance of a small axial flow
      turbine
      [NASA-TH-82726]
                                                p0003 N82-13114
   Gas turbine ceramic-coated-vane concept with
      convection-cooled porous metal core
      [ NASA-TP-1942]
                                                p0016 N82-14090
   A finite element stress analysis of spur gears including fillet radii and rim thickness effects [MASA-TM-82865] po 10 1 M82-28646
Small axial turbine stator technology program [NASA-CR-165602] p0028 N8.
THIE AIRPOILS
                                                p0028 N82-32367
   Measurement and prediction of mean velocity and
      turbulence structure in the near wake of an
                                                p0010 A82-26137
    Solution of the unsteady subsonic thin airfoil
      problem
                                                p0012 A82-41267
THIE PILES
 NT ENERGY ABSORPTION FILMS
   Ion-beam-induced topography and surface diffusion
                                                p0160 A82-46426
    Study of the photovoltaic effect in thin film
      barium titanate
[NASA-CR-165081]
                                                p0131 N82-16479
    Morphelogical and frictional behavior of sputtered MoS2 films
      [ NASA-TH-82809]
                                                 p0076 N82-22387
    Thin file temperature sensors, phase 3 --- for
      engine-test evaluation [NASA-CR-165476]
                                                 P0097 N82-22479
    Ion beam sputter deposited diamond like films
[NASA-TM-82873] p0069 N82-26
The dryout region in frictionally heated sliding
                                                p0069 N82-28445
      contacts
      [NASA-TM-82796]
                                                 p0088 N82-28574
   On the solution of creep induced buckling in
      general structure
                                                 p0115 A82-39514
THREE DIMENSIONAL BOUNDARY LAYER
   The three-dimensional boundary layer on a rotating helical blade
                                                 p0009 A82-15459
   Three dimensional turbulent boundary layer
      development on a fau rotor blade [AIAA PAPER 82-1007]
                                                p0011 182-31965
```

W.

ORIGINAL PAGE IS OF POOR QUALITY

THREE DINERSIONAL PLOW	Development of a simplified proc
NT SECONDARY FLOW	chamber life prediction
Characteristics of the flow in the annulus-wall	[NASA-CR-165585]
region of an axial-flow compressor rotor blade passage	THRUST CONTROL HT THRUST VECTOR CONTROL
[AIAA FAPER 82-0413] p0009 A82-17933	V/STOL propulsion control techno
Forms of three-dirensional supersonic free jets in	[AIAA PAPER 81-2634]
linear approximation	Thrust modulation methods for a
A82-19196	aircraft
Three-dimensional flow calculations including	[WASA-TH-82747]
boundary layer effects for supersonic inlets at angle of attack	THROST DISTRIBUTION Tests of a D vented thrust defle
[ATAA PAPER 82-0061] p0005 A82-19778	behind a simulated turbofan en
Three sensor hot wire/film technique for three	[NASA-CR-3508]
dimensional mean and turbulence flow field	Inert gas ion thruster
measurement	[NASA-CR-165521]
p0097 N82-30300	TERUST LOADS
Finite volume calculation of three-dimensional potential flow around a propeller	Applications of the DOE/KASA win engineering information system
[AIAA PAPER 82-0957] p0010 A82-31933	caginously interest by the
Three dimensional flow field inside the passage of	THRUST REVERSAL
a low speed axial flow compressor rotor	Thrust reverser for a long duct
[ATAA PAPER 82-1006] p0011 A82-31964	turbofag engines
Three-dimensional flow field in the tip region of	[NASA-CASE-LEW-13199-1]
a compressor rotor passage. I - Mean velocity profiles and annulus wall boundary layer	THRUST VECTOR CONTROL Effect of a part span variable i
[ASME PAPER 82-GT-11] p0011 A82-35280	TF34 fan performance
Three-dimensional flow field in the tip region of	[NASA-CR-165458]
a compressor rotor passage. II - Turbulence	A real time Pegasus propulsion s
properties	VSTOL piloted simulation evalu
[ASME PAPER 82-GT-234] p0011 A82-35416	[NASA-TH-82770]
Three-dimensional shock structure in a transonic flutter cascade	Performance of a 2D-CD nonaxisym
p0006 182-37937	nozzle on a turbojet engine at [NASA-TH-82881]
Development of a locally mass flux conservative	TERUSTORS
computer code for calculating 3-D viscous flow	U CKET ENGINES
in turbomachines	THUEDERSTORMS
[NASA-CR-3539] p0007 N82-22214	NASA research programs respondin
Turbofan forced mixer-nozzle internal flowfield.	recommendations
Volume 3: A computer code for 3-D mixing in axisymmetric nozzles	TILTING ROTORS
[NASA-CR-3494] p0091 N82-22460	A pad perturbation method for th
Fringe localization requirements for	coefficients of tilting-pad jo
three-dimensional flow visualization of shock	
waves in diffuse-illumination double-pulse	TIBE
hclographic interferometry	NT FLIGHT TIME
[NASA-TP-1869] p0095 N82-22481 Numerical modeling of three-dimensional confined	TIEE DIVISION MULTIPLE ACCESS 30/20 GHz communications satelli
flows	[AIAA 82-0449]
[NASA-CR-165583] p0158 N82-24078	Dynamic switch matrix for the TD
Scme aspects of calculating flows about	switching system
three-dimensional subsonic inlets	[AIAA 82-0458]
[NASA-TH-82789] p0004 N82-25213 Three dimensional mean velocity and turbulence	Baseband-processed SS-TDMA commu
characteristics in the annulus wall region of an	architecture and design concer [AIAA 82-0482]
axial flow compressor rotor passage	Open-loop nanosecond-synchroniza
[NASA-CR- 169003] p0026 N82-25252	satellite communications
The design and instrumentation of the Purdue	
annular cascade facility with initial data	Wideband, high speed switch mate
acquisition and analysis [NASA-CR-167861] p0008 N82-26237	SS-TDMA applications
Comparison of experimental and analytical	TIME MARCHING
performance for contoured endwall stators	On the solution of creep induced
[NASA-TM-82877] p0019 N82-26299	general structure
Three dimensional flow field inside compressor	
rotor, including blade boundary layers	TIME SERIES ANALYSIS
[NASA-CR-169120] p0091 N82-27686 Computer program for calculating full potential	Illustration of a new test for d
transonic, quasi-three-dimensional flow through	in mean in precipitation serie
a rotating turbosachinery blade row	Identification of multivariable
[NASA-TP-2030] p0005 N82-28247	turbofan engine dynamics from
Turbine endwalk single cylinder program	[NASA-TM-82785]
[NASA-CR-169278] p0091 N82-31U38	TIN COMPOUNDS
Three dimensional flow measurements in a turbine scroll	NT TIN OXIDES
[NASA-CE- 167920] p0009 N82-32310	TIB OXIDZS Electron beam induced damage in
THREE DIMENSIONAL HOTION	Indium Tin Oxide
NT SECCUDARY FLOW	
NT THREE DIMENSIONAL FLOW	Secondary electron emission yiel
THROTTLING	
External fuel vaporization study	TIP SPRED
[NASA-CF- 165513] p0073 N82-14371 TITRUST	Porvard acoustic performance of
NT FOCKET TERUST	designed for a high specific f
THRUST CHAMBERS	TIPS
A simplified design procedure for life prediction	NT BLADE TIPS
of rocket thrust chambers	TIRES

```
edure for thrust
                                               p0044 M82-21253
                                         p0029 AS2-16909
                                         subsonic V/STOL
                                               p0003 N82-13112
                                         ctiug nozzle
                                         gine
                                               p0006 #82-17122
                                               p0044 N82-21252
                                         d turbine
                                               p0122 N82-23696
                                         fan engine --- for
                                               p0019 N82-26293
                                         inlet guide vane on
                                         p0023 N82-12075
system model for
                                         ation
                                         p0016 N82-13144
metric exhaust
altitude
                                               P0005 N82-26241
                                         g to workshop
                                                      N82-21146
                                         ne dynamic
ournal bearings
p0110 X82-14400
                                         te multibeam antenna
                                         p0079 182-23486
                                         p0085 A82-23494
inication system
                                               p0079 A82-23508
                                         tion for wideband
                                         p0036 A82-27224
rix development for
                                               p0086 A82-43784
                                          buckling in
                                               p0 115 A82-39514
                                         letecting a shift
                                                      A82-13217
                                         high performance
                                         closed loop data
p0076 N82-20339
                                         ITO coated Kapton
                                                p0 159 A82-41546
                                                p0038 N82-14226
                                         a model turbofan
flow (QF-14)
p0 152 N82-21036
TIRES
   Rolling resistance of electric vehicle tires from track tests
```

p0043 A82-35087

[AIAA PAPER 92-1251]

```
[ NASA-TM-82836]
                                                 p0124 N82-28786
   On the road performance tests of electric test
      vehicle for correlation with road load simulator
      [ NASA-TM-82900 ]
                                                 p0127 N82-33829
TITABATES
 NT BARIUM TITANATES
TITABLOR
   Structural dynamics of shroudless, hollow, fan
     blades with composite in-lays
[ASME PAPER 82-GT-284]
                                                 p0022 A82-35456
   Energy efficient engine shroudless, hollow fan
   blade technology report
[NASA-CR-155586] p0024 N83
Streetural dynamics of shroudless, hollow fan
blades with composite in-lays
                                                  p0024 N82-21196
      [ NASA-TM-82816]
                                                 p0018 N82-22266
TITABIUM A LOYS
   Interrelation of material microstructure,
      ultrasonic factors, and fracture toughness of two phase titanium alloy
      [ NASA-TM-82810 ]
                                                 p0110 M82-20551
   Method and apparatus for coating substrates using
      lasers
      [ NASA-CASE-LEW- 13526- 1]
                                                 p0059 N82-22347
TITABLUE COMPOUNDS
NT PARTUM TITANATES
TOLBRANCES (PHYSIOLOGY)
NT RADIATION TOLERANCE
TOLLBEIN-SCHLICHTING WAVES
Generation of instability waves at a leading edge
      [ NASA-TM-82835]
                                                 pC087 N82-22453
 U ESSURE BEASUREMENT
TOOLS
 NT MILLING MACHINES
TOPOGRAPHY
   Ion-beam-induced topography and surface diffusion
                                                 p0 160 A82=46426
   Small passenger car transmission test: Chevrolet
      Malibu 200C transmission with lockup p NASA-CR-165182]
                                                 p0105 N82-16410
   Small passenger car transmission test: Mercury
     Lynx ATX transmission [NASA-CR-165510]
                                                 p0 106 NB2-24496
TORQUE MEASURING APPARATUS
 U RQUEMETERS
TORQUERETERS
   A digital optical torquemeter for high rotational
      speed applications [NASA-TM-82914]
                                                 p0095 N82-31664
TORSIONAL STRESS
   Forced torsional properties of FMR composites with
      varying nadic ester concentrations and
      processing histories
                                                 p0051 A82-45630
   Failure analysis of a tool steel torque shaft
     [ NASA-TM-82758]
                                                 p0058 N82-11184
TOTAL EMERGY SYSTEMS
   Develop and test fuel cell powered on-site
      integrated total energy system.
                                              Phase 3:
      Full-scale power plant development [WASA-CR-165328]
                                                 p0117 H82-13490
   Technology development for phosphoric acid fuel
     cell powerplant, phase 2 [NASA-CR-165426]
                                                 p0 131 N82-16482
   Develop and test fuel cell powered on-site
      integrated total energy systems.
                                               Phase 3:
      Full-scale power plant development [NASA-CR-165455]
                                                 p0131 N82-16483
TOWERS
   Effect of rotor configuration on quyed tower and foundation designs and estimated costs for intermediate site horizontal axis wind turbines
                                                 p0121 N82-22649
      [ NASA-TM-82804 ]
   Vibration analysis of three guyed tower designs
      for intermediate size wind turbines
[ NASA-CR-165589]
TRACE CONTABINANTS
                                                 p0137 N82-30709
   An automated system for global atmospheric sampling using B-747 airliners
      [ NASA-CR- 165264]
                                                 p0139 N82-13554
TRACTION
   Regimes of traction in concentrated contact
      lubrication
      [ASME PAPER 81-LUB-16]
                                                 p0107 182-18431
   Design study of a continuously variable roller cone traction CVT for electric vehicles
      [ NASA-CE- 15984 1]
                                                 p0105 N82-12445
```

```
Traction contact performance evaluation at high
      speeds
      I NASÁ-CR-1652261
                                                 p0 105 N82-16409
   Stress evaluations under rolling/sliding contacts
      [ NASA-CR-165561]
                                                p0113 N82-17521
   Multicoller traction drive speed reducer:
   Evaluation for automotive gas turbine engine [NASA-TP-2027] p0 10 1 M82
The influence of surface dects and grooves on traction in Sliding EHD point contacts
                                                p0 10 1 #82-26678
      [ NASA-TM-82943]
                                                p0 10 2 N8 2-32734
TRAINING NHULATORS
 NT PLIGHT SIMULATORS
TRAJECTORIES
 DT ELECTRON TRAJECTORIES
DT HOON-EARTH TRAJECTORIES
MT PARTICLE TRAJECTORIES
TRANSCENDENTAL FUNCTIONS
 NT PERIODIC FUNCTIONS
 NT TANGENTS
TRANSDUCERS
 MT PRESSURE SENSORS
TRANSFER FUNCTIONS
   Pressure transfer function of a JTI5D mozzle due
to acoustic and convected entropy fluctuations
     [NASA-TH-82842]
                                                p0152 N82-22951
TRANSFER ORBITS
   Mass driver reaction engine characteristics and
     performance in earth orbital transfer missions p0046 A82-18199
   Propulsion system options for low-acceleration
      orbit transfer
      [AIAA PAPER 82-1196]
                                                p0047 A82-35056
   Shuttle to GEO propulsion tradeofy's [AIAA PAPER 82-1245]
                                                P0034 A82-35082
   A small scale lunar launcher for early lunar
      material utilization
                                                p0032 A82-35617
   Centaur capabilities for communications satellite
     launches
     [AIAA PAPER 82-0558]
                                                p0034 A82-36286
TRANSPORMERS
   Preliminary design development of 100 KW rotary
     power transfer device [NASA-CR-165431]
                                                p0084 #82-23395
   Component technology for space power systems
     [NASA-TM-82928]
                                                p0082 882-30474
TRANSBORIZON RADIO PROPAGATION
   A review of transhorizon propagation phenomena
                                                p0079 A82-10679
TRANSIENT LOADS
NT SHOCK LOADS
TRANSIENT RESPONSE
   Clade loss transient dynamic analysis of
      turbomachinery
     [AIAA PAPER 82-1057]
                                                p0030 A82-34982
   Engine dynamic analysis with general nonlinear
     finite element codes. II - Bearing element implementation, overall numerical characteristics and benchmarking
      [ASME PAPER 82-GT-292]
                                                p0 108 A82-35462
   Transient catalytic combustor model [NASA-CR-165324]
                                                p0129 N82-13507
TRANSISTOR CIRCUITS
   A PWM transistor inverter for an ac electric
      vehicle drive
                                                D0085 A82-20744
   A 10-ky series resonant converter design,
      transistor characterization, and base-drive
      optimization
                                                p0086 A82-36927
   Analysis of transistor and snubber turn-off
     dynamics in high-frequency high-voltage high-power converters
      TNASA-CR-1687601
                                                p0084 N82-22438
TRANSISTORS
 NT BIPOLAR TRANSISTORS
 MT PIELD EFFECT TRANSISTORS
High voltage power transistor development [NASA-CR-?65547] p008-
                                                P0084 N82-18506
 NT CHRONIUM
 NT COBALT
 NT GOLD
 NT IRON
 NT NIOBIUM
 NT PLATINUM
 NT PLATINUM ISOTOPES
```

NT TANTALISM

p0 16 1 162-32 187

Aerodynamic damping measurements in a transonic

ORIGINAL PAGE IS OF POOR QUALITY

```
NT 711ANIUM
                                                                                                           compressor
                                                                                                                                                                   p0012 A82-35459
 NT TUNGSTEN
N° ZINC
                                                                                                           [ASME PAPER 82-GT-287]
                                                                                                        Performance of single-stage axial-flow transonic compressor with rotor and stator aspect ratios of 1.63 and 1.78, respectively, and with design pressure ratio of 1.82
[NASA-TP-1974]

p0017 N82-197
 NY ZIFCCNIUM
    Adhesion and friction of single-crystal diamond in contact with transition metals
                                                                p0 103 A82-18680
                                                                                                   TRANSONIC FLOW
                                                                                                        A finite element formulation of Euler equations for the solution of steady transonic flows
 NT SECONDARY FLOW
 HT THREE DIMENSIONAL PLOW
TRANSLEMAR SPACE
O TERPLANETARY SPACE
TRANSMISSION
                                                                                                        #AIAA PAPER 82-0062 | p0009 A82-17759
An example of a solution to transonic equations
for shock-free flow about a symmetric profile
 NT ACOUSTIC PROPAGATION
NT CONDUCTIVE HEAT TRANSPER
NT CONVECTIVE HEAT TRANSPER
                                                                                                        Application of a finite element algorithm for the solution of steady transonic Euler equations
[AIRA PAPER 82-0970] p0010 A82-319
 NT ELECTRIC POWER TRANSHISSION
NT FREQUENCY DIVISION MULTIPLE ACCESS
                                                                                                                                                                   P0010 A82-31939
                                                                                                           computational design method for transonic
                                                                                                        turbomachinery cascades
[ASME PAPER 82-GT-117] p0022 A82-35348
Investigation of rotational transonic flows
through ducts using a finite element scheme
[AIAA PAPER 82-1267] p0012 A82-37711
 NT REAT TRANSFER
NT LIGHT SCATTEPING
NT MICROWAVE TRANSMISSION
  NT MULTIPLEXING
 NT RADIATIVE HEAT TRANSFER
 NT SATELLITE TRANSMISSION
                                                                                                        High-speed laser anemometer system for intrarotor
 NT SHOCK WAVE PROPAGATION
NT SCUND TRANSMISSION
                                                                                                           flow mapping in turbomachinery [NASL-TP-1663]
                                                                                                                                                                   p0095 N82-19521
 HT TRANSHORIZON RACIO PROFAGATION HT WAVE PROPAGATION
                                                                                                        Development of a locally mass flux conservative computer code for calculating 2-D viscous flow
    Advances in high-speed rolling-element bearings [NASA-TH-82910] 00101 NASA-
                                                                                                           in turbomachines
                                                                                                   in turbomachines
[NASA-CR-3539]

Computer program for calculating full potential
transonic, quasi-three-dimensional flow through
a rotating turbomachinery blade row
[NASA-TP-2030]

TRANSONIC FLUTTER
                                                                p0 10 1 N82-28644
     Precision of spiral-bevel gears
       [ NASA-TF- 82888 ]
                                                                p0102 N82-30552
TRANSMISSION EFFICIENCY
    Conversion and matched filter approximations for
        serial minimum-shift keyed mcdulation
                                                                p0080 182-26713
                                                                                                        Three-dimensional shock structure in a transonic
     Small passenger car transmission test: Mercury
                                                                                                           flutter cascade
       Lynx ATX transmission [NASA-CR-165510]
                                                                                                                                                                    p0006 A82-37937
                                                                p0 106 N82-24496
                                                                                                   TRANSONIC INLETS
TRABSMISSION LINES
                                                                                                     U PERSONIC INLETS
  NT WAVEGUIDES
                                                                                                   TRANSONIC WIND TUNNELS
                                                                                                        Development and utilization of a laser velocimeter system for a large transonic wind tunnel
[NASA-TH-82886] p0095 N82-31663
Development of a laser velocimeter for a large
    The 30/20 GHz communications satellite trunking
        network study
[NASA-CP-1654671
                                                                p0078 N82-13302
TRAUSHISSION LOSS
                                                                                                           transonic wind tunnel
    A review of transhorizon propagation phenomena
                                                                p0079 A82-10679
                                                                                                                                                                   p0096 NB2-32688
    On the cause of the flat-spot phenomenon observed
                                                                                                        Seeding considerations for an LV system in a large
        in silicon solar cells at low temperatures and low intensities --- in deep space environments
                                                                                                           transonic wind tunnel
                                                                                                                                                                    p0096 N82-32689
TRANSMISSIONS (MACHINE ELEMENTS)

Design study of a continuously variable reller cone traction CVT for electric vehicles

police - CP = 1598411

Channel of
                                                                                                   TRANSONICS
                                                                                                     U ANSONIC FLOW
                                                                                                   TRANSPIRATION COOLING
                                                                                                     U EAT COOLING
                                                                                                    TRANSPONDERS
     Small passenger car transmission test: Chevrolet Malibu 200C transmission with lockup [NASA-CR-165182] p0105 N82-16
                                                                                                        Cross-impact study of foreign satellite
                                                                                                           communications on NASA's 30/20 GHz program
                                                                                                   [NASA-CR-165154]

TRANSPORT AIRCRAFT

NT BOEING 747 AIRCRAFT

HT DC 9 AIRCRAFT

NT DC 10 AIRCRAFT
                                                                p0105 N82-16410
                                                                                                                                                                   p0078 N82-17420
     Advanced Gas Turbine (AGT) powertrain system
initial development report
[NASA-CR-165130] p0132 N
                                                                p9132 N82-16485
     Small passenger car transmission test: Mercury
        Lynx ATX transmission
                                                                                                     NT SHORT HAUL AIRCRAFT
        [ NASA-CP- 165510]
                                                                p0106 N82-24496
                                                                                                        Propulsion study for Small Transport Aircraft
                                                                                                        Technology (STAT)
[NASA-CR-165499]
Propulsion study for Small Transport Aircraft
Technology (STAT), Appendix B
[NASA-CR-165499-APP-B]
p0022 N82-1003B
     Mathematical models for the synthesis and optimization of spiral bevel gear tooth surfaces --- for helicopter transmissions
        E NASA-CR-35531
                                                                 p0106 #82-25516
     Lu rica, effects on efficiency of a helicopter
        transmission
                                                                                                        Study of advanced propulsion systems for Small
                                                                                                   Transport Aircraft Technology (STAT) program
[NASA-CR-165610] p0026 W82-24202
TRANSPORT CORFFICIENTS
U ANSPORT PROPERTIES
TRANSPORT PROPERTIES
        [ NASA-TM-82857]
                                                                p0 100 N82-25520
     Multicoller traction drive speed reducer:
    Evaluation for automotive gas turbine engine [NASA-TP-2027] p0 10 | N82-Tooth profile analysiis of circular-cut, spiral-bevel gears [NASA-TB-82840] p0 10 | N82-
                                                                p0101 N82-26678
                                                                                                     NT ELECTRICAL RESISTIVITY
                                                                 P0101 N82-26681
                                                                                                     MT THERMAL CONDUCTIVITY
     Reliability model for planetary gear [NASA-TM-62859]
                                                                                                      NT VISCOSITY
                                                                 p0 10 1 N82-28643
                                                                                                        Watural convection with combined driving forces
     Kinematic precision of gear trains [NASA-TH-82897]
                                                                                                                                                                   p0093 A82-31445
                                                                                                        Thermodynamic and transport combustion properties of hydrocarbons with air. Part 1: Properties
                                                                 DO 102 N82-32733
TRANSMITTANCE
     Pree electron lasers for transmission of energy in
                                                                                                           in SI units
                                                                                                                                                                    p0 161 N82-32186
        space
                                                                                                        Thermodynamic and transport combustion properties of hydrocarbons with air. Part 2: Compositions corresponding to Kelvin temperature schedules in
        [ NASA-CR- 165520]
                                                                D0098 N82-25499
TRANSONIC AIRCRAFT
U PERSONIC AIRCRAFT
TRAESCRIC COMPRESSORS
```

[NASL-TP-1907]

```
ORIGINAL PAGE IS
   Thermodynamic and transport combustion properties

of hydrocarbons with air. Part 3: Properties

in US Gustomary units
      [ NASA -TP- 1908]
   [NASA-TP-1908] p0161 N82-32188 Thermodynamic and transport combustion properties
      of hydrocarbons with air. Part 4: Compositions corresponding to Pankine temperature schedules
in part 3 [NASA-TF-1909]
                                                  p0 16 1 N82-32 189
 NT MIXING LENGTH FLOW THEORY
TRANSPORTATION
 NT AIR TRANSPORTATION
 NT SPACE SHUTTLE ORBITERS
 NT SPACE TRANSPORTATION SYSTEM
    Barriers to the utilization of synthetic fuels for
      transportation
      [ NASA-CR- 1655171
                                                  p0073 NB2-13243
TRANSUBANIUM ELEMENTS
 NT PLUTCHIUM 244
TRAPATT DIODES
U ALANCHE DIODES
TRAVELIEG BAVE TUBES
   Experimental verification of a computational procedure for the design of TWI-refocuser-MDC
      systems --- Multistage Depressed Collectors
                                                  p0082 182-16128
    Multistage depressed collector for dual mode
      operation --- for microwave transmitting tubes
[NASA-CASE-LEW-13282-1] p0081 N82-24415
    Computer modeling of multiple-channel input
      signals and intermodulation losses caused by nonlinear traveling wave tube amplifiers [NASA-TP-1999] p0082 N82
                                                  p0082 N82-25441
TRIBOLOGY
    Universal binding energy relations in metallic
      adhesion
      [ NASA-TM-82706]
                                                  p0058 N82-11183
    Application of surface analysis to solve problems
      of wear
      [ NASA-TM-82753]
   Geometrical aspects of the tribological properties of graphite fiber reinforced polymide composites [NASA-TH-82757] p0066 M82~1519
                                                  p0066 NB2~15198
    Elucidation of wear mechanisms by ferrographic
      analysis
      " NASA-TM-82737]
                                                  p0066 N82-15199
    Tribological characteristics of a composite
      total-surface hip replacement
      [ NASA-TP- 1853]
                                                  p0066 N82-16239
    Effects of artificially produced defects on film
      thickness distribution in sliding EHD point
      contacts
      [ NASA-TM-82732]
                                                  pCC99 N82-16412
   Trihological properties at 25 C of seven polyimide films bonded to 440 C high-temperature stainless
      [ NASA-TP-1944]
                                                  p0067 N82-19373
    Tribological properties and XPS studies of ion
      plated gold on nickel and iron [NASA-TM-82814]
                                                  PCC59 N82-22344
    Tribological characteristics of mitrogen (N+)
      implanted iron
      [ NASA-IM-82839]
                                                  p0060 N82-24322
    Correlation of tensile and shear strengths of
      metals with their friction properties
      [ NASA-TM-82828]
                                                  p0060 N82-24325
    Tribological properties of sintered
      polycrystalline and single crystal silicon carbide
       NASA-TH-82829]
                                                  p0068 N82-24343
   Film shape calculations on supercomputers [NASA-TM-82856] p010
                                                  p0100 N82-25519
TRICGERS
 U TUATORS
TRIGOVERETRIC FUNCTIONS
 NT TANGENTS
TROPOP AUSE
   Aircraft sampling of the sulfate layer near the tropopause following the eruption of Mount St.
                                                  p0140 A82-37450
TROPOSPHERIC SCATTERING
```

A review of transhorizon propagation phenomena

TROPOSPHERIC WAVES

U PROXIMATION

NT PLANETARY WAVES
TRUBCAZION (MATERNATICS)

```
TRUMES (LIMES)
U ANSHISSION LIMES
TROUBLOWS
 U APTS (MACHINE ELEMENTS)
TRUSSES
   Primary propulsion/large space system interaction
      study
      [ HASA-CR-165277 ]
                                                 p0044 N82-18315
TUBING
 U PES (TUBES)
TUBGSTEN
   Cesiation of W/001/ - Work function lowering by multiple dipole formation
    Retrofit and acceptance test of 30-cm ion thrusters
                                                 p0044 #82-12133
      [NASA-CR-165259]
    Tungsten fiber reinforced superalloy composite
      high temperature component design considerations
[HASA-TH-82811]
                                                 p0049 N82-21259
 U ECTRON TUNNELING
TURBENE BLADES
   Thermal and flow analysis of a convection,
      air-cooled ceramic coated porous metal concept
    for turbine vanes
[ASME PAPER 81-HT-48] p0020 A82-10952
Aeroelastic characteristics of a cascade of
      mistured blades in subsonic and supersonic flows [ASME PAPER 81-DET-122] p0021 A82-1933
                                                 p0021 182-19337
   Improved plasma sprayed MCTAll coatings for aircraft gas turbine applications
                                                 p0065 A82-20742
   Effects of blade loading and rotation on
compressor rotor wake in end wall regions
[ATAA PAPER 82-0193] p0010 A82-22063
Turbine blade nonlinear structural and life analysis
      [AIAA PAPER 82-1056] p0021 A8 comprehensive method for preliminary design
                                                 p0021 182-34981
      optimization of axial gas turbine stages
    [AIAA PAPER 82-1264] p0030 A82-35
The effect of rotor blade thickness and surface
finish on the performance of a small axial flow
                                                 p0030 A82-35091
      turbine
      [ASME PAPER 82-GT-222]
                                                 p0022 A82-35409
    Pabrication of turbine components and properties
      of sintered silicon nitride
[ASME PAPER 82-GT-252]
                                                  p0071 A82-35431
    Structural dynamics of shroudless, hollow, fan
      blades with composite in-lays [ASME PAPER 82-GT-284]
                                                  p0022 A82-35456
    Fabrication of sinterable silicon nitride by
      injection molding
                                                 p0071 L82-37015
    Winding for the wind
                                                  PO 138 A82-37078
    Aerodynamic performance of high turning core
      turbine vanes in a two-dimensional cascade
      [ AIAA PAPER 82-1288]
                                                 p0005 AB2-37716
    (NASA-CR-165351] p0023 N82-10040
    Creep shear behavior of the oxide dispersion
      strengthened superalloy HA 6000E [NASA-TH-82704]
                                                  D0058 N82-10195
    Trends in high temperature gas turbine materials
    [NASA-TH-82715] p0058 N82-11182
Progress in protective coatings for airgraft gas
      [NASA-TM-82715]
      turbines: A Review of NASA sponsored research [NASA-TH-82740] p0058 N82-1
                                                 p0058 N82-12216
    The effect of rotor blade thickness and surface
      finish on the performance of a small axial flow
      turbine
    [NASA-TM-82726] p0003 N82-
Variable gain for a wind turbine pitch control
                                                  p0003 N82-13114
                                                 p0119 N82-16478
      [ NASA-TM-82751]
    Energy efficient engine shroudless, hollow fan
      blade technology report
    [NASA-CR-165586] p0024 N82-
Tungsten fiber reinforced superalloy composite
                                                  p0024 N82-21196
      high temperature component design considerations
      [ NASA-TM-82811]
                                                  p0049 N82-21259
    Structural dynamics of shroudless, hollow fan
       blades with composite in-lays
                                                  p0018 N82-22266
       [NASA-TH-82816]
    Thin file temperature sensors, phase 3 --- for
      engine-test evaluation [NASA-CK-165476]
                                                  p0097 N82-22479
    Review of analysis methods for rotating systems
      with periodic coefficients
                                                  p0135 N82-23702
```

p0C79 A82-10679

Analytic investigation of effect of end-wall

TERBOFAE REGIEES

Laser anemometer measurements in an	
cascade of core turbine vanes and	comparison
with theory	
[NASA-TP-2018] The design and instrumentation of the	p0004 N82-26234
annular cascade facility with init	
acquisition and analysis	
[NASA-CR-167861]	p0008 N82-26237
Fully plasma-sprayed compliant backe turbine seal	d Ceramic
[NASA-CASE-LEW-13268-2]	p0101 #82-26674
Comparison of laser anemometer measu	
theory in an annular turbine casca	
experimental accuracy determined b	y parameter
estimation [NASA~TM-82860]	p0005 N82-28250
Past generation of three-dimensional	
boundary-conforming periodic grids	
for turbing blades and propellers	
[NASA-CR-165596]	p0009 N82-28253
<pre>Method of protecting a surface with silicon-slurry/aluminide coating -</pre>	
for gas turbine engine blades and	
[NASA-CASE-LEW-13343-1]	p0068 N82-28441
Fully plasma-sprayed compliant backe	d ceramic
turbine seal [NASA-CASE-LEW-13268-17	-0060 M02-20052
Experience and assessment of the DOE	p0069 N82-29453
2000-Kilowatt wind turbine generat	
North Carolina	
[NASA-TM-82721]	p0125 N82-30710
Advanced ceramic coating development industrial/utility gas turbines	LOE
[NASA-CP-169952]	p0065 NB2-33494
URBINE ENGINES	• • • • • • • • • • • • • • • • • • • •
NT BRISTOL-SIDDELAY BS 53 ENGINE	
NT GLS TURBINE ENGINES NT JFT ENGINES	
NT TURBOPAN ENGINES	
NT TURBOJET ENGINES	
NT TUFBCPROP ENGINES	
Interactive-graphic flowpath plottin	g for turbine
ongines [NASA-TM-82756]	p0017 N82-15041
Elevated temperature fatique testing	
[NASA-TM-82745]	p0111 N82-16419
Cooled variable-area radial turbine	technology
program	-003h x83-1033+
f MASA-CF- 165408] The role of modern control theory in	p0024 N82-19221
controls for aircraft turbine engi	
[NASA-IM-82815]	E0018 N82-22262
Advanced general aviation engine/air	frame
Integration study [NASA-CF-165565]	p0025 N82-22268
Fracture mechanics criteria for turb	
section : aponents	
[NASA *CF- ,67896]	p0027 N82-25257
Bird impact analysis package for tur	prue endine
fan blades [NASA-IM-82831]	p) 112 N82-26701
Energy efficient engine: High press	
uncooled rig technology report	
[NASA-CR- 165149]	p0031 M82-32383
URBINE PUMPS Advanced superposition methods for h	ton speed
turborump vibration analysis	1141 Speed
[NASA-CF- 165379]	p0104 N82-11465
Liquid oxygen turbopump technology	
[NASA-CR- 165487]	p0105 N82-11468
URBING WHEELS Net shape fabrication of Alpha Silic	on Carbide
turbine components	on carbiae
[ASME PAPER 82-GT-2161	p0071 AB2-35403
Fabrication of turbine components an	d properties
of sintered silicon nitride	************
[ASME PAPER 82-GT-252] Design and development of a ceramic	p0071 182-35431
for the AGT101	
[ATAA FAPER 82-1209]	p0 109 1182-35480
Fatigue and creep-fatigue deformation	n of several
nickel-base superalloys at 650 C	n0062 182-87200
URBINES	p0062 A82-47398
NT AXIAL FLOW TURBINES	

NT GAS TURBINES NT STEAM TURBINES NT BIND TURBINES

```
contouring on stator performance [WASA-TP-1943]
                                                        p0003 #82-14051
   The WASA Lewis large wind turbine program
      [ NASA-TH-82761]
                                                        p0119 #82-16495
   CF6 jet engine performance improvement: High pressure turbine active clearance control [NASA-CR-165556] p0027 M8
                                                        p0027 M82-28297
   Cooled variable nozzle radial turbine for rotor craft applications
[NASA-CR-165397] p0028 N82-29
Flow visualization study of the horseshoe vortex
                                                        p0028 N82-29323
      in a turbine stator cascade
      [ NASA-TP-1884 ]
                                                        p0088 M82-30498
    Turbine endwall single cylinder program
   [MASA-CR-169278] p0091 M82-3
The CF6 jet engine performance improvement: Low pressure turbine active clearance control [NASA-CR-165557] p0029 M82-3:
                                                        p0091 ¥82-31638
                                                        p0029 N82-33393
TURBOCHARGERS
 U PERCHARGERS
 U REOCOMPRESSORS
TURBOCOMPRESSORS
   Water ingestion into jet engine axial compressors
[ATAN PAPER 82-0196] p0030 A82-17.
Characteristics of the flow in the annulus-wall
region of an axial-flow compressor rotor blade
                                                        p0030 A82-17836
       passage
       [AIAA PAPER 82-0413]
                                                        p0009 A82-17933
    Three dimensional flow field inside the passage of
    a low speed axial flow compressor rotor
[AIAA PAPER 82-1006] p0011 A82-3196
Investigation of the tip-clearance flow inside and
                                                        p0011 A82-31964
      at the exit of a compressor rotor passage. I -
       Mean velocity field
       [ASHE PAPER 82-GT-12]
                                                        p0011 A82-35281
    The use of optimization techniques to design
      controlled diffusion compressor blading
       [ASHE PAPER 82-GT-149]
                                                       p0022 A82-35373
    The effect of rotor blade thickness and surface
       finish on the performance of a small axial flow
       turbine
       [ASNE PAPER 82-GT-222]
                                                        p0022 A82-35409
    Progress in the development of energy efficient
       engine components
       [ASME PAPER 82-GT-275]
    The effect of rotor blade thickness and surface
      finish on the performance of a small axial flow
       turbine
      [NASA-TM-82726]
                                                        p0003 N82-13114
    The use of optimization techniques to design
       controlled diffusion compressor blading
   Computer program for aerodynamic and blading design of multistage axial-flow compressors [WASA-TP-1946] p0016 Mag-15030 Analytical traces
    Analytical investigation of nonrecoverable stall
    p0018 M82-21195
Computer modeling of fan-exit-splitter spacing
effects on P100 response to distortion
[NASA-CR-167879]
    STGSTK: A computer code for predicting multistage axial flow compressor performance by a meanline stage stacking method
[NASA-TP-2020] p0018 N82-252
                                                        p0018 N82-25250
    Three dimensional mean velocity and turbulence
      characteristics in the annulus wall region of an
       axial flow compressor rotor passage
       [NASA-CR-169003]
                                                        p0026 N82-25252
    Core compressor exit stage study, volume 6
                                                        p0027 N82-27310
       [ NASA-CR-165553]
    Advanced stratified charge rotary aircraft engine
       design study
[NASA-CR-165398]
                                                        p0107 N82-27743
TURBOCONVERTERS
 U REOGENERATORS
TURBORLECTRIC CONVERSION
 U REOGENERATORS
TURBOFAN ENGINES
 NT BRISTOL-SIDDELEY BS 53 ENGINE
 NT TF-34 ENGINE
    An iterative finite element-integral technique for
    predicting sound radiation from turbofan inlets in steady flight
[AIAA PAPER 82-0124] p0030 A82-177
Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL
       [AIAA PAPER 81-2637]
                                                        p0020 A82-19214
```

```
Sensor failure detection system --- for the Pi00
     turbofan engine
[NASA-CR-165515] p0023 No
Tests of a D wented thrust deflecting nozzle
                                                                                             p0023 N82-13145
          behind a simulated turbofan engine
          [ NASA-CR-3508]
                                                                                             p0006 NB2-17122
     CF6 jet engine performance improvement: High pressure turbine roundness [NASA-CR-165555] p0024 N82
                                                                                             p0024 NB2-17174
     Comparison of two parallel/series flow turbofan propulsion concepts for supersonic Y/STOL [NASA-TH-82743] p0004 N82-18178
      Effects of fan inlet temperature disturbances on
          the stability of a turbofan engine
     [NASA-TH-82699] p0017 N82-18 dentification of multivariable high performance turbofan engine dynamics from closed loop data [NASA-TH-82785] p0076 N82-20 p0076 N8
                                                                                            p0017 N82-18222
                                                                                            p0076 N82-20339
     Forward acoustic performance of a model turbofan designed for a high specific flow (QF-14) [NASA-TP-1968] p0 152 N82-21036
      Y/STOL Tandem Fan transition section model test
           --- in the Lewis Research Center 10-by-10 foot
          wind tunnel
     [NASA-CR-165587] p0007 N82-
Energy efficient engine shroudless, hollow fan
                                                                                             p0007 N82-21158
           blade technology report
          [ NASA-CR- 165586 ]
                                                                                             p0024 N82-21196
      Energy efficient engine exhaust mixer model
     technology
[NASA-CP-165459]
Turbofan forced mixer-nozzle internal flowfield.
Volume 1: A benchmark experimental study
[NASA-CP-3492]
p0090 N82-22458
      [NASA-CF-3492] p0090 N82-22458
Turbofan forced mixer-nozzle internal flowfield.
           Volume 2: Computational fluid dynamic predictions
          [ NASA-CR-3493]
                                                                                            p0091 N82-22459
     Turbofan forced mixer-nozzle internal flowfield.

Volume 3: A computer code for 3-D mixing in axisymmetric nozzles
          [ NASA-CR-3494 ]
                                                                                             p0091 N82-22460
      Computer modeling of fan-exit-splitter spacing effects on P100 response to distortion
                                                                                             p0025 N82-23246
           [ NASA-CR- 167879]
      Alternatives for jet engine control [NASA-CR-168894]
                                                                                             p0026 N82-23247
      Exhaust emissions survey of a turbofan engine for flame holder swirl type augmentors at simulated altitude flight conditions
           [ NASA-TH-82787]
                                                                                             p0019 N82-25255
      Thrust reverser for a long duct fan engine --- for
      turbofan engines
[NASA-CASI-LEW-13199-1]
Acoustic properties of turbofan inlets
[NASA-CR-169016]
                                                                                             p0019 N82-26293
                                                                                             p0153 N82-27090
      Performance deterioration due to acceptance
           testing and flight loads; JT90 jet engine
           diagnostic program
      [NASA-CR-165572] p0027 N82-27309 Finite element-integral simulation of static and
           flight fan noise radiation from the JT15D
           turbofan engine
      [NASA-TM-82936] p0152
Fough analysis of installation effects on
                                                                                             p0152 N82-31068
           turborrop noise [ NASA-TM-82924]
                                                                                             p0 152 N82-32082
       Automated procedure for developing hybrid computer
           simulations of turbofan engines. Part 1:
           General description
      General description
[NASA-TP-1851]

The CP6 jet engine performance improvement: Low pressure turbine active clearance control
[NASA-CR-165557]

D0029 N82-3:
                                                                                             p0 146 N82-33020
                                                                                             p0029 N82-33393
TURBOG ENERATORS
      Lewis Research Center's coal-fired, pressurized, fluidized-bed reactor test facility
      [NASA-IM-81616] p008
Aluminum blade development for the Mod-OA
200-kilowatt wind turtine
                                                                                             p0087 N82-11397
           [ NASA-TH-82594]
                                                                                             p0119 N82-14633
      New features and applications of PRESTO, a computer code for the performance of
      requerative, superheated steam turbine cycles [NASA-TP-1954] p0119 N82-16
Assessment of steam-injected gas turbine systems
                                                                                             p0119 N82-16477
           and their potential application [NASA-TM-82735]
                                                                                             p0 119 N82-18694
      Experience with modified aerospace reliability and
           quality assurance method for wind turbines
```

```
TURSG-TH-828U3]
                                                             PO 110 NB2-19550
     Performance of a 2D-CD monaxisymmetric extanst
nozzie on a turbojet envine at altitude
        [ NASA-TH-8288 I]
                                                             p0005 #82-26241
TURBOJET REGINES
NT BEISTOL-SIDDELEY BS 53 ENGINE
  NT TURBOPAN ENGINES
NT TURBOPROP EEGINES
    Development of high-speed rolling-element bearings. A historical and technical perspective [NASA-TH-62884] p0100 N82-24497 Furformance of a 2D-CD nonaxisymmetric exhaust
        nozzle on a turbojet engine at altitude
        NASA-TH-828817
                                                             p0005 N82-26241
     Environmental and High-Strain Rate effects on
        composites for engine applications [NASA-TM-82882]
                                                             p0051 N82-31449
TURBONACHINE BLADES
  NT COMPRESSOR BLADES
  HT ROTOR BLADES (TURBOHACHINERY)
NT STATOR BLADES
  NT TURBINE BLADES
     Vibrations of twisted rotating blades
[ASME PAPER 81-DET-127] p0 115 A82-
The influence of Coriolis forces on gyroscopic
                                                             p0 115 A82-19341
        motion of spinning blades
        [ASME PAPER 82-GT-163]
                                                             p0030 A82-35384
     Comparison of beam and shell theories for the
     vibrations of thin turbomachinery blades
[ASME PAPER 82-GT-223] p0 | 15 A82-3540
Interaction of upstream flow distortions with high
                                                             PO 115 A82-35408
        Mach number cascades
[NASA-TM-82759]
                                                             p0003 N82-12043
     Design of supercritical cascades with high solidity
       [NASA-CR-165600]
                                                             p0007 N82-22210
     An experimental investigation of gapwise
    An experimental investigation of gapwise periodicity and unsteady aerodynamic response in an oscillating cascade. 1: Experimental and theoretical results --- turbine blades [NASA-CR-3513]

Computer program for calculating full potential transonic, quasi-three-dimensional flow through a rotating turbomachinery blade row [NASA-TP-2030]

BROWACHTMERRY
TURBORACHIBERY
 NT AXIAL FLOW TURBINES
NT CENTRIPUGAL COMPRESSORS
NT CENTRIPUGAL PUMPS
  NT GAS TURBINES
  NT STEAM TURBINES
  NT TURBINE PUMPS
  MT TURBINES
  ET TURBOCOMPRESSORS
  NT TURBOGENERATORS
  NT WIND TURBINES
     AGT100 turbomachinery --- for automobiles
        [AIAA PAPER 82-1207]
                                                             p0 108 A82-35061
        computational design method for transonic
        turbomachinery cascades [ASME PAPER 82-GT-117]
                                                             p0022 A82-35348
     High-speed laser anemométer system for intrarotor
    flow mapping in turbomachinery
[NASA-TP-1663]
Composite seal for turbomachinery
[NASA-CASE-LEW-12131-3]
                                                             p0095 #82-19521
                                                             p0099 NB2-19540
     Development of a locally mass flux conservative computer code for calculating 3-D viscous flow
        in turbomachines
     [NASA-CH-3539] p0007 NB2-22214
GRID3C: Computer program for generation of C type
multilevel, three dimensional and boundary
conforming periodic grids
        [NASA-CR-167846]
                                                             p0008 N82-26239
     Fully plasma-sprayed compliant backed ceramic
        turbine seal
        [ NASA-CASE-LEW-13268-1]
                                                              p0069 N82-29453
TURBOPROP AIRCRAFT
     A shock wave approach to the noise of supersonic propellers
        [ NASA-TM-82752]
                                                              p0151 #82-16809
     A preliminary comparison between the SR-3
        propeller noise in flight and in a wind tunnel
         [NASA-TM-82805]
                                                             p0152 N82-21998
                                                                      Volume
     Advanced turboprop testbed systems study.
        1: Testbed program objectives and priorities, drive system and aircraft design studies,
        evaluation and recommendations and wind tunnel
        test plans
```

57

CALLED TOTAL SOLICE STATE

```
I NASA-CB-167928-VOL-11
                                                        p0028 N82-32370
TURBOPEOP ENGINES
    Propulsion study for Small Transport Aircraft
   Technology (STAT)
[NASA-CR-165499]
[Valuation of wind tunnel performance testings of an advanced 45 deg swept 8-bladed propeller at Mach numbers from 0.45 to 0.85
                                                        p0022 N82-10037
      [ NASA-CT- 3505 ]
                                                        p0007 N82-19178
    Advanced general aviation comparative
      engine/airframe integration study
                                                        p0025 N82-22263
      [ NASA-CR- 165564]
    Study of advanced propulsion systems for Small
Transport Alccraft Technology (STAT) program
(NASA-CP-165610] p0026 N82-24202
    Future propulsion opportunities for commuter
      airplanes
    pno 18 N82-24203
Summary and recent results from the NASA advanced
High Speed Propeller Research Frogram
[NASA-TM-82891]
    Propulsion opportunities for future commuter
      aircraft.
      [ NASA-TH-82915]
    Bough analysis of installation effects on
      turtorrop noise
[NASA-TM-82924]
                                                        p0 152 N82-32082
    Advanced turboprop testbed systems study. Volum
1: Testbed program objectives and priorities,
drive system and aircraft design studies,
                                                                Volume
       evaluation and recommendations and wind tunnel
       test plans
       f NASA-CP- 167928-VOL-11
                                                        p0028 N82-32370
    Advanced turnoprop testled systems study [NASA-CI-167895]
                                                        p0014 N82-33375
TURROPHERS
 U BRINE PUMPS
TURBOROTORS
 U RBINE WHYELS
TURBULINCE
 NT ISOTROPIC TURBULENCE

HT ELISHA TURBULENCE

Effect of location in an array on heat transfer to
a cylinder in crossflew
[NASA-TM-82797] pc087 N82-194
                                                        PC087 N82-19493
    Three dimensional mean velocity and turbulence
       characteristics in the annulus wall region of an
       axial flow compressor rotor passage
       [ NASA-CF- 169003]
                                                        p0026 N82-25252
    Laser anemometer using a Fabry-Perot
interferometer for measuring mean velocity and
turbulence intensity along the optical axis in
       turbosachinery
       [ NASA-TM-8284 1 ]
                                                        p0095 N82-28605
    Small axial turbine stator technology program [NASA-CR-165602] p0028 N82-32367
    Turbulent solution of the Navier-Stokes equations
      for uniform shear flow [NASA-TM-82925]
                                                        p0089 N82-32634
TURBULEN BOUNDARY LAYER
Turbulent boundary layer heat transfer experiments
- A separate effects study on a convexly-curved
       [ASME PAPER 81-HT-78]
                                                        p0092 A82-10963
    Three dimensional turbulent boundary layer
       development on a fan rotoc blade [AIAA FAPER 82-1007]
                                                        p0011 A82-31965
    Turbulent boundary layer heat transfer experiments: Convex curvature effects including
       introduction and recovery
       [ NASA-CR- 35 10 ]
                                                        p0090 N82-17456
TURBULENT PLOW
 NT CAVITATION FLOW
    On the prediction of swirling flowfields found in
       axisymmetric combustor geometries
                                                        p0029 A82-12120
    Distorted turbulence in axisymmetric flow
                                                        p0089 A82-16071
    Secondary effects in combustion instabilities
      leading to flashback [ATAN FAPER 82-0037]
                                                        p0056 A82-17746
    Characteristics of the flow in the annulus-wall region of an axial-flow compressor rotor blade
       passage
                                                        p0009 A82-17933
       FAIAN PAPER 82-04131
    Time resolved density measurements in premixed
       turbulent flames
       [AIAA PAPER 82-0036]
                                                        p0056 A82-22033
```

```
Numerical analysis of confined turbulent flow
                                                    p0093 A82-24748
    Numerical modelling of turbulent flow in a
      combustion tunnel
   p0093 A82-27000 Numerical modeling of turbulent combustion in
      premixed dases
    Three sensor hot wire/film technique for three
      dimensional mean and turbulance flow field
      measurement
                                                    p0097 A82-30300
   Three-dimensional flow field in the tip region of a compressor rotor passage. II - Turbulence
      properties
   [ASME PAPER 82-GT-234] POOI! A82-35416
Analysis of the decay of temperature figituations
      in isotropic turbulence
                                                    p0089 A82-40781
    Investigations of flowfields found in typical
      combustor geometries
      [ NASA-CR-168585 ]
    Mass and momentum turbulent transport experiments
   with confined coaxial jets
[NASA-CR-165574] p0090 N82-19496
Turbofan forced mixer-nozzle internal flowfield.
Volume 3: A computer code for 3-D mixing in
axisymmetric nozzles
      [ NASA-CR-3494 ]
                                                    p0091 N82-22460
    Three dimensional flow field inside compressor
      rotor, including blade boundary layers [NASA-CR-169120]
                                                    p0091 N82-27686
    Experimental study of turbulence in blade end wall
      corner region
      [ NASA-CR-169283]
                                                    p0091 NB2-31639
   Flow process in combustors
[NASA-CR-169294]
                                                    p0092 N82-31642
TURBULENT JETS
    Turbulence measurements in a confined jet using a
      six-orientation hot-wire probe technique
[AIAA PAPER 82-1262]
TURBULENT MIXING
                                                    p0094 A82-37710
   With confined coaxial jets
[NASA-CE-165574] p0090 N82-19
TURBULENT WAKES
 NT PROPELLER SLIPSTREAMS
    Interaction of compressor rotor blade wake with
    wall boundary layer/vortex in the end-wall region
[ASMM PAPER 81-GR/GT-1] p0010 A82-1930
Effects of blade loading and rotation on
compressor rotor wake in end wall regions
                                                    p0010 A82-19301
      [AIAA PAPER 82-0193]
    [AIAN PAPER 82-0193] p0010 A82-22063 Measurement and prediction of mean velocity and
      turbulence structure in the near wake of an
      airfoil
                                                    p0010 A82-26137
   Numerical analysis and FORTRAN program for the computation of the turbulent wakes of turbomachinery rotor blades, isolated airfoils and cascade of airfoils
      [ HASA-CR-3509]
                                                    p0006 N82-18184
TVC (CONTROL)
U RUST VECTOR CONTROL
 NT MECHANICAL TWINNING
THISTING
    Vibrations of twisted rotating blades
      [ASME PAPER 81-DET-127]
                                                    p0115 A82-19341
TWO DIMENSIONAL PLOW
    Numerical analysis of confined turbulent flow
                                                    p0093 A82-24748
    An example of a solution to transonic equations
      for shock-free flow about a symmetric profile
                                                            AB2-26439
    Investigation of rotational transonic flows
      through ducts using a finite element scheme
[AIAA PAPER 82-1267] p0012 A8
                                                    p0012 A82-37711
    Aerodynamic performance of high turning core
    turbine vanes in a two-dimensional cascade [AIAA PAPER 82-1288] p0005 At Aerodynamic performance of high turning core turbine vanes in a two dimensional cascade
                                                    p0005 A82-37716
      [NASA-TM-82894]
                                                    p0004 N82-26240
    Plow visualization study of the horseshoe vortex
      in a turbine stator cascade
      [NASA-TP-1884]
                                                     p0088 W82-30498
TWO PRASE PLOW
    Toward the use of similarity theory in two-phase
```

OPPER ATMOSPHERE

NT MESOSPHERE

```
choked flows
   p0089 A82-16570
Two dimensional stagnation point flow of a dusty
     was mear an oscillating plate
   p0012 A82-37535 Flows through sequential orifices with heated
     spacer reservoirs
     [ NASA-TM-82855 ]
                                                POC88 N82-24455
   The drycut region in frictionally heated sliding
     contacts
     [ NASA-TH-82796]
                                                 p0088 N82-28574
TWO BEFLECTOR ANTENNAS
   Focal surfaces of offset dual-reflector antennas
                                                p0080 A82-36265
UDINET ALLOYS
   Effects of cobalt on the microstructure of Udinat
     700
     [ NASA-CP- 165605]
                                                 p0064 N82-28409
ULTRAHIGH VACOUM
   Anagrobic polymers as high vacuum leak sealants
                                                p0 108 A82-21967
ULTRASCRIC DENSIRETERS
   Eltrasonic velocity for estimating density of
     structural ceramics
     [ NASA-TF-82765]
                                                 p0066 N82-14359
ULTRASONIC FLAW DETECTION
   Acoustic microscopy of silicon carbide materials
                                                p0075 A92-33031
   On ultrasonic factors and fracture toughness
                                                p0116 A82-42863
ULTRASCHIC RADIATION
   Ultrasonic input-output for transmitting and
     receiving longitudinal transducers coupled to
     same face of isotropic elastic plate [NASA-CE-3506]
                                                p0110 N82-18613
ULTENSORIC TESTS
   Ultrasonic velocity for estimating density of
   structural cerarics
[NASA-TM-82765] p006
Interrelation of material microstructure,
                                                 p0066 N82-14359
      ultrasonic factors, and fracture toughness of
      two phase titanium alloy
                                                 p0110 N82-20551
      F NASA-TM-828101
   Ultrasonic scanning system for imaging flaw growth
      in composites
      [ NASA-TH- 62799 ]
                                                 p0076 N82-22386
ULTRASONIC WAVES
U TRASONIC RADIATION
ULTRAVIOLET HADIATION
 NT FAB ULTRAVIOLET RADIATION
ULTRAVIOLET SPECTRA
   Ultraviolet observations of the 1980 eclipse of the symbiotic star CI Cyqni
                                                        482-21331
UNDERGEOUND STRUCTURES
   Assessment of a 40-kilowatt stirling engine for underground mining applications
      [ NASA-TM-82822]
                                                 P0125 NB2-30714
UNIFORM PLOW
   Conversion of acoustic energy by lossless liners
                                                 p0 154 A 82-36 195
   Turbulent solution of the Navier-Stokes equations
      for uniform shear flow
      [ NASA-TM-82925]
                                                 pC089 NB2-32634
UBIPOLAR THANSISTORS
U ELC EFFECT TRANSISTORS
UNITED STATES OF AMERICA
 NT KENTUCKY
UNLOADING WAVES
   Indentation law for composite laminates
     [ NASA-CR- 165460 ]
                                                 p0052 N82-15123
UNSTRADY PLOW
 NT CSCILLATING FLOW
   Sclutions of the compressible Navier-Stokes equations using the integral method [AIAA FAPER 81-0046] p0093 1
                                                 p0093 A82-23832
    An experimental investigation of gapwise
     near experimental investigation of gapwise periodicity and unsteady aerodynamic response in an oscillating cascade. 1: Experimental and theoretical results --- turbine blades [NASA-CR-3513] p0008 N82-262
```

Interaction of upstream flow distortions with high

Mach number cascades p0003 ¥82-12043 [NASA-TH-82759] USER MANUALS (COMPUTER PROGRAMS) Spherical roller bearing analysis. SKF computer program SPHERBEAN. Volume 2: User's manual MASA-CR-165204] p0106 NB2-20541 High speed cylindrical roller bearing analysis. SKF computer program CYBEAN. Nolume 2: User's manual MANUAL [MASA-CR-165364] FOR COMPUTER PARTIES TO COMPUTER PARTIES PARTIES TO COMPUTER PARTIES PARTI Research report: program ATSTY005. PLANETSYS, a computer program for the steady state and transient thermal analysis of a planetary power transmission system [NASA-CR-105366] p0146 H82-3197 p0 146 N82-31970 DTILITIES Interfacing wind energy conversion equipment with utility systems Evaluation of present thermal barrier coatings for potential service in electric utility gas turbines [NASA-CR-165545] p0063 #82-18368 Phosphoric acid fuel cell technology status
[PASA-TM-82791] p0120 N82-19670 UTILIZATION DT COAL UTILIZATION MT LASER APPLICATIONS MT WASTE ENERGY UTILIZATION MT WINDPOWER UTILIZATION Y BAND U TREKELY HIGH PREQUENCIES V GROOVES High voltage V-groove solar cell [HASA=CASE-LEN- 1340 1-2] p0 123 N82-24717 V/STOL AIRCRAFT NT HELICOPTERS MT VERTICAL TAKEOFF AIRCRAFT Y/STOL propulsion control technology
[AIAA PAPER 81-2634] p0029 A82Comparison of two parallel/series flow turbofan
propulsion @sheepts for supersonic Y/STOL p0029 A82-16909 [AIAA PAPER @1-2637] p0020 A82-19214 A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[AIAA PAPER 81-2663] p0020 A82-192
Experimental and analytical results of tangential p0020 A82-19221 blowing applied to a subsonic V/STOL inlet [AIAA PAPER 82-1084] p0005 A p0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921 Low speed testing of the inlets designed for a tanden-fan V/STOL nacelle --- conducted in the Revis 10 by 10 foot wind tunnel [PASI-TH-82728] p0003 882-1 p0003 N82-11042 A Bulmary of V/STOL inlet analysis methods p0003 N82-11043 [NASA-TH-82725] Thrust modulation methods for a subsonic Y/STOL aircraft [NASA-TH-82747] p0003 N82-13112 A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation [NASA-TH-82770] p0016 N82-13144 Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL [WASA-TM-82743] p0004 N82-18178 V/STOL Tandem Fan transition section model test
--- in the Lewis Research Center 10-by-10 foot wind tunnel [NASA-CR-165587] p0007 N82-21158 Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet p0004 N82-24165 [NASA-TH-82847] A summary of V/STOL inlet analysis methods [NASA-TM-82885] p0005 M82-28249 VACANCIES (CRYSTAL DEFECTS)
On the cause of the flat-spot phenomenon observed in silicon solar cells at low temperatures and low intensities [NISA-TM-82903] p0 126 182-31777 VACUUE NT HIGH VACUUM NT ULTRAHIGH VACOUM VACUUM APPARATUS NT MOLECULAR PUMPS VACUUM DEPOSITION

Refractory coatings and method of producing the same

p0008 N82-26229

))

```
[ N F3-CASE-LEW- 13169-1]
                                                     p0060 N82-29415
                                                                                   VASCULAR SYSTEM
VACUUM NETS:
PEFFUE TO VACUUM exhaust pressure on the
DET TO THE VACUUM exhaust pressure on the
DET TO THE BECORDS

PO 157

PA 14A PAPER 82-0295)

PO 157
                                                                                     BT AORTA
                                                                                    TCE
                                                                                     U RIABLE CYCLE ENGINES
                                                                                    VECTOR ANALYSIS
                                                     p0157 A82-20292
    Program of vacuum exhaust pressure on the per number of BHD ducts at high Defield
                                                                                        acceleration of convergence of vector sequences
                                                                                                                                         p0 149 E82-29075
                                                                                          [NASA-TH-82931]
                                                                                   VECTOR SPACES
HT EIGENVALUES
HT EIGENVECTORS
      TND. . . TH-82750]
                                                      p0157 M82-13908
VACUUM PURPS
NT HOIECULAR PUMPS
VACUUM TUBE OSCILLATORS
                                                                                   ET HATRICES (HATHEMATICS)
ET VECTORS (HATHEMATICS)
VECTORS (MATHEMATICS)
 NT KLYSTROWS
 HT MAGNETRONS
                                                                                     NT EIGENVECTORS
  NI TRAVELING WAVE TUBES
VACUUM TUBES
                                                                                        Acceleration of convergence of vector sequences
                                                                                          [NASA-TH-82931]
                                                                                                                                         p0149 #82-29075
 NT KLYSTROKS
                                                                                    VELOCITY
  NI MAGRETECHS
NT TRAVELING WAVE TUBES
VACUUM ULTRAVIOLET RADIATION
U R ULTBAVIOLET RADIATION
                                                                                     MT ACOUSTIC VELOCITY
                                                                                     MT PLOW VELOCITY
MT HIGH SPEED
VANADIME COMPOUNDS
                                                                                     NT PROPAGATION VELCCITY
                                                                                     MT ROTOR SPEED
    Moderate temperature Na cells, III -
      Electrochemical and structural studies of Cr0.5v0.5s2 and its Wa intercalates
                                                                                     MT SUBSONIC SPEED
                                                                                     MT SUPERSONIC SPEEDS
                                                      p0055 A82-15732
                                                                                     NT TIP SPEED
                                                                                     NT WIND VZLOCITY
Small passenger car transmission test: Chevrolet
Halibu 200C transmission with lockup
[MASA-CR-165182] p0105 M82-16
VANES
 NT GUIDE VANES
 NT JET VANES
Aerodynamic performance of high ture ing core
                                                                                                                                         p0105 N82-16410
      turbine vanes in a two-dimensiona hascade
[AIAA FAPER 82-1288] 0005 A
                                                                                        Small passenger car transmission test: Mercury
                                                                                    Lynk ATX transmission [NASA-CR-165510]
VELOCITY COUPLING
                                                       0005 A82-37716
    Gas turbine ceramic-coated-vane concept with
                                                                                                                                         p0 106 N82-24496
       convection-cooled porous metal core
      [ NASA-TP- 1942]
                                                      p0016 N82-14090
                                                                                        Coupled cavity traveling wave tube with velocity
    Method of protecting a surface with a silicon-clurry/aluminide coating --- coatings
                                                                                          tapering
TWASA-CASE-LEW-12296-11
                                                                                                                                         p0082 N82-26568
      for gas turbing engine blades and vanes
[NASA-CASE-LEW-13343-1] p0066
                                                                                    VELOCITY DISTRIBUTION
                                                      p0068 N82-28441
                                                                                        The effect of inflow velocity profiles on the
VAPOR DEPOSITION
                                                                                       performance or Supellocate Type 10002 A81-32240 [AILA PAPER 81-0273] p0002 A81-32240 Multigrid simulation of asymptotic curved-duct flows using a semi-implicit numerical technique p0010 A82-29003
                                                                                          performance of supersonic ejector nozzles
  NT VACUUM DEPOSITION
    Experimental and theoretical studies of the laws
       governing condensate deposition from combustion
       qases
                                                      P0057 A82-28709
                                                                                        Three dimensional turbulent boundary layer
    An experimental study of airfoil icing
                                                                                          development on a fan rotor blade
      characteristics
                                                                                          [ATAA PAPER 82-1007]
                                                                                                                                          p0011 182-31965
      [ BASA-TM-82790]
                                                                                        Investigation of the tip-clearance flow inside and
                                                      p0001 N82-17083
VAPOR GENERATORS
                                                                                           at the exit of a compressor rotor passage. I
                                                                                          Mean velocity field [ASME PAPER 82-GT-12]
  U PORIZERS
VAPOR PHASE EPITARY
                                                                                                                                          p0011 A82-35281
    ON-VPE growth of Mg-doped Gals ---
OrganoMetallic-Vapor Phase Epitaxy
                                                                                        Velocity gradient method for calulating velocities in an axisymmetric annular duct
                                                      p0159 A82-38411
                                                                                          [ NASA-TP-2029 ]
                                                                                                                                         p0005 N82-29270
                                                                                        Development and utilization of a laser velocimeter
    Transient catalytic combustor model [NASA-CF-165324]
                                                                                           system for a large transonic wind tunnel
                                                      p0129 N82-13507
                                                                                          [NASA-TM-82886]
                                                                                                                                         p0095 N82-31663
VAPORIZERS
                                                                                    VELOCITY FIELDS
    Experimental study of external fuel vaporization [ASME FAPER 82-GT-59] p0075 A82-3
                                                                                    U LOCITY DISTRIBUTION VELOCITY ERASUREMENT
                                                      p0075 A82-35312
    Retrofit and acceptance test of 30-cm ion thrusters
                                                                                        Measurement and prediction of mean velocity and
      [ NASA-CF- 165259]
                                                      p0044 N82-12133
                                                                                           turbulence structure in the near wake of an
VAPORIZING
 UT EOILING
                                                                                                                                          p0013 A82-26137
  HT COAL GASIFICATION
                                                                                        The velocity field near the orifice of a Helmholtz
 HIT FLASHING (VAPORIZING)
HIT PROPELLAND EVAPORATION
Electrostatic fuel conditioning of internal
combustion engines
[NASA-CP-169029]
p0106 N
                                                                                        resonator in grazing flow
[NASA-CR-168548] p0153 N82-
Comparison of laser anemometer measurements and
theory in an annular tyrbine cascade with
experimental accuracy determined by parameter
                                                                                                                                          P0153 N82-18994
                                                      p0106 N82-26680
                                                                                           estimation
                                                                                           [NASA-TH-G2860]
    High-speed motion picture camera experiments of
      cavitation in dynamically loaded journal bearings
                                                                                        Laser anemometer using a Pabry-Perot
       [ NASA-TH-82798]
                                                      p0 100 N82-20543
                                                                                           interferometer for measuring mean velocity and
VARIABLE CYCLE ENGINES
                                                                                           turbulence intensity along the optical axis in
    V/SICL Tandem Fan transition section scdel test
--- in the Lewis Research Center 10-by-10 foot
                                                                                           turbomachinery
                                                                                           [ NASA-TH-8284 11
                                                                                                                                          D0095 N82-28605
       wind tunnel
                                                                                        Development and utilization of a laser velocimeter
                                                                                           system for a large transonic wind tunnel
       [ NASA-CR-165587]
                                                      p0007 N82-21158
VARIABLE GECKETRY STRUCTURES
                                                                                           [NASA-TM-82886]
                                                                                                                                          p0095 N82-31663
    Pollution reduction technology program small jet
                                                                                    VELOCITY PROFILES
aircraft engines, phase 3
[NASA-CE-165386]
VARIANCE (STATISTICS)
NT BIVARIATE ANALYSIS
NI MULTIVAPIATE STATISTICAL ANALYSIS
                                                                                     U LOCITY DISTRIBUTION
                                                      p0023 N82-14095
                                                                                    VENTURI TUBES
                                                                                    Venturi nozzle effects on fuel drop size and
nitrogen oxide emissions
[NASA-TP-2028] p0020 N
                                                                                                                                          p0020 N82-31329
VARIATIONS
  HT ANNUAL VARIATIONS
                                                                                        Aerodynamic analysis of VTOL inlets and definition
  NT MAGNETIC VARIATIONS
                                                                                           of a short, blowing-lip inlet
```

[NASA-CR- 1656 17]

P0007 NB2-22211

U PCRIZING

ORIGINAL PAGE IS OF POOR QUALITY

```
VIBRATION
 NT PENDING VIBRATION NT FLUTTER
 NT FORCED VIERATION
HT FP EE VIERATION
HT FESSMANT VIERATION
 NT STRUCTURAL VIBRATION
 NT TRANSONIC PLUTTER
VIBRATION DAMPERS
U PRATICM ISOLATORS
   Aerodynamic damping measurements in a transonic
      centressor
      TASKE PAPER 82-GT-2871
                                                 DC012 A82-35459
   Analysis of high load dampers
      [ NASA-CP- 165503]
                                                 p0026 N82-23248
VIBRATION ISOLATORS
   Analysis of high load dampers
     [ NASA-CR- 165503]
                                                 p0026 #82-23248
VIBRATION HODE
   Vibrations of twisted rotating blades
[ASME FAPER 81-DET-127]
                                                 p0 115 A82-1934 I
   Nonlinear analysis of rotor-bearing systems using component mode synthesis
      [ ASME PAPER 82-GT-303 ]
                                                 p0104 A82-35468
    Advanced superposition methods for high speed
turbopump vibration analysis
[NASA-CR-165379]
VIBRATION PROTECTION
                                                 p0104 W82-11465
U ERATICE ISOLATORS VIBRATION TESTS
   Vibration analysis of three guyed tower designs
      for intermediate size wind turbines
      [ NASA-CR- 1655891
                                                 p0137 N82-30709
VISCOPLASTIC FLOW
U SCOFLASTICITY
 NT THER HOVISCOBLASTICITY
   Motion of a rigid punch at the boundary of an
      orthotropic viscoelastic half-plane
                                                        182-26436
VISCOPLASTIC FLOW
 U SCOPLASTICITY
VISCOPLASTICETY
   On a study of the /Delta T/c and C/asterisk/
integrals for fracture analysis under noc-steady
      creep
                                                 p0115 A82~36782
   Research and development program for non-linear
      structural modeling with advanced
      time-temperature dependent constitutive
      relationships
                                                 p0024 N82-16080
      F NASA-CD- 1655331
   Nonlinear constitutive theory for turbine engine
      structural analysis
                                                 p0112 N82-33744
   Some observations in high pressure rhaology of
      lubricants
   [ASME PAPER 81-LUB-17] p0070 A82-
Some observations in high pressure rheology of
                                                 p0070 A82-18432
      lubricants
      [ ASME FAPER 8 1-LUB-17]
                                                 p0070 A82- 18432
VISCOUS PLOW
 NT EOUNCARY LAYER FLOW
 NT BOUNDARY LAYER SEPARATION
 NT SECONDARY FLOW
 NT SEPARATED PLOW
   A study of viscous flow in stator and rotor passages
[ASME FAPER 82-GT-248] p0011 A82-35427
Computational methods for internal flows with
emphasis on turbomachinery
      [ NASA-TM-82764]
   Development of a locally mass flux conservative
      computer code for calculating 3-D viscous flow
      in turbomachines [NASA-CR-3539]
                                                 p0007 N82-22214
   A new numerical approach for compressible viscous
      flows
      [ NASA-CR- 168842]
                                                p0090 N82-22455
   The design and instrumentation of the Purdue
      annular cascade facility with initial data
nandal cased an analysis nasa-cr-167861]
VISUALIZATION OF PLOW
U OW VISUALIZATION
                                                 pC008 N82-26237
VOLATILIZATION
```

```
VOLCABORS
   Aircraft sampling of the sulfate layer near the
     tropopause following the ecuption of Mount St.
     Helens
                                              DO 140 A82-37450
VOLT-AMPERE CHARACTERISTICS
   Numerical simulation of sheath structure and
     current-voltage characteristics of a
     conductor-dielectric disk in a plasma
                                              p0040 A82-15904
   End region and current consolidation effects upon
     the performance of an HHD channel for the ETF conceptial design --- Engineering Sest Pacility
     FATAN PAPER 82-03251
                                              p0 157 A82-17889
   Impedance conversion using quantum limit
     nonreciprocity for superconductor mixer
     compensation
                                              p0 159 A82-31276
   Advances in high output voltage silicon solar cells
                                             p0127 182-44942
   On the cause of the flat spot phenomenon observed in silicon solar cells at low temperatures and low intensities
                                              p0044 A82-44965
   Modeling the full-bridge series-resonant power
     converter
                                              p0086 A82-46385
U ECTRIC POTENTIAL
VOLTAGE CONVERTERS (DC TO DC)
   A new approach to the minimum weight/loss design
     of switching power converters
                                              p0082 A82-16831
   High-frequency high-voltage high-power DC-to-DC
     converters
                                              p0083 N82-12347
   Modeling and Analysis of Power Processing Systems
     (MAPPS). Volume 1: Technical report
[NASA-CR-165538]
                                              P0083 M82-14447
   Simplified dc to dc converter
     [ NASA-CASE-LEW- 13495-1]
                                              p0082 #82-24432
VOLTAGE GREERATORS
NT PHOTOVOLTAIC CELLS
VOLTAGE REGULATORS
   Modeling and Analysis of Power Processing Systems (MAPPS). Volume 1: Technical report [NASA-CR-165538] p0003 N82-144
                                              P0083 N82-14447
VORTEX COLUMNS
 U RTICES
VORTEX DISTURBANCES
U RTICES
VORTEX PLOS
U RTICES
 U RTICES
VORTICES
   Propeller tip vortex - A possible contributor to
     aircraft cabin noise
                                              p0 152 A82-17603
   Application of a finite element algorithm for the
     solution of steady transonic Euler equations
[ATAA PAPER 82-0970] p0010 A82-31939
   Plow visualization study of the horseshoe vortex
     in a turbine stator cascade
     [ NASA-TP-1884 ]
                                              p0088 N82-30498
   Turbine endwall single cylinder program
                                              p0091 N82-31638
     [ NASA-CR-169278]
   Flow process in combustors
[NASA-CR-169294]
                                              p0092 #82-31642
VIOL AIRCRAFT
 U RTICAL TAKEOFF AIRCRAPT
```

W

TAPERS

Method of making a high voltage V-groove solar cell

[NASA-CASE-LEW-1340 I-1] p0124 N82-29709

Development of a large area space Holar cell

assembly

[NASA-CR-167929] p0 137 N82-30706

High voltage planar multijunction solar cell

[NASA-CASE-LEW-13400-1] p0 125 N82-31764

SAMES

NT LAMINAR WAKES

NT LAMINAR WAKES

NT PROPELLER SLIPSTREAMS

NT TURBULENT WAKES

ORIGINAL PAGE IS OF POOR QUALITY

```
The NASA-LeRC wind turbine sound prediction code p0 123 W82-23730
                                                                                      MATER PLON
                                                                                          Dynamics of snow cover in mountain regious of the
                                                                                             Aral Sea basin, studied using satellite
   Turbulent boundary layer heat transfer experiments
                                                                                             photographs
      - A separate efforts study on a convexly-curved
                                                                                                                                                       A82-27462
                                                                                       WAVE ATTREVATION
   [ASME FAPER BI-HT-78] p0092 182-10 Hoat transfer in cooled porous region with curved
                                                                                      NT ACOUSTIC ATTENUATION NT SHOCK WAVE ATTENUATION WAVE DIFFRACTION
      boundary
   pg089 A82-14848
Interaction of compressor rotor blade wake with
                                                                                           Diffraction by a finite strip
                                                                                                                                               p0150 A82-33605
      wall boundary layer/vortex in the end-wall region [ASME PAPER 81-GR/GT-1] p0010 A82-1930
                                                                                          Investigation of a coab-type slow-wave structure
                                                       p0010 A82-19301
   Effects of blade loading and rotation on compressor rotor wake in end wall regions [ALMA FAPER 82-3193] p0010
                                                                                             for millimeter-wave masers
                                                                                                                                                       A82-18368
                                                       p0010 A82-22063
                                                                                       WAVE EQUATIONS
   Numerical analysis of confined turbulent flow
                                                                                          Effects of internal heat transfer on the structure of self-similar blast waves
   p0093 A92-24748
Three-discussional flow field in the tip region of
                                                                                                                                               n0093 182-32225
      a compressor rotor passage I - Mean velocity profiles and annulus wall boundary layer
                                                                                           Diffraction by a Cluite strip
                                                                                                                                               PO 150 A 82-33605
   [ASME FAPER 82-GT-11] P0011 A82-35280 Three-dimensional flow field in the tip region of
                                                                                           The transmission or scattering of elastic waves by
                                                                                             an inhomogeneity of simple geometry:
                                                                                      C()MPATISON OF theories
['JASA-CR-)69034]
WAVE //WTERACTION
NT SHOCK WAVE INTERACTION
      a compressor rotor passage. II - Turbulence
      properties
                                                                                                                                               p0079 N82-26526
   [ASME PAPER 82-GT-234] p0011 A82-35416
Analytic investigation of effect of end-wall
contouring on stator performance
[NASA-TP-1943] p0003 N82-14051
                                                                                           Soupled cavity traveling wave tube with velocity
                                                                                              tapering
    Development of a simplified procedure for thrust
                                                                                             [ NASA-CASE-LEW- 12296-1]
      chamber life prediction [NASA-CF-165585]
                                                                                       WAVE PROPAGATION

NT ACOUSTIC PROPAGATION

NT LIGHT SCATTERING
   Three dimensional mean velocity and turbulence characteristics in the annulus wall region of an axial flow compressor rotor passage [NASA-CR-169003] p0026 N82-252
                                                                                        NT SHOCK WAVE PROPAGATION
                                                                                           Methods for the calculation of axial wave numbers in lined ducts with mean flow
                                                       p0026 N82-25252
   Comparison of experimental and analytical performance for contoured endwall stators [NASA-TH-62077] p0019
                                                                                                                                               p0 153 A82-14044
                                                                                           Generation of instability waves at a leading edge
                                                                                           [NASA-TM-62835] p0087 N62-224
The transmission or scattering of elastic waves by
                                                                                                                                              p0087 N82-22453
                                                        p0019 N82-26299
    Velocity gradient method for calulating velocities
                                                                                       an inhomogeneity of simple geometry: A comparison of theories [NASA-CR-169034] p007
      in an axisymmetric nonular duct [NASA-TP-2029]
                                                        p0005 N82-29270
WALL PERSSORE
                                                                                                                                               p0079 N82-26526
    A simplified design procedure for life prediction of rocket thrust chambers
                                                                                        NT LIGHT SCATTERING
NT RAMAN SPECTRA
      [ AX AA FAPER 82-1251]
                                                        p0043 A82-35087
    Experimental study of turbulence in blade end wall
                                                                                        NT RAYLEIGH SCATTERING
      corner region
[NASA-CP-169283]
                                                                                        YT TROPOSPHERIC SCATTERING
                                                        pC091 N92-31639
                                                                                           The transmission or scattering of elastic waves by
                                                                                             an inhomogeneity of simple questry: A comparison of theories [NASA-CR-169034] p007
WALL TEMPERATURE
    A heat exchanger computational procedure for
   temperature-dependent fouling
[ASME PAPER 81-HI-75] p0092 A82-1096
Tube entrance heat transfer with deposit formation
                                                                                                                                               p0079 NB2-26526
                                                        p0092 A82-10961
                                                                                       BAVEFORMS
                                                                                           Ultrasonic input-output for transmitting and receiving longitudinal transducers coupled to same face of isotropic elastic plate
      [ AIAA PAPER 82-0918]
                                                        p0093 A82-31908
                                                                                                                                               p0110 N82-18613
 NT NOZZLE WALLS
                                                                                              [ NASA-CR-3506 ]
 NT FORCUS WALLS
                                                                                       WAVEGUIDES
                                                                                           Coupled cavity traveling wave sube with velocity
 NT THIN WALLS
WARREL ENGINES
Advanced general aviation engine/airframe
                                                                                             tapering [NASA-CASE-LEW-12296-1]
                                                                                                                                               D0082 N82-26568
       integration study
      [ NASA-CR- 165565]
                                                        p0025 N82-22268
                                                                                           Application of surface analysis to solve problems
    Real time pressure signal system for a totary engine [NASA-CASE-LEW-13622-1] p0019 N82-26294
                                                                                              [ NASA-TH-82753]
                                                                                                                                               p0099 W 4519
    Advanced stratified charge rotary aircraft engine
                                                                                           Elucidation of wear mechanisms by ferrograph
      design study
[ NASA-CR-165398]
                                                                                              analysis
                                                                                                                                               p0066 £82-15199
                                                                                              F WASA-TH-827371
                                                        p0 107 N82- 27743
                                                                                           Effects of artificially produced defects on film
thickness distribution in sliding BHD point
WARRING
 O ATING
WASPALOY
                                                                                              contacts
    Microstructural effects on the room and elevated
                                                                                              [ NASA-TH-82732]
      temperature low cycle fatique behavior of Waspaloy
[NASA-CR-165497] p0113 N82-26702
                                                                                           Tribological properties at 25 C of seven polyimide films bonded to 440 C high-temperature stainless
                                                        n0113 N82-26702
WASTE DISPOSAL
                                                                                              steel
                                                                                           [NASA-TP-1944]
Surface chemistry and wear behavior of single-crystal silicon carbide sliding against iron at temperatures to 1500 C in vacuum p0067 N82-19374
    Femsibility of an earth-to-space rail launcher
       system --- emphasizing nuclear waste disposal
      application
[IAF PAPER 82-46]
WASTE EMERGY UTILIZATION
                                                                                           Friction wear and auger analysis of iron implanted with 1.5-MeV nitrogen ions
[NASA-TP-1989] p0059 N82-213
    Collection and dissemination of thermal energy
       storage system information for the pulp and
       paper industry
                                                                                                                                               p0059 N82-21300
```

A- 123

p0136 N82-24686

HISTES

WATER CONTENT U ISTURE CONTENT

NT INCUSTRIBL WASTES

NT RADIOACTIVE WASTES

Tribological characteristics of mitrogen (#+)

Tooth profile analysiis of circular-cut, spiral-bevel gears

p0060 N82-24322

p0101 #82-26681

implanted iron

[NASA-TH-828391

[NASA-TH-82840]

```
The dryout region in frictionally heated sliding
                                                                                 WIDEBAND COMMUNICATION
                                                                                     Open-loop nanosecond-synchronization for wideband satellite communications
      contacts
      [ NASA-TH-82796]
                                                    pCC88 N82-28574
   Poundary lubrication: Revisited [NASA-TM-82858]
                                                                                                                                      p0036 162-27224
                                                    p0069 W82-29458
                                                                                     Wideband, high speed switch matrix development for
   Refractory coatings
[NASA-CASE-LEW-13169-2]
                                                                                        SS-TDMA applications
                                                    p0061 W82-30371
                                                                                                                                      p0086 A82-43784
                                                                                     Cross-impact study of foreign satellite communications on NASA's 30/20 GHz program
   Plastic deformation and wear process at a surface
      during unlubricated sliding
      [ NASA-TH-82820 ]
                                                    p0102 N82-32735
                                                                                        [ NASA-CR-165154 ]
                                                                                                                                      p0078 M82-17420
   Wear mechanism based on adhesion [NASA-IP-2037]
                                                                                 BIGHTHAN THEORY
                                                                                 U ELD THEORY (PHYSICS)
                                                    p0103 N82-32737
WEAR INHIBITORS
   Composite seal for turbemedinery [ MASA-CASE-LEW-12131-3]
                                                                                  U MOSPHERIC CIRCULATION
                                                    p0099 N82-19540
                                                                                 BIED REERGY
WEAR TRATS
                                                                                   U NDPOWER UTILIZATION
   Effect of gamma irradiation on the friction and
                                                                                 WIND SHEAR
      wear of ultrahigh molecular weight polyethylene
                                                                                     Effect of heavy rain on aircraft
                                                    p0062 A82-10674
                                                                                                                                              NB2-21149
   The effect of oxygen concentration on the
                                                                                 WIND TUNNEL APPARATUS
     boundary-lubricating characteristics of a C ether and a polyphenyl ether to 300 C
                                                                                     The design and instrumentation of the Purdue
                                                                                       annular cascade facility with initial data acquisition and analysis
                                                    p0070 A82-21699
                                                                                 [ HASA-CR-167861]
WIND TUNNEL BALANCES
U ND TUNNEL APPARATUS
   Development of CdO-graphite-Ag coatings for gas
                                                                                                                                      p0008 N82-26237
      bearings to 427 C
   Elucidation of wear mechanisms by ferrographic
                                                                                 WIND TUNNEL MODELS
      analysis
                                                                                     Thrust modulation methods for a subsonic V/STOL
       NASA-TM-82737]
                                                    p0066 NB2-15199
                                                                                        aircraft
   Priction and wear of iron in corros; we metal [NASA-TP-1985] p0058 N
                                                                                 [NASA-TH-82747] p0003 M82-1.
WIND TUNNEL TESTS
Propeller tip vortex - A possible contributor to
                                                                                                                                      D0003 M82-13112
                                                    p0058 N82-20291
   Sputtered silicon nitride coatings for wear
      protection
                                                                                        aircraft cabin noise
      [NASA-TH-82819]
   Inbricant effects on efficiency of a helicopter
                                                                                     Aerodynamic characteristics of airfolls with ice
      transmission [NASA-7M-82857]
                                                                                        accretions
                                                     DO 100 N82-25520
                                                                                                                                      p0010 A82-22081
                                                                                        [AIAA PAPER 82-0282]
   Occurre ce of spherical ceramic debris in indertation and sliding contact
                                                                                     In-flight acoustic results from an advanced-design
                                                                                        propeller at Mach numbers to 0.8
      [ NACA-TP-2048]
                                                                                     [AIAA PAPER 82-1120] p0021 As A remote millivolt multiplexer and amplifier
                                                    p0C69 N82-32491
                                                                                                                                      p0021 A82-35017
   Effect of heavy rain on aircraft
                                                                                        module for wind tunnel data acquisition
                                                            N82-211/9
                                                                                                                                      p0083 A82-41845
                                                                                     Icing tunnel tests of a composite porous leading edge for use with a liquid anti-ice system ---
WEATHER CONDITIONS
 U ATHER
                                                                                     Lewis icing research tunnel
[NASA-CR-164966] p0014 N82-11052
Study of controlled diffusion stator blading. 1.
Aerodynamic and mechanical design report
WEATHER PORECASTING
   The NASA MERIT program - Developing new concepts for accurate flight planning
      [ AI AA PAPER 82-0340 ]
                                                    p0014 A82-17894
    NASA research programs responding to workshop
                                                                                        [ NASA-CR-165500 ]
                                                                                                                                      p0024 #82-16081
      recommendations
                                                                                      An experimental investigation of gapwise
                                                                                     An experimental investigation of gapwise periodicity and unsteady aerodynamic response in an oscillating cascade. Volume 2: Data report. Part 1: Text and mode 1 data [NASA-CR-165457-VOL-2-PT-1] p0006 N82-1816 Application of an airfoil stall flutter computer prediction program to a three-dimensional wing: Prediction versus experiment [NASA-CR-168586] p0007 N82-1916 Evaluation of wind tunnel performance testings of
                                                            N82-21146
WEATHER FROMTS
U CNIS (METEOROLOGY)
WEATHER MODIFICATION
                                                                                                                                      p0006 N82-18180
 NT FOG DISPERSAL
NT LIGHTNING SUPPRESSION
WEATHERING
   Environmental effects on sclar concentrator virrors
                                                            182-23394
                                                                                      Evaluation of wind tunnel performance testings of
                                                                                        an advanced 45 deg swept 8-bladed propeller at Mach numbers from 0.45 to 0.85
WEBS (MEMBRANES)
O MERANÉS
                                                                                        [ NASA-CR-3505 ]
WEDGES
    Elastic-plastic finite-element analyses of
                                                                                      V/STOL Tandem Fan transition section model test
      thermally cycled single-edge wedge specimens
                                                                                        --- in the Lewis Research Center 10-by-10 foot
      [ NASA-TP- 1982]
                                                                                        wind tunnel
                                                    p0111 N82-20565
    Elastic-plastic finite-elevent analyses of
                                                                                        [ NASA-CR- 165587 ]
                                                                                                                                       p0007 N82-21158
      thermally cycled double-edge wedge specimens [NASA-TP-1973] p0111 N82
                                                                                      A preliminary comparison between the SR-3
                                                    p0111 N82-20566
                                                                                        propeller noise in flight and in a wind tunnel
WEIGHT (MASS)
NT STRUCTURAL WEIGHT
                                                                                     [NASA-TH-82805] p0 15
An experimental investigation of gapwise
                                                                                                                                       p0152 N82-21998
                                                                                        periodicity and unsteady aerodynamic response in
an oscillating cascade. I: Experimental and
theoretical results --- turbine blades
WEIGHT REDUCTION
   Power system design optimization using Lagrange
      multiplier techniques
                                                     p0085 A82-20743
                                                                                        [NASA-CR-3513]
                                                                                                                                       p0008 N82-26229
WELDING
                                                                                     Turbine endwall single cylinder program
 NT DIFFUSION WELDING
                                                                                                                                       p0091 M82-31638
                                                                                        [NASA-CR-169278]
WETHESS
                                                                                  WIND TUNNELS
                                                                                   NT CASCADE WIND TUNNELS
NT COMBUSTION WIND TUNNELS
 U TSTURE CONTENT
 NT COUNTER-FOTATING WHEELS
                                                                                   NT SHOCK TURNELS
 NT FLYWHEELS
                                                                                   NT SUPERSONIC WIND TUNNELS
 NT TURBINE WHEELS
                                                                                   NT TRANSONIC WIND TUNNELS
WHIBL INSTABILITY
U TARY STABILITY
PHISKER COMPOSITES
                                                                                  WIND TURBINES
                                                                                     Winding for the wind
                                                                                                                                       p0138 A82-37078
   High tomperature compositos. Status and future
                                                                                     Microprocessor control system for 200-kilowatt
      directions
                                                                                        Mod-OA wind turbines [NASA-TM-82711]
      [ NASA-TM-82929]
                                                     p0051 N82-30336
                                                                                                                                       p0120 N82-21710
```

[NASA - CP-2185]

ORIGINAL PAGE IS OF POOR QUALITY

```
Method for predicting impulsive noise generated by
                                                                             Hod-2 wind turbine system cluster research test
program. Volume 1: Initial plan E-1290
[NASA-TH-82906] p0123 N82-2
     wind turbine rotors
     [ NASA-TH-82794]
                                                                                                                          p9123 N82-26807
   Effect of rotor configuration on guyed tower and foundation designs and estimated costs for
                                                                          WING OSCILLATIONS
                                                                              Solution of the unsteady subsonic thin airfoil
     intermediate site horizontal axis wind turbines
                                                                                problem
     [ NASA-TH-82804]
                                                p0 121 382-22649
                                                                                                                          p0012 A82-41267
   Evaluation of lightning accommodation systems for wind-driven turbine rotors
                                                                          WING TABLE
                                                                             Experimental study of fuel heating at low
temperatures in a wing tank model, volume
[NASA-CR-165391] p0073
     [ NASA-TH-82784]
                                                p0 122 #82-23679
   Wind turbine dynamics
                                                                                                                          p0073 #82-11224
   [NASA-CP-2185] p0 12
Applications of the DOE/NASA wind turbine
                                                                          HINGS
                                                p0 122 N82-23684
                                                                           NT TILTING ROTORS
     engineering information system
                                                                              Muserical simulation of one-dimensional heat
                                                p0 122 N82-23696
                                                                                transfer in composite bodies with phase change
                                                                                --- wing deicing pads [NASA-CR-165607]
   Calculation of quaranteed mean power from wind
     turbine generators
                                                                                                                          p0002 N82-22142
   whirl flutter analysis of a horizontal-axis wind
                                                                          SIRR
                                                                           NT GUY WIRES
      turbine with a two-bladed teetering rotor
                                                                          BIRE CLOTE
                                                p0122 N82-23707
                                                                              Metal homeymonb to porous wireform substrate
   Comparison of upwind and downwind rotor operation of the DOE/NASA 100-kW MOD-0 wind turbine
                                                                                diffusion bond evaluation
                                                                                [ WASA-TH-82793]
                                                                                                                          p0110 M82-18612
                                                                              Study of vaper flow into a capillary acquisition device --- for cryogenic rocket propellants
                                                p0122 N82-23710
   A review of resonance response in large
     horizontal-axis wind turbines
                                                                                 NASA-CR-1678831
                                                                                                                          p0091 #82-24452
   p0122 N82-23711 The NASA-LeRC wind turbine sound prediction code
                                                                          WIRE MESE
                                                                           U RE CLOTH
                                               p0 123 N82-23730
                                                                          BORK PUNCTIONS
   Mod-2 wind turbine system cluster research test
                                                                             Cesiation of W/001/ - Work function lowering by
     program. Volume
                 Volume 1: Initial plan E-1290
                                                                                multiple dipole formation
                                                p0123 N82~26807
   Vibration analysis of three guyed tower designs for intermediate size wind turbines
                                                                          BRAPAROUND CONTACT SOLAR CELLS
                                                                           U LAR CELLS
   [NASA-CR-165589] p0137 N82-30709
Experience and assessment of the DOE-NASA Mod-1
                                                                          BROUGHT ALLOYS
                                                                             Effects Of cobalt on structure, microchemistry and properties of a wrought nickel-base superalloy
      2000-Kilowatt wind turbine generator at Boone,
     North Carolina [NASA-TM-82721]
                                                P0125 N82-30710
   Theoretical and experimental rower from large horizontal-axis wind turbines
                                                                                                          X
     [ NASA-TH-82944]
                                                p0127 N82-33830
                                                                          X PAY SPECTROGRAPHY
WIND VELOCITY
                                                                           U RAY SPECTROSCOPY
   Calculation of quaranteed mean power from wind
                                                                          X BAY SPECTROMETRY
     turbine generators
                                                                           U RAY SPECTROSCOPY
                                                p0 122 N82-23699
                                                                          I BAY SPECTROSCOPY
WINDHILLS (WINDPOWERED MACHINES)
                                                                              Application of surface analysis to solve problems
   Microprocessor control system for 200-kilowatt
                                                                                of wear
     Mod-OA wind turbines
                                                                                [NASA-TN-82753]
                                                                                                                          p0099 N82-14519
     [ NASA-TM-82711]
                                                D0120 NB2-21710
                                                                          X RAYS
   Wind turbine dynamics
                                                                           NT SOLAR X-RAYS
     [ NASA-CP-2185]
                                                p0122 N82-23684
   The cretical and experimental power from large horizontal-axis wind turbines
[NASA-TM-82944] p0127 N82
                                                p0127 N82-33830
WINDPOWER UTILIZATION
                                                                              Comparison of upwind and downwind rotor operation
   The NASA Lewis large wind turbine program
                                                                                of the DOE/NASA 100-kw MOD-0 wind turbine
   [NASA-TH-82761] p0 119 N82-16495
Mod-2 wind turbine system cluster research test
                                                                                                                          p0122 N82-23710
                                                                          YAMETERS
     program. Volume 1: Initial clan E-1290
     [ NASA-TM-82906]
                                                p0123 N82-26807
                                                                          TOUNG MODULUS
   Theoretical and experimental power from large
                                                                           U DULUS OF ELASTICITY
     horizontal-axis wind turbines
                                                                          TTRIUM COMPOUNDS
     F NASA-TM-829441
                                                p0 127 N82-33830
                                                                           NT YTTRIUM OXIDES
WINDPOWERED GENERATORS
                                                                          YTTRIUM OXIDES
   Interfacing wind energy conversion equipment with
                                                                             Creep and rupture of an ODS alloy with high stress
     utility systems
                                                                                rupture ductility --- Oxide Dispersion
                                                                                Strengthened
   Aluminum blade development for the Mod-OA
                                                                                                                          P0065 A82-40335
     200-kilowatt wind turbine
                                                                              Phase stability in plasma-sprayed, partially
     [ NASA-TM-825947
                                                p0119 N82-14633
                                                                                stabilized zirconia-yttria
   The NASA Lewis large wind turbine program [NASA-TM-82761] p0:1
                                                                                                                          P0070 A82-41552
   NASA-IM-82761] p0 119 N82-16495
Design, evaluation, and fabrication of low-cost
composite blades for intermediate-size wind
turbines
                                                                              Effects of heating rate on density,
                                                                                microstructure, and strength of Si3N4-6 wt.% Y2O3 and a beta-prime sialon [ACS PAPER 42-B-81] p0070 A82
                                                                                                                          p0070 A82-42366
                                                                              The influence of gamma prime on the recrystallization of an oxide dispersion
     [ NASA-CR- 165342]
   Experience with modified aerospace reliability and
     quality assurance method for wind turbines
                                                                                strengthened superalloy - MA 6000B
     [NASA-TM-82803]
                                                p0110 N82-19550
                                                                                                                          p0062 A82-47393
   Effect of rotor configuration on guyed tower and
                                                                              Effect of fuel to air ratio on Mach 0.3 burner rig
     foundation designs and estimated costs for
                                                                                hot corrosion of 2r02-Y203 thermal barrier
     intermediate site horizontal axis wind turbines [NASA-TM-82804] p0121 N82-22649
                                                                                coatings
                                                                                [NASA-TH-82879]
                                                                                                                          p0061 N82-30373
   Evaluation of lightning accommodation systems for
     wind-driven turkine rotors
     [ NASA-TM-82784]
                                                p0 122 N82-23679
   Wind turbine dynamics
                                                                          ZENER DIODES
```

U ALANCHE DIODES

p0 122 N82-23684

```
BIBC
      Mechanism and models for zinc metal morphology in
Hechanism and models for alkaline media [NASA-TM-02768]

BIBC WICKEL BATTERIES

U CREI ZINC BATTERIES

U LVES ZINC BATTERIES

U LVES ZINC BATTERIES

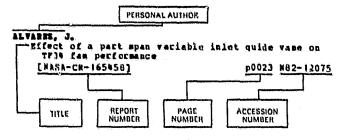
U LVES ZINC BATTERIES

U LVES ZINC BATTERIES

THEORYTHM
                                                                                p0120 #82-19671
 BIRCONIUM
      Nicral ternary alloy having improved cyclic
oxidation resistance
[NASA-CASE-LEW-13339-17
ZIBCONIUM COMPOUNDS
NT ZIRCONIUM OXIDES
                                                                                p0061 N82-31505
 EISCONIUM OXIDES
      Phase stability in plasma-sprayed, partially
          stabilized zirconia-yttria
                                                                                p0070 A82-41552
      Performance of laser glazed Zr02 TBCs in cyclic oxidation and corrosion burner test rigs [NASA-TH-82830] p0059 N82-22346 Effect of fuel to air ratio on Mach 0.3 burner rig hot corrosion of Zr02-Y203 thermal barrier
          coatings
      [NASA-TM-32879] p0061 N82-
Failure mechanisms of thermal barrier coatings
exposed to elevated temperatures
                                                                                p0061 N82-30373
          [ NASA-TM-82905]
                                                                                p0061 N82-32461
```

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report sumber helps to indicate the type of document listed (e.g., NASA report, trai tlation. NASA contractor report). The page and accession numbers are located peneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence with the IAA accession numbers appearing first

ARNAD, H. S. Exhaust das seasuroments in a propose fueled swirl stabilized combustor [NASA-CR-169293] p0091 NB2-316 p0091 NB2-31641 ABBOTT, J. H. A summary of V/STOL inlut analysis methods p0006 182-40921 A summary of V/STOL inlot analysis methods [NASA-TH-82885] p0005 N82-28249 ABDALLA, E. L.
TF34 Convertible Engine System Technology Program
p0022 A82-40521 ABDRIBOUR, Z. A. Permanent magnet properties of Mn-Al-C between -50 C and +150 C ABDELVANAB, M. Effects of fan inlot temperature disturbances on the stability of a turbofan engine [NASA-TH-82699] p0017 N82-18222 ABRAHAH, K. H. Moderate temperature Na cells, III -Floatrochemical and structural studies of Cr0.5VC.5S2 and its Na intercalates p0055 A82-15732 Hoderate temperature Na cells. IV - VS2 and NbS2C12 as rechargeable cathodes in molten NaAlC14 p0055 A82-15743 ADAMS, D. F.
Analysis of crack propagation as an energy absorption machanism in metal matrix compositus [NASA -CR- 16505 1] p0052 N82-14288 Micromochanical predictions of crack propagation and fracture energy in a single fiber horon/aluminum model composite T NASA-CR- 1685501 p0052 N82-18326 ADAMS, H. Engine dynamic analysis with general nonlinear finite element codes. II - Pearing element implementation, overall numerical characteristics and henchwarking [ASME FAPER 82-GT-292] p0 108 A82-35462 Engine dynamic analysis with general nonlinear finite element codes. Part 2: Bearing element implementation overall numerical characteristics and benchmaking [HASA-CR- 167944] p0028 N82-33390 AIRLEO, R. A. Structural dynamics of shroudless, hollow, fan

hlades with composite in-lays [ASME PAPER 82-GT-284]

Structural dynamics of shroudless, hollow fan blades with composite in-lays [NASA-TH-82016] p0018 NO. Large displacements and stability analysis of 00016 NG2-22266 Large displacements and stability analysmonlinear propeller structures
[NASA-TH-02850] p0
Tensile buckling of advanced turboprops
[NASA-TH-02896] p0 po 112 N82-31707 p0 112 H82-31708 AKAY, M. U.

A finite element formulation of Euler equations for the solution of Stuady transonic flows [ATAA PARER 82-0062] p0009 A82-17759 Application of a finite element algorithm for the volution of stondy transonic Buler equations (ATAA PAPER 82-0970] p0010 AB2 p0010 A82-31939 Investigation of rotational transonic flows through ducts using a finite element scheme [AINA PAPER 82-1267] p0012 X82-37711 AKHTER, H. M. Sensor failure d'Atection system [NASA-CR- 1655 15] p0023 NB2-13145 ALLAIRE, P. E. A pad porturbation method for the dynamic coefficients of tilting-pad journal bearings p0110 A82-14400 ALLEE, J. Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL pROPULSION concepts for supersonic V/STOL pROPULSION of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL pROPULSION (743) PROPULSION (743) p0020 A82-19214 PC004 N82-18176 ALLISON OF Y Advention in high output voltage silicon solar cells p0127 AB2-44942 ALSTON, W. B.

PHR polyimides-review and update
[NASA-TH-82821] p0068 M
ALTHMKIRCH, M. A.

Buoyancy effects on the temperature field in p0068 N82-24342 downward spreading flower p0094 A82-41203 ALVANES, J.

Effect of a part span variable inlet guide vane on TF34 fan performance
[NASA-CR-165458] p0023 N82-120 p0023 NB2-12075 ALYEA, F. W. Comparative analysis of CCNHD power plants p0 /58 A82-20747 Chopper-controlled discharge life cycling studies on lead-acid batteries [NASA-CR- 1656 16] p0134 N82-20661 ANDERSON, D. H. Combustor development for automotive gas turbines [AIAA PAPER 82-1208] PO 104 A82-35062 Gas-turbino critical research and advanced technology support project [HASA-TH-81708] p0118 N82-13509 Gas turbino critical research and advanced technology (CRT) support project [NASA-TH-82872] p0 126 N82-31776 A now strategy for officient solar energy conversion: Parallel-processing with surface plasmons [NASA-TH-828671 p0042 N82-2935# ANDERSON, N. Z. .

Multiroller traction drive speed reducer: Evaluation for automotive gas turbing angine [NASA-TP-2027] p0101 N82-26678 AMDERSON, N. J., Bearings: Tochnology and needs [WASA-CR-167908]

PO 106 NB2-26679

p0022 A82-35456

ANDERSON, W. L.
Thin fills temperature sensors, phase 3 [NASA-CR- 165476] pD097 N82-22479 AUDENSSON, C. A. Ceranic thermal barrier coatings for gas turbine engines [ASHE FAPER 82-GT-265] p0071 A82-35441 ANDREWS, D. G. The supply of lunar oxygen to low earth orbit p0032 A82-35618 Development of a high-temperature durable catalyst for use in catalytic combusters for advanced automotive gas turbine engines [NASA-CR-165396] p0130 N82-13510 ANTOINE, A. C. Effect of some nitrogen compounds thermal stability of jet A [NASA-TH-82908] p007: p0072 N82-27519 ANISTRONG, T. P.
Numerical simulation of plasma insulator interactions in space. Fart 1: The self consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric effects p0039 NB2-14273 High- and low-resistivity silicon sclar cells p0046 182-11762 Advances in high output voltage silicon solar cells p0127 A82-44942 ABON, P. R. Sputtered silicon nitride coatings for wear protection [NASA-TM-82819] p0067 N82-20314 Some properties of RP sputtered hafnium nitride coatings [NASA-TM-#2026] p0067 N82-21331 BRP, V. The dryout region in frictionally heated sliding contacts T NASA-TH-827961 D0088 N82-28574 ARSONS, R. H. Creep and rupture of an CDS alloy with high stress rupture ductility ASHON, I. Market assessment of photovoltaic power systems for agricultural applications in Mexico [NASA-CR- 16544]] PO 128 N82-10506 Market assessment of photovoltaic power systems for agricultural applications in Norocco [NASA-CP- 165477] p0 130 NB2- 14627 ASHUS, J.
IMPATT power building blocks for 20 GHz spaceborne transmit amplifier [AIAA 82-0498] p0086 A82-23566 ASHUSSEN, J. Standing waves along a microwave generated surface wave plasma p0 158 A82-26952 ASTLEY, R. J. Acoustic transmission in lined flow ducts - A finite element eigenvalue problem p0 154 A82-17663 Application of steady state finite element and transient finite difference theory to sound propagation in a variable area duct: A comparison with experiment [NASA-TM-82678] p0151 N82-15847 ATASSI, H. Sound generated in a cascade by three-dimensional disturbances convected in a subsonic flow rath PAPER 81-20461 p0153 x82-10460 Path-independent integrals in finite elasticity and inelasticity, with body forces, inertia, and arbitrary crack-face conditions On a study of the /Delta T/c and C/asterisk/ integrals for fracture analysis under non-steady creep p0115 A82-36782 Hoving singularity creep crack growth analysis with the /Delta T/c and C/asterisk/ integrals p0116 A82-40066

Creep crack-growth: A new path-independent T sub o and computational studies [MASA-CR-166930] p0113 882-249 PO 113 N82-24503 Creep crack-growth: A new path-independent integral (T sub c), and computational studies [NASA-CR-167897] p0114 N82-29619 ATTWOOD, S., Baseband-processed SS-TDMA communication mystem architecture and design concepts [AIAA 82-0482] p0079 182-23508 p0104 N82-10401 an evaluation of a propage heat transfer correlation [NASA-TH-82911] p0088 #82-26611

ABGUST, R.,
A multi-purpose method for analysis of spur gear
tooth loading
[MASA-CE-165163] p0104 M82-16 AURITHEAU, C. A., Deposit formation in hydrocarbon rocket fuels with В BACM, L_{\bullet} , J_{\bullet} . Blade loss transient dynamic analysis of turbomachinery [AIAA PAPER 82-1057] BADGLEY, P. . Advanced stratified charge rotary aircraft engine design study [NASA-CR-165398] p0 107 N82-27743 BADLANI, H., Development of a simplified procedure for thrust chamber life prediction [NASA-CR-165585] p0044 N82-21353 BADLABI, H., L.,
A simplified design procedure for life prediction
of rocket thrust chambers [AIAA PAPER 82-1251] DAERST, C., F. D0043 A82-35087 Study of advanced propulsion systems for Small Transport Aircraft Technology (STAT) program [NASA-CR-165610] p0026 #82-24202 BANR, D., Socioeconomic impact of photovoltaic power at Schuchuli, Arizona [NASA-CR-165551] p0 133 N82-19669 DAME, D. W., WASA/General Electric broad-specification fuels combustion technology program - Phase I results and status [ATAA PAPER 82-1009] p0021 A82-35000 BAILBY, W. J. Cryogenic fluid management experiment [MASA-CR-165495] p0039 #82-15117 Regimes of traction in concentrated contact lubrication [ASME PAPER 81-LUB-16] p0107 A82-18431 Some observations in high pressure rheology of lubricants [ASME PAPER 81-LUB-17] P0070 A82-18432 Some observations in high pressure rheology of lubricants [ASME PAPER 81-LUB-17] p0070 A82-18432 p0119 N82-16495 [NASA-TH-82761] BALIGA, G. Numerical simulation of one-dimensional heat transfer in composite bodies with phase change [NASA-CR-165607] p0002 N82-2 p0002 N82-22142 BALODIS, V. Fast recovery, high voltage silicon diodes for AC motor controllers p0086 882-36926 BAUKAITIS, H. Evaluation of lightning accommodation systems for wind-driven turbine rotors [NASA-TH-82784] p0122 N82-23679 BANKS, B. A. Texturing polymer surfaces by transfer casting [NASA-CASE-LEW- 13120-1] P0068 N82-28440 Ion beam sputter deposited diamond like films p0069 N82-28445 [NASA-TH-82873] Surface texturing of fluoropolymers [NASA-CASE-LEW-13028-1] p0070 x82-33521 BARA, M. Maximum entropy image reconstruction from projections

p0049 N82-21260

```
182-11053
BANANOE, S.
Creep and rupture of an ODS alloy with high stress
       rupture ductility
                                                    p0065 A82-40335
    A theory of the n-i-p silicen solar cell
                                                    FO 128 A82-45055
Baraona, C. R.
Thin foil silicon solar cells with coplanar back
       contacts
                                                    DO 127 A82-44944
    Solar cell development for the power extension
      package
       | NASA-TH-826851
    Large area low-cost space solar cell development
      [ #ASA-TH-82902]
                                                    p0126 NB2-32854
BARIS, J.
    Preparation and evaluation of advanced electroc/talysts for phosphoric acid fuel cells [NASA-C/-165519] p0129 M82-12
                                                    p0129 N82-12573
    Proparation and evaluation of advanced
      elect/ccatalysts for phosphoric acid fuel cells [NASA-CR-165594] p0132 M82-17
BABBITT, C. A.
Hicral ternary alloy having improved cyclic
      oxidation resistance [NASA-CASE-LEW-13339-1]
                                                    p0061 N82-31505
BARRETT, L. E.
A pad perturbation method for the dynamic
       coefficients of tilting-pad journal bearings
                                                    PO 110 A82-14400
BARBIGER, H. T.
    Environmental effects on solar concentrator mirrors
                                                            A82-23394
DARTON, R. S.
Experience and assessment of the DOR-NASA Mod-1
       2000-gilowatt wind turbing generator at Boone,
       North Carolina
      [ HASA-TH-82721]
                                                    p0125 N82-30710
BATANIS, A. P.
Low Nox heavy fuel combustor concept program
[NASA-CE-165481] p0138 N
                                                    PO 138 N82-33827
EAUMSTER, R. J.
Optical tip clearance sensor for mircraft engine
       controls
       FAINA PAPER 82-11311
                                                    p0015 A82-37691
    Role of optical computers in aeronautical control
       applications
                                                    p0156 N82-15897
PAUM RISTER, K. J.
Numerical techniques in linear duct acoustics,
1980-87 update
        NASA-TM-827301
                                                    p0151 N82-12890
    Application of steady state finite element and transient finite difference theory to sound propagation in a variable area duct: A
       comparison with experiment
    p0151 N82-15847
Pinite element-integral simulation of static and
flight fan noise radiation from the JT15D
turbofan engine
      turbofan engine
[NASA-TM-82936]
                                                    p0 152 N82-31068
BRAL, G.
    Low NO sub x heavy fuel combustor concept program
      [ NASA-CF- 1655 12]
                                                    p0 129 N82-12572
BEATTIE, E. C.
    Sensor failure detection system [NASA-CR-165515]
                                                    p0023 N82-13145
    Preliminary study, analysis and design for a power switch for digital engine actuators
       f NASA-CR- 1595591
                                                    p0085 N82-23394
BRATTLE, J. R.
30-cm mercury ion thruster technology
                                                    p0046 A82-15434
BECK, B. D.
    The CF6 jet engine performance improvement: Low pressure turbine active clearance control
       [ NASA-CR- 165557]
                                                    p0029 N82-33393
BEEBE, K. W.
Low NO sub x heavy fuel combustor concept program
      phase 1A gas tests
      [ NASA-CR- 167877]
                                                    p0055 N82-25337
BEER, J. H.
    Flow aerodynamics modelin, of an MHD swirl
      combustor - Calculations and experimental verification
```

```
Bulles, D., L.
Internal breakdown of charged spacecraft dielectrics
                                                       p004 | A82-18312
DEEG, L. L.

Jet impingment heat transfer enhancement for the

GPS-3 Starling engine

p0163 MB2-11
                                                       p0163 M82-11993
DEBEN, M. A.
    WASA research in aircraft propulsion [ASHE PAPER 82-GT-177]
                                                      p0022 A82-35389
    WASA research in aircraft propulsion
      [ MASA-TH-827711
                                                       p0016 N82-13146
[MASA-Th-O...,]

BELA, A.,

Fuel quality processing study, volume !

[MASA-CR-165327-VOL-1] p013!

Fuel quality/processing study. Volume 2:

Appendix. Task ! literature survey

[MASA-CR-165327-VOL-2] p013!
                                                      p0135 #82-24649
                                                       p0135 #82-24650
    Mass and momentum turbulent transport experiments with confined coaxial jets
       [ MASA-CR-165574 ]
                                                       p0090 M82-19496
BESTS, D. J. ...
Ispact of uniform electrode current distribution
       on ETF
       [ LIAA PAPER 82-0423 ]
                                                       p0157 A82-17941
     Hagnetohydrodynas 75 (HHD) Engineering Test
Facility (ETF) 200 MWe power plant. Design
       Requirements Document (DRD)
    [NASA-TH-82705] p0099 N82-12446
Impact of uniform electrode current distribution
       on ETF
       [ NASA-TH-82875]
                                                       p0123 N82-25636
BERCLE, R. . V.
    Magnetohydrodynamics (MHD) Engineering Test
       Facility (ETF) 200 NWe power plant. Design
Requirements Document (DED)
       [ NASA-TH-82705]
                                                       p0099 N82-12446
BERG, R. D.
    Comparative analysis of the conceptual design
       studies of potential early connercial MHD power
       plants (CSPEC)
       [ NASA-TH-82897]
Effects of internal heat transfer on the structure of self-similar blast waves
                                                       D0093 A82-32225
The 30/20 GHz flight experiment system, phase 2.
       Volume 1: Executive summary [NASA-CR-165409-VOL-1]
                                                       p0078 182-20362
    The 30/20 GHz flight experiment system, phase 2.
    Volume 2: Experiment system description [NASA-CR-165409-VOL-2] p0078 H82-2
The 30/20 GHz flight experiment system, phase 2.
Wolume 4: Experiment system development plan
                                                      p0078 882-20363
       [NASA-CR-165409-VOL-4]
                                                       p0078 N82-20365
BERKOPKC, F.
First results of material charging in the space
       environment
       [NASA-TM-84743]
                                                       p0081 N82-24431
BREKORITE, M.,
Advanced stratified charge rotary aircraft engine
design study
       [NASA-CR-165398]
                                                       90107 NB2-27743
BERHAY, A. H.
    Past recovery, high voltage silicon diodes for AC
       motor controllers
                                                       D0086 A82-36926
BERHAM, S. G.
The 30/20 GHz flight experiment system, phase 2.
Volume 3: Experiment system requirement document
[NASA-CR-165409-Vol-3] p0078 N82-20364
                                                       p0078 N82-20364
BETHER, R. H.
    Environmental effects on solar concentrator mirrors
 BEYLER, C. L.
    Plane structure in a swirl stabilized combustor
       inferred by radiant emission measurements
                                                       p0056 A82-28694
BHAT, S. T.,
Analysis of high load dampers
       [ NASA-CR-165503]
                                                       p0026 N82-23248
 BHATT, R. T.
    Thermal degradation of the tensils properties of
       undirectionally reinforced FP-31203/EZ 33
       maquesium composites
```

F NASA-TM-828171

p0094 A32-44782

BOLLENBACHER, C.

```
Hodulus, strength and thermal exposure studies of FP-Al203/aluminum and FP-Al203/magnesium
      composites
      [ NASA-TM-02868]
                                                     p0050 M82-30335
BHUSBAN, B.
    Development of CdO-graphite-Aq coatings for qas
hearings to 427 C
                                                     p0 108 A82-27079
BIGHAN, J.
Electromechanical actuators
                                                             182- 12 14 B
BILL, B. C.
    Composite seal for turbomachinery
      [ NASA-CAS P-LEW-12131-3]
                                                     p0099 NB2-19540
    Fully plasma-sprayed compliant backed ceramic
      turbine seal
       I NASA-CASE-LEW-13268-2]
                                                     p0101 N82-26674
    Fully plasma-sprayed compliant tacked ceramic
      turbine seal
      [ NASA-CASE-LEW-13268-1]
                                                     pC069 N82-29453
BILLINGS, W. W.
    High voltage DC switchgear development for
      multi-kW space power system: Aerospace
technology development of three types of solid
state power controllers for 200-1100VDC with
current ratings of 25, 50, and 80 amperes with
one type utilizing an electromechanical device
      [ NASA-CR- 1654137
                                                     p0083 N82-13357
BIRCHENOUGH, A. G.
    Variable gain for a wind turbine pitch control [NASA-TM-82751] p0119 N82
                                                     p0119 N82-16478
    Microprocessor control system for 200-kilowatt Mod-OA wind turbines
      [ NASA-TM-82711]
                                                     p0120 N82-21710
    Investigation into the role of NaCl deposited on
      oxide and metal substrates in the initiation of
      hot corresion
      T NASA-CR- 1650291
                                                     p0063 NB2-13217
DISHOP, A. R.
    The effect of inflow velocity profiles on the performance of supersonic ejector nozzles
      [ AI AA PAPER 81-0273]
    MINA PAPER 81-0273] p0002 A21-32548
Three-dimensional flow calculations including
      boundary layer effects for supersonic inlets at a ple of attack
[AIAA PAPER 82-0061] p0005 A82-197
                                                     p0005 A82-19778
BITTKER, D. A. Effect of hydrocarbon fuel type on fuel
      [ NASA-TH-82916]
                                                     p0072 N82-28460
BIZCH, P. T.
    Comparative thermal fatigue resistance of several
      oxide dispersion strengthened alloys
                                                     p0062 A82-11399
BLACK, D. H.
Evaluation of wind tunnel performance testings of an advanced 45 deg swept 8-bladed propeller at Bach numbers from 0.45 to 0.85
      [ NASA-CR-3505]
                                                     p0007 ¥82-19178
BLACK, G.
    Blade loss transient dynamic analysis of
      turbomachinery
[AIAA PAPER 82-1057]
                                                     p0030 A82-34982
BLIMPTIS, T.
Development of a dual-field heteropoplar power
      converter
      [ NASA-CR- 165168]
                                                     p0084 NB2-24424
BLOOMER, H. E.
QCSFE under-the-wing engine acoustic data
      [ NASA-TM-82691]
                                                     p0019 N82-27311
    QCSEE over-the-wing engine acoustic data [NASA-TH-82708] p00
                                                     p0020 N82-29324
BLUMBUTHAL, P. Z.
A remote millivolt multiplexer and amplifier
      mcdule for wind tunnel data acquisition
BOIAMCHUK, A. A.
    Ultraviolet observations of the 1980 eclipse of
      the symbiotic star CI Cygni
                                                             A82-27331
BOLDMan, D. R.
Three-dimensional shock structure in a transonic
      flutter cascade
                                                     p0006 A82-37937
```

Environmental assessment of the 40 kilowatt fuel

cell system field test operation | DOE/NASA/2701-1]

```
BOND, J. W.
   The development of central peaks in lunar craters
                                                        A82-14333
BORREGO, J. N. Low temperature growth and electrical
      characterization of insulators for Gaas MISPETS
                                                 p0159 #82-11959
      [NASA-CR-164972]
BOULES, E. B.
    Study of vapor flow into a capillary acquisition
      device
      [ NASA-CR-167883]
                                                 p0091 M82-24452
BOWNAN, R. L.
Reliable serial thermography for energy conservation
     [ NASA-TH-81766]
                                                 P0117 N82-14552
BOUYER, J. M.
Worldwide satellite market demand forecast
p0079 N82-25423
NoILE, R. J. .

Analytic investigation of effect of end-wall contouring on stator performance [NASA-TP-1943] p0003 N
                                                 D0003 N82-14051
    Comparison of experimental and analytical
      performance for contoured endwall stators
       [NASA-TH-62877]
                                                 p0019 MB2-26299
BRADLEY, E.,S. Advanced turboprop testbed bystems study.
      1: Testhed program objectives and priorities, drive system and aircraft design studies,
      evaluation and recommendations and wind tunnel
      test plans
      [ NASA-CR-167928-VOL-1]
                                                 D0028 N82-32370
Strength distributions of SiC ceramics after
      oxidation and oxidation under load [ACS PAPER 9-C-80C]
                                                 p0071 A82-20143
   Effects of oxidation and oxidation under load on strength distributions of Si3N4
      FACS PAPER 69-8-801
                                                 p0071 A82-35871
BRAGG, H. ,B.
   Aerodynamic characteristics of airfoils with ice
      accretions
      [AIAA PAPER 82-0282]
                                                 p0010 A82-22081
   Rime ice accretion and its effect on airfoil performance
      [NASA-CR-165599]
                                                 p0008 N82-24166
BRAIMED, W. A.,
Refractory coatings and method of producing the same [NASA-CASE-LEW-13169-1] p0060 N82-29415
   Refractory coatings
[NASA-CASE-LEW-13169-2]
                                                 p0061 #82-30371
BRANDRORST, H. . U.
   Gallium arsenide solar cells-status and prospects
      for use in space
                                                 p0043 482+11765
BRANDHORST, H., U., JR...
Naterial and processing needs for silicon solar
      cells in space
                                                 p0032 N82-26336
   Bffects of processing and dopant on radiation damage removal in silicon solar cells
      [ NASA-T. 82892]
                                                 p0042 N82-31443
   On the cause of the flat-spot phenomenon observed
      in silicon solar cells at low temperatures and
      low intensities
      [NASA-TH-82903]
                                                 p0 126 N82-31777
DRATTON, R. J.,
Ceramic thermal barrier coatings for gas turbine
      engines
      [ASME PAPER 82-GT-265]
                                                 p0071 A82-35441
    Evaluation of present thermal barrier coatings for
     potential service in electric utility gas turbines
      [ NASA-CR-165545]
                                                 p0063 NB2-18368
SRAUW, J.

The dryout region in frictionally heated sliding
     [ NASA-TM-82796]
                                                 p0088 N82-28574
lubrication
      [NASA-TM-82807]
                                                 D0042 N82-20240
Small das turbine combustor primary zone development
[AINA PAPER 82-1159] p0103 A82-35036
Evaluation of fuel injection configurations to
control carbon and soot formation in small GT
      combustors
      [AIAA PAPER 82-1175]
                                                 p002 | A82-3504 |
BRILLY, U. R.
   Turbofan forced mixer-nozzle internal flowfield.
```

p0137 N82-29721

```
Volume 3: A computer code for 3-D mixing in
        axinymmetric nexzlon
        [ KANA-CR-3144]
                                                                 p0091 N82-22460
ERIT, N. J.

Jot impingment heat transfer enhancement for the

GFU-3 Stirling engine

[NASA-TH-H2727]

po163 NH2-11
                                                                 60163 N82-11993
BROCKETT, W.
Swall axial turbine stator touheelegy program
p0028 N82-32367
PRODER, J. D.
On the cause of the flat-spot phenomenon observed in silicon solar cells at lev temperatures and
        lew intensitios
                                                                 p0043 A82-39599
     Cn the cause of the flat spot phenomenon observed
in silicon solar colls at low temperatures and
        low intensities
                                                                 p0044 A82-44965
     On the cause of the flat-spot phenomenon observed
        in silicon solar cells at low temperatures and low intensities
        [ NASA-IN-82903]
                                                                 p0126 N82-31777
BROUSTEIN, L.

The J6/27 GHz flight experiment system, phase 2.

Volume 1: Executive summary
[MASA-CR-165409-VOL-17]

PCC78 M82-2
                                                                 pCC78 N82-20362
     The 30/20 GHz flight experiment system, phase 2. Volume 2: Experiment system description [NASA-CR-16509-YOL-2] p0C78 N82-2
                                                                 p0C78 N82-20363
     The 30/20 GHz flight experiment system, phase 2.

Volume 3: Experiment system requirement document
[NASA-CE-165409-VoL-3] p0078 N82-20364
     [ NACA-CE- 103474-401-2 |
The 10/20 GHz flight experiment system, physic 2.
Volume 4: Experiment system devalopment plys
r NASI-CE- 165409-VOL-4 |
p0078 %64-20365
BROOKS, A.

TF14 Convertible Figure System Technology Program
p0022 A82-40521
     DUBBS, A. P.
Lightweight dionel engine designs for commuter
type eircraft
        [ HASA-CR- 165470]
                                                                 n0023 N82-11068
EROFM, G. V.
Hadnotic hoat pumping
[NASA-CASE-LEW-12508-3]
                                                                 20008 NB2-24449
     V/SIGL propulsion control technology
[AIAA FAPER 81-2634]
                                                                 p0029 A82-16909
 BROWN, K. W.
     Structural tailoring of engine blades (STAERL) (NASA-CP-1679497 p0028 NB2-33391
[NASA-CP-19.52.]

BROWNE, L.

Consunications satellite systems capacity analysis
[NASA-CR-167911] p0034 N82-27331

BRUCE, T. W.

Pollution reduction technology program small jet
aicgraft engines, phase 3
[NASA-CR-165386] p0023 N82-14095
         technology progent small jet aircraft engines,
        phase 3
         [ HASA-CR-165387]
                                                                  p0024 N82-14096
 BRUTON, W. M.
      Analytical investigation of nonrecoverable stall
     nnsa-TH-82/92]
Antemated procedure for developing hybrid computer simulations of turbofan engines. Part 1: General description [Next-me]
        [ NASA-"P- 1051]
                                                                 p0146 N82-33020
 BUBSEY, R. T.
      Extended range stress intensity factor expressions
         for chevron-notched short bar and short rod
        fracture toughness specimens
                                                                 DO 112 A82-40357
 BUCKELE, D. R.

Voiling glara reduction methods compared for ophthalmic applications

poths A
                                                                  p0143 A82-13289
      A digital optical torquemeter for high rotational 
Greed applications
[MASA-TM-82314] p0095 M82-31
                                                                  D0095 N82+31664
 BUCKLEY, D. H.
      Adhesion and friction of single-crystal diamond in contact with transition metals
                                                                  p0103 A82-18680
      Application of surface analysis to solve problems
        of wear
        [ NASA-TH-82753]
                                                                 pC099 N82-14519
```

```
Surface chemistry and wear behavior of single-sayatal milicon carbide milding against iron at temperatures to 1500 C in vacuum
        NAS1-58-19471
                                                             p0067 #82-19374
    Friction and wear of iron in corrosive metal [NASA-TP-1985]
                                                             P0058 N82-20291
    Influence of Mineral oil and additives on microhardness and surface chemistry of caquesius
       oxide (001) surface [MASA-TP-1986]
                                                             p0067 N82-20316
    Priction and surface chemistry of some ferrous-base metallic classes pt [NASA-TP-1991]
    Tribological properties and XPS studies of ion
       plated gold in nickel and iron [NASA-TH-82014]
    p0059 M82-22344
Surface chemistry, microstructure and friction
properties of some ferrous-bear metallic glasses
at temperatures to 750 C
[MASA-TR-20044
        [ NASA-TP-2006 ]
                                                             p0060 M82-22349
    Effects of environment on sicrobardness of
        maquesium oxide
       [ NASA-TP-2002]
                                                             p0068 M82-22366
    Correlation of tensile and shear strengths of metals with their friction properties [MASA-TM-02020] p0060 NB
                                                             p0060 N87-24325
    Tribological properties of sintured polycrystalline and single crystal silicon carbide
       [ MASA-TH-82829]
                                                             p0068 NU2-24343
    Influence of corrosive solutions on microhardness
       and chemistry of magnesium oxide /001/ murfaces [NASA-TP-2040] p0102 NB2-31691
       [ NASA-TP-2040 ]
    Occurrence of spherical ceramic dubris in indentation and sliding contact
        [ NASA-TP-2048]
                                                             p0069 #82-32491
    Plastic deformation and wear process at a Eurface
during unlubricated sliding
        [NASA-TH-82820]
                                                             p0102 N82-32735
    Wear wechanism based on adhesion [NASA-TP-2037]
                                                             p0103 N82-32737
    A study of the nature of solid particle impact and
shape on the erosion morphology of ductile metals
       [ NASA-TH-82933]
                                                             p006 | K02-33493
BUCY, R. W.
    Programs in the development of energy efficient
       engine components
       [ASHE PAPER 82-GT-275]
                                                             P0030 A82-35450
BUDD, P. A.
Oblique-incidence secondary emission from charged
       dielectronics
                                                             D0039 N82-14227
DUGGELE, A. E.
Three-dimensional shock structure in a transonic
       flutter cascade
                                                             p0006 A82-37937
BUJOLD, M. P.
Small passenger car transmission test: Chevrolet
Halibu 200C transmission with lockup
[MASA-CR-165182]
p0105 M82-16
                                                             PO 105 NB2-16410
    Small passenger car transmission test: Morcury
       Lynx ATX transmission [NASA-CR-165510]
                                                             p0106 N82-24496
BULEAR, D. L.
Catalytic combustion of residual fuels
       [ NASA-TH-82731]
                                                             ₽0118 N82-13504
    [ masA=zn=2731 ] 50118 M82-13504

Experimental Eudy of an integral catalytic

combustor: Heat exchanger for Stirling engines

[MasA=zn=82783] 50119 M82-18691

Catalytic combustion of actual low and madium

heating value gason

[MasA=zn=82930] 50125 M82-30717
BUOED, D. P.
Analysis of high load dampers
[MASA-CR-165503]
                                                              p0026 NB2-23248
BURER, K., A.

Endurance test and evaluation of alkaling water electrolysis cells
[MASA-CR-165524] p0 130 #82-
                                                              p0 130 #82-13508
BURKHART, J. A.
    p0099 X82-12446
BURLEY, R., R.,
Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35
                                                             60005 A82-35195
     Experimental and analytical results of tangential
        blowing applied to a subsonic V/STOL inlet
```

PRESONAL AUTHOR INDEX

(NASA-TM-82847) Burns, R. K.	POOC4 N82-24165	theoretical results [NASA-CR-3513]	p0008 N82-26229
Performance and operational econom		CARTER, R. A.	***************************************
for a coal qasification combined cogeneration powerplant	-cycle	modeling and Analysis of 1 wer (MAPPS). Volume 1: Technic	al report
[NASA-TH-82729] Parametric performance analysis of	p0120 N82-19672 stens-injected	[NASA-CR-165538] Hodeling and Analysis of Power	p0083 N82-14447 Processing Systems
qas turbine with a thermionic-energy-converter-line		(MAPPS). Volume 2: Appendi	ces p0145 N82-16748
[NASA -TH-82736]	p0121 N82-23678	CARUTHERS, J. E.	
Integrated queifier combined cycle system to produce liquid hydroge	n	'Coriolis resonance' Within a	p0012 182-37938
[WASA-TH-82921] BURBILL, G.	p0 125 N82-30713	CASSIMBLLI, J. High pover solar array switchi	my regulation
Application of photovoltaic electr rural education/communication ne		CATALDO, B. L.	P0043 A82-11736
developing countries		Design of a 35-kilowatt bipola	
BUSBAIBA, A. A.	p0137 N82-29720	battery for low Earth orbit [NASA-TM-82844]	p0123 N82-24647
A simple finite difference procedu vortex controlled diffuser	re for the	CATELLA, G. C. Prec electron lasers for trans	mission of energy in
[ATAL PAPER 82-0109] Rodeling parameter influences on M	p0030 A82-17788 HD swirl	space [NASA-CR-165520]	p0098 N82-25499
combustion nozzle design [ATAA PAPER 82-0984]	p0011 A82-31947	CERNANSKY, N. P. Formation of oxides of nitroge	
Flow merodynamics modeling of an M combustor - Calculations and exp	HD swirl	spray combustion of hydrocar	
verification		CHAI, A. T.	•
BUTTRILL, S. E., JR.	p0094 A82-44782	High voltage V-groove solar co	p0123 N82-24717
Oxidation and formation of deposit hydrocarbon fuels	•	Method of making a high voltag [NASA-CASZ-LEW-13401-1]	p0124 N82-29709
[NASA-CE-165534] BUZINSKI, B. E.	p0073 N82-18402	High voltage planar multijunct [NASA-CASE-LBW-13400-1]	ion solar cell p0125 N82-31764
Wideband, high speed switch matrix SS-TDMA applications	development for	CHAI, AT. Hultiquection high voltage con	centrator solar cells
22 23 spp. 22	PC086 A82-43784	Pabrication of multijunction h	p0043 A82-11796
C		concentrator solar cells by technology	
CABBAAL, A.		recunoxody	p0127 X82-44957
Application of photovoltaic electrical education/communication ne		CHAIT, IL. HHD oxidant intermediate tempe	rature ceramic
developing countries	p0137 N82-29720	heater study [NASA-CR-165453]	
CAIRELLI, J. B. Test results and facility descript		CHARY, R. C. Rumerical simulation of sheath	
4C-kilowatt stirling engine		current-voltage characterist	ics of a
[NASA-TM-82620] Assessment of a 40-kilowett stirli		conductor-dielectric disk in	p0040 A82-15904
underground mining applications [NASA-TH-82822]	p0125 N82-30714	Numerical simulation of plasma interactions in space. Part	insulator : I: The self
CALFO, F. D. Micronized coal burner fucility		consistent calculation	p0039 N82-14272
Micronized coal burner fucility [NASA-CASE-LEW-13426-1] CAMPANY, A. D.	p0126 N82-31769	Numerical simulation of plasma interactions in space. Part	
Advanced superposition methods for turborump vibration analysis	high speed	effects	p0039 N82-14273
[NASA-CR- 165379]	p0 104 N82-11465	CHAMIS, C.,C.	•
CAMPBELL, S. S. Effects of heating rate on density		Structural dynamics of shroudl blades with composite in-lay	s
ricrostructure, and strength of Y203 and a beta-prima sialon		[ASHE PAPER 82-GT-284] Sensitivity analysis results o	
[ACS PAPER 42-8-91] CANAL, E.	p0C70 A82-423G6	various parameters on compos	ite design p0051 A82-37101
Study of controlled diffusion state		Impact resistance of fiber com	posites p0112 A82-39852
[NASA-CF-165500] CARL, D. R.	p0024 N82-16081	Integrated analysis of engine [NASA-TH-82713]	
Iow NOx heavy fuel combustor conce Phase 1: Combustion technology		Durability/life of fiber components of the compo	sites in
[NASA-CE- 165482]	p0 136 N82-24725	[NASA-TH-82749]	p0049 N82-14287
CARLSON, A. W. HHD oxidant intermediate temperate	re ceramic	Prediction of composite hygral [NASA-TH-82780]	p0049 N82-16181
heater study [MASA-CR- 165453]	p0131 N82-15527	Structural dynamics of shroudl blades with composite in-lay	
CARRUTHERS, W. D. Oxidation stability of advanced re	action-bonded	[NASA-TM-82816] Compression behavior of unidir	p0018 N82-22266 ectional fibrous
Si3N4 materials [ACS PAPER 52-E-80P]	p0074 A82-33030	composite	p0050 N82-22313
CARTA, F. C.		Designing with figer-reinforce	
An experimental investigation of a periodicity and unsteady agreedy	namic response in	random composites) [NASA-TH-82812]	p0050 N82-24300
an oscillating cascade. Volume Part 1: Text and mode ! data		Environmental and High-Strain composites for engine applic	cations
[NASA-CF-165457-VOL-2-FT-1] An experimental investigation of o	p0006 N82-18180 japwise	[NASA-TM-82882] Tensile buckling of advanced t	p0051 N82+31449 turboprops
periodicity and unsteady aerody an oscillating cascade, 1: Expe	nasic response in	[NASA-TH-82896]	p0112 N82-3170
The state of the s	the state of the s		

The state of the s

p0118 N82-11551

```
CRANG, A.
The influence of Coriolis forces on gyroscopic
      motion of spinning blades
[ASME PAPER 82-GT-163]
                                                        p0030 A82-35384
    Modeling and Analysis of Power Processing Systems (HAPPS). Volume 1: Technical report
       (MAPPS). Volume
[NASA-CE-165538]
                                                        p0083 N82-14447
    Hodeling and Analysis of Power Processing Systems (MAPPS). Volume 2: Appendices
       [ NASA-CR- 165539]
                                                        DO145 N82-16748
Chang, N. L. Computer model of catalytic combustion/Stirling
       engine heater head
[NASA-CR-165378] p0134 W82-2260
CHANG, R. L. S.
Development of a high-temperature durable catalyst
                                                        p0134 #82-22666
       for use in catalytic combustors for advanced
       automotive gas turbine engines [NASA-CR-165396]
                                                        p0 130 M82-13510
CHANG, S. R.

A finite element stress analysis of spur quars including fillet radii and rim thickness effects [NASA-TM-82865] point M82-28646

On finite element stress analysis of spur quars quars
      [ NASA-CR-167938]
                                                        p0 107 #82-29 60 7
CHARLESTON, J.
    Performance of advanced chromium electrodes for
       the NASA Redox Energy Storage System
[NASA-TM-82724] p0118 M
CHARLESTON, J. A.
Improved chronium electrodes for REDOX cells
[NASA-CASE-LEW-13653-1] p0121 M
                                                        p0118 W82-12574
                                                        p0121 N82-22672
CHARDAT, A. F.
    The velocity field near the orifice of a Helmholtz resonator in grazing flow [NASA-CR-168548] p0 153 N82-1899
                                                        p0 153 N82-18994
CREE, D. E.

Detection of a change in the oxidation state on aluminum surface using angular correlation of positron annihilation radiation
                                                                A82-30374
    Investinguish of spray characteristics for itselfs injection of fuels containing dissolved
       and superheated fuels
      T HASA-CR-3563]
                                                        p0027 NB2-26295
CHEN, L. -D.
    Atomization and combustion properties of flashing
       injectors
      [AIAA PAPER 82-0300]
                                                        p0092 A82-17880
    Undoped semi-insulating LEC Gals - A model and a
       mechanism
                                                        p0 159 A82- 13754
    Stoichiometry-controlled compensation in liquid encapsulated Czochralski Gals
                                                        p0 150 A82- 17585
    Compensation mechanism in liquid encapsulated
       Czochralski Gals Importance of melt stoichiosetry
                                                        p0686 A82-40403
    Effect of melt stoichiometry on twin formation in
       LEC Gals
                                                        p0160 A82-46517
    High purity low dislocation GaAs single crystals po 159 N82-23030
CHENG, J. H.
    Detection of a change in the oxidation state ou
       aluminum surface using angular correlation of
       positron annihilation radiation
                                                                A82-30374
CHERNOY, I. A.
    An example of a solution to transonic equations for shock-free flow about a symmetric profile
                                                                A82-26439
CHERNOV, V. IU.

Dynamics of snow cover in mountain regions of the
       Aral Sea basin, studied using satellite
       photographs
                                                                A82-27462
CHEMPAN, W. T.

Investigation of a comb-type slow-wave structure
for millimeter-wave masers
                                                                A82-18368
CHIAPPETTA, L. H.
    A heat exchanger computational procedure for
```

temperature-dependent fouling

[ASME PAPER 61-HT-75]

```
CAIMA, R. . V.,
Comparison of two and three dimensional flow
     computations with laser agenometer measurements
in a transpaid compressor rotor
     [ WASA-TH-82777]
                                                p0004 M82-15020
CHIH, S.
   Environmental effects on solar concentrator sirvors
                                                        892 23394
CHISBOLH, B. C.
Study of coutrolled diffusion stator Whiteling. |-
      Aerodynamic and mechanical design report
                                                 p0024 #82-16081
      [ WASA-CR-165500 ]
   On the opening of premixed Bunsen flame tips
                                                p0057 A82-37570
   IMPATT power building blocks for 20 GHz spaceborne
      transmit amplifier
      [AIAA 82-0498]
                                                p0086 A82-23566
   ), Y.C.
Mode propagation in nonuniform circular ducts with
     potential flow
[NASA-TH-82766]
                                                p0 15 1 N82-14881
CHOI, P. M.
Alignment of fluid molecules in an EHD contact.
     [ASLE PREPRINT 81-LC-5C-1]
                                                p0 107 A82-18407
   Boundary-layer effects in composite laminates.
     Free-edge stress sigularities, II - Free-edge
stress solutions and basic characteristics
                                                p0116 A02-46806
   Boundary layer thermal stresses in angle-ply
      composite laminates, part 1 [NASA-CR-165412]
                                                p0113 N82-26713
   Boundary-layer effects in composite laminates:
Free-edge stress singularities, part 6
                                                p0114 N82-26718
      [ NASA-CR-165440 ]
CHOO, Y. X.

New features and applications of PRESTO, a

computer code for the performance of

regenerative, superheated steam turbine cycles
      [ NASA-TP-1954 ]
                                                p0119 #82-16477
    Parametric performance analysis of steam-injected
      gas turbine with a
      thermionic-energy-converter-lined combustor
      [NASA-TH-82736]
                                                p0121 N82-23678
CMORIN, A. J. Numerical modelling of turbulent flow in a
      combustion tunnel
                                                p0093 A82-27000
    Numerical modeling of turbulent combustion in
      premixed gases
                                                p0056 A82-28708
   Effects of condensation and surface action on the
      structure of steady-state fronts
                                                        A92-19360
CUBISHAN, C. Socioeconomic impact of photovoltaic power at
      Schuchuli, Arizona
[NASA-CR-165551]
                                                 p0133 N82-19669
CHRISTIE, R. J.
   Vibration analysis of three quyed tower designs for intermediate size wind turbines
                                                p0137 N82-30709
      [NASA-CR-165589]
CHRISTER, L. Technology development for phosphoric acid fuel
      cell powerplant, phase 2
      [ NASA-CR- 1654 26 ]
                                                p0131 N82-16482
CHU, B. K.
   Development of a high-temperature durable catalyst
      for use in catalytic combustors for advanced
   automotive gas turbine engines
[NASA-CR-165396] p0 130 N82-
Computer model of catalytic combustion/Stirling
                                                 p0 130 N82-13510
      engine heater head
      [NASA-CR-165378]
CHUANG, S. ,Y.
   Detection of a change in the oxidation state on
      aluminum surface using angular correlation of
      positron annihilation radiation
                                                        A82-30374
CICCOLELLA, D.,
A new antenna concept for satellite communications
     # NASA-CR-1679241
                                                 p0079 N82-31584
CIONI, J. A.
   Solar cell development for the power extension
      package
```

[NASA-TH-82685]

p0092 382-10961

THASA-TH-82866]

```
Large area low-cost space solar cell development f NASA-TH-829021 p0126 N82-32854
                                                                                  A finite element stress analysis of spur quars
including fillet radii and rim thickness effects
[NASA-TH-82865] p0 10 1 M82-28646
CLAIRG, B. G.
Thin film temperature sensors, phase 3
                                                                                  Precision of spiral-bevel gorrs
      [ NASA-CR- 165476]
                                                  PC097 N82-22479
                                                                                    [ NASA-TH-82898]
                                                                                                                                PO 102 NC2-30552
CLARE, J. P.
                                                                                  Kinematic procision of quar trains
    Study of electrical and chesical propulsion
                                                                                    [ NASA-TH-82887]
                                                                                                                                p0 102 M82-32733
      systems. Volume 1: Frecutive summary
                                                                              COTHER, J. V..
Primary propulsion/large space system interaction
      [ NASA-CR- 16550 2-VOL- 1 ]
                                                  P0046 N82-11110
                                                                                    study
                                                                                    [NASA-CR-165277]
CLARE, J. S.
                                                                                                                                p0044 N82-18315
                                                                              CRAME, R. K.
A review of transhorizon propagation phenomena
    Gas-turbine critical research and advanced
      tachnology support project [NASA-TH-61708]
                                                  p0118 N82-13509
                                                                                                                                 P0079 A82-10679
COMBB, Pa B.

The orthogonal in-situ machining of single and polycrystalline aluminum and copper, volume 1

[ NASA-CR-168929 ] p0076 N82-24361
                                                                              CRAULRY, E. Y.
                                                                                  Aerodynamic damping measurements in a transonic
                                                                                    Compressor
                                                                                    [ASHE PAPER 82-GT-287]
                                                                                                                                p0012 A82-35459
                                                                                  In-plane inertial coupling in tuned and severely mistuned bladed disks
COLLETT, C. R.
    Characteristics of the IeRC/Hughes J-series 30-cm
      engineering model thruster
                                                                                    [ASKE PAPER 82-GT-288]
                                                                                                                                p0012 A82+35460
                                                                              CREEKHORE, B.,
A real time Pegasus propulsion system model for
                                                  P0046 A82-15435
COLLID, R. E. Coaxial prime focus feeds for paraboloidal reflectors
                                                                                    VSTOL piloted simulation evaluation [AIAA PAPER 81-2663]
                                                                                                                                p0020 182-19221
                                                                                  A real time Pegasus propulsion system model for VSTOL pixoted simulation evaluation
      [ NASA-CR- 167934]
                                                  p0C78 N82-31585
COLLINS, F. G.
                                                                                    [ NASA-TH-82770]
                                                                                                                                p0016 N82-13144
    Design of prototype charged particle fog dispersal
                                                                              CROLET, D. R., JR.
First results of material charging in the space
      [ NASA-CR-3481]
                                                  p0141 N82-16659
COLLINS, J. L. Experience and assessment of the DOE-NASA Mod-
                                                                                     environment
                                                                                    FNASA-TH-847431
                                                                                                                                p0081 #82-24431
       2000-Kilowatt wind turbine generator at Boone,
                                                                              CROUSE, J. R.
                                                                                  Computer program for aerodynamic and blading design of multistage axial-flow compressors
       North Carolina
      [ BASA-TH-82721]
                                                  00125 N82-30710
COMGDON, C. W.
Jet impingement heat transfer enhancement for the
                                                                                    [ NASA-TP-1946]
                                                                                                                                p0016 N82-15039
                                                                              CRUGHOLA, A. Effect of gamma irradiation on the friction and
      GPU-3 Stirling engine [NASA-TH-82727]
                                                  p0 163 N82-11993
                                                                                     wear of ultrahigh molecular weight polyethylene
CONNECTE, D. J.
Coupled cavity twaveling wave tube with valocity
                                                                                                                                 D0062 A82-10674
        aper inq
                                                                                  The effects of controls and controllable and
      [ NASA-CASE-LEW- 1229 6- 1]
                                                  p0082 N82-26568
                                                                                    storage loads on the performance of stand-alone
COMMORS, J. P.
                                                                                     photovoltaic systems
    The aerospace technology laboratory (a
                                                                                                                                p0 127 A82-45027
      perspective, then and now) [NASA-TH-82754]
                                                                              CJERKY, A. H.
                                                  p003 | N82-19229
                                                                                  Ion beam textured graphite electrode plates [NASA-CASE-LEW-12919-2] p0050
COOKE. D. L.
                                                                                                                                 D0050 N82-26386
    Additional extensions to the MASCAP computer code,
                                                                              CURTIS, H., B.
                                                                                  Determination of optimum sunlight concentration
level in space for 3-4 cascade solar cells
[NASA-TM-82899] p0126 M82-32853
      volume 3
      [ NASA-CR- 167857]
                                                  P0040 N82-26378
CORBAN, R. R.
                                                                              CUSANO, C.
Effects of artificially produced defects on film
    Interactive-graphic flowpath plotting for turbine
       engines
      [ NASA-TH- 82756]
                                                  DO017 N82- $5041
                                                                                     thickness distribution in sliding BHD point
CORNELIUS, C. J.
Effects of condensation and surface motion on the
                                                                                     contacts
                                                                                  [NASA-TH-82732] p0099 NS:
The influence of surface dents and grooves on traction in sliding EHD point contacts
                                                                                                                                p0099 NS2-16412
       structure of steady-state fronts
                                                          A82-19360
                                                                                    [ NASA-TM-82943]
                                                                                                                                p0102 N82-32734
                                                                              CUTROUS, M. B.
    Comparison of upwind and downwind rotor operation
      of the DOE/NASA 100-kW MOD-0 wind turbine
                                                                                  Low NOx heavy fuel combustor concept program,
                                                  p0122 N82-23710
                                                                                     phase I
                                                                                     [ NASA-CR-165449]
                                                                                                                                 p0135 N82-24651
    Wideband, high speed switch matrix development for SS-TDMA applications
                                                                                  Low NO sub x heavy fuel combustor concept program
                                                                                    phase 1A gas tests [MASA-CR-167877]
                                                  p0086 A82-43784
                                                                                                                                 p0055 N82-25337
COULSON, C. E.
                                                                                  Low NO sub x heavy fuel combustor concept program
                                                                                    phase 1A gas tests
[NASA-CR-167877]
    Active clearance control system for a turbomachine
      [ NASA-CASE-LEW-12938-1]
                                                  p0020 N82-32366
                                                                                                                                 p0055 N82-25337
COY.
    Optimal tooth numbers for compact standars spur
[ASHE FAPER 81-DET-115]
                                                                              DADONE, L.
                                                  p0 102 A82-19335
                                                                                  Performance degradation of propeller/rotor systems
    Surface quonetry of circular cut spiral bevel gears [ASHE PAPER 61-DET-114] p0 108 A82-1933
                                                                                    due to rime ice accretion [AIAA PAPER 82-0286]
                                                  p0 108 A82- 19334
                                                                                                                                 p0014 A62-28322
    Lubricant effects on efficiency of a helicopter
                                                                              Damilie, K., E.,
Deposit formation in liquid fuels. I - Effect of
       transmission
    [NASA-TM-82857] politooth profile analysiis of circular-cut, spiral-bevel quars
                                                   p0100 N82-25520
                                                                                     coal-derived Lewis bases on storage stability of
                                                                                     Jet A turbine fuel
                                                                                                                                 p0074 A82-22241
                                                                              DAILBY, C. L.

Shuttle to GEO propulsion tradeoffs
[AIAA PAPER 82-1245] p0034 A82-35082
Integrated propulsion for near-Earth space
missions. Volume 1: Executive summary
[NASA-CR-167889-VOL-1] p0045 N82-33424
       [ NASA-TM-82840]
                                                  p0101 N82-26681
    Reliability model for planetary gear
      [ NASA-TM-82859 ]
                                                  p0101 N82-28643
    The optimal design of involute gear teeth with
       unequal addenda
```

p0 10 1 W82-28645

	I	ı t	ė	q	Ľő	it	C	d	p	r	ր	u	1:	i	DI	ì	Ê	ot	. 1	n c	a	r	K	ri	: h	B	рa	Ce	•				
			ij	S	٤i	. 0	u.	ß,		١	ľo	1	u	4	1	2 :		7	0	c)	111	ic	a.	L									
											78	8	9	• 1	0		٠2	1								P	0 0	46	•	NO 2	-	334	25
CYI											. 1	_			£.		_																
	1.	ì	: U	r	j.	ñ	n	υķ		6	LI N	4	n:	*		Ţ		ea	13	u į	c	4 6	ın'	CB	71	•	P.E	.0.	1 1	x ød			
															3	6	1									b	0 0	56	ŝ	A 82	-	220	33
DAT	I								7			_		•	•		•									•				.,			
	Q	ua	'n	t	İ١	à	ŧ.	L٧	0		9	p	a I	C	ıt.	Ļ	n	ņ	L	1	e	tι	a.	l L i	1	y,	1 t	10	e	rox	ġ,	lò	
		£	r	0	Ŗ	1	t	H	d	Q(ó	٠	p	01	ķ	ij	Ó	n	p	r (d	UC	; t		þý	h	i q	ΙÞ					
		F	, G	E	EC) E	•	a n	C	0	1	1	q.	u)	, d	(n	rc			O	g t	. 4	ph'	7	•	* ^		,	NB2	١	162	ne
	r	or	'n	91	it		£	nr		al	- 1	ä	'n		n	1		ai	1	á	•	n d	1	R.	Ť١	۳,	ų ų	Th	'n	of	7	120	90
	•	" . C	Ċ	75	94	1	a	ct	. 61	d	c	o	•	pć	u	ni	la	7.0	'n	٠,	tĥ	G.	8	to	cac	10	E	ita	b	ıĭī	ŧ	 Y	•
		¢	(ij,	t		A.	t	U	r b	i	n	Ų	£	ue	1									•						.	
	_				٠																					p	00	74	1	AB2	-	222	40
	U	e i	10	8	11		I	o i		a	t i	٥	n	. 1	n	1	ı	qu	L	d.	Ľ	ue		5.	I			10.1	e	ct	0	E	
										i						١	Ja	25 6	10	•	J11	*	, ,,	yr.	191	*	es t		11,	lit	7	01	•
							-			2.00																р	00	74	i	A 82	-	222	41
	D	eţ	o	X	Lt	Ť	ţ	or	•	a	Ļi	0	n	į	i.n	1	ļł	ġυ	ıi	đ	£	€.	1	s,	I	11		. 1	h	đ			
		ŧ	t	ť	QC	: t	. 1	o f	,	В	1	Q	C	t c	d	ŧ	١į	tr	0	ŋ (ņ	(Ċ.	r p	oul	ıd	5	or	1	dia	13 (b L	
		1	: u	G	1																						٠,	171		. 65		224	a e
CAI	12	16		R		9																				h	UL	, ,,	•	A 82	-	434	()NO.
								pu	ı	S	a t	ı	o	n e	3	a l	90	¥e	3	tı	ır	bo		010	001	11	n r	: r	u	n ps			
																										p	Q Ç	76	5	AB2	4	464	30
DAV							_										_	.,												.			
	å																													ion		OE	
		1) E	ŏ	f	i	a	13 13	ă	n	ì	à	n)	ni	ñ	u	9	N.	1	ï	b	οi	m	da	L. At Marie	ï	ai	ini		ait	J		
		ŕ	A	5	N)	5	p	AF	Ľ	R	8	2	-(G		Ĭ	'n			_	_					p	ōd	iii	ì	A82	-	352	80
	Ţ	h t		Q	-(1 1	ĸ	O I	E	i	on	ñ	1		:1	01	•	£i	i e	10	į	i	1	th:	n I	t İ	p	re	þ	A82 Lon		o£	
		,	l	C	OI.	r	r,	OE	ı	(O)	C	r	Q	ţc	r	į	m	SE	in	qı	8.	3	I	=	T	ır	bι	H	n	CO			
								io			п	•	_	n n		,	271	1								ń	nά			A 8 2		251	16
	1	ht	. 6	Ö	ï	Ĭ		or	19	ï	on	a	ī		10	ì	1	ý¢	1	0 (:i	ŧ١		a ne	1 (ŧü	rt	ul	La	nce	1	334	
																														n o		AI	L
		ť	l i	ţ	ä.	L	ť	1, c	'n		C	ı	pı	Ċſ	113	8 (r	τ	0	t	¢Ľ	1	a	88	a q								
		ַַן	N	٨	5/		ć	ļ: -		6	90	Ú	3	1												þ	0 (126	5	NB2	-	25 2	252
DAV									à	٠.		,		e		١. ،		41		u.	ŧ			ha		. n	. 4			val	1		
	-																													bla		ë	
			ð																														
		្ន្រ	À	Ī	A)	١.	P	ΛĒ	, 4	R	8	12	- 1	ņ	11	3	1									þ	0 0	105)	λ82	-	179	33
UA V	11	٠, د	١,	ľ	•	9	•		٠.,	a.			ŧ.	٠.		٠.		1		,	~ in	ù		**					. ,	1 ;	i.		
	٠		i	r	CI	. 4	ť	ŧ.	, c,	'n	σì	n	6	В.	•	ρl	ın	Bt	; }	3	uų	•	r		,	4,74	•	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			u	•	
		ſ	N	A	SI	١-	c	R=	٠,	6	53	B	6	1												p	CC	2:	3	N82	-	140	95
	Ē	nı	3 5		£١	16	1	0	d	ld	01	ıd	u		3	1	'n	11	Lu	t,	lo	Ŋ.	Ţ	ē d	uc	ŧΪ	10	1					
			e e					Q.C	Į Y	•	Βī	:0	9	Ľ	M	1	3 #	a J	Ļ		10	¢	a	ir	C E	ı Ç	t	er	١q	ine	В	•	
								P	. 1	6	5.7	ıA	7	٦												1)	nέ	126		NA2	ندا	140	96
DAY	I							** .	•			-	٠	1												۳	***		•			, ,	
	T	h١)	A	G7	C 1	1	ŀ	t	0	C y	n	0	l¢	g	Y	-	٠,	l ti	ŧ	1 11	to) W	ót.	LV	Ì	a I	Lte	3 E	nat	Ŀ	VQ.	
				ė																						þ	Q ?		7	VB.	-	H	183
DA'								-6	,	_	e		h		n.		ń	. 1		h.	_ n	20		-a	26	n.A			٠.	nde			
	**		1 4						•	9	•	•		•	431	•	-	- L	• • •	••		4.1	+ 44	n, U	48		ç	, 44 &	. a	ii de	•••	-	
		,																															96
	N																													u Ac	r	H.	
		1	ا موج	_	٠.	i	e. C	CI	L	۸.	ַ	Ç	ĭ	ļ.	r U	41	ı.	Ca	ļ,		CO	n	Ą	ine na	n C	3,	1	ĻΙ	•	1			
		1		•	4,1	• 1	4	u J	., (1		Ç	• 4	*	-(1,	d1	Α.	اب	ų I)		ı i	a) ez	. 5	n	òř	191	1	A 82	2-	301	50 i
	S	ųı	• 1	a	C	3-	Ł	en	19	1	o t		L	'nċ	lto	C I	ht	i	ti	8	tn	b)	11	it	i,a:					ect			
		1	Ļ	t.	ĘI	C d	1	ì	10	u	n:	ia	Ľ	i	323		-				-			-									
										6	55	3	0	1												p	00	35	2	N9:		11:	390
DAI										٠.	#.	. +	11.	١,		ń.	•	~	٠.	ان		ŧ,	. 1	-1		1.	*		٠,	gı	٠,	u+1	
		1	1		15	t r	ë	ei e	3	ć	01	ic	6	n í	r		Ėi	01	1	R	it	9	3			-0	41	ul		. A.		# % P	•
		. [1	A	SI	١-	c	R-	٠Ì	6	9:	15						* *	,							p	0	1 15	5	N82	<u></u>	33,	738
DAY	13	0)	١,		J.	٠	Ä	• •	,	J	R.																	·					
	E	ΧĮ) (r	Ĭ	10	Ŋ	tn	1		٧ť	r	1	£	LC	a i	L	or	١.	0	Ľ.	a	C	0 18	pt\	ta *	t i	LOI	18	1	.~		
			; ; 5 }						₹.	Ľ	o L		L,	п	3.	.10	18	36	111	•	9T	-	i W	1	E O.	ĽO	Cl	1 23 6	3 6	-11	۸.		
			, ,	4	.,		G																			p	ď:	18:	2	AR:	2_	16	28
DE	A E	K) 1	ı		ľ	i.	1																		ľ							•
	t,	OI	ĮŊ	-	t,e) Ľ	×	ţ	ı	g.	h-	٧	e.	10	C.	1	t y	•	X	ì	d	ţ.	Lo	n j	a n	1	h¢)ţ		eCt		_	
																															À	1	
		3	.3 (1	25	ų	¢	×	7.0	4 61		ا, ب	. 5	F	u i	. Li	. (, (1	. 2	≯ ₹ ,	<u></u>	e II	ų,	L II	e n	e d					182	2_	37	15.1
	M	ėl	: 1	Ö	à	Ó	£	t	r	o	te	d	t	iı	10	ž		gı	ır	£	a C	0	¥	it	h i					n O4		.,	,
			, 1	1	i	: 0	n	- E	31	ŭ.	Ľ	: y	1	n I	Lu		Lŋ	10	ln		ÇQ	a l	Ŀi	ng								,	
	ت ۽							NS	i i	-	LŦ	W		1.	33	4 ;]-	1	1							p	0 ()66	3	N 82	2-	284	141
DR	ı ii	E,	,	其		I		Ý	į.		m		1							ė	i		. 2.	14		_	i -			A 61		. A .	
	. "			•	-		•	٠,		**	"		*	1		- 1	-		٠	٠. ٠	-4	- (4 64			1	-•	- 21		lu	-4		

[NASA-CR- 1679 12]

```
DECKER, A. J.
    Three-dimensional shock structure in a transonic
       fluttor cascade
    p0006 A82-37937
Pringe localization requirements for
three-dimensional flow visualization of shock
waves in diffuse-illusination double-pulse
holographic interference
       holographic interferometry
       [ NASA-TP-1868]
                                                        p0095 N82-22481
DECKER, D. K.
High power solar array switching regulation
                                                        p0043 A83-11736
    IMPATT power building blocks for 20 GHz spaceborne
       transmit amplifier [AIAA 82-0498]
                                                        p0086 A82-23566
DEISSERU, R. G.
Turbulont solution of the Navier-Stokes equations
for uniform shear flow
       [ MASA-TH-82925]
                                                        p0089 NB2-32634
DELAUSANTA, D.
    Application of photovolthic electric power to the
       rural education/communication needs of
       developing countries [NASA-CR-167894]
                                                        p0137 N82-29720
[NASA-CK-10/03-]

DELONBARD, B.

Operational performance of the photovoltaic-powered grain mill and water pump at Tanqaye, Upper Volta

[NASA-TK-82767] p0 120 NB2-15
                                                        p0 120 N02-19673
DELUCIA, M. A.

Rotor fraquent protection program: Statistics on aircraft qas turbine agine rotor failures that occurred in U.S. commercial aviation during 1978 00027 N82-273
                                                        p0027 N82-27316
       FNASA-CR-1653881
DELVICS, P.
    PMR polyimidos-roview and update
(NASA-TH-82821)
DEBGAECE, R. M.
    Primary propulsion/large space system interaction
       study
       [NASA-CR=165277]
                                                        n0044 282-18315
DRWITT, K. J.
    transfer in composite hodies with phase charge
       [ NASA-CH-165607]
                                                        p0002 NB2-22142
 DEEUBÀY, E. A.
    Low NOx heavy fuel combustor concept program.
Phase 1: Combustion technology generation [NASA-CR-165482] p0 136 NE
DMANHADMIRANI, w. S.
Study of the photovoltaic effect in thin film barium titanate
                                                        p0 136 NB2-24725
       [ NASA-CR-165081]
DICABLO, J. A.
Strongth advantages of chemically polished boron
       fibers before and after reaction with aluminum
       [NASA-TH-82806]
                                                        p0049 N82-21258
    Factors influencing the thormally-induced strength degradation of B/Al composites [NASA-TM-82823] p0050 M82-242
                                                        p0050 N82-24297
    Hethod and apparatus for strengthening boron fibers (NASA-CASE-LEW-13826-1) p0050 N82-2638
                                                        P0050 N82-26385
DIRML, L. A.
    Advanced technology for controlling pollutant emissics from supersonic cruise aircraft
                                                        P0001 N81-18004
OH-VPE growth of Mg-doped GaAs
                                                        p0159 A82-38411
DITTHIN, J. M.,
Propeller tip vortex - A possible contributor to
       aircraft cabin noise
                                                        p0 152 A82-17603
    In-flight acoustic results from an advanced-design
       propeller at Mach numbers to 0.8 [AIAA PAPER 82-1120]
    Noise of the SR-3 propeller model at 2 deg and 4 deg angle of attack
        [ NASA-TH-82738]
                                                        p0 151 N82-16808
     A shock wave approach to the noise of supersonic
       propellers
       [ NASA-TH-82752]
                                                        p0151 N82-16809
     A proliminary comparison between the SR-3
       propeller noise in flight and in a wind tunnel
                                                        p0152 #82-21998
       [ MASA-TH-82805]
DODDS, W. J. NASA/General Electric broad-specification fuels
       combustion technology program - Phase I results
```

p0074 N82-31546

```
and status
           [ ATAK PAPER 62-1009]
                                                                                            30021 A82-35000
       Demonstration of catalytic combustion with
           residual fuel
           [ NASA-CR- 165369]
                                                                                             p0131 N82-16464
DODGE, F. T. Study of vapor flow into a capillary adquisition
           [ NASA-CF-1670821
                                                                                             n0091 N82-24452
 DONG, S. B.
       Analytical and experimental investigation of the
           propagation and attunuation of sound in extended
propagation and attenuation of sound in extender reaction lined ducts
[AIAA PAPER 81-2014] p0 153 A82-10 p0 0000 pm. No. No.

Integrated qualifier combined cycle polygoneration system to produce liquid hydrogen [NASA-TH-82921] p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30 p0 125 N82-30
                                                                                             p0 153 A82-10454
                                                                                             p0 125 N82~50713
       nam, о.
Prossure pulsations above turbosologular pumps
p0076 A02-46430
DOSS, H.
       Comparative analysis of CCHHO Fower plants
                                                                                            p0158 A82-20747
       Automotive Stirling anging development program
           [NASA-CR-167907]
                                                                                            p0164 N82-29235
DOWSON, D.
       Banic lybrication equations
[NASA-TH-81693]
Lubrication of rigid ellipsida solids
                                                                                            p0099 NB2-16413
           [ HASA-TH-81694]
                                                                                             PO 100 NB2-25518
DRAGO, R. J.
On the automatic generation of YEM models for complex genrs - A work-in-progress report
                                                                                             p0 109 A82-48243
DRESHFIELD, R. L.
Trends in high temperature que turbine materials
[NASA-TM-62715] p0056 M92-11162
 DURAN, M. A.
       Advanced technology for controlling pollutant
           quincions from supersonic cruise aircraft
Poviow of analysis mathods for rotating systems
           with poriodic coefficients
                                                                                             p0135 N82-23702
 DULIKERVICH, D. S.
A computational design method for transonic
           turbomachinory concades
       [ASHE PARTER 82-GT-117] p0022
CAS22 - FORTRAN program for fast design and
                                                                                             p0022 A82-35348
            analysis of shock-free airfoil cascades using
            Fictitious-gas concept [NASA-Cr-3507]
       p0006 M82-16044
GBT D3C: Computer program for generation of C type
multilevel, three dimensional and boundary
conforming periodic grids
[NASA-CR-167846] p0008 M82-26239
Fast generation of themselves
       Fant quaeration of three-dimensional computational
            houndary-conforming periodic grids of C-type
            T NASA - CR- 165596 1
                                                                                             p0009 N82-28253
OULIE, D. Cx.dation and formation of deposit precursors in hydrogarhon fuels p0073 N82-1
                                                                                             p0073 NB2- 18402
       Hann Driver Two - A status report
                                                                                             p0046 A82-18191
       Mans driver reaction engine characteristics and purformance in earth orbital transfer missions
                                                                                             p0046 A82-18199
        A small scale lunar launcher for early lunar
           anterial utilization
                                                                                             P0032 A82-35617
       Distorted turbulance in axisymmetric flow
                                                                                             p0089 X82-16071
        Analysis of the decay of temperature fluctuations in isotropic turbulence
                                                                                             P0089 A82-40781
       The promised flame in uniform straining flow
                                                                                             p0055 A82-43194
        Rough analysis of installation effects on
            turboprop noise
[NASA-TH-62924] p0152 N
DUSCHA, R. A.
40-kW phosphoric acid fuel cell field test -
Project plan
                                                                                             p0 152 N82-32082
```

```
p0 128 A62-45325
DUSTIN, N. O. Rolling remistance of electric webicle tires from
       track tests
       [ NA/A-TH-82836]
    On the road performance tests of electric test vehicle for correlation with road load simulator
       [ MASA-TH-82900 ]
                                                          p0 127 #82-33829
microstructure, and strength of Si3M4-6 wt. #
Y2O3 and a beta-prime sialon
[ACS PAPER 42-H-81] p0070 A82-
                                                           p0070 A82-42366
DYSA,
    Spherical roller bearing analysis. SKF computer program SPHERUEAM. Volume 3: Program correlation with full scale hardware tests.
       [ NASA-CR-165205]
                                                          p0106 N82-20542
    Spherical roller bearing analysis. SRY comput
program SPHERBEAN. Volume 2: User's manual
                                                        SKY computer
    [MASA-CR-165204] p0 106 M82-20
High speed cylindrical roller bearing analysis.
SKY computer program CYBEAN. Volume 2: User's
                                                          p0 106 NB2-20541
        manual
    [MASA-CH-165364] P0.546 M
Research report: User's manual for computer
       program AT811005. PLANETSYS, a computer program
       for the steady state and transient thermal analysis of a planetary power transmission myst [NASA-CR-165366] p0146 M82-3
                                                          p0146 NB2-31970
    Proliminary feasibility assessment for
       Earth-to-space electromagnetic (Railqun) launchers
       [NASA-CR-467886]
                                                           p0033 N82-29345
BABLE, R. .V.
    Propulsion study for Small Transport Aircraft
Technology (STAT)
[NASA-CR-165499] p0022 NB:
                                                           p0022 N82-10037
EASLER, T. B.
    Strength distributions of SiC ceramics after
        oxidation and oxidation under load
                                                           p0071 A82-20143
        [ACS PAPER 9-C-80C]
    Effects of exidation and exidation under load on strongth distributions of Si3N4
[ACS PAPER 69-8-80] p0071 A82-3
                                                           D0071 A82-35871
BASLEY, A. J.
     Performance and operational economics estimates
       for a coal queification combined-cycle
       cogeneration powerplant
       [NASA-TH-82729]
REJOR' H' R'
    Development of low modulus material for use in curamic gas path soal applications
        [ NASA-CR-165469]
                                                           p0022 N82~10039
EBERNARDY, R. M.
    An experiment to evaluate liquid hydrogen storage
    Cryogonic fluid management experiment [NASA-CR-165495]
                                                           p0039 N82-15117
BBERT, L. J.

The influence of cobalt on the tensile and stress-rupture properties of the nickel-base superalloy MAR-M247
                                                           p0063 A82-47399
    The influence of cobalt on the microstructure of
        the nickel-base superalloy MAR-M247
                                                           p0063 A82-47400
BCRR, A.

A finite element formulation of Euler equations for the solution of steady transonic flows

10009 A02-
     [ATAA PAPER 82-0062] p0009 A02-17759
Application of a finite element algorithm for the
        solution of steady transonic Eulor equations
                                                          p0010 A82-31939
        [AIAA PAPER 82-0970]
     Investigation of rotational transonic flows through ducts using a finite element scheme [AIAA PAPER 82-1267] p0012 A8
                                                           p0012 AB2-37711
EDDE, H.
Collection and dissemination of thermal energy storage system information for the pulp and
```

paper industry

Straight and chopped DC performance data for a

EDIE, P. C.

```
rellance ny-250AT motor with a General Riectric
     RY-1 controller
[NASA-CR-165447]
Rtraight and chopped DC performence data for a
General Electric SBY436A1 DC shunt motor with a
Coneral Electric EY-1 controller
                                                                  p0132 N82-1760H
         [ NASA-CR- 165507 ]
mages, A. G.
Aluminum blade development for the Mod-CA
200-kilowatt wind turbine
[MASA-TH-82394] p011
                                                                 P0119 N02-14633
 BECHBONN. N.
     Buoyancy effects on the temperature field in
downward spreading Clames
                                                                 112094 AB2-41203
 mismulaum, p. M.
Daveluggent of a dual-field heteropoplar power
         converter
         T NASA-CH- 165 160 1
                                                                 p0084 N82-24424
 marbor, N. N. M. Manageric broad-specification fuels
         combustion technology program - Phase I results
         and asatun
         [ VIYY BYBRU 03-1003]
      Dumonatration of catalytic combuntion with
 roniduol fuel
[HABA-CR-165169]
WELKOTT, W. W.
                                                                 p0131 N02-16484
     Stolohlowetry-controlled compensation in liquid encapsulated Caochealski Gaks
                                                                 po 158 A62-17565
     Componention mechanism in liquid encapsulated
Cuochralski Gaks Importance of melt stoichlowers
                                                                 p0086 A82-40403
Advanced general aviation comparative engine/airframe integration study [NASA-CR-165764]
                                                                 p0025 N02-22263
      Advanced attatified charge rotary alreraft engine
         denign study
[HASA-CR-165398]
                                                                 n0107 H02-27743
ELEMPARE, N. M.

Solutions of the compressible Havier-Stokes
equations using the integral method
(AIAA FARER 01-0046) pc093

ELIMBANY, A. M.
                                                                 p0093 A02-23032
      The effects of controls and controllable and
        storage Loads on the perference of stand-alone photovoltaic systems
                                                                 p0127 A02-45027
     Rot Launtatically pressed wanusacture of high
atrongth MRRI 76 disk and seal shapes
[NASA-CK-165549] p0064 Nd
                                                                 00064 N02-26439
MMCRL, M. A.

Kffeets of cobalt on the microstructure of Udimet
700
f NASA-CR-1656051 poods N82-2846
FROLENT, G. W.
Interaction of upstream flow distortions with high
                                                                 p0064 N82-28409
        Hack number cascades
[NASA-TH-82759]
                                                                 n0003 N02-12043
ENOCH, d.

Numerical simulation of sheath structure and current-voltage characteristics of a
         conductor-dislectric disk in a plasma
     Numerical simulation of plasma insulator interactions in space. Part in The self consistent calculation
                                                                 n0039 N82-14272
     Numerical simulation of plasma insulator
interactions in space. Part 2: Dislectic
         nffeats
                                                                 p0039 N02-14273
TRISKING, F. T.

Time variability and structure of quiet sun
Bources at 6 cm wavelength

pole7
                                                                 C0035-286 7310q
MISION, I.

Notified face seal for positive film stiffness
[MASA-CASE-LEN-12989-1] p0099 NO2-
MITTERS, N. D.

Notified and magnetic fields
                                                                 P0099 ND2-12442
TTTENS, N. D.

Riectric and magnetic fields
[NASA-CR-165604] poods N82-28350

NASA/Lewin Research Program
poods N82-21148
```

```
MVAME, D. J.

Hot importationally pressed manufacture of high accounts MXNL 76 disk and seal shapes [NASA-CR-165549] p0064 M8
                                                                                                                                              P0064 N82-26439
 Multijunction high voltage concentrator solar cells p0043 A82-11796
 TVAME, J., C., JR.
Pabrication of multijunction high voltage
Concentrator molar cells by integrated circuit
                   technology
                                                                                                                                              p0 127 A82-44957
          High voltage V-groove molar cell
[NASA-CASK-LKW-13401-2] p0123 M02-24717
Nethod of making a high voltage V-groove solar cell
[NASA-CASK-LKW-13401-1] p0124 M02-29709
High voltage planar multijunction molar cell
[NASA-CASK-LKW-13400-1]
[NASA-CASK-LKW-13400-1]
 WVAMS, J. M..

A multi-purpose method for analymic of spur dear tooth loading
[WASA-CR-165163] point seem 12400-11
                                                                                                                                              po 104 NB2-10401
 MARRIAN, M.
            Methods for the calculation of axial wave numbers in lined ducts with mean flow
                                                                                                                                              p0 153 A82-14044
           Acoustic transmission in lined flow ducts - A finite element eigenvalue problem
                                                                                                                                              po 154 A02-17663
          WWAMERKA, J. C.

Result- of chopper-controlled discharge life
cycling studies on lead acid batteries
[NRSA-TH-82212]

P0124 N
                                                                                                                                              n0124 N82-30700
RMING, M. N. Comparison of beam and shell theories for the vibrations of thin turbomachinery blades [ASHK PAPKR 82-07-223] po 115 AB
                                                                                                                                              po 115 A82-35408
 PARTH, G. N. Atomization and combustion properties of flashing
                   injectors
                   [AIAA PAPER H2-0300]
          Investigation of apray characteristics for flashing injection of fuels containing dissolved air and superheated fuels pooz? ws2-263: p0027 ws2-263:
                                                                                                                                              n0027 N82-26295
 PARTHAMA, No. Do.
Undoped semi-insulating LEC Gasa - A model and a
                   mechaniam
          Computer program tos calculating full potential transonic, quadi-three-dimensional flow through a rotating turbomachinery blaze row
                  [ OCOS-42-484M]
                                                                                                                                              D0005 N82-28247
[NASA-TP-2030] p0005 N8:

PASCNING, M. A.

CF6 jet engine performance improvement: High pressure turbine roundness
[NASA-CR-165555] p0024 N8:

CF6 jet engine performance improvement: High pressure turbine active clearance control [NASA-CR-165556] p0027 N8:

The CF6 jet engine performance improvement: I pressure turbine active clearance control [NASA-CR-165557] p0029 N8:

FMAN. J. S.
                                                                                                                                              p0024 N82-17174
                                                                                                                                             P0027 N82420297
                                                                                                                                             p0029 H02-33393
 PRAM, J. S.
HASA Brond Specification Fuels Combustion
                  Technology program - Pratt and Whitney Alreraft
Phase I results and status
[AIAA PAPER 82-1088] p3021 A82-30
                                                                                                                                              10021 Y85-34888
           NASA/General Electric broad-specification fuels combustion technology prodram - Phase I results
                   and atatus
                 [ 1001-20 RAGE4 KAIK]
                                                                                                                                              p0021 A82-35000
PRENT, J. M.

COLI Wodule and fuel conditioner development
[NASA-CR-165620]
PRENAMENT DR LA NORA, J.

CHARACTER STATEMENT OF A discovery of a discovery of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the statement of the 
                                                                                                                                              PO 134 NU2-21713
```

Two dimensional stagnation point flow of a dusty que near an oscillating plats

```
p0012 A82-37535
PREEMARK, J.
   Universal binding energy relations in setallic
      adhesion
       KASA-TH-827061
                                                 p0058 M82-11183
   Priction wear and auger analysis of iron implanted with 1.5-MeV nitrogen ions
[NASA-TP-1989] p0059 M82-2130
                                                 p0059 N82-21300
   Tribological characteristics of mitrogen (N+)
      implanted iron
      [ NASA-TH-82839 ]
                                                 p0060 N82+24322
FERTIS, D.
   Engine dynamic analymim with general nonlinear finite element codes. II - Bearing element
     implementation, overall numerical characteristics and benchmarking
      [ ASME PAPER 82-GT-292 ]
                                                 p010# 182-35462
   Ingine dynamic analysis with general nonlinear
      finite element codes. Part 2: Bearing element implementation overall numerical characteristics
      and benchmaking
      [ NASA-CP- 167944]
                                                 p0028 NB2-33390
FESTER, D. A.
An experiment to evaluate liquid hydrogen storage
      In space
                                                        A82-20748
   Cryogenic fluid management experiment
[NASA-CR-165495] p0039 N02-15
FINGER, D. G.
Analytical and experimental evaluation of biaxial
                                                 p0039 N82-15117
      contact stress
                                                 p0071 X82-20741
   Design and development of a ceramic radial turbine
      for the AGTIO1
      [ATAK PAPER B2-1209]
                                                 p0 109 A82-35480
PIBRE. R.
   Pover systems
                                                 p0001 N82-19146
   Power systems
                                                 p0001 N82-19146
   Component technology for space rower systems
     [ HASA-TH-82928]
                                                 p0082 N82-30474
PINKE, R. C.
   Component technology for space power systems [TAT PAPER 82-408] p0043 A
                                                 p0043 A82-44750
PISHBACH, L. H.
    NASA research in supersonic propulsion: A decade
      of progress
      [ NASA-TH-82862]
                                                 P0019 N82-26300
PLESTER, S.
   The design and instrumentation of the Purdue
     annular cascade facility with initial data acquisition and analysis [NASA-CE-167861] ponos M
                                                 n0008 NB2-26237
PLENIEG, D. P.

Nonlinear analysis of rotor-bearing systems using
      component mode synthesis
      [ASHE PAPER 82-GT-303]
                                                 p0104 A82-35468
   Effect of seals on rotor systems
     [ NASA-TH-02785]
                                                 p0099 N82-16411
PLOOD, D. Gallium arsenide solar cells-status and prospects
      for use in space
                                                 p0043 A82-11765
PLORSCHUKTE, L. W.
    Flow distributions and discharge coefficient
      effects for jet array impingment with initial
      crossflow
      [ ASHE PAPER 82-GT-156]
                                                 p0011 A82-35379
FORD. W. P.
   Numerical comparisons of nonlinear convergence
      accalorators
                                                 p0149 A82-31438
   Acceleration of convergence of vector sequences
      [ NASA-TM-02931]
                                                 p0149 N02-29075
PORESTIERI, A. P.
   On the cause of the flat-spot phenomenon observed
in silicon solar colls at low temperatures and
      low intensities
      [ NASA-TM-82903]
                                                 p0126 N82-31777
PORMAN, B. J.
The 30/20 GHz flight experiment system, phase 2.
      Volumo 1: Executive summary [NASA-CR-165409-VOL-1]
                                                 pGC78 N82-20362
   The 30/20 GHz flight experiment system, phase 2. Volume 2: Experiment system description
      [ NASA-CR- 165409-VOL-2]
                                                 p0078 N82-20363
```

```
The 30/20 CHz flight experiment System, phase 2.
      Volume 3: Experiment system regulrement document
[NASA-CR-165409-VOL-3] p0078 V82-20364
    The 30/20 GHz flight experiment system, phase 2.
      Yolume 4: Experiment system development plan
[HASA-CR-165409-VOL-4] p0078 N82-
                                                   p0078 N82-20365
FORMAN, R.

Jon beam textured graphite electrode plates
[MASA-CASE-LEW-12919-2] p0050
                                                   p0050 #82-26386
PRALEY, J. E.
    Experimental boundary integral equation
      applications in speckle interferometry
                                                  p0097 A82-36987
PRALICE, G. C. Hinisturg drag-force anemometer
                                                  p0097 A82-40132
    Extending the frequency of response of lightly
      damped second order systems: Application to the
      drag force anemometer
      [ NASA-TH-82927]
                                                  p0096 N82-32662
PRANKFORT, M.

Worldwide satellite market demand forecast
[NASA-CR-167918] p0079 N82-2:
PRATER, J. L.

A multi-purpose method for analysis of spur gear
                                                  p0079 N82-25423
      tooth loading
      [ NASA-CR-165163]
PRADUMNOFF, G.
Deposit formation in liquid fuels. III - The
      effect of solucted mitrogen compounds on diesel
      fuel
                                                  p0074 A82-23238
PREDERICK, G. R. Effect of rotor configuration on guyed tower and
      foundation designs and estimated costs for
      intermediate Site horizontal axis wind turbines
      [NASA-TH-82804]
                                                  p0121 N82-22649
FREEDRAW, R. J.,
   Development and utilization of a laser velocimeter
      system for a large transonic wind tunnel
      [ NASA-TH-82886]
                                                  p0095 NB2-31663
    Seeding considerations for an LV system in a large
      transonic wind tunnel
                                                   p0096 N82-32689
PRESENT, A. J., Cosiation of W/001/ - Work function lowering by
      multiple dipole formation
PRESERVAN, J. N.
   Direct conversion of light to radio frequency energy
                                                  p0 138 2-11712
PREMICH, K. Pabrication of sinterable silicon mitride by
      injection molding
                                                  p0071 A82-37015
Paraca, K. W. Pabrication of turbing components and properties
      of sintered silicon nitride
      [ASHE PAPER 82-GT-252]
PRIEDRAW, R.
Experiments on fuel heating for commercial aircraft b0072 N82-2648;
     [ NASA-TH-82878]
                                                  P0072 N82-26483
PROST, W.
Design of prototype charged particle fog dispersal
      unit
      [NASA-CR-3481]
                                                  p0141 N82-16659
PU, L.,S.
   On ultrasonic factors and fracture toughness
                                                  p0116 A82-42863
   The transmission or scattering of elastic waves by an inhomogenuity of simple geometry: A
      comparison of theories
      [NASA-CR-169034]
                                                  p0079 N82-26526
FURNAR, E. R.
Gas turbine critical research and advanced
     technology (CRT) support project [NASA-TH-82872]
                                                   PO 126 N82-31776
PUSADO, R. L. Geometrical aspects of the tribological properties of graphite fiber reinforced polymide compositors 000 polymide compositors 000 polymide compositors
      [ NASA-TH-82757]
                                                  p0066 N82-15198
    Tribological properties at 25 C of seven polyimide
      films bonded to 440 C high-temperature stainless
      stool
      F MASA-TP-1944 ]
   Tribological evaluation of composite materials made from a partially flucrinated polyimide [NASA-TK-82832] p0069 N82-
                                                  p0069 N82-29459
```

.

ORIGINAL PAGE IS OF POOR QUALITY

	513N4 Materials [ACS PAPER 52-8-80P] p0074 182-330?9
\mathbf{G}	GRYSER, L. C.
JIBD high pressure compressor performance	AZSOP: A computer-aided design program for linear multivariable control systems rmxsA-TH-0287!1 p0148 N02-30992
improvement [NASA-CR-165531] po 104 #82-11467	GUANDRI, S. K.
JTOD ceramic outer air seal system refinement program [NASA-CR-165554] p0106 N82-18603	Low temperature growth and electrical characterization of insulators for GaAs MISFRTS [NASA-CR-164972] p0159 882-11959
GAPPHET, E. T. Blade loss transient dynamic aralysis of turbomachinery	GRIA, K. M., Hultigrid simulation of asymptotic curved-duct flows using a semi-implicit numerical technique
[AIAA FAPER 82-1057] p0030 A82-34982	p0010 182-29003
Preformance of advanced chromium electrodes for the NASA Redox Fnergy Storage System [NASA-TH-82724] p0118 N82-12574	Multigrid simulation of asymptotic curved-duct flows using a semi-implicit numerical technique p0010 A82-29003
A preliminary study of crack initiation and growth at stress concentration sites	Winerical modelling of turbulent flow in a combustion tunnel p0093 A82-27000
[NASA-CR-169358] p0115 N82-33738 GALLARDO, V.	p0093 A82-27000 Numerical modeling of turbulent combustion in premixed gases
Blade loss transient dynamic analysis of turbomachinery [AIAA PAPER 82-1057] p0030 A82-34982	p0056 A82-28708 Effects of internal heat transfer on the structure
Three dimensional flow field inside compressor	p0093 A82-32225
rotor, including blade boundary layers [NASA-CR-169120] p0091 N82-27686	GIMMIT, C. C. Application of image processing techniques to fluid flow data analysis
Current legal and institutional issues in the commercialization of phosphoric acid fuel cells	[NASA-TH-82760] p0004 N82-16049
[NASA-CR-167867] p0136 N82-29719 GARDNER, W. B.	IMPART nover building blocks for 20 GHz spaceborne
Energy efficient engine: High pressure turbine uncooled rig technology report [NASA-CR-165149] p0031 N82-32383	transmit amplifier [ATAN 82-0498] p0086 A62-23566 GIARRATAMO, P. J.
[NASA-CR-1651491 p0031 N82-32383 GARLICK, R. G.	The dryout region in frictionally heated sliding contacts
CARLICE, R. G. Phase stability in plasma-strayed, partially stabilized zirconia-yttria p0070 A82-41552	[NASA-TH-82796] p0088 N82-28574
GARRETT, B. G. p0070 A82-41552	Propulsion study for Small Transport Aircraft Technology (STAT) [MASA-CR-165499] p0022 NB2-10037
Socioeconomic impact of photovoltaic power at Schuchuli, Arizona [NASA-CR-165551] p0133 N82-19669	4488A) 46
Fast recovery, high voltage silicon diodes for AC	Requirements for optimization of electrodes and electrolyte for the iron/chromium Redox flow cell [NASA-CR-165218] p0 136 N82-25640
motor controllers p0086 A82-36926 GRUGLER, R. E.	GLASCOW, J.,C. Comparison of upwind and downwind rotor operation of the DOB/MASA 100-kW MOD-0 wind turbine
Plow visualization study of the horseshoe vortex	p0 122 N82-23710
in a turbine stator cascade [NASA-TP-1884] GAYDA, J. Fatique and creep-fatique deformation of several	The influence of gamma prime on the recrystallization of an oxide dispersion strengthened superalloy - MA 6000B
nickel-base superalloys at 650 C	p0062 A82-47393 Creep shear behavior of the oxide dispersion
GEDBON, L. Validation of the NASCAP model using spaceflight	strengthened superalloy MA 6000E [NASA-TH-82704] p0058 N82-10195
data [AIAA PAPER 82-0269] p0038 A82-17872 GEDWILL, H. A.	Overlay metallic-cernet alloy coating systems [WASA-CASE-LES-13639-1] p0070 N82-33522 GLIEBE, P. R.
Review of NASA progress in thermal barrier coatings for stationary gas turbines	Effects of vane/blade ratio and spacing on fan noise [AIAA PAPER 81-2033] p0029 A82-10457
[NASA-TE-81716] p0058 N82-17335 Gas turbine critical research and advanced technology (CRT) support project	GOLD, P., I., Electrostatic fuel conditioning of internal combustion engines
[NASA-TH-82872] p0 126 N82-31776 Overlay metallic-cermet alloy coating systems [NASA-CASE-LEW-13639-1] p0070 N82-33522	[NASA-CR-169029] p0106 N82-26680 GOLDMAN, L. J., Analytic investigation of effect of end-wall
GEE, W. NASA Adaptive Multibeam Phased Array (AMPA): An	contouring on stator performance [MASA-TP-1943] p0003 N62-14051
application study [NASA-CR-169125] p0079 N82-28503 GEISENDORFER, B. G.	Laser anemometer measurements in an annular cascade of core turbine vanes and comparison with theory
Comparative analysis of CCMBD power plants p0158 A82-20747	[MASA-TP-2018] p0004 M82-26234 Comparison of laser anemometer measurements and
GRLL, Y. On a free-electron-laser in a uniforp magnetic field - A solution for arbitrarily strong	theory in an annular turbine cascade with experimental accuracy determined by parameter estimation
clectromagnetic radiation fields A82-28409	[WASA-TM-82860] p0005 N82-28250 Laser anemometer using a Fabry-Perot
The ac propulsion system for an electric wehicle,	interferometer for measuring mean velocity and turbulence intensity along the optical axis in
phase [NASA-CR-165480] p0129 M82-13506	turbomachinery [MASA-TH-82841] p0095 M82-28605
Oxidation stability of advanced reaction-bonded	GOLDRICH, R., S., Hathematical models for the synthesis and

GERSCE, B. M. Oxidation stability of advanced reaction-bonded

```
optimization of spiral bevel gear tooth surfaces
      [ NASA-CR-3553]
                                                   p0 106 N82-25516
   Precision of spiral-bevel gears
      [ NASA-TH-82889]
                                                   p0 102 NB2-30552
   Kinematic precision of quar trains [NASA-TH-82887]
                                                   p0102 N82-32733
GOLDSHITE, I. N. Advanced turboprop testbed systems study
                                                   p0014 N82-33375
      [ NASA-CR- 167895]
GOLDSTEIN, M. E.
    Generation of instability waves at a leading edge
[NASA-TM-62835] p0087 N82-22453
      [ NASA-TH-62835]
GONFALESAMABBIL, O. D.
Cross-linked polyvinyl alcohol films as alkaline
      [ NASA-TH-82802]
                                                   p0054 N82-22327
GORADIA, C.
    A theory of the n-i-p silicon sclar call
                                                   p0128 A82-45055
CORADIA, C. P.
   High voltage V-groove sclar cell
[HASA-CASE-LEW-13401-2]
                                                   p0 123 N82-24717
    Method of making a high voltage v-groove solar cell
[NASA-CASE-LEW-13401-1] p0124 N82-2970
                                                   p0 124 NB2- 29709
    High voltage planar multijunction solar cell
      [ NASA-CASE-I.EN-13400-1]
                                                   p0 125 N82-31764
GORDON, L. H.

Mod-2 wind turbine system cluster research test
      program. Volume 1: Initial plan E-1290
      [ NASA-TH-82906]
                                                   p0123 N82-26807
GORDON, S.
Thermodynamic and transport combustion properties
Thermodynamic and transport combustion properties
      in SI units
      [ NASA-TF- 1906]
                                                   p0161 N82-32186
   Thermodynamic and transport combustion properties of hydrocarbons with air. Part 2: Compositions
      corresponding to Kelvin temperature schedules in
      part 1
      NASE-TP- 1907]
                                                   p0161 N82-32187
    Thermodynamic and transport combustion properties
      of hydrocarbons with air, Fort 3: Properties
      in US customary units [NASA-TP-1908]
   Thermodynamic and transport combustion properties
of hydrocarbons with air. Part 4: Compositions
corresponding to Rankine temperature schedules
      in part 3
      [ NASA-IP- 1909]
                                                   p0 161 N82-32189
GORDON, W. L.
    Electron beam induced damage in ITO coated Kapton
                                                   p0 159 A82-41546
    Secondary electron emission yields
                                                   D0038 N82-14226
GORBELL. W. T.
    Computer pargram for aerodynamic and blading
      design of multistage axial-flow compressors
      [ NASA-TP- 1946]
                                                   p0016 N82-15039
GOULDIN, F. C.
    Time resolved density measurements in premixed
   turbulent flames
[AINA FAPER 82-0036] p0056 482-
Flame structure in a swirl stabilized combustor
inferred by radiant emission measurements
                                                   p0056 382-22033
                                                   p0056 A82-28694
   Flow process in combustors
      [ NASA-CP- 169294]
                                                   p0092 NB2-31642
GOVINDAN, T. R.
    Effects of blade loading and rotation on
      CCMFresor rotor wake in end wall regions [AIAA FAPER 82-0193] p0010
                                                   p0010 A82-22063
    Three dimensional turbulent boundary layer develorment on a fan rotor blade
      [ AX AA PAPER 82-1007]
                                                   p0011 A82-31965
GRABITZ, G.
    Forms of three-dimensional supersonic free jets in
      linear approximation
                                                           A82-19196
GRANDENAND, W. W.
Study of the photovoltaic effect in thin film
barium titanate
      [ NASA-CF- 165081]
                                                   p0 131 N82-16479
GRAWY, H. P.
Thin film temperature sensors, phase 3
                                                   pC097 N82-22479
      [ NASA-CE- 165476]
CREBER, I. Dilution jet behavior in the turn section of a
      reverse flow combustor
      [AINA PAPER 82-0192]
                                                   p0021 A82-20291
```

```
Dilution jet behavior in the turn section of a
      reverse flow combuster
      [ NASA-TH-82776]
                                                D0017 M82-19220
Processing of silicon solar cells by ion implantation and laser annealing
      [NASA-CR-165283]
                                                p0 128 #82-11546
GRECOREK, G. M.
Aerodynamic characteristics of airfoils with ice
accretions
      [AIAA PAPER 82-0282]
                                                p0010 A82-22081
GRRISSIEG, J. P.
   Development and utilization of a laser velocimeter
      system for a large transonic wind tunnel
      [NASA-TH-82886]
                                                p0095 NB2-31663
    Propeller flow visualization techniques
                                                p0096 N8S-32672
    Development of a laser velocimeter for a large
      transonic wind tunnel
                                                p0096 N82-32688
GRETUALL, M. S.
    Numerical modeling of three-dimensional confined
      flows
      [ NASA-CR-165583]
                                                D0158 NB2-24078
CRILL. A.
    Sputtered silicon nitride coatings for wear
      protection
      [ WASA-TH-82819]
                                                P0067 N82-20314
    Some properties of RP sputtered hafnium nitride
      coatings
      [NASA-ÍM-82826]
                                                p0067 N82-21331
    Deposition of reactively ion beam sputtered silicon mitride coatings
      [NASA-TH-82942]
                                                p0069 N82-30401
CRIMES, N. M. Thermal degradation of the tensile properties of
      undirectionally reinforced FP-A1203/EZ 33
      magnesium composites
      [NASA-TH-82817]
                                                p0049 #82-21260
GRISAPPE, S. J.
Trends in high temperature gas turbine materials
      [ NASA-TM-82715]
                                                p0058 N82-11182
GROSSENEG, J. F.
    Pough analysis of installation effects on
      turboprop noise
      [NASA-IN-82924]
                                                p0 152 N82-32082
GROSS, S.
   Overview study of Space Power Technologies for the advanced energetics program [NASA-CR-165269] p0 172 N82-1760
                                                p0 17/2 N82-17606
GRURER, R. P.
Simplified dc to dc converter
     [ WASA-CASE-LEW- 13495-1]
                                                p0082 N82-24432
GUPTA, A. K.

Modeling parameter influences on MHD swirl
combustion nozzle design
[AIAA PAPER 82-0984] p0011
                                                p0011 A82-31947
    Plow aerodynamics modeling of an MHD swirl
      combustor - Calculations and experimental
      verification
                                                p0094 A82-44782
GUPTA, D. K.
    Improved plasma sprayed MCrAly coatings for
      aircraft gas turbine applications
                                                p0065 482-20742
   Tailored plasma sprayed MCrAll coatings for aircraft gas turbine applications [NASA-CR-165234] p0064
                                                p0064 N82-19360
GUPTA, S. K.
    Design and development of a ceramic radial turbine
      for the AGTIVI
[AIAA PAPER 82-1209] p0 109 A82-
GUSTAPSON, T. K.
Stationary state model for normal metal tunnel
junction phenomena
                                                p0 109 A82-35480
                                                p0159 A82-42912
GUSTAFSSON, U. R., C.
    An automated system for global atmospheric
      sampling using B-747 airliners [NASA-CR-165264]
                                                p0139 N82-13554
GUTIERRE, O. A.

Effect of facility variation on the acoustic
      characteristics of three single stream nozzles
      [ NASA-TM-81635]
                                                p0151 N82-19944
```

HAAS, J. E.
The effect of rotor blade thickness and surface

transistor characterization, and base-drive

```
finish on the performance of a small axial flow
                                                                                                                                  optimization
          turbine
                                                                                                                                   [ HASA-CR-165546]
                                                                                                                                                                                                        p0084 #82-17439
     (ASME FARTA 82-GT-222) p0022 A82-35
The effect of rotor blade thickness and murface
finish on the performance of a small axial flow
                                                                              p0022 A82-35409
                                                                                                                         HABCOCK, D.,J.
                                                                                                                               A 10-kW series resonant converter design,
                                                                                                                                   transistor characterization, and base-drive
          turbing
                                                                                                                                   ontimization
          T NASA-TH- 82726 1
                                                                              p0003 #82-1311#
                                                                                                                                                                                                        p0086 A82-36927
     Comparison of experimental and analytical performance for contoured endwall stators [NASA-TH-02077]
                                                                                                                         MANDSCHUM, R. P.
                                                                                                                               Gas turbine ceramic-coated-vane concept with
                                                                              p0019 N02-26299
                                                                                                                                   convection-cooled porous metal core
BADDEN, G. B.
Research report: User's manual for computer
program ATS19003 SHABERTH. Steady state and
transient thormal analysis of a shaft bearing
                                                                                                                                                                                                        p0016 M82-14090
                                                                                                                                   [ NASA-TP-1942]
                                                                                                                         EARTHAM, G. A.
A preliminary study of crack initiation and growth at stress concentration sites
[MASA-CR-169358] p0115 M82-337
          system including ball, cylindrical and tapered
                                                                                                                                                                                                        p0115 N82-33738
         roller bearings [NASA-CR-165365]
                                                                                                                         BATCH, A. H.
                                                                                                                               Hagnetohydrodynamics (HHD) Engineering Test
Facility (ETF) 200 HWo power plant. Design
Requirements Document (DRD)
[NASA-TH-82705] p0099 N8
     research report: User's manual for computer program AT817005. PLANETSYS, a computer program for the steady state and transient thormal analysis of a planetary power transmission system [NASA-CR-165366]
                                                                              p0146 N82-31969
                                                                                                                                                                                                        p0099 N82-12446
                                                                                                                         Coaxial prime focus feeds for paraboloidal reflectors p0078
                                                                              p0146 N82-31970
      T. W. P.
Effect of gamma irradiation on the friction and
MADY.
                                                                                                                                                                                                        p0078 N82-31585
         wear of ultrahigh molecular weight polyethylene
                                                                                                                         BRITHAY, P. W.
                                                                              p0062 A82-10674
                                                                                                                               Acoustic microscopy of milicon carbide materials
                                                                                                                                                                                                        p0075 A82-33031
      Recrystallization and grain growth in NiAl
                                                                                                                         MELDENBERED, R. W.
                                                                                                                               Study of advanced propulsion systems for Small
Transport Aircraft Technology (STAT) program
[HASA-CR-165610] p0026 M82-24202
                                                                              p0065 A82-44529
      MASA Redox cell stack shunt current, pumping
power, and coll performance tradeoffs prost wash-22686 process washing process with the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process of the process 
                                                                                                                         MBLHS. N. R. G.
AGT 100 automotive gam turbine mystem development
[AIAA PAPER 82-1165] p0108 A82-35038
                                                                              p0054 N82-19333
                                                                                                                         BERBERY, J. H.
          photovoltaic stand-alone application
                                                                                                                               Advanced stratified charge rotary aircraft engine
                                                                              p0127 A82-11774
                                                                                                                                   design study [NASA-CR-165398]
      Design floxibility of Redox flow systems
                                                                                                                                                                                                        p0 107 N82-27743
                                                                                                                         [ HASA-TH-82854 ]
                                                                              P0054 N82-31459
BAH. C.
      Heasurement and prediction of mean velocity and turbulence structure in the near wake of an
                                                                                                                                                                                                        p0089 A82-10964
                                                                                                                               Toward the use of similarity theory in two-phase
          airfoil
     p0010 A82-26137
Three dimensional turbulent boundary layer
develorment on a few secondary
                                                                                                                                   choked flows
                                                                                                                                                                                                       P0089 A82-16570
         development on a fan rotor blade
[ Alak PAPER 82-1007]
                                                                                                                               Effects of arc current on the life in burner riq
thormal cycling of plasma sprayed ErOsub2-
                                                                              P0011 N82-31965
      Numerical analysis and FORTRAN program for the ucmputation of the turbulent wakes of
                                                                                                                                    Yaub20sub3
                                                                                                                                   [ MASA-TH-82795]
                                                                                                                                                                                                        P0087 N82-17453
         turbomachinery rotor blades, isolated airfoils and cascade of airfoils [NASA-CR-3509] p0006 N82-1
                                                                                                                               Plow through aligned sequential orifice type inlets [NASA-TP-1967] p0087 N82-20467 Flows through sequential orifices with heated
                                                                              p0006 N82-18184
HALPORD, G. R.
Turbine blade nonlinear structural and life analysis
[AIAA FAPER 82-1056] p0021 A02-34981
                                                                                                                               Spacor reservoirs
[MSSA-TM-82055] p0088 W82-2
The dryout region in frictionally heated sliding contacts
                                                                                                                                                                                                        p0088 N82-24455
      Nonlinear structural and life analyses of a
          combustor liner
                                                                                                                                   [ NASA-TH-82796]
                                                                                                                                                                                                        p0088 N82-28574
         [ 3484-TH-82846 ]
                                                                                                                               Use of fiber like materials to augment the cycle
BABAD, G.
                                                                                                                                   life of thick thermoprotective seal coatings
      Sound generated in a cascade by three-dimensional disturbances convected in a subsonic flow [AIAA FAPER 81-2046] p0153 A82-10
                                                                                                                                    [ NASA -TH-8290 1]
                                                                                                                                                                                                        p0089 N82-32633
                                                                                                                         MERDELL, T. P.
                                                                              p0153 AB2-10460
                                                                                                                               Ultrasonic velocity for ostimating density of
MARED. M. A.
                                                                                                                                   structural cerasics
      Experimental boundary integral equation
                                                                                                                                   [ WASA-TH-82765 Y
                                                                                                                                                                                                        p0066 NB2-19359
                                                                                                                         Analytical and experimental investigation of the
          applications in spoukle interferometry
                                                                              p0097 A82-36987
    MEOND, R. A.

Nybrid and electric advanced vehicle systems
(heavy) simulation
[NASA-CR-165536] p0163 Ny
                                                                                                                                   propagation and attenuation of sound in extended
                                                                                                                                    reaction lined ducts
                                                                                                                         reaction lined ducts
[ALAA PAPER 81-2014] p0153 A82-104
MIBMER, D. M.
Analysis of high load dampers
[NASA-CR-165503] p0026 W82-232
MIDDLESTON, H. R.
Free electron lasers for transmission of energy in
                                                                                                                                                                                                        p0 153 A82-10454
                                                                              p0163 N82-16938
Basic lutrication equations
                                                                                                                                                                                                        n0026 N82-23248
         [ NASA-TH-81693]
                                                                              p0099 NR2-16413
      Goometry and starvation effects in hydrodynamic
          lubrication
                                                                                                                                   space
           NASA-TH-82807]
                                                                                                                                   [ NASA-CR-165520]
     High-speed motion picture camera experiments of cavitation in dynamically loaded journal bearings [NASA-TH-62798]
Frictional heating due to asperity interaction of elastohydrodynamic line-contact surfaces
                                                                                                                               Low-thrust chemical propulsion system propollant
                                                                                                                                   expulsion and thermal conditioning study.
                                                                                                                                   Executive summary [NASA-CR-165622]
                                                                                                                               [NASA-CR-165622] p0045 /82-24287
Low-thrust chemical propulsion system propellant
                                                                              p0 100 N82-25514
          [ NASA-TP- 1882 ]
      Lubrication of rigid ellipsida solids
                                                                                                                                   expulsion and thermal conditioning study
         [ N151-IM-81694]
                                                                              p0 100 N82-25518
                                                                                                                                   [ NASA-CR-167841]
                                                                                                                                                                                                        P0045 NB2-24288
                                                                                                                         Thermal-barrier-coated turbine blade study
      File shape calculations on supercomputors
[NASA-TH-82856] pot
HANCOCK, D.
A loke series removant converter design,
                                                                              p0100 N82-25519
                                                                                                                                  [ NASA-CR-165351 ]
                                                                                                                                                                                                        P0023 NB2-10040
                                                                                                                         MIBES, T.
```

Communications satellite systems capacity analysis

[NASA-CR- 1679!1] p0034 N82-27331 HIBGST, W. R. Flow visualization of shock-boundary layer interaction p0096 NB2-32675 LOW NO RUB X heavy fuel contustor concept program [NASA-CR- 1655121 p0129 N82-12572 DIRSCHDRIN, H. S. Structural dynamics of shroudless, hollow, fan blades with composite in-lays [ASHE FAPER 82-GT-284] p0022 A82-35456 Structural dynamics of shroudless, hollow fan blades with composite in-lays [NASA-TM-82816] p0018 N82-22266 Bird impact analysis package for turbine engine fan blades [NASA-TH-82831] D0112 N82-26701 EIBSCHBERG, N. M.
Flewated temperature fatique testing of metals p0058 N82-13281 Elevated temperature fatigue testing of metals [NASA-TH-82745] p0111 182-16419 WISKES, J. R. Costation of W/001/ - Work function lowering by multiple dipole formation Thin foil silicon solar cells with coplanar back centacts p0127 A82-44944 Development of thin wraparound junction silicon Scinr cells [NASA-CP-165570] p0133 N82-18689 BO, P. T.
Dynamic switch matrix for the TDMA satellite Switching system
[AIAA 82-0458] p0085 A

Property of the first state of the first sta p0085 382-23494 p0054 N82-19333 Ferformanco mapping studies in Redox flow cells [NASA-TH-82707] p0 120 N82-20668 MOCHHUTH, J. Survey on aging on electrodes and electrocatalysts in phosphoric acid fuel cells [NASA-CR-165505] p0 128 N82-11545 Preparation and evaluation of advanced electrocatalysts for phosphoric acid fuel cells [NASA-CR- 165519] p0 129 N82- 12573 Preparation and evaluation of advanced electrocatalysts for phosphoric acid fuel cells [NASA-CR- 165594] p0132 N82-17615 MODGEON, R. B. Anion permselective membrane [NASA-CR-167872] p0 137 N82-30711 BODGE, P. E. Gas-turbine critical research and advanced technology support project [NASA-TH-81708] P0118 N82-13509 Review of NASA progress in thermal barrier coatings for stationary gas turbines NASA-TH-81716] p0058 N82-17335 Effect of fuel to air ratio on Mach 0.3 burner rig hot corrosion of ZrO2-Y203 thermal barrier coatings [NASA-TH-82879] p0061 N82-30373 Thermal fatigue and oxidation data of TAZ-BA and M22 alloys and variations [NASA-CR-1654C7] p0063 NB2-16 p0063 NB2-10193 BOPPHAN, A. C. Engine technology p0001 N82-19145 HOPPEAN, J. D. Three-dimensional flow calculations including boundary layer effects for supersonic inlets at angle of attack [AINA PAPER 82-0061] p0005 382-19778 Calculation of the flow field including boundary layer effects for supersonic mixed compression inlets at angles of attack [NASA-CR-167941] P0009 N82-29269 BOYPHAN, R. G. The aerospace technology laboratory (a perspective, then and now) [NASA-IN-82754] p0031 N82-19229

MOTPHAN, R. H. Electron beam induced damage in ITO coated Kapton p0 159 A82-41546 Secondary electron unimmion vields p0038 N82-14226 Stoichiometry-controlled compensation in liquid encapsulated Czochralski Gals PO 158 A82-17585 Compensation mechanism in liquid emcapsulated Czochralski Gals Importance of melt stoichiometry p0086 A82-40403 Effect of melt stoichiometry on twin formation in PO 160 A82-46517 High purity low dislocation Gals single crystals [NASA-CR-165593] p0159 M82-230: MOLHES, W. M., JR., 30/20 GHz demonstration system for improving orbit p0159 N82-23030 utilization P0080 A82-27189 Open-loop nanosecond-synchronization for wideband satellite communications P0036 A82-27224 HOM, K. Secondary effects in combustion instabilities leading to flashback [ATAA PAPER 82-0037] p0056 A82-17746 MORSY, C. H. Eigenvalues of the Rayleigh-Benard and Marangoni problems p0092 A82-13396 Wonlinear Marangoni convection in bounded layers. I - Circular cylindrical containers. II -Rectangular cylindrical containers p0094 A82-39501 MOOGREBOON, L. Preliminary study of temperature measurement techniques for Stirling engine reciprocating seals [NASA-CR-165479] p0 104 H82-11466 MOOVER, D. Q., JE. Cell module and fuel conditioner development [NASA-CR-165462] p0130 N82-13511 Cell module and fuel conditioner development [NASA-CR-165193] p0137 N82-30712 MODEST, G. H. Surface-tension induced instabilities: Effects of lateral boundaries [NASA-CR-165530] p0092 N82-11390 MOROWITE, S. J.
An iterative finite element-integral technique for predicting sound radiation from turbofan inlets in steady flight [AIAA PAPER 82-0124] p0030 A82-17796 Acoustic properties of turbofan inlets [NASA-CR-169016] [NASA-CR-169016] p0153 M82-27090 Finite element-integral simulation of static and flight fan noise radiation from the JTI5D turbofan engine [NASA-TH-82936] p0 152 N82-31068 MOTELER, R. K. The influence of gamma prime on the recrystallization of an oxide dispersion strengthened superalloy - MA 6000K p0062 A82-47393 CF6 jet engine performance improvement: High pressure turbine roundness [NASA-CR-165555] p0024 N82-17174 High voltage power transistor development [NASA-CR-165547] p0084 NB2-18506 NOWES, W. Lc.
New versions of old flow visualization systems
p0096 N82 p0096 N82-32670 MOUSON, T. E. Creep and rupture of an ODS alloy with high stress rupture ductility p0065 A82-40335 BRACE, P., Environmental control systems 00001 NB2-19147 HRACH. F. J. Kevlar/PMR-15 polyimide matrix composite for a complex shaped DC-9 drag reduction fairing [AIAA PAPER 82-1047] p0002 A82-37678 L.-C. Inexpensive cross-linked polymeric separators made

from water-soluble polymers

p0048 A82-23778

HOBBARTT, J. R.
Day elopment of a spinning wave heat engine
F NASA-CR-165611] p0028 NB2-31320
NUDSON, S. H.
Ceramic applications in turbing engines
[NASA-CF-1651971 p0164 N82-31158
HUELSTER, D. S.
Propulsion study for Small Transport Aircraft
Technology (STAT)
[NASA-CP- 1654991 p0022 NR2- 10037
BUGGINS, G.
Advanced stratified charge rotary aircraft engine
design study
[NASA-CF-165398] p0107 N82-27743
HUGGINS, G. I.
Advanced general aviation comparative
angine/airframe integration study
[NASA-CE-1655641 p0025 NB2-22263
MOLL, D. R.
Metal homeycomb to porous wireform subutrate
diffusion bond evaluation
[NASA-TH-02793] p7110 N82-18612
Interrolation of material microstructure,
ultrasonic factors, and fracture toughness of
two phase titanium alloy
[NASA-TM-02010] p0110 NB2-20551
BUMPHRETS, V. E.
Thorant fatigue and oxidation data of TAZ-8A and
M22 alloys and variations
[NASA-CR-165407] p0063 N82-10193
MONT, L. N.
Elastic-plastic finite-element a/wivses of
thermally cycled double-edge wadge specimens
[NASA-TP-1973] p0111 N82-20566
HORNITZ, P. I.
Effects of madic ester concentration and
processing on physical and mechanical properties of PHR/Celion 6000 composites
P0051 A82-27440
On determination of fibre fraction in continuous
fibre composite materials
p0051 A82-38133
Application of a gripping system to test a
uniaxial graphite fiber reinforced composite /FHF 15/Celion 6000/ in tension at 316 C
p0051 A82-40796 Forced torsional properties of FMR composites with
varying madic ester concentrations and
processing histories
p0051 A82-45630
NUSTON, B. L.
Surface geometry of circular cut spiral bevel gears
[ASHE PAPER 81-CET-114] p0 108 A82-19334
Tooth profile analysis of circular-cut,
sriral-bevel quars
[NASA-TM-82840] p0101 N82-26681
A finite element stress analysis of spur gears
A finite element stress analysis of spur gears including fillet radii and rim thickness effects
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] On finite element stress analysis of spur gears
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TK-B2865] p0 101 NB2-28646 On finite element stress analysis of spur gears [NASA-CR-167938] p0 107 NB2-29607
A finite element stress analysis of spur gears including fillet radii and rim thickness effects (NASA-TM-82865) p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CR-167938] p0 107 N82-29607 HWANG, D. P.
A finite element stress analysis of spur gears including fillet radii and rim thickness offects f NASA-TM-82865] p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 NASA-CP-167938] po 107 N82-29607 NASA-CP-167938] po 107 N82-29607 NASA-CP-167938] po 107 N82-29607 NASA-CP-167938] po 107 N82-29607 NASA-CP-167938] po 108
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] 00 finite element stress analysis of spur gears [NASA-CM-167938] 00 for N82-29607 NASA-CM-167938] 00 for N82-29607 NASA-CM-167938] 00 for N82-29607 NASA-CM-167938] 00 for Nasa-CM-167938]
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 WWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TK-B2865] p0 101 NB2-28646 On finite element stress analysis of spur gears [NASA-CF-167938] p0 107 NB2-29607 NWAMEG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195 A summary of V/STOL inlet analysis methods
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 HWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] On finite element stress analysis of spur gears [NASA-CM-167938] p0 107 N82-29607 HWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0 005 A82-35195 A summary of V/STOL inlet analysis methods p0 006 A82-40921 A summary of V/STOL inlet analysis methods
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] pp 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] pp 107 N82-29607 MWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] pp 10005 A82-35195 A summary of V/STOL inlet analysis methods pp 10006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] pp 10003 N82-11043
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] p0 101 N82-28646 on finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 MWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0 0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TK-82725] p0 0003 N82-11043 Experimental and analytical results of tangential
A finite element stress analysis of spur gears including fillet radii and rim thickness offects [NASA-TM-82865] Delto 1 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] PO 107 N82-29607 MWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] PO 1005 N82-35195 A summary of V/STOL inlet analysis methods po 1006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] PO 1003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] On finite element stress analysis of spur gears [NASA-CP-167938] PO 107 N82-29607 HWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] A summary of V/STOL inlet analysis methods [NASA-TH-82725] Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet analysis methods [NASA-TH-82725] Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TH-82847]
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 BWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] p0003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] p0004 N82-24165 A summary of V/STOL inlet analysis methods p0004 N82-24165 A summary of V/STOL inlet analysis methods
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] On finite element stress analysis of spur gears [NASA-CP-167938] PO 107 N82-29607 HWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] A summary of V/STOL inlet analysis methods [NASA-TH-82725] Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet analysis methods [NASA-TH-82725] Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TH-82847]
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 BWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] p0003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] p0004 N82-24165 A summary of V/STOL inlet analysis methods p0004 N82-24165 A summary of V/STOL inlet analysis methods
A finite element stress analysis of spur gears including fillet radii and rim thickness effects [NASA-TM-82865] p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 BWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] p0003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] p0004 N82-24165 A summary of V/STOL inlet analysis methods p0004 N82-24165 A summary of V/STOL inlet analysis methods
A finite element stress analysis of spur gears including filet radii and rim thickness offects f NASA-TM-82865] po 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] po 107 N82-29607 WANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet f AIAA PAPER 82-1084] po 005 A82-35195 A summary of V/STOL inlet analysis methods po 006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] po 003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] po 000 N82-24165 A summary of V/STOL inlet analysis methods [NASA-TM-82885]
A finite element stress analysis of spur gears including fillet radii and rim thickness offects [NASA-TM-82865] po 101 N82-28646 on finite element stress analysis of spur gears [NASA-CP-167938] po 107 N82-29607 MWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] po 1005 A82-35195 A summary of V/STOL inlet analysis methods po 1006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] po 1003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] po 1004 N82-24165 A summary of V/STOL inlet analysis methods [NASA-TM-82885] po 1005 N82-28249
A finite element stress analysis of spur gears including fillet radii and rim thickness offects [NASA-TM-82865] po 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] po 107 N82-29607 HWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] po 1005 N82-35195 A summary of V/STOL inlet analysis methods po 1006 N82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] po 1003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] N Summary of V/STOL inlet analysis methods [NASA-TM-82847] N Summary of V/STOL inlet analysis methods [NASA-TM-82885] po 1000 N82-28249
A finite element stress analysis of spur gears including fillet radii and rim thickness offects [NASA-TM-82865] p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 BWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] p0003 N82-11043 Experimental and analytical results of tangential blowing applied to a subsonic V/STOL inlet [NASA-TM-82847] p0004 N82-24165 X summary of V/STOL inlet analysis methods [NASA-TM-82885] I. L. Turbulence in argon shock waves
A finite element stress analysis of spur gears including fillet radii and rim thickness offects [NASA-TM-82865] p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 MWAME, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] p0003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] p0004 N82-24165 A summary of V/STOL inlet analysis methods [NASA-TM-82885] p0005 N82-28249 I. L. Turbulence in argon shock waves
A finite element stress analysis of spur gears including fillet radii and rim thickness offects [NASA-TM-82865] polici N82-28646 on finite element stress analysis of spur gears [NASA-CP-167938] polici N82-29607 MWANG, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] polici N82-35195 A summary of V/STOL inlet analysis methods polici N82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] polici Nasa-TM-82725] polici Nasa-TM-82847] polici N82-24165 A summary of V/STOL inlet analysis of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] policy N82-24165 A summary of V/STOL inlet analysis methods [NASA-TM-82885] polici N82-28249 I. L. Turbulence in argon shock waves polici N82-28249 TLRS, P. A. Thin foil silicon solar cells with coplanar back
A finite element stress analysis of spur gears including fillet radii and rim thickness offects [NASA-TM-82865] p0 101 N82-28646 On finite element stress analysis of spur gears [NASA-CP-167938] p0 107 N82-29607 MWAME, D. P. Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [AIAA PAPER 82-1084] p0005 A82-35195 A summary of V/STOL inlet analysis methods p0006 A82-40921 A summary of V/STOL inlet analysis methods [NASA-TM-82725] p0003 N82-11043 Experimental and analytical results of tangential blowing applied to a subscnic V/STOL inlet [NASA-TM-82847] p0004 N82-24165 A summary of V/STOL inlet analysis methods [NASA-TM-82885] p0005 N82-28249 I. L. Turbulence in argon shock waves

solar cells [NASA-CR-165570]

```
INGARD, K. U.
    Hode propagation in nonuniform circular ducts with
      potential flow
      [ NASA-TH-82766]
INGERO, R.
    Hydrodynamic and aerodynamic breakup of liquid
      sheets
                                                   p0087 N82-19494
      [ MASA-TM-82800]
ISHIGARI, H.
Effects of environment on microhardness of
      magnesium oxida
                                                   p0068 NB2-22366
      [ NASA-TP-2002]
    Influence of corrosive solutions on microhardness
      and chemistry of maynesium oxide /001/ surfaces
                                                   p0102 N82-31691
      [ NASA-TP-2040 ]
ISMISURA, S. Luan-limit extinction of propang/air mixtures in
      the stagnation-point flow
   p0057 A82-28736
Effects of heat loss, preferential diffusion, and
flame stretch on flame-front instability and
extinction of propane/air mixtures
    On the opening of premixed Bunsen flame tips
                                                   p0057 182-37570
    Plow distributions and discharge coefficient
      effects for jet array impingement with initial
      crossflow
[ASMS PAPER 82-GT-156] p0011

ITO, T. %.

Thermal oxidative degradation reactions of
                                                   p0011 A82-35379
      perfluoroalkylethers
      [N/ISA-CR-165516]
    Thermal oxidative degradation reactions of linear
      perfluoroalky lethers
      [ NASA-TH-82834]
                                                   p0068 #82-26468
IVAMOV, V. A. An example of a solution to transonic equations
      for shock-free flow about a symmetric profile
    Internal breakdown of charged spacecraft dielectrics
JACK, J. R.
    Reliable aerial thermography for energy conservation
                                                   p0117 N82-14552
      [NASA-TH-81766]
JACKSON, T.
    Turbulence measurements in a confined jet using a
      six-orientation hot-wire probe technique
[AIAA PAPER 82-1262] p0094
                                                   p0094 A82-37710
JACOBSON, B. O.

A hydrodynamic model of an outer hair cell
    [MASA-TH-02773] p0143 N02-1674:
High-speed motion picture camera experiments of
cavitation in dynamically loaded journal bearings
                                                  p0143 N82-16743
                                                   p0100 N82-20543
      [NASA-TH-82798]
JACOBSON, To Po

Effect of aluminum phosphate additions on composition of three-component plasma-sprayed
       solid lubricant
      [ NASA-TP-1990 ]
                                                   p0059 182-21298
JALAN, V.
   Improved chromium electrodes for REDOX cells
[NASA-CASE-LEW-13653-1] p0121 N62-22672
Requirements for optimization of electrodes and
electrolyte for the iron/chromium Redox flow cell
      [NASA-CR-165218]
                                                   p0136 N82-25640
JAMES, E.,
Developing a scalable inert gas ion thruster
      [AIAA PAPER 82-1275]
                                                   P0047 A82-37713
JABRIER, D. C.
Whirl flutter analysis of a horizontal-axis wind turbine with a two-bladed testering rotor
                                                   p0 122 N82-23707
    Theoretical and experimental power from large
      horizontal-axis wind turbines
       [NASA-TM-82944]
                                                   p0127 N82-33830
JABJUA, S. I.
    Turbulence measurements in a confined jet using a
      six-orientation hot-wire probe technique
      [AIAA PAPER 82-1262]
                                                   P0094 A82-37710
Ceramic applications in turbine engines [NASA-CR-165197] p0
                                                   P0164 N82-31158
```

p0133 N82* 18689

PERSONAL AUTBOR TUDER

JARRIT, M. W. Effects of cobalt on structure, microchemistry and
properties of a wrought nickel-base superalloy
p0065 A82-34973
JAVIDI, B. Secondary electron emission from a charged
dielectric in the presence of normal and oblique
electric fields [NASA-CP-168558] p0084 NB2-18501
[NASA-CF-168558] p0084 N82-18501 JEBKINS, R. H.
A comprehensive method for preliminary design
optimization of axial gas turbine stages [AIAA FAPER 82-1264] p0030 A82-35091
JENNESS, C. H.
Advanced turboprop testhed systems study. Volume
 Testbed program objectives and priorities, drive system and aircraft design studies,
evaluation and recommendations and wind tunnel
test plans [NASA-CF-167928-VOL-1] p0028 N82-32370
JENTZ, M. E.
Puel quality processing study, volume 1
[NASA-CP-165327-VOL-1] p0135 N82-24649 Fuel quality/processing study Volume 2:
Appendix, Task literature survey
[NASA-CR-165327-VOL-2] p0135 NB2-24650
JERACKI, R. J. Propeller tip vortex - A possible contributor to
aircraft cabin noise
Noise of the SR-3 propeller model at 2 deg and 4
Age angle of attack
[NASA-TH-82738] p0 151 M82-16808
An experiment to evaluate liquid hydrogen storage
in space
A82-20748
JOHNSEN, R. L. Preliminary analysis of a downsided advanced
gas-turbine engine in a subcompact car
[NASA-TH-82848] p0163 N82-26051 JOHNSON, B.
Development of a dual-field heteropoplar power
converter [NASA-CP-165168] p0084 N82-24424
JOHNSON, B. V. Mass and momentum turbulent transport experiments
with confined coaxial jets [NASA-CR-165574] p0090 N82-19496
JOHNSON, D. A.
Chemical and electrochemical behavior of the
Cr(3)/Cr(2) half cell in the NASA Redox Energy Storage System
F NASA-TH-82913] p0055 N82-33463
Johnson, D. C. Jet impingement heat transfer enhancement for the
GPU-3 stirling engine
[NASA-TH-82727] p0163 N82-11993
JOHNSON, G. H. Multiple-grid acceleration of Lax-Wendroff
algorithms
[NASA-TH-01843] p0149 N82-22922 Relaxation solution of the full Euler equations
[NASA-TM-82889] p0149 W82-24589
JOHNSON, J. A., III
Turbulence in argon shock waves p0158 A82-11117
JOHESON, R. E.
An automated system for global atmospheric sampling using B-747 airliners
[NASA-CR-165264] p0139 NB2-13554
JOHNSON, S. H.
Venturí nozzle effects on fuel drop size and nifrogen oxide emissions
[NASA-TE-2028] p0020 N82-31329
JOHNSTON, E. A.
Thrust reverser for a long duct fam engine [NASA-CASE-LEW-13199-1] p0019 882-26293
JOHNSTON, J. P.
Turbulent boundary layer heat transfer
experiments: Conver curvature effects including introduction and recovery
[NASA-CR-3510] p0090 N82-17456
JOHNSTON, R. P. Active clearance control system for a turbomachine
[NASA-CASE-LEW-12938-1] p0020 N82-32366
JOHES, A. L.

of a short, blowing-lip inlet

```
[ WASA-CR-1656 17 ]
                                                p0007 M82-22211
JOHES, C. Advanced stratified charge rotary aircraft engine
      design study
      [ NASA-CR-165398]
                                                p0107 #82-27743
JOHES, J. C.
   An experimental investigation into the feasibility
      of a thermoelectric heat flux gage
                                                D0095 #82-14494
      [ NASA-TH-82755]
JOHRS, W. R.
   Effect of gamea irradiation on the friction and
wear of ultrahigh molecular weight polyethylene
                                                p0062 A82-10674
   Tribological characteristics of nitrogen (8+)
      implanted iron
      [WASA-TH-82839]
                                                p0060 ¥82-24322
JOURS, W. R., JR.,
The effect of oxygen concentration on the
boundary-lubricating characteristics of a C
      ether and a polyphenyl ether to 300 C
                                                p0070 A82-21699
   Pabrication and wear test of a continuous
      fiber/particulate composite total surface hip
      replacement
      [NASA-TH-81746]
                                                P0066 #82-11211
    Elucidation of wear mechanisms by ferrographic
      analysis
      [ NASA-TH-82737]
                                                p0066 NB2-15199
    Tribulogical characteristics of a composite
      total-surface hip replacement
       NASA-TP-1853]
                                                p0066 NB2-16239
   Priction wear and auger analysis of iron implanted with 1.5-MeV mitrogen ions
   Thermal and oxidative degradation studies of formulated C-ethers by gel-permeation chromatography
      [ NASA-TP-1994]
                                                p0068 N82-21332
    Thermal oxidative degradation reactions of linear
      perfluoroalky lethers
   [NASA-TM-02834]
Boundary lubrication: Revisited
[NASA-TM-02858]
                                                p//068 N82-26468
                                                p0069 N82-29458
    Finite volume calculation of three-dimensional
      potential flow around a propeller [AIAA PAPER 82-0957]
                                                p0010 A82-31933
JOULIE, G. On stability of premixed flames in stagnation -
                                                p0057 182-37574
   A remote millivolt multiplexer and amplifier
      module for wind tunnel data acquisition
                                                p0083 A82-41845
JUHASE, A. J.
Optimization of the oxidant supply system for combined cycle HHD power plants
      [ NASA-TH-82909 ]
   [NASA-TH-82909] p0123 N82-26790
Comparative analysis of the conceptual design
      studies of potential early commercial MHD power
      plants (CSPEC)
      [NASA-TH-82897]
                                                p0 123 NB2-27838
JURKOVICH, M. Ploy vir alization of shock-boundary layer
      Extraction
                                                p0096 N82-32675
JURTA, R. H.
   On determination of fibre fraction in continuous
      fibre composite materials
                                                p0051 A82-38133
```

On determination of fibre fraction in continuous fibre composite materials

P0051 A82-38133

K

KAPATORS, M.

Ultraviolet observations of the 1980 eclipse of the symbiotic star CI Cyqni

A82-27331

KAMEL, M., M.

Effects of internal heat transfer on the structure of self-similar blast waves

P0093 A82-32225

KAMI, S.

Characteristics of the LeRC/Hughes J-series 30-cm engineering model thruster

P0046 A82-15435

KAM, M., K.

Pirst results of material charging in the space environment

```
[ NASA-TH-89793]
                                                  p0081 M82-24431
EXHURI, J. W.
Stress evaluations under rolling/sliding contacts
p0113 N82-1752)
RABTOLA, R. A.

Effects of vane/blade ratio and spacing on fan noise
[ATAA PAPIR 81-2033] p0029 A82-10457
   Some aspects of calculating flows about three-dimensional subsonic inlets
[NASA-TH-82789] p0004 M82-2521 MAPOOR, V. J. hultijunction high voltage concentrator solar cells
                                                  p0004 #82-25213
   p0043 A82-11796
Fabrication of multijunction high voltage
      concentrator solar cells by integrated circuit
      technology
                                                  n0127 A82-44957
WARAGULLE, M.

Ultrasonic input-output for transmitting and receiving longitudinal transducers coupled to
      same face of isotropic eleatic plate
      [ NASA-CF- 3506 ]
                                                  p0110 N82-18613
EARAS, J. C.
   Design and verification of a sultiple fault
tolerant control system for STS applications
using computer simulation
      [AIAA 81-2173]
                                                  p0035 A02-10124
      A. H.
   Contation of W/001/ - Work function lowering by
      multiple dipole formation
                                                          A82-30002
RASCAR, A. P.
Nonlinear analysis of rotor-bearing systems using
component mode synthesis
      [ASHE PAPER #2-GT-303]
                                                  p0 104 182-35468
   Gas turbing ceramic-coated-vane concept with
      convection-cooled porous metal core
      [ NASA-TP- 1942]
                                                  p0016 N82-14090
KASPER, E. J.

A simplified design procedure for life prediction of rocket thrust chambers
[AIAA PAPER 82-1251] p0043 A82-35
                                                  p0043 A82-35087
MASRATE, B.
A simplified design procedure for life prediction
      of rocket thrust chambers
      [ATA] PAPER 82-1251]
                                                  P0043 A82-35087
   Development of a simplified procedure for thrust chamber lize prediction [NASA-CF-165585] p0044 N82-2
                                                  p0044 N82-21253
KASUBA, E.
   A multi-purpose mathod for analysis of spur year
      tooth loading [NASA-CR-165163]
                                                  p0104 N82-10401
RATSHIS, T.

Velocity gradient worked for calulating velocities

1 an axisymetric annular duct
     [ NASA-TP-2029 1
                                                  p0005 N82-29270
EATE, I.
   Space Shuttle Orbiter charging
      [AIAA PAPER 82-0119]
                                                  p0040 A82-17793
   Validation of the NASCAP model using spaceflight
      data
      TAIAA PAPER 82-0269]
                                                  P0038 X82- 17872
    'Bootstrap' charging of surfaces composed of
      multiple materials
                                                  p0085 A82-18318
   NASCAP simulation of latoratory charging tests
      using multiple electron quas
   Differential charging of high-voltage spacecraft -
      The equilibrium potential of insulated surfaces
                                                  p0041 A82-35547
   Representation and material charging response of
      qeoplasma environments
                                                  p0039 N82-14249.
   Simulation of charging response of SCATHA (P78-2)
                                                  p0039 N82-14250
   Charging of a large object in low polar Earth orbit
                                                  p0039 N82-14275
   Additional extensions to the NASCAP computer code,
      volume 1
      [ NASA-CR- 1678551
                                                  p9146 N82-25810
    Additional extensions to the NASCAP computer code.
      volume 7
      [ NASA-CF- 167856]
                                                  p0040 N82-26377
```

```
Turbine blade nonlinear structural and life analysis [AIAA PAPER 82-1056] p0021 A82-34981 Develop and tost fuel cell powered on-site integrated total energy system. Phase 3: Tell-scale power plant development [MSSA-CR-165328] p0117 M62-13490
     Elastic-plastic finite-element analyses of
       thermaily cycled single-edge wedge specimens [MASA-TP-1982] p0111 #82
                                                          PO 111 #82-20565
     Blastic-plastic finite-element analyses of
thermally cycled double-edge wedge specimens
[MASA-TP-1973] p0 [11 M82
                                                          p0111 M82-20566
     Monlinear structural and life analyses of a
       combustor liner
        [ NASA-TH-82846]
     Evaluation of inelastic constitutive models for
       nonlinear structural analysis
        [ NASA-TH-82845]
                                                           PO112 N82-24502
    Development and test fuel cell powered on-site
integrated total energy systems. Phase J:
Full-scale power plant development
       [ MASA-CR-167898]
                                                           p0137 #82-30705
KAUPAÀH, H.,Z.
    Experimental simulation of blased solar arrays
       with the space plasma [NASA-CR-165485]
                                                           p0 (57 N82-10880
    Electric thruster research
[NASA-CR-165603]
Electric and magnetic fields
[NASA-CR-165604]
                                                           p0045 #82-24285
                                                           p0045 M82-28350
KAUTE, M. E.,
    Mechanism and models for zinc metal morphology in
       alkaline media
[NASA-TH-82768] p0 120 M82

KAWAI, B. T.

KOVJAY/PHR-15 pglyimide matrix composite for a

COMPLAX Shapod DC-9 dway reduction fairing

[AZAA PAPER 82-1047] p0002 A82
                                                           p0 120 N82-19671
                                                           p0002 A82-37678
     Kevlar/PMR-15 reduced drag DC-9 reverser stang
       falcing
       [NASA-CR-165448]
                                                           p0052 NB2-31448
The 30/20 GHz flight experiment system, phase 2.
Volume 1: Executive summary
[NASA-CR-165409-VOL-1] p0078 NB2-2
                                                           p0078 N82-20362
    The 30/20 GHz flight experiment system, phase 2.
Volume 2: Experiment system description
[NASA-CR-165409-VOL-2] p0078 N82-2
                                                          p0078 N82-20363
     The 30/20 GHz flight experiment system, phase 2.
       Volume 3: Experiment system requirement document
[NASA-CR-165409-Vol-3] p0078 NB2-2036
                                                          p0078 NB2-20364
    [NASA-CR-163409-VOL-3]
The 30/20 GHz flight experiment system, phase 2.
Yolume 4: Experiment system development plan
fulsi-CR-165409-VOL-4]
p0078 N82-20365
KATS, W. H.
    Turbulent boundary layer heat transfer
       experiments: Convex curvature effects including introduction and recovery
       [ NASA-CR-3510 ]
                                                           p0090 N82-17456
MAIA, E. R. V.
Aeroelastic characteristics of a cascade of
       mistured blades in subsonic and supersonic flows
       [ASME PAPER 61-DET-122]
                                                          p0021 A82-19337
    Coupled bending-bending-torsion flutter of a
       mistuned cascade with nonuniform blades
     [NASA-TH-82813] p0111 N82-2
Whirl flutter analysis of a horizontal-axis wind
turbing with a two-bladed teetaxing rotor
                                                          p0111 N82-21604
                                                           p0 122 N82-23707
ERITER, I. D.
    Impact of advanced propeller technology on
       aircraft/mission characteristics of several
        general aviation aircraft
       [NASA-CR-167984]
                                                           p0009 NB2-33347
Input filter compensation for switching regulators [NASA-CR-169005] p0085 NB2-254
                                                           p0085 N82-25442
KELLER, J. L.
    Mathematical modeling of ice accretion on airfoils
       [AIAA PAPER 82-0284]
                                                           p0014 A82-27098
KELLER, L. H.
    Alignment of fluid Molecules in an EHD contact
       [ASLE PREPRINT 81-1.C-5C-1]
                                                           p0 107 A82-18407
     Analysis of infrared emission from thin adsorbates
                                                           p0056 A82-21431
```

Test results and facility description for a

40-kilowatt stirling engine

```
[ NASA-TH-82620]
                                                   p0163 N82-13013
    Assessment of a 40-kilowatt stirling engine for underground mining applications
      [ NASA-TH-82822]
                                                   p0125 N82-307:4
EXEMPALL, B. R. P.
Anaerobic polymers is high vacuum leak sealants
                                                   p0108 A82-21967
   Pressure pulsations above turbonclecular pumps
                                                   F0076 A82-46430
Single pass rub phenomena - Analysis and experiment
[ASHE FAPER 81-LUB-55] p0107 A82-1844
ERBSLAKE, W. R.
Feasibility of an earth-to-space rail launcher
                                                   p0107 382-18449
      system
      [ IAF PAPER 82-46]
                                                   p0033 A82-44659
RESSEL, P.
Design of prototype charged particle fog dispersal
      [ HASA-CR-3481]
                                                   p0141 N82-16659
[ NASA-CR- 165327-VOL-2]
                                                   p0 135 N82- 24650
RESSIZE, R. E.
Fuel quality processing study, volume
[RASA-CP-165327-VOL-1]
p
                                                   p0 135 N82-24649
      1. S.
   Micral ternary alloy having improved cyclic
      oxidation resistanc
      [ NASA-CASE-LEV- 13359- 1]
                                                   p0061 N82-31505
RNAMORIWAL, P. K.
Acoustic microscopy of silicon carbide materials
                                                   p0075 A82-33031
AGT 10 1 automotive gas turbing system development [AIAA FAPER 82-1166]
The AGT 101 advanced automotive gas turbine [ASHE PAPER 82-GT-72]
                                                   p0 108 A82-35039
                                                   p0 108 482-35321
KIRLB, R. E.
   Aeroelastic characteristics of a cascade of
   mistuned blades in subsonic and supersonic flows
[1SME FAPER 81-DET-122] pi)021 A82-193:
Coupled bending-bending-tersion flutter of a
mistuned cascade with nonuniform blades
[NASA-TH-82813] p0111 N82-216
                                                   pi)021 A82-19337
                                                   p0111 NB2-21604
KIH, Q.
   Raman study of the improper ferroelectric phase
      transition in iron iodine boracite
   Phosphoric acid fuel cell technology status
     [NASA-TH-82791]
                                                   p0120 N82-19670
KING.
       B. J.
   Modeling the full-bridge series-resonant power
      converter
                                                   p0086 A62-46385
   Alignment of fluid molecules in an EHD contact [ASLE FREPRINT 81-LC-5C-1] p0107 A82
                                                   p0 107 A82-18307
RIRALY, L. J.
   Ultrasonic scanning system for imaging flaw growth
      in composites
       NASA-TH- 827991
                                                   p0076 N82-22386
    A high speed implementation of the random
      decrement algorithm
      [ NASA-TH-82853]
                                                   p0076 N82-22388
   Piezoelectric composite materials
[NASA-CASE-LEW-12582-1]
                                                   p0054 N82-31450
KIRKFATRICK, C. G.
   Stoichiometry-controlled compensation in liquid
      encapsulated Czochralski GaAs
                                                   p0 158 A82- 17585
   Compensation mechanism in liquid encapsulated
      Czochralski GaAs Importance of melt stoichiometry
                                                   P0086 A82-40403
   High purity low dislocation GaAs single crystals [NASA-CR-165593] p0159 W82-2:
                                                   p0 159 N82-23030
KLANN, J. L.
   Preliminary analysis of a downsized advanced
      gas-turbine engine in a subcompact car
      [ NASA-TM-82848]
                                                   p0 163 N82-26051
ELECKNEE, R. J.

Spherical roller bearing analysis. SKF computer program SPHERBEAN, Volume 1: Analysis.
      [ NASA-CR- 165203]
                                                   P0106 N82-20540
   Spherical roller bearing analysis.
                                                 SKF computer
      program SPHERBEAN. Volume 2: User's manual
      [ NASA-CR- 165204]
                                                   p0 106 #82-20541
```

```
Spherical coller bearing analysis. SKF computer program SPHERBEAN, Volume 3: Program
        correlation with full scale hardware tests
        [ WASA-CR-165205]
                                                            p0106 M82-20542
    High speed cylindrical coller bearing analysis.

SKF computer program CIBEAH. Volume 2: User's
        manual
     [MASA-CR-165364] p0 146 M82-
Research report: User's manual for computer
program AT81y003 SHABERTH. Steady state and
transient thornal analysis of a shaft bearing
                                                             p0146 NB2-31968
        system including ball, cylindrical and tapered
        roller bearings
        [ NASA-CR-165365]
    Persearch report: User's manual for computer program ATSIY00]). PLANETSYS, a computer program for the steady state and transient thermal analysis of a planetary power transmission system
       [NASA-CR-165366]
                                                            p0 146 N82-31970
KLHIH, W., N.
     Experience with modified aerospace reliability and
       quality assurance method for wind turbines [NASA-TH-82803]
                                                             p0110 182-19550
KLYBA, S. J. .
Ultrasonic velocity for estimating density of
       structural ceramics [NASA-TH-82765]
Fuel quality processing study, volume 1
[NASA-CR-165327-VOL-1]
p0
                                                            p0135 #82-24649
    p0135 M82-24650
[NASA-CR-1055., vol., REMAPP, Me, No.
Active clearance control system for a turbomachine (NASA-CASE-LEW-12938-1] p0020 N62-32366 ROBAK, J.A.

Lewis Research Center's coal-fired, pressurized, fluidized-bed reactor test facility p0087 N82-11397
MOCKAR, M.,J.,
Work of fracture in aluminum metal-matrix composites
                                                             p0053 A82-31339
     Tensile properties of SiC/aluminum filamentary
       composites - Thermal degradation effects
                                                             p0053 182-46220
CONd-air performance of a 15.41-cm-tip-diameter axial-flow power turbine with variable-area stator designed for a 75-kW automotive gas
        turbine angine
       [ NASA-TH-82644]
                                                             p0024 N82-21193
KOEL, P. J.
    Thermodynamics and kinetics of the sulfation of porous calcium silicate
[NASA-TM-82769] p0048 N82-
                                                             D0048 N82-15119
p0014 N82-11052
NOLACKI, J.

A new approach to the minimum weight/loss design of switching power converters
                                                             p0082 A82-16831
    The 30/20 GHz communications satellite trunking
       network study
       [ HASA-CR-165467]
                                                             p0078 N82-13302
Analysis and design of a standardized control module for switching regulators
                                                             P0083 A42-46388
KOOUS, H.,C.
     First results of material charging in the space
       environment
[NASA-TH-84743] p0081 N82-2443

KORKAN, K., D.,

Performance degradation of propeller/rotor systems
due to zime ice accretion
[ATAA PAPER 82-0286] p0014 A82-2833
                                                             P0081 N82-24431
                                                             D0014 A82-28322
 KORTOVICH, C., S.
     Development of materials and process technology
       for dual alloy disks
[NASA-CR-165224] p0063 NO ECSEARL, E., C.,
Multistage depressed collector for dual mode operation
                                                             p0063 N82-18370
       [ WASA-CASE-LEW- 13282-1]
```

P0081 N82-24415

[NASA-CR-165387]

p0024 N82-14096

```
EOSBARL, N, G.
Experimental verification of a computational procedure for the design of TWT-refocuser-MDC
        systems
                                                            p0082 A82-16128
    Analytic investigation of afficiency and performance limits in klystron amplifiers using
        sultidimonsional computer programs; muiti-stage depressed collectors; and thereionic cathode
        life studies
     p0118 W82~12553
Three-dimensional relativistic field-electron
        interaction in a sulticavity high-power
     klystron. 1: Basic theory pnost Na;
[NASA-TP-1992] pnost Na;
Three-dimensional relativistic field-electron
                                                             pn081 N82-22439
Three-dimensional relativistic field-elect interaction in a multicavity high-power klystrom. Part 2: Working Equations [NASA-TP-2008]

ROTSOT, M. T.

Fuel quality processing study, volume |
[NASA-CR-165327-VOL-1]
Fuel quality/processing study. Volume 2:
Appendix. Task | literature survey [NASA-CR-165327-VOL-2]

ROTAIN. A.
                                                             p0081 N82-23397
                                                            p0135 N82-24649
                                                             p0 135 N82-24650
BOZNK, Am
Small axial turbine stator technology program
[NASA-CF-165602] p0028 W82-32367
KOZJONSKI, H.
     Energy efficient engine exhaust mixer model
        technology
[NASA-CF-165459]
                                                             p0025 N82-22264
 KRAIDŠKY, I.
     Electron beam induced damage in ITO coated Kapton
                                                             p0 159 A82-41546
     Secondary electron emission yields
                                                             p0038 N82-14226
     Cesiation of W/001/ - Work function lowering by
        multiple dipole formation
                                                                      A82-30002
     Chopper-controlled discharge life cycling studies
        on lead-acid batteries
[HASA-CR-165616]
                                                             p0134 N82-20661
 KRATZER, R. H.
Thermal oxidative degradation reactions of
        perfluoroalkylethers
        [ NASA-CR- 165516]
                                                             p0048 N82-12135
     Thursal cxidative degradation reactions of linear perfluoroalky lethers [NASA-TH-82834] p0068 N82-26
                                                             p0068 N82-26468
KRAUSE, L. N.
Miniature drag-force anemometer
                                                             p0097 A82-40132
     Measurement of oil film thickness for application
to elastomeric Stirling engine rod seals
        [ASME PAPER 81-108-9]
                                                             p0 107 A82-18426
 RRESKOVSKY, J. P.
Turnofan forced sixer-nozzle internal flowfield.
Volume 3: A computer code for 3-D mixing in axisymmetric nozzlos
        [ NASA-CR-3494]
                                                              p0091 N82-22460
 KROSEL, S. M. Application of integration algorithms in a
        parallel processing environment for the
        simulation of jet engines [NASA-TM-82746]
                                                             p0149 N82-14849
     Automated procedure for developing hybrid computer simulations of turbofan engines. Part 1:
        simulations of turbofan engines.
General description
        [ NASA-TP- 1851]
                                                              p0 146 N82-33020
 KUBASCO, A. J.
     Low NOx heavy fuel combustor concept program [NASA-CR-167876] p0074 N
                                                             p0074 N82-26482
 RUBBY, J. A.
     Mass Driver Two - A status report
                                                             p0046 A82- 18191
     A small scale lunar launcher for early lunar
        material utilization
                                                              p0032 A82-35617
     Pollution reduction technology program small jet
        aircraft engines, phase 3 [NASA-CR-165386]
                                                             p0023 N82-14095
     EFFS fuel addendum: Pollution reduction technology program small jet aircraft engines,
        phase 3
```

```
YLA observations of solar active regions at 6 cm
        wavelength
                                                                 p0167 A82-10156
     Time variability and structure of quiet sun
        sources at 6 cm wavelength
                                                                 p0167 A82-26003
     Magnetic structure of a flaring region producing impulsive microwave and hard X-ray bursts
                                                                 p0 167 182-27323
EUROSAKA, E.
      'Coriolis resonance' within a rotating duct
                                                                  D0012 A82-37938
MNOK, C., K.
Bluff-body flameholder wakes - A simple numerical
        solution
        [AIAA PAPER 82-1177]
                                                                 p0093 A82-35043
LABITZKE, K.
     Stratospheric-sesospheric midwinter disturbances -
         A summary of observed characteristics
LADDEN, R. M.
Evaluation of wind tunnel performance testings of an advanced 45 deg swept 8-bladed propeller at Each numbers from 0.45 to 0.85
        [ NASA-CR-3505 ]
                                                                  P0007 N82-19178
LAPLES, J. H.
Turbine blade nonlinear structural and life analysis
[AIAA PAPER 82-1056] p002| A82-3498|
LAKSHNYARAYAWA, B.
Interaction of compressor rotor blade wake with
wall boundary layer/vortex in the end-wall agion
[ASHE PAPER 81-GR/GT-1] p0010 16, 1930
                                                                 PAOIO A6. 19301
      Effects of blade loading and rotation on compressor rotor wake in end wall regions
                                                                 P0010 A82-22063
         [AXAA PAPER 82-0193]
      Heasurement and prediction of sean velocity and
         turbulence structure in the near wake of an
         airfoil
      Three sensor hot wire/film technique for three dimensional mean and turbulence flow field
         measurement
      Three dimensional flow field inside the passage of
         a low speed axial flow compressor rotor
[AINA PAPER 82-1006] p0011 A82-31964
      Three dimensional turbulent boundary layer
      development on a fan rotor blade
[ATAL PAPER 82-1007] p0011 A82-31
Three-dimensional flow field in the tip region of
                                                                  p0011 A82-31965
         a compressor rotor passage. I - Mean velocity
         profiles and annulus wall boundary layer
     profiles and annulus wall boundary layer
[ASME PAPER 82-GT-11]
Investigation of the tip-clearance flow inside and
at the exit of a compressor rotor passage, I -
Hean velocity field
[ASME PAPER 82-GT-12]
Three-dimensional flow field in the tip region of
         a compressor rotor passage. II - Tuchulence
         properties
                                                                  p0011 A82-35416
         [ASHE PAPER 82-GT-234]
     numerical analysis and FORTRAN program for the computation of the turbulent wakes of turbomachinery rotor blades, isolated airfoils and cascade of airfoils
         [ WASA-CR-3509]
                                                                  p0006 N82-18184
      Three dimensional mean velocity and turbulence
         characteristics in the annulus wall region of an
         axial flow compressor rotor passage
                                                                  p0026 N82-25232
         [NASA-CR-169003]
     [NASA-CR-169003] pouzo 882-2222
Investigation of the tip clearance flow inside and
at the exit of a compressor rotor passage
[NASA-CR-169004] p0026 882-2525
Three dimensional flow field inside compressor
                                                                  p0026 882-25253
         rotor, including blade boundary layers
[WASA-CR-169120] poor
                                                                  p0091 N82-27686
     Engine dynamic analysis with general nonlinear finite element codes. II > Bearing element implementation, overall superical characteristics and beachtarking [ASHE PAPER 82-07-292]
Engine dynamic analysis with general nonlinear finite element codes. Part 2: Bearing class
                                                                  PO 108 A82-35462
         finite element codes. Part 2: Bearing pleasat
```

```
imblementation overall numerical characteristics
      and benchmaking
      [ HASA-CR- 167944]
                                               p0028 N82-33390
LAMBERT, R. P.
    The acoustical structure of highly porous
      opun-cell foams
                                               p0 154 A82-45165
LAM. B.
   Oxidation and formation of deposit precursors in
      hydrocarbon fuels
      [ NASA-CR- 165534]
                                               p0073 N82-18402
LANGSTON, L. S.
   Turbine endwall single cylinder program
      [ NASA-CR- 169278]
                                               p0091 N82-31638
LAPRAD, B. F.
Sensor failure detection system
     [ NASA-CR- 165515]
                                               p0023 N82-13145
LARGE, G. D.
   Cooled variable-area radial turbing technology
      program
      [ NASA-CR- 165408 ]
                                               p0024 W82-19221
LARKIN, Ma
   Snergy efficient engine exhaust mixer model
technology
      [ NASA-CR- 1654591
                                               p0025 N82-22264
LARSON, V. H.
   Characteristic dynamic energy equations for
      Stirling cycle analysis
                                               p0138 A82-1/816
LASAGNA, P. L. In-flight acoustic results from an advanced-design
      propeller at Mach numbers to C.B
      [ AT AA PAPER 82-1120 ]
                                               p0021 A82-35017
    A preliminary comparison between the SR-3
      propeller noise in flight and in a wind tunnel [NASA-TH-82805] p0152 N82-2
                                               p0152 N82-21998
LASHWAY, R. W.
   Progress in coramic component fabrication technology [AIAA PAPIR 92-1211] p0071 A82-35064
LAU. S. K.
   Ceramic thermal barrier coatings for gas turbine
      engines
      (ASHE PAPER 82-GT-265)
                                               p0071 A82-35441
   Evaluation of present thermal barrier coatings for
      potential service in electric utility gas turbines
      [ NASA-CR- 165545]
                                               p0063 M82-18368
LAURE, J. L.
Alignment of fluid molocules in an EHD contact
[ASLE PREPRINT 81-LC-5C-11 po 107 A82-
                                               p0 107 A82- 18407
    Analysis of infrared emission from thin adsorbates
                                               p0056 A82-21431
LAVRIMOVICE, A. A. Invastigation of a comb-type slow-wave structure
      for millimeter-wave masers
                                                       A82-18368
LAW, C. K.
   Loan-limit extinction of propane/air mixtures in
      the stagnation-point flow
                                               p0057 A82-28736
   Effects of heat loss, preferential diffusion, and
      flame stratch on flame-front instability and extinction of propane/air mixtures
                                               p0057 A82-32877
   On the opening of premixed Bunsen flame tips p0057 A82-37570
   On stability of premixed flames in stagnation -
      Point flow
                                               p0057 A82-37574
LAWLEY, A.

Nork of fracture in aluminum metal-matrix composites
p0053 A82-31339
Tensile properties of Sic/aluminum filamentary
      composites - Thermal degradation effects
                                               p0053 A82-46220
Testing of fuel/oxidizor-rich, high-pressure
      proburners
      T NASA-CP- 1656091
                                               p0074 N82-24353
LEACH, K.
   Energy efficient engine: Turbine transition duct
model technology report
      [ NASA-CH- 167996]
                                               p0029 N82-33394
LECREM, B. T.

LOW NOW heavy fuel combustor concept program
[NASA-CR-165481] p0138 N
                                                PO 138 N82-33827
LEE, D.
   Study of controlled diffusion stator blading. 1.
     herodynamic and mechanical design report
[NASA-CP-165500] p0024
                                               p0024 N82-16081
```

```
LBB, F. C. A new approach to the wininum weight/loss design
      of switching power converters
   Power system design optimization using Lagrange
      multiplier techniques
                                                p0085 A82-20743
   Analysis and design of a standardized control
     module for switching regulators
                                                p0083 A82-46388
   Modeling and Analysis of Power Processing Systems (MAPPS), Volume 1: Technical report [MASA-CR-165538] p0083 M82-144
                                               P0083 M82-14447
    Modeling and Analysis of Power Processing Systems
     (MAPPS) Wolume 2: Appendices [MASA-CR-165539]
                                                DO 145 NB2-16748
   Imput filter compensation for switching regulators [NASA-CR-169005] p0085 N82-25442
LII.
      J. K.
    Vibrations of cantilovered shallow cylindrical
     shells of rectangular planform
                                                p0 115 A82-11298
   Vibrations of twisted rotating blades
     [ASME PAPER 81-DET-127]
                                                p0115 \82-19341
     5. ,5.
   Ultrasonic input-output for transmitting and
     receiving longitudinal transducers coupled to
      same face of isotropic elastic plate
     [ NASA-CR-3506 ]
                                                p0110 N82-18613
   , S., W.,
NASA Adaptive Multibeam Phased Array (AMPA): An
     application study [NASA-CR-169125]
                                                p0079 N82-28503
LRE. S. Y.
   Coramic thermal barrier coatings for gas turbine
     engines
     [ASME PAPER 82-GT-265]
                                                D0071 A82-35441
   Evaluation of present thermal barrier coatings for potential service in electric utility gas turbines
                                                p0063 N82-18368
     [ NASA-CR-165545]
LERN, W. L..

First results of material charging in the space
environment
      [ NASA-TH-84743]
                                                p0081 N82-24431
LEUTIDEN, B.,
   The role of modern control theory in the design of
     controls for aircraft turbine engines [NASA-TH-02815] p0
                                                p0018 N82-22262
   AESOP: A computer-mided design program for linear multivariable control systems
      [ NASA-TM-82871]
                                                p0148 N82-30992
LEIBECKI, H. . Y. .
Synthetic battery cycling techniques
      [ NASA-TH-82945]
                                                p0125 N82-30715
LEININGER, C. C.
   Model degradation effects on sensor failure
     detection
                                                n0 148 A82-13143
LRISSA, A. W.
    Vibrations of cantilevered shallow cylindrical
      shells of rectangular planform
                                                p0115 A82-11298
   Vibrations of twisted rotating blades [ASME PAPER 81-DET-127]
                                               p0 115 A82-19341
   Comparison of beam and shell theories for the vibrations of thin turbomachinery blades
      [ASME PAPER 82-GT-223]
                                                P0115 A82-35408
LEKOUDIS, S. G.
   Solutions of the compressible Navier-Stokes
     equations using the integral mothod [ATAA PAPER 81-0046]
                                                p0093 A82-23832
   A new numerical approach for compressible viscous
      flows
     [NASA-CR-168842]
                                                p0090 N82-22455
LERCH, B. A.
    Microstructural effects on the room and elevated
      temperature low cycle fatigue behavior of Waspaloy
     [NASA-CR-165497]
                                                p0113 N82-26702
LEROY, B., E. Satellite-aided land mobile communications system implementation considerations
     [ NASA-TM-8286 | ]
                                                p0036 N82-25290
LBSCO, D. J. .
A digital optical torquemeter for high rotational
      [NASA-TH-82914]
                                                p0095 N82-31664
LHUNG, M.,S.
   Pirst results of material charging in the space
```

environment

```
[ NASA-TH-84743]
                                                    p0081 #82-24431
ENVIRE, S. R.

Overlay metallic-cernet alloy coating systems
[NASA-CASE-LEW-13639-1] p0070 N83
                                                    p0070 NB2-33522
LEVOSH, B.
    On a free-electron-laser in a uniform magnetic field - A solution for arbitrarily strong electromagnetic radiation fields
                                                            182-28409
    Low NOx heavy fuel combustor concept program.
       Phase 1: Combustion technology generation
       [ HASA-CR- 165482]
                                                    p0136 N82-24725
    An automated system for global atmompheric
sampling using B-747 airliners
[NASA-CR-165264] p0139
                                                    p0 139 N82-13554
LEWIS, C. N.
ON-VPE growth of Mq-doped Gaks
                                                    p0 159 A82-38411
    tropopouse following the eruption of Hount St.
       Helens
                                                    p0140 A82-37450
LIEBERT, C. H.
Gas turbine ceramic-coated-vane concept with
       convection-cooled porous metal core
                                                    p0016 N82-14090
       [ NASA-TP- 1942]
    Covering solid, film cooled surfaces with a duplex thermal barrier coating [NASA-CASE-LEW-13450-1] p0088 N82-2546
                                                    n0088 N82-25463
LILLEY, D. G.

Con the prediction of swirling flowfields found in
       axisymmetric combustor geometries
                                                    p0029 A82-12120
    A simple finite difference procedure for the
       vortex controlled diffuser
    [ATAA PAPER 82-0109] p0036
Mean flowfields in axisymmetric combustor
geometries with swirl
                                                    n0030 A82-17788
       [ AIAA PAPER 82-0177 ]
                                                    p0092 A82-17824
    Modeling parameter influences on MHD swirl combustion nozzle design
        ATAA PAPER 82-0984]
                                                    p0011 A82-31947
    Bluff-body flameholder wakes - A simple numerical
       sclution
    Turbulence measurements in a confined jet using a six-orientation hot-wire probe technique [ALAA PAPER 82-12621
    Flow aerodynamics modeling of an MHD swirl combustor + Calculation
       verification
                                                    p0094 A82-44782
    Investigations of flowfields found in typical
       combustor quometries
    [NASA-CR-162461] p0090 N82-15360
Investigations of flowfields found in typical
      combustor geometries
[NASA-CR-168585]
                                                    p0090 N82-19495
    Investigations of flowfields found in typical
      combustor geometries [NASA-CR-169295]
                                                    p0092 N82-31643
LIN. A.
    Mumerical analysis of confined turbulent flow
p0093 A82-24748
    Bluff-body flameholder wakes - A simple numerical
       sclution
       [AIAA FAPER 82-1177]
    Tooth profile analystis of circular-cut,
spiral-bevel quars
[NASA-TH-82840] po!
                                                    p0 10 1 N82-26681
LINDRERG, L. J.
Oxidation stability of advanced reaction-bonded
[ACS PAPER 52-8-80P]
    Fabrication and wear test of a continuous
       fiber/particulate composite total surface hip
      replacement [NASA-TM-81746]
                                                    p0066 NB2-11211
    Tribological characteristics of a composite
       total-surface hip replacement
      [ NASA-TP-1853]
                                                    p0066 NB2-16239
LING. J. S.
    Performance of advanced chromium electrodes for
```

```
the MASA Hedox Energy Storage System
       [ NASA-TH-82724]
                                                            p0118 #82~12574
LINSCOTT, B., S.,
Aluminum blade development for the Mod-OA
200-kilowatt wind turbine
       [NASA-TM-82594]
                                                            p0119 N82-14633
LIPSHITZ, A.
    Dilution jet behavior in the turn section of a reverse flow combustor
       [AIAA PAPER 82-0192]
                                                            p0021 182-20291
     Hodified face seal for positive film stiffness [#ASA-CASE-LEW-12909-1] p0099 #82
                                                           p0099 #82-12442
    Dilution jet behavior in the turn section of a reverse flow combuster [WASA-TM-82776] p0017 N82
                                                            p0017 182-19220
LITTLE, So. H. .

Advanced turboprop testbed systems study. Volume
1: Testbed program objectives and priorities,
drive system and aircraft design studies,
        evaluation and recommendations and wind tunnel
        test plans
[MASA-CR-167928-VOL-1] p0028 M82-323
LITVIN, F., L.,

Mathematical models for the synthesis and optimization of spiral bevel quar tooth murfaces
                                                            D0028 M82-32370
       [ NASA-CR-3553 ]
                                                           p0106 N82-25516
     Precision of spiral-bevel gears
       [NASA-TH-82888]
                                                            p0 10 2 N8 2-30552
     Kinematic precision of gear trains
       [ NASA-TH-82887]
                                                            p0 102 M82-32733
LHOUYE, C. T.,
Brushfire arc discharge model
                                                            p0038 ¥82-14224
LORPPLER, I. J.
    QCSEE over-the-wing engine acoustic data
       [ MASA-TH-82708]
                                                            p0020 #82-29324
LORUBETHAL, S. H.
    Effects of ultra-clean and centrifugal filtration
    on rolling-element bearing life
[ASHE PAPER 8!-LUB-35] p0 10:
Multiroller traction drive speed reducer:
                                                            p0 103 A82-18436
       Evaluation for automotive gas turbine engine
       [ NASA-TP-2027 ]
LORDANN, R. P. NASA Broad Specification Fuels Combustion
       Technology program - Pratt and Whitney Aitcraft
Phase I results and status
[AIAA PAPER 82-1088] p0021 A82-34
                                                            p0021 182-34999
LOCAIS, W. R.,
Improved boundary lubrication with formulated C-
       ethers
       [NASA-TH-82808]
                                                            p0067 N82-20313
[NASA-TR-82808] p006.

LORAH, B.'.L.,

Fuel quality processing study, volume |

[NASA-CR-165327-VOL-1] p013.

Fuel quality/processing study, Volume 2:

Appendix, Task | literature survey

[NASA-CR-165327-VOL-2] p013.
                                                           p0135 N82-24649
                                                            p0 135 N82-24650
LOUIS, J. P.
     Plow aerodynamics modeling of an MHD swirl
       combustor - Calculations and experimental
        verification
                                                            p0094 A82-44782
LOVEREG R. , H.
    Integrated propulsion for near-Earth space
       missions. Volume 1: Executive summary [NASA-CR-167889-VOL-1] p004
                                                            p0045 #82-33424
     Integrated propulsion for near-Earth space
       missions. Volume 2: Technical [NASA-CR-167889-VOL-2]
                                                            p0046 N82-33425
LOVBERG, R. H. Shuttle to GEO propulsion tradeoffs [AIAA PAPER 82-1245]
                                                            p0034 A82-35082
LOURLL, C. I.,
Long-term high-velocity oxidation and hot
corrosion testing of several NiCral and FeCral
base oxide dispersion strengthened alloys
n0062 A82-3
                                                            p0062 A82-37151
     Gas-turbine critical research and advanced
        technology support project [NASA-TM-81708]
                                                            p0118 N82-13509
     Nicral ternary alloy having improved cyclic oxidation resistance [NASA-CASE-LEW-13339-1] p0061
                                                            p0061 N82-31505
    Gas turbine critical research and advanced
technology (CRT) support project
[NASA-TH-62872] p0 126
                                                            p0 126 N82-31776
     Pailure mechanisms of thermal barrier coatings
        exposed to elevated temperatures
```

[NASA-TH-82905] LBCAS, J. G.		
LUCAS. J. G.	p0061 N82-32461	MALOY, J. J.
Forward acoustic performance of a	model turbates	An insight into auxiliary propulsion requirements of large space systems
designed for a high specific fl		[MASA-TH-82827] p0042 M82-2428
[NASA-TP- 1968]	p0152 NB2-21035	MANDELL, M.,J.,
CH-VPE growth of Mg-doped Gals		MASCAP simulation of laboratory charging tests using multiple electron guns
	p0159 A82-38411	p0033 182-1831
LUDUIG, L. P. Gas turbine céramic-coated-vane c	ongont with	Differential charging of high-voltage spacecraft -
convection-cooled porous metal		The equilibrium potential of insulated surfaces p0041 A82-3554
[NASA-TP-1942]	p0016 N82-14090	Representation and material charging response of
Composite seal for turbomachinery [HASA-CASE-LEW-12131-3]	p0099 N82-19540	geoplasma environments p0039 M82-1424
LUERS, J. K.	• • • •	Simulation of charging response of SCATHA (P78-2)
Mathematical modeling of ice accre		satellite
Effect of heavy rain on aircraft	p0014 A82-27098	p0039 N82-1425 Additional extensions to the WASCAP Domputer code,
***	N82-21149	volume 1
30/20 GHz communications satellite	e multibéam antenna	[MASA-CR-167855] p0146 M82-2581 Additional extersions to the MASCAP computer code,
[AIAA 82-0449]	p0079 882-23486	volume 2
LUIDENS, R. W. Comparison of two parallel/series	flow turbofor	[NASA-CR-167856] p0040 N82-2637
propulsion concepts for supersc		Additional extensions to the NASCAP computer code, volume 3
[ATAA FAPER 81-2637]	p0020 A82-19214	[NASA-CR-167857] p0040 N82-2637
Comparison of two parallel/series propulsion concepts for superso		MANSON, S. S. Fatigue life prediction in bending from axial
[NASA-TH-82743]	p0004 N82-18178	fatigue information
Secondary electron emission yield:	~	[NASA-CR-165563] p0113 N82-2056
sectagaty election emission yield	p0038 N82-14226	Comparative analysis of CCMHD power plants
LUPTON, H. W.	, .	p0 158 182-2074
Micronized coal burner facility [NASA-CASE-LEW-13426-1]	p0 126 N82-31769	Cross-linked polyvinyl alcohol films as alkaline
LYONS, V. J.	• =	battery separators
Effect of fuel-air-ratio nonunifor emissions of nitrogen oxides	rmity on	[NASA-TM-82802] p0054 H82-2232
[NASA-TP- 1798]	p0016 NB2-13143	Materials science issues encountered during the
		development of thermochemical concepts
M		BARDER, J. H.
MACAUTEUR, C. D.		Development of materials and process technology
Mathematical modeling of ice accre	etion on airfoils p0014 A82-27098	for dual alloy disks [NASA-CR-165224] p0063 N82-1837
HACGERGOR, C. A.		EAREK, C. J.
Reusable rocket engine maintenance [NASA-CR-165569]		Experimental study of the effects of secondary air
HACKALL, K. G.		on the emissions and stability of a lean premixed combustor
In-flight acoustic results from a	n advanced-design	[AIAA PAPER 82-1072] p0021 A82-3499
	6	
propeller at Mach numbers to 0.	8 p0021 182-35017	An experiment to evaluate liquid hydrogen storage
(AIAA FAPER 82-1120) HACKAY, R. A.	p0021 A82-35017	An experiment to evaluate liquid hydrogen storage in space
[AINA FAPER 82-1120] BACKAY, R. A. The influence of orientation on the contraction of t	p0021 A82-35017 he stress rupture	An experiment to evaluate liquid hydrogen storage in space A82-2074
(AIAA FAPER 82-1120) HACKAY, R. A.	p0021 A82-35017 he stress rupture	An experiment to evaluate liquid hydrogen storage in space
[AIAA FAPER 82-1120] BACKAY, R. A. The influence of orientation on toproperties of nickel-base supercrystals	p0021 A82-35017 he stress rupture	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. J. HHD oxidant intermediate temperature cernmic heater study
TAINA FAPER 82-1120] MACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals BACKLIS, S. L.	p0021 A82-35017 he ftress rupture alloy single pú062 A82-47397	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N82-1552
[AIAA FAPER 82-1120] BACKAY, R. A. The influence of orientation on toproperties of nickel-base supercrystals	p0021 A82-35017 he stress rupture alloy single p0062 A82-47397 n equipment with	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I BHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N82-1552 MARPLE, D. T., F. Optical tip clearance sensor for aircraft engine
[AIAA FAPER 82-1120] HACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals HACKLIS, S. L. Interfacing wind energy conversion utility systems	p0021 A82-35017 he ftress rupture alloy single pú062 A82-47397	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. L. BHD oxidant intermediate temperature cernmic heater study [NASA-CR-165453] p0131 N62-1552 MARPLE, D. T. F. Optical tip clearance sensor for aircraft engine controls
[AIAA FAPER 82-1120] HACKAY, R. A. The influence of orientation on the properties of nickel-base superconstals HACKLIS, S. L. Interfacing wind energy conversion utility systems HAHISHI, J. H. Hicromechanical predictions of cr.	p0021 A82-35017 he stress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. L. HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N62-1552 MARPLE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A62-3769
[AIAA FAPER 82-1120] BACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals BACKLIS, S. L. Interfacing wind energy conversion utility systems MAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single	p0021 A82-35017 he stress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. L. BHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N82-1552 MARPLE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A82-3769 MARSHALL, R. A. Peasibility of an earth-to-space rail launcher
FAIRA FAPER 82-1120] BACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals BACKLIS, S. L. Interfacing wind energy conversion utility systems MAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550]	p0021 A82-35017 he stress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. L. HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N62-1552 MARPLE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A62-3769
[AIAA FAPER 82-1120] HACKAY, R. A. The influence of orientation on the influence of nickel-base supercrystals HACKLIS, S. L. Interfacing wind energy conversion utility systems HAHISHI, J. H. Hicromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] HAHHOUD, N. F.	p0021 A82-35017 he fitress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. L. HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N62-1552 MARPIE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A82-3769 MARSHALL, R. A. Feasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] p0033 A82-4465
FAIRA FAPER 82-1120] BACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals BACKLIS, S. L. Interfacing wind energy conversion utility systems MAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550]	p0021 A82-35017 he stress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] PO 131 N62-1552 MARPLE, D. T. F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] PO015 A82-3769 MARSHALL, R. A. Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] PO033 A82-4465
FAIRA FAPER 82-1120] BACKIY, R. A. The influence of orientation on the properties of nickel-base supercrystals BACKLIS, S. L. Interfacing wind energy conversion utility systems MAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] BAHBOUD, E. F. Analysis and design of a standard module for switching regulators	p0021 A82-35017 he stress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] PO 131 N62-1552 MARPLE, D. T. F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] PO015 A82-3769 MARSHALL, R. A. Feasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] PO033 A82-4465 MARSTON, C. M. COMPARATIVE, R. E.
[AIAA FAPER 82-1120] BACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals BACKLIS, S. L. Interfacing wind energy conversion utility systems MAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] BAHROUD, N. F. Analysis and design of a standard	p0021 A82-35017 he fitress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. L. HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N62-1552 MARPIE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A62-3769 MARSHALL, R. A. Feasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] p0033 A82-4465 MARSTON, C. M. Comparative analysis of CCMHD power plants p0158 A82-2074 MARTIE, R. E. Alkaline regenerative fuel cell systems for energy
ALAA FAPER 82-1120] **RACKIY, R. A. The influence of orientation on the properties of nickel-base supercrystals **EACKLIS, S. L. Interfacing wind energy conversion utility systems **MAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] **EACKLIS, S. L. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] **BAHBOUD, N. F. Analysis and design of a standard module for switching regulators **MAIRN, B. D. The influence of orientation on the properties of nickel-base supercribes.	p0021 A82-35017 he fitress rupture alloy single p#062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HID oxidant intermediate temperature ceramic heater study [NASA-CR-165453] P0 131 N62-1552 MARPLE, D. T. F. Optical tip clearance sensor for aircraft engine controls [AIAN PAPER 82-1131] P0015 A82-3769 MARSHALL, R. A. Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] P0033 A82-4465 MARSTON, C. H. Comparative analysis of CCMHD power plants p0158 A82-2074 MARTIE, R. E. Alkaline regenerative fuel cell systems for energy storage P0042 A82-1170
TAINA FAPER 82-1120] ***BACKAY, R. A.** The influence of orientation on the properties of nickel-base supercrystals ***BACKLIS, S. L.** Interfacing wind energy conversion utility systems ***BAHISHI, J. H.** ***Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] ***BAHBOUD, N. F.** Analysis and design of a standard module for switching regulators ****HAIEH, N. D.** The influence of orientation on the content of t	p0021 A82-35017 he stress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N62-1552 MARPIE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A62-3769 MARSHALL, R. A. Feasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] p0033 A82-4465 MARSTON, C. H. Comparative analysis of CCHHD power plants p0158 A62-2074 MARTIN, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Flectrochemical energy storage for an orbiting
ALAA FAPER 82-1120] ***BACKIY, R. A.** The influence of orientation on the properties of nickel-base supercrystals ***BACKLIS, S. L.** Interfacing wind energy conversion utility systems ***MAHISHI, J. H.** Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] ***BHBOOD, N. F.** Analysis and design of a standard module for switching regulators ***MATER. N. D.** The influence of orientation on the properties of nickel-tase supercrystals ***Patigue and creep-fatigue deformation on the properties of nickel-tase supercrystals ***Patigue and creep-fatigue deformation on the properties of nickel-tase supercrystals	p0021 A82-35017 he fitress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HID oxidant intermediate temperature cernmic heater study [NASA-CR-165453] p0 131 N62-1552 MARPLE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A82-3769 MARSHALL, R. A. Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] p0033 A82-4465 MARSTON, C. H. Comparative analysis of CCMHD power plants p0158 A82-2074 MARTIE, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Tlectrochemical energy storage for an orbiting space station [MASA-CR-165436] p0132 N82-1760
TAINA FAPER 82-1120] ***MACKAY, R. A.** The influence of orientation on the properties of nickel-base supercrystals ***BACKLIS, S. L.** Interfacing wind energy conversion utility systems ***MAHISHI, J. H.** ***Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] ***MAHOUD, N. F.** Analysis and design of a standard module for switching regulators ***MAHENDER HAME AND The influence of orientation on the properties of nickel-base supercrystals	p0021 A82-35017 he stress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] P0 131 N62-1552 MARPLE, D. T. F. Optical tip clearance sensor for aircraft engine controls [AIAN PAPER 82-1131] P0015 A82-3769 MARSHALL, R. A. Feasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] P0033 A82-4465 MARSTON, C. M. Comparative analysis of CCHHD power plants p0158 A82-2074 MARTIN, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Clectrochemical energy storage for an orbiting space station [HASA-CR-165436] PARTIN, R. L.
TAINA FAPER 82-1120] ***BACKIY, R. A.** The influence of orientation on the properties of nickel-base supercrystals ***BACKLIS, S. L.** Interfacing wind energy conversion utility systems ***BAHISHI, J. H.** Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] ****BHBOOD, N. F.** Analysis and design of a standard module for switching regulators ***********************************	p0021 A82-35017 he fitress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several C p0062 A82-47398 nsile and	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N62-1552 MARPIE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A82-3769 MARSHALL, R. A. Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] p0033 A82-4465 MARSTON, C. H. Comparative analysis of CCMHD power plants p0158 A82-2074 MARTIE, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Clectrochemical energy storage for an orbiting space station [HASA-CR-165436] p0132 N82-1/60 MARTIE, R. L. B747/JT9D flight loads and their effect on engine
[AIAA FAPER 82-1120] **HACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals **HACKLIS, S. L. Interfacing wind energy conversion utility systems **HAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] **HAHHOUD, K. F. Analysis and design of a standard module for switching regulators **HAITH, B. D. The influence of orientation on the properties of nickel-base supercrystals **Fatigue and creep-fatigue deformanickel-base superalloys at 650 of the influence of cobalt on the testress-rupture properties of the stress-rupture properties of	p0021 A82-35017 he fitress rupture alloy single p0062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several C p0062 A82-47398 nsile and	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HID oxidant intermediate temperature ceramic heater study [NASA-CR-165453] P0 13 1 N62-1552 MARPLE, D. T. F. Optical tip clearance sensor for aircraft engine controls [AIAN PAPER 82-1131] P0015 A82-3769 MARSHALL, R. A. Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] Comparative analysis of CCMHD power plants p0158 A82-2074 MARTIE, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Flectrochemical energy storage for an orbiting space station [MASA-CR-165436] P0 132 N62-1760 MARTIE, R. L. B747/JT9D flight loads and their effect on engine running clearances and performance deterioration; BCAC NAIL/P and WA JT9D engine
TAINA FAPER 82-1120] ***BACKIY, R. A.** The influence of orientation on the properties of nickel-base supercrystals ***BACKLIS, S. L.** Interfacing wind energy conversion utility systems ***BAHISHI, J. H.** Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] ****BHBOOD, N. F.** Analysis and design of a standard module for switching regulators ***********************************	p0021 A82-35017 he stress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several C p0062 A82-47398 nsile and e wickel-base	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N62-1552 MARPLE, D. T. F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] p0015 A82-3769 MARSHALL, R. A. Feasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] p0033 A82-4465 MARSTON, C. M. Comparative analysis of CCHHD power plants p0158 A82-2074 MARTIN, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Clectrochemical energy storage for an orbiting space station [MASA-CR-165436] p0132 N82-1/60 MARTIN, R. L. B747/JT9D flight loads and their effect on engine running clearances and performance deterioration; BCAC NAIL/P and WA JT9D engine diagnostics programs
TAINA FAPER 82-1120] **BACKIY, R. A. The influence of orientation on the properties of nickel-base supercrystals **BACKLIS, S. L. Interfacing wind energy conversion utility systems **BAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] **BAHBOUD, N. F. Analysis and design of a standard module for switching regulators **BAITH, H. D. The influence of orientation on the properties of nickel-base supercrystals **Fatigue and creep-fatigue deformanickel-base superalloys at 650 of the stress-rupture properties of the superalloy MAR-M247 The influence of cobalt on the mickel-base superalloy MAR-M247	p0021 A82-35017 he fitress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several c p0062 A82-47398 nsile and e wickel-base p0063 A82-47399 crostructure of	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. L. HID oxidant intermediate temperature ceramic heater study [NASA-CR-165453] MARPIE, D. T.,F. Optical tip clearance sensor for aircraft engine controls [AIAN PAPER 82-1131] MARSHALL, R. A. Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] MARSTON, C. H. Comparative analysis of CCMHD power plants poli58 A82-2074 MARTIE, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Thectrochemical energy storage for an orbiting space station [MASA-CR-165436] MARTIE, R. L. B747/JT9D flight loads and their effect on engine running clearances and performance deterioration; BCAC MAIL/P and WA JT9D engine diagnostics programs [NASA-CR-165573] P0027 N82-2829
TAINA FAPER 82-1120] ***BACKAT, R. A.** The influence of orientation on the properties of nickel-base supercrystals ***BACKLIS, S. L.** Interfacing wind energy conversion utility systems ***BAHISHI, J. H.** Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] ***BAHBOUD, N. F.** Analysis and design of a standard module for switching regulators ***PATEMENT N. D.** The influence of orientation on the properties of nickel-base supercrystals **Patigue and creep-fatigue deformanickel-base superalloys at 650 of the stress-rupture properties of the superalloy MAR-M247	p0021 A82-35017 he stress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several C p0062 A82-47398 nsile and e wickel-base p0063 A82-47399 crostructure of	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] P0 131 N62-1552 MARPLE, D. T. F. Optical tip clearance sensor for aircraft engine controls [AIAN PAPER 82-1131] P0015 A82-3769 MARSHALL, R. A. Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] P0033 A82-4465 MARSTON, C. H. Comparative analysis of CCHHD power plants p0158 A82-2074 MARTIN, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Flectrochemical energy storage for an orbiting space station [MASA-CR-165436] P0132 N62-1/60 MARTIN, R. L. B747/JT9D flight loads and their effect on engine running clearances and performance deterioration; BCAC NAIL/P and WA JT9D engine diagnostics programs [NASA-CR-165573] P0027 N82-2829 MARTE, J., E. Operational performance of the
TAINA FAPER 82-1120] **BACKIY, R. A. The influence of orientation on the properties of nickel-base supercrystals **BACKLIS, S. L. Interfacing wind energy conversion utility systems **BAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] **BAHBOOD, N. F. Analysis and design of a standard module for switching regulators **BAITH, H. D. The influence of orientation on the properties of nickel-base supercrystals **Patigue and creep-fatigue deformanickel-base superalloys at 650 of the influence of cobalt on the testess-rupture properties of the superalloy MAR-M247 The influence of cobalt on the mickel-base superalloy MAR-M247 **The influence of cobalt on the mickel-base superalloy MAR-M247 **BAJUHDAR, B. C.	p0021 A82-35017 he fitress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several c p0062 A82-47398 nsile and e wickel-base p0063 A82-47399 crostructure of E247 p0063 A82-47400	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HID oxidant intermediate temperature ceramic heater study [NASA-CR-165453] [NASA-CR-165453] [NASA-CR-165453] [NASA-CR-165453] [NASA-CR-16573] [NASA-CR-16573] [NASA-CR-16573] [NASA-CR-16573] [NASA-CR-16573] [NASA-CR-16573] [NASA-CR-165573] [NASA-CR-16577] [NASA-CR-16577] [NASA-CR-16577] [NASA-CR-16577] [NASA-CR-165573]
[AIAA FAPER 82-1120] **HACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals **HACKLIS, S. L. Interfacing wind energy conversion utility systems **HAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] **HAHHOUD, K. F. Analysis and design of a standard module for switching regulators **HAITH, H. D. The influence of orientation on the properties of nickel-base supercrystals **Fatigue and creep-fatigue deformanickel-base superalloys at 650 of the influence of cobalt on the test stress-rupture properties of the superalloy MAR-M247 The influence of cobalt on the mickel-base superalloy MAR-M247 The influence of cobalt on the mickel-base superalloy MAR-M247 **HAJUHDAR, B. C. Frictional heating due to aspertit	p0021 A82-35017 he fitress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several C p0062 A82-47398 nsile and e wickel-base p0063 A82-47399 crostructure of H247 p0063 A82-47400 y interaction of	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. I HHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] MARPLE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAN PAPER 82-1131] MARSHALL, R. A. Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] MARSTON, C. H. Comparative analysis of CCHHD power plants polisa A82-2074 MARTIN, R. E. Alkaline regenerative fuel cell systems for energy storage p0042 A82-1170 Flectrochemical energy storage for an orbiting space station [MASA-CR-165436] MARTIN, R. L. B747/JT9D flight loads and their effect on engine running clearances and performance deterioration; BCAC MAIL/P and WA JT9D engine diagnostics programs [NASA-CR-165573] ARTI, J. E. Operational performance of the photovoltaic-powered grain mill and water pump at Tangaye, Upper Volta [NASA-TH-02767] P0120 M82-1967
[AIAA FAPER 82-1120] **BACKAY, R. A. The influence of orientation on the properties of nickel-base supercrystals **BACKLIS, S. L. Interfacing wind energy conversion utility systems **BAHISHI, J. H. Micromechanical predictions of crand fracture energy in a single boron/aluminum model composite [NASA-CR-168550] **BAHHOUD, N. F. Analysis and design of a standard module for switching regulators **HAIFH, R. D. The influence of orientation on the properties of nickel-base supercrystals **Fatigue and creep-fatigue deformanickel-base superalloys at 650 of the influence of cobalt on the test stress-rupture properties of the superalloy MAR-M247 The influence of cobalt on the mickel-base superalloy MAR-M247 The influence of cobalt on the mickel-base superalloy MAR-M247 **HAJUHDAR, B. C.	p0021 A82-35017 he fitress rupture alloy single pú062 A82-47397 n equipment with A82-21148 ack propagation fiber p0052 N82-18326 ized control p0083 A82-46388 he stress rupture alloy single p0062 A82-47397 tion of several C p0062 A82-47398 nsile and e wickel-base p0063 A82-47399 crostructure of fi247 p0063 A82-47400 y interaction of	An experiment to evaluate liquid hydrogen storage in space A82-2074 MARKSBERRY, C. L. HID oxidant intermediate temperature ceramic heater study [MASA-CR-165453] MARPLE, D. T., F. Optical tip clearance sensor for aircraft engine controls [AIAA PAPER 82-1131] Peasibility of an earth-to-space rail launcher system [IAF PAPER 82-46] MARSTON, C. M. Comparative analysis of CCMHD power plants p0158 A82-2074 MARTIE, R. E. Alkaline regenerative fuel cell systems for energy storage P0042 A82-1170 Flectrochemical energy storage for an orbiting space station [MASA-CR-165436] P17/JT9D flight loads and their effect on engine running clearances and performance deterioration; BCAC NAIL/P and WA JT9D engine diagnostics programs [NASA-CR-165573] MARTIE, J., E., Operational performance of the photovoltaic-powered grain mill and water pump at Tanqaye, Upper Volta

```
[ NASA-TH-82917]
                                                        DO 126 N82-3382B
HASTERS, P. A.
Duposit formation in hydrocarbon rocket fuels with
an evaluation of a propane heat transfer
       [ NASA-TH-82911]
                                                        D0088 N82-26611
HATEER, K.
    Automotive Stirling engine development program
       [ NASA-CR- 167907]
                                                        p0 164 N82-29235
HATTHEY, K. V.
    Processing of silicon solar cells by ion implantation and laser annealing
       [ NASA-CR- 165283]
                                                        p0126 W82=11546
NATTREWY, E. W. 30/20 GHz communications satellite multibeam antenna
TAXA 82-0449 ]
                                                        POC79 A82-23486
    Hechanism and models for zinc metal morphology in alkaline media
       [ NASA-TH- 62768]
                                                        PO 120 NB2- 1967 I
HAYO, F. R.
    Oxidation and formation of deposit procursors in
       hydrocarbon fuels
       [ NASA-CR- 165534]
                                                        P0073 N82- 18402
RCALEREY, H. E.
Creep and rupture of an CDS alley with high stress
rupture ductility
                                                        p0065 A82-40335
HCALISTER, A. J.

Non-noble catalysts and catalyst supports for phosphoric acid fuel cells

[NASA-CR-165289] p0137 N83
                                                        p0137 N82+30722
SCREIFS, R. P.
    Summary of electric vehicle do motor-controller
       tests
       [ NASA-TH-82863]
                                                        p0082 N82-33636
HCCARTHY, J. F., JR.
NAS1 research activities in aeropropulsion
       [ NASA-TH-82788]
                                                        POO 17 N82- 16084
    Local and national impact of aerospace research
       and technology
       [ NASA-TH-82775]
                                                        P0 162 NB2+20006
mccharms, B. F.

Revlar/PNR-15 polyimide matrix composite for a complex shaped DC-9 drag reduction fairing [ATAA PAPER 82-1047] p0002 A82-
                                                        p0002 A82-37678
MCCOXW. D. K.
    Design study of a continuously variable roller cone traction CVT for electric vehicles [NASA-CR-179841] p0105 N82
                                                        PO 105 N82-12445
MCDOWALD, G.
    Effects of arc current on the life in burner rig
thormal cycling of plasma strayed Erosub2-
        Yaub20aub3
       [ NASA-TM-82795]
    Use of fiber like materials to augment the cycle
life of thick thermoprotective seal coatings
       [ MASA-TH-8290 1]
                                                        p0089 N82-32633
HCDOWALD, N.
    Turbofan forced mixer-nezzle internal flowfield.
Volume 3: A computer code for 3-D mixing in axisymmetric nezzles
       [ NASA-CR-3494]
                                                        p0091 NB2-22460
MCGENER, R. K.
    Hybrid and electric advanced vehicle systems
       (beavy) simulation [NASA-CR-165536]
                                                        P0163 N82-16938
Sensor failure detection system
       [ NASA-CR- 1655 15 ]
                                                        D0023 N82-13145
AGT100 turbomachinery
       [ ATAA FAPER 62-1207]
                                                        p0 108 A82-35061
MCKINKIE, D. J., JR.
Advoncoustic performance of an externally blown
flap configuration with several flap noise
       suppression devices
[NASA-TP-1995] p0 152 N82-24942 NCKNIGHT, N. L.
Turbing blade nonlinear structural and life analysis
                                                        p0152 N82-24942
       [AIAA PAPER 02-1056]
                                                        p0021 A82-34581
MCLALLIN, K. L.
    Cold-air performance of a 15-41-cm-tip-diameter
       axial-flow power turbine with viriable-area stator designed for a 75-kW aw omotive gas
       turbine engine
       [ NASA-TH- 82644]
                                                        p0024 N82-21193
BCLAUGBLIN, D.
    On the prediction of swirling flowfields found in
```

```
axisymmetric combustor quonatrius
                                                         p0029 A82-12120
    Mean flowfields in axisymmetric combustor
       quosetries with mairl [ATAA PAPER 82-0177]
                                                         P0092 A82-17824
    Turbulence measurements in a confined jet using a six-orientation hot-wire probe technique [AIAA PAPER 82-1262] p0094 £82-37
                                                         p0094 £82-37710
    Investigations of flowfields found in typical
       combustor quometries [NASA-CR-165061]
                                                         P0090 #82-15360
Computational methods for internal flows with emphasis on turbomaghinery
       [ NASA-TM-82764]
                                                         p0003 N82-13113
MEACHAM, W. L.
    Monlinear analysis of rotor-boaring systems using
       component mode synthesis
       [ASHE PAPER 82-GT-303]
                                                         p0 104 A82-35468
BENTA, S.,
Effects of processing and dopant on radiation
damage removal in silicon solar cells
p0042 N8
                                                         p0042 N82-31443
MRIER, R. C.
Interfacing wind energy conversion equipment with
       utility systems
ENITER, R. J.

Evaluation of the potential of the Stirling engine
for heavy duty application
[NASA-CR-165473] p0 128 N82-105
                                                         p0 128 N82-10505
MRIMORES, M.,
Preliminary study of temperature measurement
techniques for Stirling engine reciprocating seals
       [NASA-CR-165479]
                                                          p0 104 N82-11466
MRISSINGER, H. . F. ,
    Integrated propulsion for near-Earth space
       wisaiona. Yolume 1: Executive summar [NASA-CR-167889-VOL-1] p00
                                                         p0045 N82-33424
    Integrated propulsion for near-Earth space missions. Volume 2: Technical
       [ NASA-CR-167889-VOL-2 ]
                                                          p0046 NB2-33425
Proliminary results on performance testing of a
       turbocharged rotary combustion engine [NASA-TH-82772] po
                                                         p0017 N82-21194
LOW-thrust chemical propulsion system propollant expulsion and thormal conditioning study.
       [ NASA-CR- 165622]
    Low-thrust charical propulsion system propellant expulsion and thermal conditioning study [NASA-CR-167841] p0045 NB2-24
                                                         p0045 N82-24288
EXERTIL, W.
Identification of multivariable high performance turbofan engine dynamics from closed loop data
       [ NASA-TH-82785]
                                                         p0076 N82-20339
    The role of modern control theory in the design of
       controls for aircraft turbing engines
       [NASA-TM-82815]
                                                          D0018 N82-22262
MENUTKA, J. P. P. Progress in protective coatings for aircraft gas turbines: A Review of NASA sponsored research [NASA-TH-82740] p0058 NG2-1
                                                          p0058 N62-12216
    Evaluation of wind tunnel performance testings of
an advanced 45 deg swept 8-bladed propeller at
Mach numbers from 0.45 to 0.85
       [ NASA-CR-3505 ]
                                                          P0007 N82-19178
MBULEMBERG, A. Advances in high output voltage silicon solar cells p0127 A82-44942
MEULEMBERG, A., JR.
High- and low-resistivity silicon solar cells
                                                          p0046 A82-11762
ERYRR, L. J. Cooled variable-area radial turbine technology
       program
       [ NASA-CR-165408]
                                                          p0024 N82-19221
MRYER, W. L.
    Prodiction of sound radiation from different
       practical jet engine inlets [NASA-CR-165120]
                                                          0153 N82= 16810
ENTERS, G. J. .
Nonlinear structural and life analyses of a
        combustor liner
       [ MASA-TH-82846]
                                                          PO111 N82-24501
```

[NASA-TM-82905]

p0061 N82-32461

ORIGINAL PAGE IS OF POOR OUALITY

```
Fracture mechanics criteria for turbine engine hot
      section components [NASA-CR-167896]
                                                    p0027 N82-25257
Exhaust emissions reduction for intermittent
      ccabustion aircraft engines
      [ NASA-CR- 1679 14]
                                                    p0029 N82-33392
   (B. H. E.
Ultrasonic scanning system for imaging flaw growth
      in composites
      [ NASA-TM-82799]
                                                    p0076 N82-22386
HICHARL, C. J.
Enurgy efficient engine shroudless, hollow fan
      blade technology raport [NASA-CB-165586]
                                                    p0024 NB2-21196
MICHALITSIANDS, A. G.
Ultraviolet observations of the 1980 eclipse of
the symbiotic star CI Cyqni
Forward acoustic performance of a model turbofan designed for a high specific flow (QF-14)
[NASA-TP-1968] p0 152 N82-21036

HIMALOED, J. R.

A real time Pegasus propulsion system model for VSTOL piloted simulation evaluation
[NIAN PAPER 81-2663] p0020 A82-19221
    A real time Pegasus propulsion system model for
      VSTOL piloted simulation evaluation
      [ NASA-TM-82770]
                                                    p0016 NB2-13144
    A piecewise linear state variable technique for
      real time propulsion system simulation [NASA-TM-82851]
                                                    p0018 N82-24201
HIKKELSON, D. C.
SURBARY and recent results from the NASA advanced
High Speed Propeller Research Program
      [NASA-TM-82891]
                                                    P0001 N82-26219
HILDBOR, H. P.
    Permanent magnet properties of Mn=Al=C between -50 C and +150 C
                                                    p0085 A82-20505
    Hard permanent magnet development trends and their
      application to A.C. machines
                                                    p0083 A82-20745
    Small das turbine combustor primary zone development
[AIAA PAPER 82-1159] p0103 A82-35036
Werification of an acoustic transmission matrix
      analysis of sound propagation in a variable area
       duct without flow
      [ NASA-TM-82741]
                                                    p0151 N82-12891
    Pressure transfer function of a JT15D nozzle due
to acoustic and convected entropy fluctuations
[NASA-TH-82842] p0 152 N82-2:

WILLAW, P. P., JR.

Applications of high-temperature powder metal
                                                    p0152 N82-22951
      aluminum alloys to small gas turbines
                                                    p0065 482-48244
    Propeller tip vortex - A possible contributor to
       nircraft cabin noise
                                                    p0 152 A82-17603
MILLER, D. R.
    Comparison of upwind and downwind rotor operation
      of the DOE/NASA 100-kW MOD-0 wind turbine
                                                    p0122 N82-23710
MILLER, F. Q.
Gallium arsenide solar array subsystem study
      [ NASA-CR- 167869]
                                                    p0 138 N82-32855
HILLER, L. A. Peasibility of an earth-to-space rail launcher
       system
       [INE PAPER 82-46]
                                                    p0033 A82-44659
    Preliminary feasibility assessment for
       Earth-to-space electromagnetic (Railgun) launchers
       [ NASA-CR- 167886]
                                                    p0033 N82-29345
HILLER, B. A. Phase stability in plasma-sprayed, partially
       stabilized zirconia-yttria
                                                    p0070 A82-41552
    Thermodynamics and kinetics of the sulfation of
       porous calcium silicate
       [ NASA-TH-82769]
                                                    D0048 N82-15119
    Review of NASA progress in thermal barrier coatings for stationary gas turbines
```

[NASA-TH-81716]

failure mechanisms of thermal barrier coatings exposed to elevated temperatures

```
Overview study of Space Power Technologies for the
      advanced energetics program
      [MASA-CR-165269]
                                                 p0 132 N82-17606
MILLS, H. R.
   Voltage gradients in solar array cavities as possible breakdown sites in spacecraft-charging-induced discharges
                                                 P0038 A82-18317
   Voltage gradients in solar array cavities as
      possible breakdown sites in
      spacecraft-charging-induced discharges
      [ WASA-TH-82710]
                                                  P0037 N82-11107
Application of integration algorithms in a parallel processing environment for the simulation of jet engines
[NASA-TM-82746] p0149
                                                 P0149 N82-14849
   A generalized memory test algorithm [NASA-TH-82874]
                                                  p0146 N82-31971
MINGR, R. V.
   Patique and creep-fatique deformation of several
      nickel-base superalloys at 650 C
                                                  p0062 182-47398
Processing of silicon solar cells by ion
      implantation and laser annealing
      [NASA-CR-165283]
                                                 p0 128 N82-11546
MIRTICH, H. J.
   Surface texturing of fluoropolymers [NASA-CASE-LEW-13028-1]
                                                 p0070 N82-33521
BISENCIE, J. A.,
Effect of oxide files on hydrogen permeability of
      candidate Stirling engine heater head tube alloys
      [ NASA-TH-82824]
                                                 p0060 N82-24323
    Evaluation of Candidate stirling engine heater
tube alloys at 820 deg and 860 deg C
                                                  p0061 N82-30372
      [ NASA-TH-82837]
MITCHELL, A. M.,
Lubricant effects on efficiency of a helicopter
      transmission
      [NASA-TH-82857]
                                                  DO 100 N82-25520
MITCHELL, G. A.,
    Summary and recent results from the NASA advanced
      High Speed Propeller Research Program [NASA-TH-82891] p0
                                                  p0001 N82-26219
MITTEA, R.

NASA Adaptive Multibeam Phased Array (AMPA): An application study

p0079 M92-2
                                                  p0079 MA2-28503
MIYASARA, K.
    Effects of heat loss, preferential diffusion, and flame stretch on flame-front instability and extinction of propage/air mixtures
                                                  p0057 A82-32877
MITOSHI, K.
Adhesion and friction of single-crystal diamond in
      contact with transition metals
                                                  p0103 A82-18680
    Surface chemistry and wear behavior of
       single-crystal silicon carbide sliding against
       iron at temperatures to 1500 C in vacuum
      [NASA-TP-1947]
                                                  p0067 NB2-19374
    Friction and wear of iron in corrosive metal
      [NASA-TP-1985]
                                                  p0058 N82-20291
    Influence of mineral oil and additives on
       microhardness and surface chemistry of magnesium
       oxide (001) surface
       [ NASA-TP-1986]
                                                  p0067 N82-20316
    Friction and surface chemistry of some
       ferrous-base metallic glasses [NASA-TP-1991]
                                                  p0059 N82-21301
    Tribological properties and XPS studies of ion plated gold on nickel and iron
       [ NASA-TH-82814]
                                                  p0059 N82-22344
    Surface chemistry, microstructure and friction
      properties of some ferrous-base metallic glasses at temperatures to 750\ \text{C}
      [NASA-TP-2006]
                                                  p0060 N82-22349
    Correlation of tensile and shear strengths of
       metals with their friction properties
       [ NASA-TH-82828]
                                                  p0060 N82-24325
    Tribological properties of sintered polycrystalline and single crystal silicon carbide
       [NASA-TM-82829]
                                                  p0068 N82-24343
    Influence of corrosive solutions on microhardness
       and chemistry of magnesium oxide /001/ surfaces
                                                  p0102 N82-31691
       [ NASA-TP-2040 ]
```

p0058 N82-17335

ž

```
Occurrence of spherical ceramic debris in indentation and sliding contact
             [ NASA-TP-2048]
                                                                                                       p0069 N82-32491
MISBNA, P. F.
       First results of material charging in the space
            environment
             [ NASA-TH-84743]
                                                                                                      P0081 N82-24431
EXECUTO, s.
Lean-limit extinction of propane/air mixtures in
             the stagnation-point flow
                                                                                                      p0057 A82-28736
        Conversion of acoustic energy by lossless liners
                                                                                                      p0154 A82-36195
HOPPIT, B. J.

Turbulent boundary layer heat transfer experiments

- \( \) separate effects study on a convexly-curved
             [ ASHE PAPER 81-HT-78]
                                                                                                      p0092 A82-10963
        Turbulent boundary layer heat transfer experiments: Convex curvature effects including
             introduction and recovery
             [ NASA-CH-3510]
                                                                                                       n0090 N82-17456
BONGIA No. Co.

Pollution reduction technology program small jet aircraft engines, phase 3
[NASA-CR-165386] p0023 W02-16
                                                                                                      p0023 W82-14095
        ERBS fuel addendum: Pollution reduction tuchnology program small jet aircraft ungines,
             phase 3
             [ NASA-CR- 165387]
                                                                                                       p0024 N82-14096
Performance of single-stage axial-flow transonic
             compressor with rotor and stator aspect ratios
            of 1.63 and 1.78, respectively, and with design pressure ratio of 1.82 [NASA-TP-1974] p0017 M82-19
       Performance of single-stage axial-flow transonic compressor with rotor and stator aspect ratios of 1.63 and 1.77, respectively, and with design pressure ratio of 2.05
[NASA-TP-2001] p0018 N82-22
                                                                                                       p0018 N82-22269
        Rotor tip clearance effects on overall and
             blade-element performance of axial-flow
transonic fan stage
             [ NASA-TP-2049]
                                                                                                       p0020 NB2-33389
HOORE, T. J.
Ultrasonic velocity for estimating density of structural ceramics
[NASA-TH-82765] p0066 N8
                                                                                                       p0066 N82-14359
MOORHEAD, P. E.
Metal honeycosb to porous wireform substrate
             diffusion bond evaluation
             [ NASA-TH-82793]
                                                                                                       p0110 N82-18612
MORALES, W.
        Thermal and oxidative degradation studies of formulated C-ethers by gel-permeation
             chromatography
             [ NASA-TP- 1994]
                                                                                                      p0068 N82-21332
BORENO, V.
Nonlinear structural and life analyses of a
             combustor liner [NASA-TM-82846]
                                                                                                       p0111 N82-24501
MORGAN, J. L.
        Effect of vacuum exhaust pressure on the performance of MHD ducts at high B-field [AINA PAPER 82-0396] p0157
        Ining PAPER H2-0396] p0157 A82-20292 Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-field p0157 M82-12000 Results and Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Com
         Results and comparison of Hall and DW duct
              experiments
              [ NASA-TM-82864]
                                                                                                       p0157 N82-25961
MORRIS, J. F.
High thermal power density heat transfer
             [ NASA-CASE-LEW- 12950- 1]
                                                                                                       p0087 N82-11399
HORRIS, P. J.
The three-dimensional boundary layer on a rotating
             helical blade
                                                                                                       p0009 A82-15459
MOSS, J. E., JR.
Exhaust emissions survey of a turbofan engine for flame holder swirl type augmentors at simulated altitude flight conditions
             [ NASA-TH-82787]
                                                                                                        p0019 NB2-25255
 HOYER, D. W.
```

Fffects of ultra-clean and centrifugal filtration

on rolling-element bearing life

[ASME PAPER 61-LUB-35]

```
#BOG, T.,S.,
#agnetohydrodynamics (MHD) Engineering Test
Pacility (ETF) 200 MMe power plant. Design
Requirements Document (DRD)
      [ WASA-TH-82705]
                                                     p0099 M82-12446
MURLLER, A.
    Advanced stratified charge rotary aircraft engine
      design study [MASA-CR-165398]
                                                     p0107 N82-27743
[ WASA-CR-168586]
BUNE, D.
    Extended range stress intensity factor expressions
for chevron-notched short bar and short rod
      fracture toughness specimens
STRAILIDHARAM, U.
Fatigue life prediction in bending from axial
      fatigue information
      [ NASA-CR-165563]
                                                     p0113 #82-20564
MURATA, K. Haximum entropy image reconstruction from
      projections
                                                              A82-11053
MURDOCK, R. W.
    Computer modeling of fan-exit-splitter spacing effects on P100 response to distortion [NASA-CR-167879] p0025 N82-
                                                     p0025 #82-23246
AURPHY, D. P. .
Analysis of crack propagation as an energy absorption mechanism in metal matrix composites
      [ NASA-CR-165051]
                                                     p0052 N82-14288
EVERTE, K. . No. S.

Three dimensional flow field inside the passage of
      a low speed axial flow compressor rotor
                                                     p0011 182-31964
      [AIAA PAPER 82-1006]
Water ingestion into jet engine axial compressors
[AIAA PAPER 82-0196] p0030 A82-17
                                                     p0030 A82-17836
MYERS, D.
    Advanced stratified charge rotary aircraft engine
       design study
(NASA-CR-165398) p0 107 N82-2

EYSHENGO, V., V.,
Investigation of a comb-type slow-wave structure
                                                     DO 107 M82-27743
      for millimeter-wave masers
```

A82-18368 DAIK, S. K. Development of improved high temperature coatings for IN-792 + HF [NASA-CR-165395] p0063 M82-143 p0063 NB2-14333 WAINTGER, J. J.

Performance and operational economics estimates
for a coal gasification combined-cycle
cogeneration powerplant [NASA-TH-82729] The influence of cobalt on the tensile and stress-rupture properties of the nickel-base superalloy MAR-H247 p0063 A82-47399 The influence of cobalt on the microstructure of the nickel-base superalloy MAR-M247 p0063 A82-47400 Effects of ultra-clean and centrifugal filtration on rolling-element bearing life [ASME PAPER 81-LUB-35] p0103 A82-18436 MRIL. J. T. Pabrication of turbine components and properties of sintered silicon nitride [ASME PAPER 82-GT-252] p0071 A82-35431 Pabrication of sinterable silicon nitride by injection molding P007 | A82-37015 MELANDER, H. C. Real-time microcomputer simulation for space Shuttle/Centaur avionics

Nonlinear analysis of rotor-bearing systems using

component mode synthesis

[ASHE PAPER 82-GT-303]

P0033 A82-48245

p0104 482-35468

p0 103 A82-18436

MELSON, H. D.

C	P POOK &		
On finite deformation elasto-plasticit	;y	[WASK-TH-82671] WYLAND, T. W. Hicroprocessor control system for 20	p0120 N82-21712
DESDITT, J. A.	0116 182-45869	Mod-OA wind turbines	
Solute transport during the cyclic ori Ni-Cr-Al alloys	idation of	[MASA-TH-82711]	p0120 M82-21710
[NASA-CRe 165544] BEUGEBAUER, H.	00064 N82-27462	0	
Overview study of Space Power Technology	gies for the	OBERLE, L. G. A digital optical torquemeter for his	ah rotetional
	0132 N82-17606	speed applications	
LV measurements with an advanced turbo	prop	[NASA-TM-82914] OCONHELL, J. M.	p0095 N82-31664
MEUSTADTER, B. E.	0097 N82-32690	TP 102 in-duct combustor noise measus turbine nozzle, volume 1	rements with a
Applications of the DOE/NASA wind turk engineering information system		[NASA-CR-165562-VOL-1] YF 102 in-duct combustor noise measu	p0153 ¥82-21031 rements with a
BEYELOFF, S.	00122 N82-23696	turbine nozzle, volume 2 [NASA-CR-165562-VOL-2]	p0 153 N82-21032
Market assessment of photovoltaic pove for agricultural applications in Col	lombia	YF 102 in-duct combustor noise measure turbine nozzle, volume 3	
[NASA-CR-165524]	0134 N82-22770	[WASA-CR-165562-VOL-3] ODONWELL, W. J.	p0155 N82-21033
IMPATT power building blocks for 20 Gi transmit amplifier		A simplified design procedure for li of rocket thrust chambers	
[AIAA 82-0498] WICE, A. W.	0086 A82-23566	[AIAA PAPER 82-1251] Development of a simplified procedur	p0643 A62-35087 e for thrust
	status 00123 N82-25637	chamber life prediction [NASA-CR-165585]	pr/044 M82-21253
WIEDERDING, W. C. High temperature electronic requirement	its in	OHIRA, J. B. Fuel quality processing study, volum	e 1
aeropropulsion systems [E-708]	0081 ¥82-15313	[NASA-CR-165327-VOL-1] Fuel quality/processing study. Volu	p0135 N82-24649 me 2:
MIBLSON, C. E. Advanced superposition methods for bid turbopump vibration analysis	jh speed	Appendix. Task literature surve [NASA-CR-165327-VOL-2] OKRAW, M.,C.	P0 135 N82-24650
[NASA-CB- 165379]	0104 N82-11465	IMPATT power building blocks for 20	GHz spaceborne
	0 105 NB2-11468	transmit amplifier (ATAA 82-0498)	p0086 A82-23566
Current legal and institutional issue		OLIVER, J. R. Undoped semi-insulating LEC Gals - A	model and a
	0136 N82-29719	mechanism	p0 159 A82-13754
Formation of oxides of nitrogen in more spray combustion of hydrocarbon fuel	ls	OLSEW, R.,C. Hodification of spacecraft potential electron emission on ATS-5	
MOLFI, J.	0057 A82-37571	Field-aligned ion streams in the ear	p0040 A82-16194 th's midnight
Market assessment of photovoltaic power for agricultural applications in Nice	geria	region	p0140 A82-31009
[NASA-CR-165511] MONNAST, J. E.	P0133 N82-18698	The hidden ion population of the mag	necosphere p0140 A82-32630
Numerical simulation of sheath structure current-voltage characteristics of a conductor-dielectric disk in a plasm	1	OLSEN, W. A., JR. Aircraft icing research at NASA [NASA-TM-829!9]	p0013 N82-30297
	P0040 A82-15904	OLSSON, W. J.	
Numerical simulation of plasma incolations in space. Part 7: The consistent calculation	e self	Performance deteriorgtion due to acc testing and flight loads; JT90 jet diagnostic program	engine
Numerical simulation of plasma insulation	00039 N82-14272	[NASA-CR-165572] B747/JT9D flight loads and their eff	p0027 ¥82-27309 ect on engine
interactions in space. Part 2: Die effects		running clearances and performance deterioration; BCAC NAIL/P and WA	1
i i	P0039 N82-14273	diagnostics programs	
Effect of fuel injector type on performance of the	rmance and	[NASA-CR-165573] OMBILL, G. K.	p0027 N82-28296
emissions of reverse-flow combustor [NASA-TP-1945]	p0016 NB2-15040	Mass Driver Two - A status report	p0046 A82-18191
MORWOOD, E. Advanced stratified charge rotary airc		OPPENZIM, A. K. Secondary effects in combistion inst	
design study	p0 107 N82-27743	leading to flashback [AIAA PAPER 82-0037]	p0056 A82-17746
MOVAK, R. C. Development of low modulus material for		Numerical modelling of turbulent flo combustion tunnel	w in a
	p0022 N82-10039	Numerical modeling of turbulent comb premixed gases	p0093 A82-27000 oustion in
NOVICK, A. S. Small gas turbine combustor primary zo			P0056 A82-28708
[AIAA FAPER 82-1159] Low NOx heavy fuel combustor concept addendum: Low/mid heating value ga		Effects of internal heat transfer on of self-similar blast waves	p0093 A82-32225
evaluation	•	ORANGE, L.	
Low NOx heavy fuel combustor concept	p0055 N82-25338 program p0136 N82-25635	Voltage gradients in solar array cav possible breakdown sites in spacecraft charging induced discha	
WUSSLE, R. C.	- 	spacecraft-charging-induced discha	p0038 A82-18317
Experimental performance of the regen- the Chrysler upgraded automotive ga- engine		Voltage gradients in solar array cav possible breakdown sites in spacecraft-charging-induced discha	

multiple materials

```
[ HASA-TH-82710 ]
                                                   PP037 N82-11107
                                                                                  NASCAP simulation of laboratory charging tests
ORANGE, T. W. Crack displacements for J/I/ testing with compact
                                                                                     using multiple electron quas
                                                                                                                                 p0033 A82-18319
      srecimens
                                                                                  Charging of a large object in low polar Banth orbit
                                                                                                                                 P0039 N82-14275
                                                   p0112 A82-40358
OSTRACH, 5.
    Natural convection with combined driving forces
                                                                                  A pad perturbation method for the dynamic
                                                   p0093 A82-31445
                                                                                    coefficients of tilting-pad journal bearings
OTTERSON, D. A.
Aircraft sampling of the sulfate layer near the
tropopause following the eruption of Mount St.
                                                                                                                                 p0110 A82-14400
                                                                              PATER, R. H. Novel improved PMR polyimides
                                                                                    [ NASA-TH-82733]
       Nelens
                                                                                                                                 p0049 N82-11117
                                                   DO 140 AB2-37450
                                                                               PATERSON, E. V.
OWER, E. A., JE.
                                                                                  Turbofan forced mixer-nozzla internal flowfield.
    High-frequency high-voltage high-power DC-to-DC
                                                                                     Volume 1: A benchmark experimental study
      converters
                                                                                     [ NASA-CR-3492]
                                                                                                                                 p0090 N82-22458
                                                                              PAULOVICE, P. J.
Propeller flow visualization techniques
                                                   p0083 N82-12347
    Analysis of transistor and snubber turn-off dynamics in high-frequency high-voltage
                                                                                                                                 p0096 #82-32672
      high-power converters
                                                                              PELOSE, J. R.
Dynamic switch matrix for the TDMA satellite
      [ NASA-CP- 1687601
                                                   p0084 N82-22438
                                                                                    switching system
                                                                                     [AIAA 82-0458]
                                                                                                                                 p0085 A82-23494
                                                                              PELOUCH, J. J., JR.
Systems integration
PACIOREK, K. J. L.
    Thermal exidative degradation reactions of linear
                                                                                                                                 p0042 N82-27371
      perfluoroalky lethers
                                                                               PRUKO, P. P.
                                                                                  Summary and evaluation of the conceptual design study of a potential early commercial HHD power plant (CSPEC)
[NASA-TM-82734] p0119 N82-164
       [ NASA-TM- 828 14]
                                                   p0068 N82-26468
PACIOREK, K. L.
    Thermal exidative degradation reactions of
      porflucroalkylethers [NASA-CR-165516]
                                                                                                                                 DO119 N82-16481
                                                                              PRESISI, F. J.
Improved plasma sprayed MCraly coatings for
                                                   p0048 N82-12135
PADOVAN, J.
    Engine dynamic analysis with general nonlinear finite element codes, II - Fearing element implementation, overall numerical characteristics and henchmarking
                                                                                     aircraft gas turbine applications
                                                                                                                                 p0065 A82-20742
                                                                                  Tailored plasma sprayed MCrAlY coatings for aircraft gas turbine applications [NASA-CR-165234] p0064 1
      [ASHE FAPER 02-GT-292]
                                                   p0 108 A82-35462
                                                                                                                                 p0064 N82-19360
                                                                              PRINCIPLE, J. A. Construction of solutions for some nonlinear
    On the solution of creep induced buckling in
       deneral structure
                                                   p0115 A82-39514
                                                                                     two-point boundary value problems
    Self-adaptive closed constrained solution algorithms for nonlinear conduction
                                                                                     [NASA-TM-82937]
                                                                                                                                 p0 144 NB 2-30949
                                                                               PERASSO, H. M.
    p0094 A82-45157
Engine dynamic analysis with general nonlinear
finite element codes. Part 2: Bearing element
implementation overall numerical characteristics
                                                                                  Dynamic switch matrix for the TDMA satellite switching system
                                                                                     [AIAA 82-0458]
                                                                                                                                 p0085 A82-23494
                                                                               PERKINS, P. J.
       and benchmaking
                                                                                  Ozone and aircraft operations
       [ NASA-CP- 167944]
                                                   p0028 N82~33390
                                                                                                                                 p0001 882-21145
PAGLIARO, P.
                                                                               PRSSAGNO, S. L.
    Proparation and evaluation of advanced
                                                                                  Development of a high-temperature durable catalyst
      electrocatalysts for phosphoric acid fuel cells
                                                                                     for use in catalytic combustors for advanced
      [ NASA-CA- 165519]
                                                   p0129 N82-12573
                                                                                     automotive gas turbine engines [NASA-CR-165396]
    Preparation and evaluation of advanced
                                                                                                                                 p0130 N82-13510
       electrocatalysts for phosphoric acid fuel cells
                                                                              PETERS, W. H.
Digital imaging techniques in experimental stress
      [ NASA-CR- 165594]
                                                   p0 132 N82- 17615
PREDYR, A.
    Investigation of the tip-clearance flow inside and at the exit of a compressor rotor passage. I -
                                                                                                                                 p0097 A82-34231
                                                                                  Experimental boundary integral equation
      Mean velocity field [ ASMB PAPER 82-GT-12]
                                                                                     applications in speckle interferometry
                                                                                                                                 p0097 A82-36987
    Investigation of the tip clearance flow inside and at the exit of a compressor rotor passage
                                                                              PETERSON, D.

Development of a simplified procedure for thrust
       [ NASA-CR- 169004]
                                                   F/0026 N82-25253
                                                                                     chamber life prediction
PAPATHAKOS, L. C.
Aircraft sampling of the sulfate layer near the
                                                                                     [NASA-CR-165585]
                                                                                                                                 p0044 N82-21253
                                                                               PETERSON, D. M.
       tropopause following the eruption of Mount St.
                                                                                   Study of multi-megawatt technology needs for
       Helens
                                                                                     photovoltaic space power systems.
                                                                                                                                Volume 1:
                                                                                     Executive summary [NASA-CR-165323-VOL-1]
                                                   p0 140 A82-37450
PARIDON, C. A.
                                                                                                                                 p0130 N82-14636
                                                                                   Study of multi-megawatt technology needs for photovoltaic space power systems, volume 2
    Reliability model for planetary gear [NASA-TM-82859]
                                                   p0 10 1 N82-28643
PARKE, P. I.
                                                                                     [ NASA-CR-165323-VOL-2]
                                                                                                                                 p0130 N82-14637
    Investigation and evaluation of a computer program
to minimize three-dimensional flight time tracks
                                                                               PHILIPPI, T. H.
                                                                                  International market assessment of stand-alone
    [NASA-CR-168419] p0145 N82-17879
Shaded computer graphic techniques for visualizing
                                                                                     photovoltaic power systems for cottage industry
                                                                                     applications
       and interpreting analytic fluid flow models
                                                                                     FNASA-CR-165287 1
                                                                                                                                 p0132 N82-16494
                                                                               PMILLIPS, B. R.
Resonance tube hazards in oxygen systems
       [ NASA-CR- 168418]
PARKER, B. W.
                                                                                                                                 p0072 N82-21415
    Barriers to the utilization of synthetic fuels for
                                                                                     [NASA-TH-82801]
       transportation
                                                                               PHILLIPS, W.
      [ NASA-CR- 165517]
                                                   p0073 N82-13243
                                                                                   Gyerview study of Space Power Technologies for the
PARKS, D. E.
Space Shuttle Orbiter charging
                                                                                     advanced energetics program
                                                                                     FRASA-CR-1652691
                                                                                                                                  p0132 N82-17606
      [ AIAA PAPER 82-0119]
                                                   p0040 A82-17793
                                                                               PIRCE, F. S.
    'Bootstrap' charging of surfaces composed of
                                                                                  Extended range stress intensity factor expressions for chevron-sotched short bar and short rod
```

fracture toughness specimens

p0085 A82-18318

P0112 A82-40357

PIER, C. P. Agreement for NASA/OAST - USAF/AFSC space interdependency on spacecraft environment interaction

p0038 N82-14271

PILLER, S. Automotive Stirling engine development program p0 164 NB2- 29235 [NASA-CR-167907] T. T.

Internal breakdown of charged spacecraft dielectrics p0041 A82-18312

PIEVICS, J.

Spherical roller tearing analysis. SKF computer program SPHERBEAN. Volume 1: Analysis

p0 106 N82-20540 [NASA-CR- 165203] PITTS, L.

Moderate temperature Na cells III -Electrochemical and structural studies of Cr0.570.552 and its Na intercalates

p0055 A82-15732 Moderate temperature Na cells IV - VS2 and NbS2C12 as rechargeable cathodes in molten NaAlC14 p0055 A82- 15743

PLATT, C. Z. Structural tailoring of engine blades (STAEBL)
[NASA-CF-167949] p0028 N82
PLEASANT, R. L.
Study of multi-megawatt technology needs for p0028 N82-33391

photovoltaic space power systems. Volume 1: Executive summary

[NASA-CF-165323-VOL-1] p0130 N: Study of multi-megawatt technology needs for p0 130 N82-14636

photovoltaic space power systems, volume 2 [NASA-CR-165323-VOL-2] p0130 N82-14637

Low-thrust chemical propulsion system propellant expulsion and thermal conditioning study. Executive summary

[NASA-CR- 165622] p0045 N82-24287 low-thrust chemical propulsion system propellant expulsion and thermal conditioning study

[NASA-CP- 167841] P0045 N82-24288

PORSCHEL, R. L. 30-cm mercury ion thruster technology

p0046 A82-15434 Characteristics of the LeRC/Hughes J-series 30-cm engineering model thruster

Retrofit and acceptance test of 30 cm ion thrusters [NASA-CP- 165259] p0004 N82-12133

POOR, R. M. Experience and assessment of the DOE-NASA Mod-1 2000-Kilowatt wind turbine generator at Boone,

North Carolina [NASA-TM-82721] p0125 N82-30710 POPPEL, G. L.

Optical tip clearance sensor for aircraft engine centrols

[AI AA PAPER 82-1131] P00 15 A82-37691

PONOUSKI, J. S.
A simplified design procedure for life prediction of rocket thrust chambers [AIAA PAPER B2-1251] p0043 A82-35087

Development of a simplified procedure for thrust chamber life prediction p0044 N82-21253

[NASA-CP- 165585] PORTER, T. R.

Environmental effects on defect growth in composite materials [NASA-CR-165213] p0052 N82-20248

POST, R. E. Light weight nickel battery plaque [NASA-CASF-LRW-13349-1] p0121 N82-22673

POTTER, K. W. Illustration of a new test for detecting a shift

in mean in precipitation series AB2-13217

POURGARE, M. Three dimensional flow field inside the passage of a low speed axial flow compressor rotor p0011 A82-31964 [AIAA PAPER B2-1006]

Three-dimensional flow field in the tip region of a compressor rotor passage. I - Mean velocity profiles and annulus wall houndary layer [ISHE PAPER 82-GT-11] p0011 A82-35

Three-dimensional flow field in the tip region of a compressor rotor passage. II - Turbulence properties

(ASME FAPER 82-GT-234) p0011 A82-35416 POULCERE, H. Three dimensional flow field inside compressor rotor, including blads boundary layers
[WASA-CR-169120]

p00 p0091 #82-27686

POUBLL, C. W. Advanced turboprop testbed systems study. Volume 1: Testbed program objectives and priorities, drive system and aircraft design studies, evaluation and recommendations and wind tunnel test plans [NASA-CR-167928-YOL-17 p0028 M82-32370

POURLL, E. A.
Development of a spinning wave heat engine [MASA-CR- 1656 11] p0028 NB2-31328

POULLE, J. Overview study of Space Power Technologies for the

advanced energetics program [MASA-CR-165269] p0132 MB2-17606

POUBLL, J. A.
High temperature electronic requirements in aeropropulsion systems

[E-708] p0081 #82-15313 High-speed laser anemometer system for intrarotor

flow mapping in turbomachinery [NASA-TP-1663] n0095 N82-19521 POURR, J. L.

Heasuring the spacecraft and environmental interactions of the 8-cm mercury ion thrusters on the P80-1 mission

p0043 A82-15438

Wideband, high speed switch matrix development for SS-TDMA applications D0086 182-43784

PRATT, T. K.
Structural tailoring of engine blades (STAEBL) [HASA-CR- 167949] p0028 N82-33391

PRATT. W. B. Advanced stratified charge rotary aircraft engine design study [NASA-CR-165398] p0107 N82-27743

PRINCIP, D. P.
Preliminary results on performance testing of a turbocharged rotary combustion engine

[NASA-TM-82772] PROPART, D. D. Development of improved high temperature coatings

for IN-792 + HP [NASA-CR-165395] p0063 N82-14333

PROKOPIUS, P. R.
Phosphoric acid fuel cell technology status [NASA-TH-82791] p0 120 N82-19670 PROTEROE. D.

Low NOx heavy fuel combustor concept program. Phase I: Combustion technology generation [NASA-CR" 165482] p0136 N82-24725

PRETRYSLEUSKY, J. S. Thin film temperature sensors, phase 3 p0097 N82-22479 [NASA-CR-165476]

PURVIS, C. K., SCATHA SSPH charging response: NASCAP predictions compared with data

p0037 N82-14251 Comparison of NASCAP modelling results with lumped circuit analysis p0037 N82-14255

QUACKEMBUSH, C., L.
Fabrication of turbine components and properties of sintered silicon nitride p0071 A82-35431 [ASHE PAPER 82-GT-252] Pabrication of sinterable silicon nitride by injection molding p0071 A82-37015

QUAYLE, 5. 5.
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype flat \$3 PC 2.4 liter automobile [NASA-CR-165535] p0164 H82-18068

PACKLEY, R. A.
The AGT101 technology - An automotive alternative p0107 A82-11783 AGT101 automotive gas turbine system development [AIAA PAPER 82-1166] PO 108 A82-35039

```
The AGT 101 advanced nutomotive gas turbine [ASHE PAPER B2-GT-72] p0108
                                                                                                     p0 108 A82-3532 I
BADHAY, S.
       Hodeling and Analysis of Power Processing Systems (MAEPS). Volume 2: Appendices [NASA-CR-165539] p0145 M82-16
                                                                                                     p0145 #82-16748
BABORSKI, H. A.
CF6 Jet Engine Diagnostics Program: High pressure
            compressor clearance investigation
            [ NASA-CR- 165580]
                                                                                                     p0025 N82-21197
      Perearch report: User's manual for computer program AT81y003 SHABIRTH. Steady state and transient thermal analysis of a shaft bearing system including ball, cylindrical and tapered roller bearings
            [ NASA-CR- 165365]
[ NASA-CR- 165365]

Computer property a computer property a computer property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property and property
        Besearch report:
            program AT817005. PLAMETSYS, a computer program
for the steady state and transient thermal
analysis of a planetary power transmission system
[NASA-CR-165366] p0146 M82-3197
                                                                                                     p0146 N82-31970
BANNAN, P.
        Bathematical models for the synthesis and optimization of spiral bevel gear tooth surfaces
            [ MASA - CR- 3553 ]
                                                                                                     p0106 N82-25516
        A new approach to the minimum weight/loss design
            of switching power convertors
                                                                                                     p0082 A82-16831
        Modeling and Analysis of Power Processing Systems (MAPPS). Volume 1: Technical report
            [ NASA-CE- 165538]
                                                                                                     POOR3 N82-14447
        Experimental study of turbulence in blade end wall
            cerner region
            [ WASA-CR- 169283]
                                                                                                     p0091 N82-31639
PAJAN, R. S.
Evidence for Pu-244 fission tracks in hibonites
            from Murchison carbonaceous chendrite
        A proliminary study of crack initiation and growth
            at stress concentration sites
            [ NASA-CR- 169358]
                                                                                                      p0115 N82-33738
Experimental study of the effects of secondary air on the esissions and stability of a lean
            premixed combustor
[AIAA PAPER 82-1072]
BANINS, P.
        Experimental verification of a computational procedure for the design of TWT-refocuser-MDC
             systems
                                                                                                     p0082 A82-16128
RAMSET, W. Developing a scalable inert gas ion thruster
            [ AIAA PAPER 82-1275]
                                                                                                     p0047 A82-37713
 RAMSEY, W. D.
       Inert gas ion thruster
[NASA-CR-165521]
                                                                                                      p0044 N82-21252
KANSON, V. P. Digital imaging techniques in experimental stress
            analysis
                                                                                                      DC097 A82-34231
        Experimental boundary intogral equation
             applications in speckle interferowetry
                                                                                                      p0097 A82-36987
         VLA observations of solar active regions at 6 cm
             wavelength
                                                                                                      p0167 A82-10156
NAO, P. V.
A study of the nature of solid particle impact and shape on the ercsion morphology of ductile metals
             [ NASA-TH-82933]
                                                                                                      p0061 K82-33493
 RATAJCHAR, A. P.
       Operational performance of the photovoltaic-powered grain mill and water pump at Tanqaye, Upper Volta
[NASA-TM-82767] p0120 N82-19
                                                                                                      p0120 N82-19673
         Design description of the Tangaye Village
            photovoltaic power system [ NASA-IM-82917]
                                                                                                      p0126 N82-33828
RAUTIO, J. C.
        Adaptive rain fade compensation
```

Interaction of compressor rotor blade wake with

RAVINDRABATE, A.

```
wall boundary layer/vortex in the end-wall region [ASHE PAPER 81-GR/GZ-1] p0010 A82-1930 Po.E.,
                                                          p0010 A82-19301
BAT,
    Characterization of advanced electric propulsion
       systems
       [AIAA PAPER 82-1246]
                                                          p0071 182-35083
    Characterization of advanced electric propulsion
       systems
       [HASA-CR-167885]
                                                          p0045 N82-26381
REAGLE, J. R.
Failure analysis of a tool steel torque shaft
                                                          P0058 N82-11184
       [ WASA-TM-82758]
EBCTOR, W. P., III
Centaur capabilities for communications satellite
       launches
       [AIAA PAPER 82-0558]
ANDDY, D. R. Multigrid simulation of asymptotic curved-duct
       flows using a semi-implicit numerical technique
                                                          DO010 A82-29003
PEDDY, J. M. Pinite-element modeling of layered, anisotropic composite plates and shells: A review of recent
BEID, L.
    Performance of single-stage axial-flow transonic compressor with rotor and stator aspect ratios of 1.63 and 1.78, respectively, and with design pressure ratio of 1.82
[NASA-TF-1974] p0017 N82-19
     Performance of single-stage avial-flow transonic
       compressor with rotor and stator aspect ratios of 1.63 and 1.77, respectively, and with design pressure ratio of 2.05
       [ NASA-TP-2001]
                                                          p0018 M82-22269
Alkaline regenerative fuel cell systems for energy
       storace
     Performance of advanced chromium electrodes for
        the NASA Redox Energy Storage System
                                                          p0118 N82-12574
        [ NASA-TH-82724]
    Improved chromium electrodes for REDOX cells [NASA-CASE-LEW-13653-1] p0121 N
                                                          p0121 N82-22672
    Light weight nickel battery plaque
[WASA-CASE-LEW-13349-1] p0121 No
Chemical and electrochemical behavior of the
                                                          p0121 N82-22673
       Cr(3)/Cr(2) half coll in the NASA Redox Energy
        Storage System
       [ NASA-TH-82913]
                                                           F0055 NB2-33463
REILLY, H. J.

Barriers to the utilization of synthetic fuels for
       transportation
       [NASA-CR-165517]
REIMMANN, J. J.
Selected bibliography of NACA-NASA aircraft icing
       publications
        [ NASA-TH-8 165 1]
                                                           p0014 NB2-11053
    Aircraft icing research at NASA
[NASA-TH-82919] p0013 N82-3

REISEPFELD, S.

The 30/20 GHz flight experiment syntem, phase 2.

Volume 1: Executive summary
[NASA-CR-165409-VOL-1] p0078 N82-2
                                                          p0013 NH2-30297
    The 30/20 GHz flight experiment system, phase 2. Volume 2: Experiment system description [NASA-CR-165409-VOL-2] p0078 N62-2
                                                          p0078 N82-20363
     The 30/20 GHz flight experiment system, phase 2.
       Volume 3: Experiment system requirement document [NASA-CR-165409-VOL-3] p0078 N82-20364
    The 30/20 GHz flight experiment system, phase 2. Volume 4: Experiment system development plan
       [NASA-CR-165409-VOL-4]
                                                          p0078 N82-20365
REMICE, R. J.

Stabilizing platinum in phosphoric acid fuel cells
[NASA-CR-165483] p0130 N82-146
                                                          p0130 N82-14628
    Stabilizing platinum in phosphoric acid fuel cells [NASA-CR-165606] p0136 N82-297
                                                          p0136 N82-29718
REMGSTORFF, G. W. P.
Friction and wear of iron in corrosive metal
                                                          p0058 N82-20291
       [ NASA-TP-1985 ]
REYNOLDS, B.
    Effects of blade loading and rotation on compressor rotor wake in end wall regions [AIAA PAPER 82-0193] p0010
                                                          p0010 AB2-22063
RELY. B. J.
     Exhaust emissions reduction for intermittent
       combustion aircraft engines
```

P0080 A82-27178

[NASA-CR-167914] BHODB, D. L.	p0029 N82-33392
On the prediction of swirling flow	
axisymmetric combustor quemetric	p0029 A82-12120
Man flowfields in axisymmetric co	abustor
[AIAA PAPER 82-0177]	p0092 A82-17824
Analytic investigation of effect of	of end-wall
contouring on stator performance	p0003 NB2-14051
[NASA-TP-1943] DIBARICH, J. J.	•
The 30/20 GHz flight experiment sy Volume 1: Executive summary	stem, phase 2.
[NASA-CR-165409-VOL-1]	p0078 NB2-20362
The 30/20 GHz flight experiment s Volume 2: Experiment system des	stem, page 2. scription
[NASA-CR-165409-VOL-2] The 30/20 GHz flight experiment s	p0078 N82-20363
Volume 3: Experiment system rec	guirement document
[NASA-CR-165409-VOL-3] NIBERICH, J. J.	p0078 #82-20364
The 30/20 GHz flight experiment s	
Volume 4: Experiment system dev	p0078 N82-20365
RICCA, J. J. On determination of fibre fraction	in continuous
fibre composite materials	
MICE, E. E.	p0051 A02-30133
Peasibility of an earth-to-space is system	rail launcher
FIAF PAPER 82-461	p0033 A82-44659
Preliminary feasibility assessment Earth-to-space electromagnetic	t for (Railgun) launchers
[NASA-CR-167886]	p0033 NB2-29345
a shock wave approach to the noise	of supersonic
propellers [NASA-TM-82752]	n0151 N82-16809
NICE, W. J.	•
Preliminary results on performance turbocharged rotary combustion	
[NASA-TH-82772] Real time pressure signal system :	p0017 N82-21194 for a rotary engine
[NA SA - CASE-LEW- 13622- 1]	p0019 NB2-26294
CF6 jet engine performance improve	ement: Nigh
pressure turbine active clearant [NASA-CR-165556]	ce control p0027 N82-28297
RICHERSON, D. W.	•
Analytical and experimental evaluation contact stress	ation of blaxial
Oxidation stability of advanced re	p0071 A82-20741
Si3N4 materials	
[ACS PAPER 52-8-80P]	p0074 A82-33030
Automotive Stirling engine develo	pment program p0164 N82-29235
RIDDLEBAUGH, S. M.	
Dilution jet behavior in the turn reverse flow combustor	section of a
[AIAA PAPER 82-0192] Effect of fuel injector type on p	p0021 A82-20291
emissions of reverse-flow combu	stor
[NASA-TP-1945] Dilution jet behavior in the turn	p0016 N82-15040 section of a
reverse flow combuster	
[NASA-TH-82776] RIGO, H. S.	p0017 N82-19220
Hagnetohydrodynamics (MID) Engine Pacility (ETF) 200 MWe power pla	ering Test ant. Design
Requirements Document (DRD)	
[NASA-TH-82705] BOBACK, B.	p0099 N82-12446
Deposit formation in hydrocarbon : [ASME PAPER 82-GT-49]	fuels p0075 \alpha82-35307
FOBERTS, J. C.	
Fabrication and wear test of a co fiber/particulate composite tot	
replacement	
[NASA-IN-81746] Tribological characteristics of a	p0066 N82-11211 composite
total-surface hip replacement [NASA-TP-1853]	p0066 N82-16239
POBERTS, W. K.	

Aircraft sampling of the sulfate layer near the

```
tropopause following the eruption of Mount St.
                                            DO140 A82-37450
BOBERTSON, R.,I.
   Primary propulsion/large space system interaction
     study
     [ NASA-CR-165277]
                                            p0044 M82-18315
BOBINSON, J., W. Oblique-incidence secondary emission from charged
     dielectronics
   p0039 #82~14227 Mapping of electrical potential distributions with
     charged particle beams [NASA-CR-168556]
BOBLESON, P. A.,
30-cm mercury ion thruster technology
                                            p0046 A82-15434
ROBINSON, H. S.
Surface diffusion activation energy determination
     using ion beam microtexturing
                                            DO 159 A82-21965
   Quasi-liquid states observed on ion beam
     microtextured surfaces
                                            p0159 182-30335
   Ion-heam-induced topography and surface diffusion
                                            p0160 A82-46426
   Experimental simulation of biased solar arrays
     with the space plasma [WASA-CR-165485]
                                            DO 157 NB2-10880
   Electric thruster research
     [ MASA-CR-165603]
                                            p0045 N82-24285
   Electric and magnetic fields
                                            p0045 N82-20350
     [NASA-CR-165604]
   Ion beam microtexturing and enhanced surface
     diffusion
      [ NASA-CR-1679481
                                            p0065 N82-31509
BORSON. R.
   A 10kW series resonant converter design,
     transistor characterization, and base-drive
     optimization
     [ NASA-CR-165546]
                                            p0084 N82-17439
ROBSON, R. R.
   A 10-kW series resonant converter design
     transistor characterization, and base-drive
     optimization
                                            p0086 A82-36927
Walidation of the NASCAP model using spaceflight
     data
                                             p0038 A82-17872
      [ATAA PAPER 82-0269]
   Testing of a spacecraft model in a combined
      environment simulator
                                             p0033 A82-18310
   Testing of a spacecraft model in a combined
     environment simulator
     [ NASA-TH-82723]
                                             P0037 N82-11106
BOCK, S. H.
   Sensor failure detection system
     [ NASA-CR-165515]
                                             p0023 N82-13145
ROCKWOOD, F. A. Ceramic applications in turbine engines [NASA-CR-165197] p0
                                             p0164 N82-31158
The effect of rotor blade thickness and surface
     finish on the performance of a small axial flow
      turbine
      [ASME PAPER 82-GT-222]
   The effect of rotor blade thickness and surface finish on the performance of a small axial flow
      turbine
     [ NASA-TH-827261
   Experimental study of the effects of secondary air on the emissions and stability of a lean
      premixed combustor
      [AIAA PAPER 82-1072]
                                             p0021 A82-34992
Standing waves along a microwave generated surface
      wave plasma
   Cooled variable nozzle radial turbine for rotor
      craft applications
     [NASA-CR-165397]
                                             p0028 N82-29323
NONE, D. A. Multiroller traction drive speed reducer:
      Evaluation for automotive gas turbine engine
      [ NASA-TP-2027 ]
                                             p0101 N82-26678
```

Atomization and combustion properties of flashing

ECHRBACH, C.
Evaluation of wind tunnel performance testings of an advanced 45 deg swept 8-bladed propeller at Mach numbers from 0.45 to 0.85 [NASA-CP-3575] BOLLBUILER, R. J. DOCOT NB2-19178 Tevis Research Center's coal-fired, pressurized, fluidized-bed reactor test facility p0087 N82-1 p0087 N82-11397 Lavis pressurized, fluidized-bed combustion program. Data and calculated results [NASA-TM-81767] PO P0124 N82-30704 BORNHOSKI, G. N., JR.

Hechanisus of deformation and fracture in high
temperature low cycle fatigue of Rene 80 and IN 100 [NASA-CR- 165498] BOSE. J. H. Universal hinding energy relations in metallic adhes for [NASA-TM-827061 p0C58 N82-11183 ROSEBBLAT, S. Eigenvalues of the Rayleigh-Benard and Marangoni problems Nonlinear Marangoni convection in bounded layers, I - Circular cylindrical containers. II - Rectangular cylindrical containers p0094 A82-39501 Surface-tension induced instabilities: Effects of lateral boundaries [NASA-CR- 165530] ROSEBLIEB, J. W. Spherical roller bearing analysis. SKF computer program SPHERBEAN, Volume 3: Program correlation with full scale hardware tests [NASA-CR- 1652051 p0106 N82-20542 ROSEJOED, T.

LOW NO subx heavy fuel combustor concept program.

Phase 1A: Coal gas addendum
[NASA-CR-165577] p0133 N82-18 p0133 N82-18690 BOSFJORD, T. J. Evaluation of fuel injection configurations to control carbon and soot formation in small GT combustors [AIAA FAPER 82-1175] p0021 A82-35041 Investigation of soot and carbon formation in small gas turbine combustors [NASA-CF- 1678531 BOSHER, D. E. Experimental and theoretical studies of the laws governing condensate deposition from combustion dases p0057 A82-28709 ROSS, P. T. Contustor development for automotive gas turbines [AIAA FAPER #2-1208] p0 104 A82-35062 BOSSNAGEL, S. H. Surface diffusion activation energy determination using ion beam microtexturing p0 159 A82- 21965 Quasi-liquid states observed on ion beam microtextured surfaces Ion-beam-induced topography and surface diffusion p0160 A82-46426 BOTH, S. P. A real time Pegasus propulsion system model for VSTCL piloted simulation evaluation [ATAA FAPER 81-2663] p0020 A82-P0020 A82-19221 A real time Pegasus propulsion system model for VSTOL riloted simulation evaluation [NASA-TM-82770] p0016 N82-13144 A piecewise linear state variable technique for real time propulsion system simulation P00 18 N82-2420 1 [NASA-TM-82851] ROWSE, J. H. Study of advanced propulsion systems for Small Transport Aircraft Technology (STAT) program

[NASA-CR- 1656 10]

[AIAA PAPER B2-0269]

data

WOBIN, A. G. Validation of the NASCAP model using spaceflight

NhS2C12 as rechargeable cathodes in mclten NaAlC14

BUPICH, H. W.
Moderate temperature Na cells IV - VS2 and

injectors [AIAA PAPER 82-0300] D0092 A82-17880 NUSSELL, D. A. Testing of solar coll covers and encapsulants conducted in a simulated space environment [NASA-CR-165475] NUSSELL, L. H. Flow visualization study of the horseshoe vortex in a turbine stator cascado [NASA-2P-1884] DOORS NB2-30498 RUSSELL, P.

LOW NO sub x heavy fuel combustor concept program
[NASA-CE-165512] p0129 N82-12572 BUTLEDGE, S. K. Ion beas sputter deposited diamond like films [NASA-TH-82873] p0069 #82-28445 Conversion and matched filter approximations for serial minimum-shift keyed modulation P0080 A82-26713 Near optimum delay-line detection filters for serial detection of MSK signals D0086 A82-43867 Thrust reverser for a long duct fan engine p0019 N82-26293 [NASA-CASE-LEW- 13 199-1] SAARI, D. P. MHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N82-15527 SABIERS, R. L. Low-thrust chemical propulsion system pump technology FWASA-CE-1652191 p0105 N82-13427 SABOURIN, D. Baseband-processed SS-TDMA communication system architecture and design concepts [AIAA 82-0482] p0079 A82-23508 SAIN, H. A tensor approach to modeling of nonhomogeneous nonlinear systems p0 148 A82-19064 SAIB. M. K. Alternatives for jet engine control [NASA-CR-168894] p0026 M82-23247 SALVINO, J. T.

Rotor fragment protection program: Statistics on aircraft gas turbine ngire rotor failures that occurred in U.S. commercial aviation during 1978 [NASA-CR-165388] p0027 N82-27316 SANADICH, N. R. QCSEE under-the-wing engine acoustic data [NASA-TH-82691] p0019 N82-27311 SANDERS, B. W. Tangential blowing for control of strong normal shock - Boundary layer interactions on inlet ramps [AIAA PAPER 82-1082] p0005 A82-37684 SANGER, E. L.

The use of optimization techniques to design controlled diffusion compressor blading [ASHE PAPER 82-GT-149] p0022 AB2-35373 The use of optimization techniques to design controlled diffusion compressor blading [NASA-TM-82763] P0016 N82-14094 SANTIAGO, J. P. Turbulence in argon shock waves p0158 A82-11117 SARE, J. H. Design of supercritical cascades with high solidity [WASA-CR-165600] P0007 N82-22210 SAVAGE, M. Optimal tooth numbers for compact standard spur gear sets [ASME PAPER 81-DET-115] p0103 A82-19335 Reliability model for planetary gear [WASA-TH-82859] p0101 N82-28643 The optimal design of involute gear teeth with unequal addenda T NASA-TH-828661 PO 10 | N82-28645 SAVING, J. B.,
Effect of rotor configuration on guyed tower and
foundation designs and estimated costs for
intermediate site horizontal axis wind turbines [NASA-TH-82804] p0121 #82-22649

p0026 N82-24202

p0038 A82-17872

P0055 A82-15743

```
SAWITZ, P. Li.
   Planning satellite communication services and
      spectrum-orbit utilization
      TAINA 82-05267
                                                 P0080 A82-23538
SCHILLING, H. Coaxial prise focus feeds for paraboloidal
      reflectors
[NASA-CR-167934]
                                                 p0078 N82-31585
SCHHARL, E. J.
VLA observations of solar active regions at 6 cm
      vavelength
                                                 p0 167 A82-10 156
    Magnetic structure of a flaring region producing
      impulsive microvave and hard X-ray bursts
                                                 p0 167 A82-27323
SCHHIDT, E. Gverview study of Space Power Technologies for the
      Advanced energetics program
[NASA-CR-165269]
SCHHIDT, G. F.
    Development of battery separator composites
      [ NASA-CR- 165508]
                                                 PO 128 N82-11547
SCHWAUSS, E. R. First results of material charging in the space
      environment
      [ NASA-TM-84743]
                                                 p0081 N82-24431
SCHEFIDER, M. H. Thermal expansion accommodation in a jet engine
      frage
                                                 p0029 A82-11999
SCHWEIDER, P. W.

Siffect of a part span variable inlet guide wane on
TF14 fan performance
[NASA-CR-165453] p0023 M82-120
                                                 p0023 N82-12075
SCHHURLLE, G. W.
    Papresentation and material charging response of
      quoplasma environments
                                                  p0039 N82-14249
    Simulation of charging response of SCATRA (P78-2)
      satellito
                                                 p0039 N82-14250
SCHOCK, H. J.

Proliminary results on performance testing of a
      turbocharged rotary combustion engine
      [ NASA-TH-82772]
                                                 pC017 N82-21194
SCHOENHAN, L.
    Propulsion system options for low-acceleration
      orbit transfer [AIAA FAPER 82-1196]
                                                 p0047 A82-35056
    Fuel/oxidizer-rich high-pressure preburners
      [ NASA-CR- 165494 ]
                                                 p0073 N82-10245
    Low-thrust Isp sensitivity study
      [ NASA -CR- 1656217
                                                 n0045 N82-22309
SCHUBERT, P. H.
    Alkaline regenerative fuel cell systems for energy
      storage
                                                 D0042 A82-11706
    Endurance test and evaluation of alkaline water
      electrolysis cells
      [ NASA-CF- 165424 ]
                                                 p0130 N82-13508
SCHULSCW, E. M.
Recrystallization and grain growth in NiAl
                                                 p0065 A82-44529
SCHULTZ, D. P.
Gas-turbine critical research and advanced
      technology support project [NASA-TM-81708]
                                                 p0 118 N82-13509
    Techniques for enhancing durability and
      equivalence ratio control in a rich-lean,
      three-stage ground power gas turbine combustor
      [ NASA-TM-82922]
                                                 p0 124 N82-29717
    Gas turbine critical research and advanced technology (CRT) support project [NASA-TH-82872] p0 126
                                                 p0 126 NB2-31776
SCHOON, S. R.
Effect of oxide films on hydrogen permeability of
      candidate Stirling engine heater head tube alloys
      [NASA-TH-82824]
                                                  pC060 NB2-24323
SCHUAB, J. A.

Low NOr heavy fuel combustor concept program.
Phase 1: Combustion technology generation
[NASA-CP-165482] p0136 N8
                                                 p0 136 N82- 24725
    Low and medium heating value coal gas catalytic combustor characterization [NASA-CR-165560] p0138 N82-
                                                 p0 138 N82-32856
SCHUAB, J. R.
    Aerodynamic performance of high turning core
      turbine vanes in a two-dimensional cascade [NIMA PAPER 82-1288] p0005 A
                                                 p0005 A82-37716
```

```
Aerodynamic performance of high turning core
     turbine vames in a two disensional cascade [NASA-TH-82894]
                                               P0004 M82-26240
SCHUARTE, H. J.
   Progress on advanced dc and ac induction drives
     for electric vehicles
(WASA-TH-82895] p0163 #82-31160 SCHURDDHAME, M., F.,
Tangential blowing for control of strong normal shock - Boundary layer interactions on inlet ramps [AIAA PAPER 82-1082] p0005 A82-37684
SCOPE, J. R. The 30/20 GHz flight experiment system, phase 2.
   Volume 1: Executive summary
[NASA-CR-165409-VOL-1]
The 30/20 GHz flight experiment system, phase 2.
Volume 2: Experiment system description
                                               p0078 N82-20362
     [ NASA-CR-165409-VOL-2 ]
                                               p0078 N82-20363
   The 30/20 GHz flight experiment system, phase 2.
      Volumo 3: Experiment system requirement document
[NASA-CR-165409-VOL-3] p0078 N82-2036
                                               p0078 N82-20364
   SCOTT, W. G. 30/20 GHz communications satellite multibeam antenna
     [AILA 82-0449]
                                               p0079 A82-23486
SEASMOLTE, R. G.
   High-speed laser anemometer system for intrarotor
      flow mapping in turbomachinery [NASA-TP-1663]
                                               p0095 N82-19521
   Comparison of laser anemometer measurements and theory in an annular turbine cascade with
      experimental accuracy determined by parameter
      estimation
      [NASA-TH-82860]
   Laser anemometer using a Fabry-Perot
interferometer for measuring mean velocity and
      turbulence intensity along the optical axis in
      turbonachinery
                                               p0095 N82-28605
      [ HASA-TH-828417
   Status of laser anemometry in turbomachinery
      research at the Levis Research Center
                                               p0096 #82-32686
SEASHULTE, R., G.
   Laser anemometer measurements in an annular
      cascade of core turbine vanes and comparison
     with theory
[NASA-TP-2018]
                                               p0004 N82-26234
SEDERGUIST, R. Low NO subx heavy fuel combustor concept program.
      Phase IA: Coal gas addendum [NASA-CR-165577]
SEGALL, S. B.
    Pree electron lasers for transmission of energy in
      space
      [NASA-CR-165520]
                                               p0098 M82-25499
SEIDEL, R., C. Variable gain for a wind turbine pitch control
     [ NASA-TH-82751]
                                                p0119 NB2-16478
SENG, G. T.
   Characterization of an Experimental Referee
      Broadened Specification (ERBS) aviation turbire
      fuel and ERBS fuel blends
                                                p0072 #82-32504
      [NASA-TM-82883]
SENGERS, J. V.
Toward the use of similarity theory in two-phase
      choked flows
                                                P0089 A82-16570
SERAPINI, J. S.
    LV measurements with an advanced turboprop
                                                p0097 N82-32690
SERAPINI, T. T.
    High-temperature resins
                                                p0051 A82-42657
    PMR polyimides-review and update
      [NASA-TH-82821]
                                                p0068 N82-24342
SESHADRI, K.
    Experimental and theoretical studies of the laws
      governing condensate deposition from combustion
      gases
                                                p0057 A82-28709
SHALTHEC, R. K.
    Experience and assessment of the DOE-WASA Mod-1
      2000-Kilowatt wind turbine generator at Boone,
      North Carolina
      [NASA-TH-82721]
                                                p0125 N82-30710
SHALTENS, R. K.
    Aluminum blade development for the Mod-OA
```

Managagaga a sparing practice of space residency of the compared space of the compared s

[NASA-TH-02594]	
	p0119 NB2-14633
SHANNON, J. L., JR.	
Extended range stress intensity fact	or aunreweione
for chevron-notched short bar and	
	BUOLE TOO
fracture toughness specimens	
	p0112 182-40357
SHAW, M.	
Computer modeling of fan-exit-splitt	er spacing
offects on P100 response to distor	
[NASA-CR- 167879]	p0025 M62-23246
	Socks wat water
SHAW, W. J.	X
The combined offects of Fe and H2 on	tne
nitridation of silicon	
	p0070 A82-42924
Nitridation of silicon	
[NASA-TM-82722]	p0066 #82-15197
SEAU, R. J.	,
Performance degradation of propeller	/rotor evetors
due to rime ice accretion	,10101 0,01015
	-0016 103-20222
[AIAA PAPER 82-0286]	P0014 A82-28322
An experimental study of airfoil ici	ng
characteristics	
[NASA-TH-82790]	P0001 N82-17083
Aircraft leing research at NASA	
T NASA-TH-829191	p0013 N82-30297
SHEERY, K. D.	F
Current legal and institutional issu	og in the
commercialization of phosphoric ac	
[NASA-CD- 167867]	p0136 N82-29719
SHEIBLEY, D. W.	
Inexpensive cross-linked polymeric a	eparators made
from water-soluble polymers	
	P0048 A82-23778
Method of making formulated plastic	
soluble electrode cells	
[NASA-CASE-LEW-12358-2]	p0054 N82-21268
Cross-linked polyvinyl alcohol films	as alkalino
tattory separators	
[NASA-TM-82802]	p0054 N82-22327
Advanced inorganic separators for al	
MASA = CAS F= 1. FU= 1 (17 f= 1 1	nn 174 WXX-2470X
[NASA-CASE-LEN-13171-1]	p0124 N82-29708
SRECEAU, Y.	
A study of viscous flow in stator an	d rotor passages
SHRORAH, Y. A study of viscous flow in stator an [ASME PAPER 82-GT-248]	
SHIORAN, Y. A study of viscous flow in stator an [ASME FAPER 82-GT-248] SHEBLOCK, T. P.	d rotor passages p0011 182-35427
SHIGHAN, Y. A study of viscous flow in stator an [ASHE FAPIR 82-GT-248] SHERLOCK, T. P. LOV NO sub x heavy fuel combustor co	d rotor passages p0011 x82-35427 ncept program.
SHIGHAN, Y. A study of viscous flow in stator an [ASHE FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 11: Combustion technology g	d rotor passages p0011 x82-35427 ncept program.
SHORAW, Y. A study of viscous flow in stator an [ASRE FAPER 82-GT-248] SHERLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 1A: Combustion technology g gas fuels	d rotor passages p0011 182-35427 ncept program. eneration coal
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPER 82-GT-248] SHEBLOCK, T. P. Low NO sub x heavy fuel combustor co Phase IX: Combustion technology g qas fuels [NASA-CR-165614]	d rotor passages p0011 x82-35427 ncept program.
SHIORAN, Y. A study of viscous flow in stator an [ASHE FAPER 82-GT-248] SHERLOCK, T. P. LOV NO sub x heavy fuel combustor co Phase 1A: Combustion technology g qas fuels [NASA-CR-165614] SHEO, Y. C.	d rotor passages p0011 x82-35427 ncept program. eneration coal p0055 x82-22326
SHIGHAN, Y. A study of viscous flow in stator an [ASHE FAPER 82-GT-248] SHERLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 1A: Combustion technology g qas fuels [NASA-CR-165614] SHEO, Y. C. The transmission or scattering of el	d rotor passages p0011 x82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by
SHIORAN, Y. A study of viscous flow in stator an [ASME PAPER 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 1A: Combustion technology g qas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr	d rotor passages p0011 x82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHERLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 1A: Combustion technology g qas fuels [NASA-CP-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A
SHIORAN, Y. A study of viscous flow in stator an [ASME PAPER 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 1A: Combustion technology g qas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr	d rotor passages p0011 x82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHERLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 1A: Combustion technology g qas fuels [NASA-CP-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A
SHIORAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHERLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 1A: Combustion technology g qas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometricomparison of theories [NASA-CR-169034] SHEYBIN, L.	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 M82-26526
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. Low NO sub x heavy fuel combustor co phase 11: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEYBIN, L. Research report: User's manual for	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 M82-26526 computer
SHIORAN, Y. A study of viscous flow in stator an [ASHE FAPIR 82-GT-248] SHERLOCK, T. P. LOW NO sub x heavy fuel combustor compass fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of elan inhomogeneity of simple geometric comparison of theories [NASA-CR-169034] SHEYNIN, L. Research report: User's manual for program A7519003 SHABIFFIN. Steady	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHERLOCK, T. P. LOW NO sub x heavy fuel combustor compasses [NASA-CR-165614] SHEO, Y. C. The transmission or scattering of elan inhomogeneity of simple geometric comparison of theories [NASA-CR-169034] SHEUNIN, L. Research report: User's manual for program ATB19003 SHABIPTH. Steady transient thermal analysis of a sh	d rotor passages p0011 x82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 11: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometricomparison of theories [NASA-CR-169034] SHEYEIN, L. Research report: User's manual for program ATS19003 SHABEFTH. Steady transient thormal analysis of a she system including ball, cylindrical	d rotor passages p0011 x82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. Low NO sub x heavy fuel combustor co Phase 11: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEYBIN, L. Research report: User's manual for program AT619003 SHABEPTH. Steady transient thormal analysis of a sh system including ball, cylindrical roller bearings	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHERLOCK, T. P. LOW NO sub x heavy fuel combustor compared to technology grass fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of elan inhomogeneity of simple geometric comparison of theories [NASA-CR-169034] SHEVELN, L. Research report: User's manual for program ATB19003 SHABIPTH. Steady transient thormal analysis of a sh system including ball, cylindrical roller bearings [NASA-CR-165365]	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHENLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 1A: Combustion technology g qas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEYBIN, L. Research report: User's manual for program ATB1y003 SHAMFPTH. Steady transient thermal analysis of a sh system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPER 82-GT-248] SHEBLOCK, T. P. Low NO sub x heavy fuel combustor co Phase 11: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEYELL, L. SHEYELL, L. Sescarch report: User's manual for program AT619003 SHABEPTH. Steady transient thormal analysis of a sh system including hall, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT619005. PLANETSYS, a co	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 M82-31969 computer mputer program
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compares 12: Combustion technology grass fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of elan inhomogeneity of simple geometric comparison of theories [NASA-CR-169034] SHEYNIN, L. Research report: User's manual for program AT819003 SHABIPTH. Steady transient thormal analysis of a sh system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT819005. PLANETSYS, a cofor the steady state and transient	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer mputer program thermal
SHIGHAM, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion of technology grass fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of elan inhomogeneity of simple geometric comparison of theories [NASA-CR-169034] SHEYNIN, L. Research report: User's manual for program AT81y003 SHABEPTH. Steady transient thormal analysis of a she system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT81y005. PLANETSYS, a cofor the steady state and transient analysis of a planetary power transient analysis of a planetary power transient analysis of a planetary power transient analysis of a planetary power transient.	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer aputer program thermal smission system
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion of the transmission or scattering of ell an inhomogeneity of simple geometric comparison of theories [NASA-CR-169034] SHEVIN, L. Research report: User's manual for program AT619003 SHABIFTH. Steady transient thermal analysis of a ship system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT619005. PLANETSYS, a conforthe steady state and transient analysis of a planetary power transient NASA-CR-165366]	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer mputer program thermal
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 11: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEYNIN, L. Research report: User's manual for program AT619003 SHABIFTH. Steady transient thormal analysis of a sh system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT619005. PLANETSYS, a co for the steady state and transient analysis of a planetary power tran [NASA-CR-165366] SHIGAKI, H.	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer aputer program thermal smission system p0146 N82-31970
SHIGHAM, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion in technology grass fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of elan inhomogeneity of simple geometricomparison of theories [NASA-CR-169034] SHEVELE, L. Research report: User's manual for program AT81y003 SHABEPTH. Steady transient thermal analysis of a she system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT81y005. PLANETSYS, a confort the steady state and transient analysis of a planetary power transing [NASA-CR-165366] SHIGAKI, H. Influence of mineral oil and additives.	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer aputer program thermal smission system p0146 N82-31970 es on
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 11: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEYNIN, L. Research report: User's manual for program AT619003 SHABIFTH. Steady transient thormal analysis of a sh system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT619005. PLANETSYS, a co for the steady state and transient analysis of a planetary power tran [NASA-CR-165366] SHIGAKI, H.	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer aputer program thermal smission system p0146 N82-31970 es on
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHENIOCK, T. P. LOW NO sub x heavy fuel combustor compassion of the same of the transmission or scattering of elements of the transmission of theories [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of elements of the transmission of theories [NASA-CR-169034] SHEYNIN, L. Research report: User's manual for program AT81y003 SHANFPTH. Steady transfent thermal analysis of a sheat system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT81y005. PLANETSYS, a conforthm steady state and transient analysis of a planetary power transmission o	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer aputer program thermal smission system p0146 N82-31970 es on
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 11: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEYNIN, L. Research report: User's manual for program AT619003 SHABIFTH. Steady transient thormal analysis of a sh system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT619005. PLANETSYS, a co for the steady state and transient analysis of a planetary power tran [NASA-CR-165366] SHIGAKI, H. Influence of mineral oil and additive microhardness and surface chemistr oxide (001) surface	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 M82-31969 computer mputer program thermal smission system p0146 M82-31970 es on y of magnesium
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor co Phase 11: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEYNIN, L. Research report: User's manual for program AT619003 SHABIFTH. Steady transient thormal analysis of a sh system including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT619005. PLANETSYS, a co for the steady state and transient analysis of a planetary power tran [NASA-CR-165366] SHIGAKI, H. Influence of mineral oil and additive wicrohardness and surface chemists oxide (001) surface [NASA-TP-1986]	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer aputer program thermal smission system p0146 N82-31970 es on
SHIGHAM, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion in technology of the state of the stat	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 N82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer mputer program thermal smission system p0146 N82-31970 es on y of magnesium p0067 N82-20316
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion in technology of the state of the stat	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer mputer program thermal smission system p0146 N82-31970 es on y of magnesium p0067 N82-20316 echanisms for
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. Low No sub x heavy fuel combustor co Phase 1A: Combustion technology g gas fuels [NASA-CR-165614] SHEU, Y. C. The transmission or scattering of el an inhomogeneity of simple geometr comparison of theories [NASA-CR-169034] SHEVELL, Research report: User's manual for program AT619003 SHABIFTH. Steady transient thormal analysis of a sh system including hall, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program AT619005. PLANETSYS, a co for the steady state and transient analysis of a planetary power tran [NASA-CR-165366] SHIGAKI, H. Influence of mineral oil and additive microhardness and surface chemistr oxide (001) surface [NASA-TP-1986] SHIB, C. I. High tomperature low cycle fatique mickel base and a copper base allo	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 M82-31969 computer mputer program thermal smission system p0146 M82-31970 es on y of magnesium p0067 N82-20316 echanisms for
SHIGHAM, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion in technology of the state of the stat	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer mputer program thermal smission system p0146 N82-31970 es on y of magnesium p0067 N82-20316 echanisms for
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion in technology of the state of the stat	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer mputer program thermal p0146 N82-31970 es on y of magnesium p0067 N82-20316 echanisms for y p0064 N82-26436
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion in technology of the state of the stat	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer program thermal smission system p0146 N82-31970 es on y of magnesium p0067 N82-20316 echanisms for y p0064 N82-26436 urved-duct
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion in technology of the state of the stat	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by y: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer mputer program thermal smission system p0146 N82-31970 es on y of magnesium p0067 N82-20316 echanisms for y p0064 N82-26436 urved-duct cal technique
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHENIOCK, T. P. LOW NO sub x heavy fuel combustor compassion of the simple quasities of an inhomogeneity of simple quasities of the transmission or scattering of elan inhomogeneity of simple quasities of the transmission of theories [NASA-CR-169034] SHENIN, L. Research report: User's manual for program ATS1y003 SHAMEPTH. Steady transient thermal analysis of a sheaves including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program ATS1y005. PLANETSYS, a conforthe steady state and transient analysis of a planetary power translandsysis of a planetary power translandsysis of a planetary power translandsysis of a planetary power translands of (001) surface [NASA-CR-165366] SHIGAKI, H. Influence of mineral oil and additive microhardness and surface chemistroxide (001) surface [NASA-CR-3643] SHIM, C. I. High temperature low cycle fatique mickel base and a copper base allowing in the constant of the complex of the	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer program thermal smission system p0146 N82-31970 es on y of magnesium p0067 N82-20316 echanisms for y p0064 N82-26436 urved-duct
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHEBLOCK, T. P. LOW NO sub x heavy fuel combustor compassion of the steady state and transfer the steady state and transfer analysis of a planetary power transign (NASA-CR-165366) SHIGAKI, H. Incluence of mineral oil and additive microhardness and surface chemistre oxide (001) surface [NASA-CR-165366] SHIB, C. I. High temperature low cycle fatique mickel base and a copper base allowed in the compassion of a copper base allowed the compassion of the compassion of a copper base allowed using a semi-implicit numerical contents.	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 N82-31969 computer mputer program thermal smission system p0146 N82-31970 es on y of magnesium p0067 N82-20316 echanisms for y p0064 N82-26436 urved-duct cal technique p0010 A82-29003
SHIONAN, Y. A study of viscous flow in stator an [ASME FAPIR 82-GT-248] SHENIOCK, T. P. LOW NO sub x heavy fuel combustor compassion of the simple quasities of an inhomogeneity of simple quasities of the transmission or scattering of elan inhomogeneity of simple quasities of the transmission of theories [NASA-CR-169034] SHENIN, L. Research report: User's manual for program ATS1y003 SHAMEPTH. Steady transient thermal analysis of a sheaves including ball, cylindrical roller bearings [NASA-CR-165365] Research report: User's manual for program ATS1y005. PLANETSYS, a conforthe steady state and transient analysis of a planetary power translandsysis of a planetary power translandsysis of a planetary power translandsysis of a planetary power translands of (001) surface [NASA-CR-165366] SHIGAKI, H. Influence of mineral oil and additive microhardness and surface chemistroxide (001) surface [NASA-CR-3643] SHIM, C. I. High temperature low cycle fatique mickel base and a copper base allowing in the constant of the complex of the	d rotor passages p0011 A82-35427 ncept program. eneration coal p0055 M82-22326 astic waves by 7: A p0079 N82-26526 computer state and aft bearing and tapered p0146 M82-31969 computer mputer program thermal smission system p0146 M82-31970 es on y of magnesium p0067 N82-20316 echanisms for y p0064 M82-26436 urved-duct cal technique p0010 A82-29003 ary of an

Advanced turboprop testhed systems study.

drive system and aircraft design studies,

1: Testhed program objectives and priorities,

evaluation and recommendations and wind tunnel

```
tweet plans
     [ NASA-CR-167928-VOL-1 ]
                                              p0028 N82-32370
SHORE, R. A.
   Focal surfaces of offset dual-reflector antennas
                                              p0080 A82-36265
   Acceleration of convergence of vector sequences
                                              p0149 ¥82-29075
     [MASA-TH-82931]
SIDIE, S. M.
Results of chopper-controlled discharge life
     cycling studies on lead acid batteries
     [ WASA-TM-82912]
                                              PO124 N82-30700
SIRDRUHARD, A.
   Low-thrust chemical propulsion system pump
      technology
      [ NASA-CR- 165219]
                                              p0 105 #82-13427
SINCEL, R.
Heat transfer in cooled porous region with curved
     boundary
                                              p0089 A82-14848
   Cauchy integral method for two-dimensional
      solidification interface shapes
                                              p0089 A82-39899
SIRMERS, P. A.
Thermal-barrier-coated turbine blade study
     [ WASA-CR-165351]
                                              p0023 N82-10040
SIGNAN, R. K.
   An iterative finite element-integral technique for
   predicting sound radiation from turbofan inlets
in steady flight
[AIAA PAPER 82-0124] p0030 A82-177
Acoustic properties of turbofan inlets
[NASA-CR-169016] p0153 N82-270
                                              p0030 A82-17796
                                              p0 153 #82-27090
SIGNORBLLI, R. A.
   High temperature composites. Status and future
      directions
      [ MASA-TM-82929]
                                              D0051 #82-30336
SINCE, T. F.
   Turbulent boundary layer heat transfer experiments - A separate effects study on a convexty-curved
      wall
      [ASME PAPER 81-HT-78]
   Turbulent boundary layer heat transfer
      experiments: Convex curvature effects including
      introduction and recovery
      [ HASA-CR-3510 ]
                                              p0090 N82-17456
SINGULAT, R_{\bullet}, J_{\bullet}. Toward the use of similarity theory in two-phase
      choked flows
                                              p0089 A82-16570
   Effect of location in an array on heat transfer to
      a cylinder in crossflow
      [NASA-TM-82797]
                                              p0087 N82-19493
SINONS, S.
   Direct conversion of light to radio frequency energy
                                              p0138 A82-11712
SIMONS. S. M.
   Phosphoric acid fuel cell technology status
                                              p0120 N82-19670
     [NASA-TM-82791]
SIMPRIM, W. . R. .
    V/STOL Tandem Fan transition section model test
                                              p0007 N82-21158
      [ NASA-CR-165587]
SIRCLAIR, J. H.
   Impact resistance of fiber composites
                                              p0112 A82-39852
   Durability/life of fiber composites in
      hygrothermomechanical environments
                                              p0049 N82-14287
      [ NASA-TM-82749]
   Prediction of composite hygral behavior made simple
      [NASA-TM-82780]
                                              p0049 N82-16181
   Compression behavior of unidirectional fibrous
      composite
      [ NASA-TH-82833]
                                              p0050 N82-22313
SINCER, J. R.
Current legal and institutional issues in the
commercialization of phosphoric acid fuel cells
      [ NASA-CR-167867]
                                              p0136 #82-29719
SINGH, S.,
   Formation of oxides of nitrogen in monodisperse
      spray combustion of hydrocarbon fuels
SISTO. F.

The influence of Coriolis forces on gyroscopic
      motion of spinning blades
      [ ASHE PAPER 82-GT-163]
SITNIKOVA, M. V.
   Dynamics of snow cover in mountain regions of the
      Aral Sea basin, studied using satellite
      photographs
```

A82-26436

A82-27462

SIVASHIBSKY, G. I.	
On stability of premixed flames in stagr Point flow	ation -
p00	57 X82-37574
SIVO, J. M. Advanced 30/20 GHz communication satelli	tes
poo Skamili. G.	134 A82- 12623
A new antenna concept for satellite comm	unications 79 N82-31584
SKIENER, A.	
	53 A82-31339
Tensile properties of SiC/aluminum filam composites - Thermal degradation effect	
p00	53 A82-46220
Assessment of a 40-kilowatt stirling end	ine for
underground sining applications [NASA-TF-82822] p01	25 N82-30714
SLAVIK, B. J. Rolling resistance of electric vehicle t	
track tests	
On the road performance tests of electri	124 N82-28786 ic test
vehicle for correlation with road load	l simulator 127 NB2-33B29
SLETTEW, C. J. Focal surfaces of offset dual-reflector	
p00	80 A82-36265
SLICKER, J. H. A PWH transistor inverter for an ac elec	tric
vehicle drive	185 A82-20744
SLINEY, E. E.	
Performance of PTFE-lined composite jour [ASLE PPEPRINT 82-AM-1A-1] pol	104 A82-37854
Performance of PTFE-lined composite jour [NASA-TM-62779] poor	nal bearings 148 NB2-17263
SHIALEK, J. L. Phase stability in plasma-sprayed, parti	
stabilized zirconia-yttria	
SHIRNOVA, T. A.	170 A82-41552
Investigation of a comb-type slow-wave s	♠ ***** * ****
	structure
for millimeter-wave masers	182-18368
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear conve	A82- 18368
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convened accelerators pp. 10	182-18368 ergence 149 182-31438
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convenancelerators p0 for acceleration of convergence of vector see	182-18368 ergence 149 182-31438 eguences
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convenancelerators p0 / Acceleration of convergence of vector se [NASA-TH-82931] SHITH, G. T.	A82-18368 ergence 149 A82-31438 equences 149 N82-29075
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convenancelerators p0 Acceleration of convergence of vector set [NASA-TM-82931] SHITH, G. T. Environmental and High-Strain Rate effections	#82- 18368 ergence 149 #82-31438 equences 149 #82-29075
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convenancelerators Acceleration of convergence of vector set [NASA-TM-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TM-82882]	A82-18368 ergence 149 A82-31438 equences 149 N82-29075 ets on
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convenience of convergence of vector set [NASA-TH-82931] polymerican mental and High-Strain Rate effect composites for engine applications [NASA-TH-82882] polymerican mental and current consolidation efficiency and current consolidation efficiency is a set of the consolidation of the cons	#82- 18368 ergence 149 #82-31438 equences 149 #82-29075 ets on 051 #82-31449
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convenance of sectors poly Acceleration of convergence of vector set [NASA-TH-82931] poly SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TH-82892] poly SHITH, J. H. End region and current consolidation effithe performance of an MHD channel for conceptual design	A82-18368 ergence 149 A82-31438 equences 149 N82-29075 ets on 051 N82-31449 ects upon the ET?
for millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convents accelerators p0 Acceleration of convergence of vector set [NASA-TM-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TM-82882] SHITH, J. H. End region and current consolidation effict the performance of an MHD channel for conceptual design [ALMA PAF. 82-0325] Effect of vacu. exhaust pressure on the	A82-18368 ergence 149 A82-31438 equences 149 N82-29075 ets on 051 N82-31449 ects upon the ET?
For millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convents accelerators Acceleration of convergence of vector set [NASA-TH-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TH-82882] SHITH, J. H. End region and current consolidation effict the performance of an MHD channel for conceptual design [AIAA PAP. 82-0325] Effect of vacu. exhaust pressure on the performance or , ND ducts at high B-fic [AIAA PAPER 82-0396]	A82-18366 ergence 149 A82-31438 equences 149 N82-29075 ets on 051 N82-31445 ects upon the ET7 157 A82-17889
For millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convents accelerators Acceleration of convergence of vector set [NASA-TH-82931] polymerican mental and High-Strain Rate effect composites for engine applications [NASA-TH-82882] polymerican manual current consolidation efficted by the performance of an HHD channel for conceptual design [ALAA PAR. 82-0325] polymerican performance or HD ducts at high B-fit [ALAA PAPER 82-0396] polymerican efficient and current consolidation effication and current consolidation efficient or consolidation effication and current consolidation efficient of an acceleration efficient consolidation efficient consolidat	#82- 18368 ergence 149 #82-31438 equences 149 #82-29075 ets on 051 #82-31445 ects upon the ET? 157 #82-17889
SHITH, D. A. Numerical comparisons of nonlinear convents accelerators Acceleration of convergence of vector set [NASA-TM-82931] polymers. SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TM-82882] polymers. SHITH, J. M. End region and current consolidation effict the performance of an MHD channel for conceptual design [AIAA PAP. 82-0325] polymers. Effect of vacu. exhaust pressure on the performance or [AD ducts at high B-fit [AIAA PAPER 82-0396] Polymers. End region and current consolidation efficiency according to the performance of an MHD channel for conceptual design	#82- 18368 erqence 149 #82-31438 equences 149 #82-29075 ets on 051 #82-31449 fects upon the ETF 157 #82-17889 end 157 #82-20292 fects upon the ETF
For millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convents accelerators [NASA-TH-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TH-82882] SHITH, J. H. End region and current consolidation effict the performance of an MHD channel for conceptual design [AIAA PAPER 82-0325] Effect of vacu. exhaust pressure on the performance or HD ducts at high B-fic [AIAA PAPER 82-0396] End region and current consolidation effication and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications and current consolidation effications a	A82-18368 ergence 149 A82-31438 equences 149 N82-29075 ets on 051 N82-31445 ects upon the ET? 157 A82-17889 ets upon the ETP
FOR millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convents accelerators polymerical comparisons of nonlinear convents accelerators polymerical comparisons of nonlinear convents accelerators polymerical comparisons of nonlinear convents accelerators [NASA-TM-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TM-82882] SHITH, J. H. End region and current consolidation efficient of vacu. exhaust pressure on the performance or [3D ducts at high B-fice [AIAA PAPER 82-0396] End region and current consolidation efficient performance of an MHD channel for conceptual design [NASA-TM-82744] Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-fice	A82-18368 erqence 149 A82-31438 equences 149 N82-29075 ets on 051 N82-31445 ects upon the ETP 157 A82-17885 ets upon the ETP 157 N82-20292 fects upon the ETP
FOR millimeter-wave masers SHITH, D. A. Numerical comparisons of nonlinear convenerations Accelerators PD Acceleration of convergence of vector set [NASA-TH-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TH-82882] SMITH, J. M. End region and current consolidation effit the performance of an HHD channel for conceptual design [AIAA PAPER 82-0325] Pffect of vacu. exhaust pressure on the performance or [BD ducts at high B-fit [AIAA PAPER 82-0396] End region and current consolidation effit the performance of an HHD channel for conceptual design [NASA-TH-82750] Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-fit [NASA-TH-82750] Results and comparison of Hall and DW design of the performance of MHD ducts at high D-fit [NASA-TH-82750]	#82- 18368 ergence 149 #82-31438 equences 149 #82-29075 ets on 051 #82-31445 fects upon the ETF 157 #82-20292 fects upon the ETF
SHITH, D. A. Numerical comparisons of nonlinear convenerations Accelerators PD Acceleration of convergence of vector set [NASA-TM-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TM-82882] SHITH, J. H. End region and current consolidation effit the performance of an HHD channel for conceptual design [ALAA PAPP. 82-0325] Pffect of vacu. exhaust pressure on the performance or [AD ducts at high B-fic [ALAA PAPPR 82-0396] End region and current consolidation effit the performance of an HHD channel for conceptual design [NASA-TM-82744] Effect of vacuum exhaust pressure on the performance of HHD ducts at high D-fic [NASA-TM-82750] Results and comparison of Hall and DW disease [NASA-TM-82864]	#82- 18368 ergence 149 #82-31438 equences 149 #82-29075 ets on 051 #82-31445 fects upon the ETF 157 #82-20292 fects upon the ETF
SHITH, D. A. Numerical comparisons of nonlinear convenerations Accelerators NASA-TH-82931] SHITH, G. T. Environmental and High-Strain Rate effections (NASA-TH-82882) SHITH, J. M. End region and current consolidation effiction for the performance of an HHD channel for conceptual design [NASA-TH-82882] PO Effect of vacu. exhaust pressure on the performance or HD ducts at high B-fic [NASA-TH-82882] End region and current consolidation efficient of vacu. exhaust pressure on the performance or HD ducts at high B-fic [NASA-TH-82784] Effect of vacuum exhaust pressure on the performance of MHD channel for conceptual design [NASA-TH-82744] PO Results and comparison of Hall and DW design (NASA-TH-82864) Universal binding energy relations in metals.	#82- 18368 ergence 149 #82-31438 equences 149 #82-29075 ets on 051 #82-31445 ects upon the ET? 157 #82-20292 fects upon the ETP 157 #82-12943
SHITH, D. A. Numerical comparisons of nonlinear convenerations Accelerators [NASA-TM-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TM-82882] SHITH, J. H. End region and current consolidation effict the performance of an MHD channel for conceptual design [ALAA PAPP. 82-0325] Fiffect of vacu. exhaust pressure on the performance or [AD ducts at high B-fic [ALAA PAPER 82-0396] Find region and current consolidation efficient of vacu. exhaust pressure on the performance of an MHD channel for conceptual design [ALAA PAPER 82-0396] Find region and current consolidation efficient of vacuum exhaust pressure on the performance of MHD ducts at high D-fic [NASA-TM-82744] Fifect of vacuum exhaust pressure on the performance of MHD ducts at high D-fic [NASA-TM-82750] Results and comparison of Hall and DW ducts at high D-fic [NASA-TM-82864] SHITH, J. R. Universal binding energy relations in meaning the second contents [NASA-TM-82864]	#82- 18368 erqence 149 #82-31438 equences 149 #82-29075 ets on 051 #82-31445 ects upon the ET? 157 #82-20292 ects upon the ETP 157 #82-12943 edid 157 #82-13908 etallic
SHITH, D. A. Numerical comparisons of nonlinear convenerations Accelerators [NASA-TH-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TH-82882] SMITH, J. H. End region and current consolidation effect onceptual design [AIAA PAPER 82-0325] POFFICE of vacu. exhaust pressure on the performance of an MHD channel for conceptual design [AIAA PAPER 82-0396] Find region and current consolidation effect of vacu. exhaust pressure on the performance of an MHD channel for conceptual design [AIAA PAPER 82-0396] Find region and current consolidation effect of vacuum exhaust pressure on the performance of MHD ducts at high D-fice [NASA-TH-82744] Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-fice [NASA-TH-82760] Results and comparison of Hall and DW desperiments [NASA-TH-82864] Universal binding energy relations in meadlesion [NASA-TH-82706]	A82-18368 ergence 149 A82-31438 equences 149 N82-29075 ets on 051 N82-31445 ects upon the ET? 157 A82-17889 edid 157 N82-12943 edid 157 N82-13908 ets 157 N82-2596
SHITH, D. A. Numerical comparisons of nonlinear convenerations Accelerations Acceleration of convergence of vector set [NASA-TH-82931] SHITH, G. T. Environmental and High-Strain Rate effect composites for engine applications [NASA-TH-82882] SHITH, J. H. End region and current consolidation effict the performance of an MHD channel for conceptual design [ALAA PAR. 82-0325] Pffect of vacu. exhaust pressure on the performance or all ducts at high B-fic [ALAA PAPER 82-0396] End region and current consolidation effication and current consolidation efficient for conceptual design [NASA-TH-82744] Effect of vacuum exhaust pressure on the performance of MHD ducts at high D-fic [NASA-TH-82750] Results and comparison of Hall and DW duexperiments [NASA-TH-82864] SMITH, J. R. Universal binding energy relations in meadhesicn [NASA-TH-82706] SMITH, J. T. Fabrication of turbine components and prof sintered silicon nitride	A82-18368 ergence 149 A82-31438 equences 149 N82-29075 ets on 051 N82-31445 ects upon the ET7 157 A82-17889 eld 157 N82-12943 ects upon the ET7 157 N82-12943 ects upon the ET7 157 N82-13908 ects upon the ET7 157 N82-13908 ects upon the ET7
SHITH, D. A. Numerical comparisons of nonlinear convenerations Accelerations [NASA-TH-82931] SHITH, G. T. Environmental and High-Strain Rate effections of composites for engine applications [NASA-TH-82882] SHITH, J. M. End region and current consolidation effiction the performance of an HHD channel for conceptual design [ALAA PAPE, 82-0325] POFFICE OF Vacu. exhaust pressure on the performance or HD ducts at high B-fic [ALAA PAPER 82-0396] End region and current consolidation efficient of the performance of an HHD channel for conceptual design [NASA-TH-82744] Effect of vacuum exhaust pressure on the performance of MHD ducts at high B-fic [NASA-TH-82750] Results and comparison of Hall and DW design of the performance of MHD ducts at high B-fic [NASA-TH-82864] SHITH, J. B. Universal binding energy relations in machesicn [NASA-TH-82706] SHITH, J. T. Fabrication of turbine components and prof sintered silicon nitride [ASME FAPER 82-GT-252] SHITH, B. J. SHITH, B. J. FAPER 82-GT-2521	#82- 18368 ergence 149 #82-31438 ergences 149 #82-31438 ergences 149 #82-31449 ests upon the ET7 157 #82-17889 ergences 157 #82-12943 ergences 157 #82-13908 ergences 157 #82-13908 ergences 157 #82-2596 ergences 157 #82-3543
SHITH, D. A. Numerical comparisons of nonlinear convenerations Accaleration of convergence of vector set [NASA-TM-82931] SHITH, G. T. Environmental and High-Strain Rate effections [NASA-TM-82882] SHITH, J. H. End region and current consolidation effiction the performance of an HHD channel for conceptual design [AIAA PAP. 82-0325] Pffect of vacu. exhaust pressure on the performance or AID ducts at high B-fic [AIAA PAPER 82-0396] End region and current consolidation efficient of the performance of an HHD channel for conceptual design [NASA-TM-82750] Find region and current consolidation effict the performance of an HHD channel for conceptual design [NASA-TM-82750] Results and comparison of Hall and DW deexperiments [NASA-TM-82864] SHITH, J. R. Universal hinding energy relations in meadhesion [NASA-TM-82706] SHITH, J. T. Fabrication of turbine components and prof sintered silicon nitride [ASME FAPER 82-GT-252]	A82-18368 ergence 149 A82-31438 equences 149 N82-29075 ets on 051 N82-31445 fects upon the ETF 157 A82-17889 ets upon the ETF 157 N82-12943 ets 157 N82-13908 ets 157 N82-25961 ets 11ic 050 N82-11183 eoperties 071 A82-3543

```
SMITH, 6. 8. Study of electrical and chemical propulsion
     systems for auxiliary propulsion of large space systems. Volume 1: Executive summary
      T NASA-CR-165502-VOL-11
                                              p0046 M82-11110
   Study of electrical and chemical propulsion systems for auxiliary propulsion of large space
     systems, volume 2 [NASA-CH-165502-VOL-2]
                                               p0044 #82-11111
   An insight into auxiliary propulsion reguirements
     of large space systems
      [ WASA-TH-82827]
                                               D0042 N82-24286
SMITERICK, J. J.
   Effect of positive pulse charge waveforms on the energy efficiency of lead-acid traction cells
                                               p0118 N82-10503
     [ NASA-TM-827091
   Design of a 35-kilowatt bipolar *ickel-hydrogen battery for low Earth orbit application
                                               p0123 #82-24647
      [ NASA-TM-82844 ]
SHOLL, A. H.
30/20 GHz communications satellite multibeam antenna
     [AIAA 82-0449]
                                               p0079 A82-23486
SHOT
      G. C.
   High temperature durable catalyst development
                                              p0056 A82-20739
   Development of a high-temperature durable catalyst
      for use in catalytic combustors for advanced
     automotive gas turbine engines [NASA-CR-165396]
                                               DO 130 N82-13510
SHOW, W. R.
   Mass Driver Two - A status report
                                               p9046 482-18191
   Mass driver reaction engine characteristics and
      performance in earth orbital transfer missions
                                               p0046 A82-18199
   A small scale lunar launcher for early lunar
      material utilization
                                               p0032 A82-35617
   The supply of lunar oxygen to low earth orbit
                                               P0032 A82-35618
SHIDER, A.
Heat transfer in cooled porous region with curved
     boundary
                                               D0089 A82-14848
SOBEL, D. R.,
Tube entrance heat transfer with deposit formation [AIAA PAPER 82-0918] p0093 182-319
SOBIECENT, H.,
                                               p0093 182-31908
   A computational design method for transonic
      turbomachinery cascades
[ASME PAPER 82-GT-117]
                                               p0022 A82-35348
   CAS22 - FORTRAN program for fast design and
      analysis of shock-free airroil cascades using
      fictitious-gas concept
[NASA-CR-3507]
                                               p0006 N82-16044
SOCKOL, P. H.,
Computational methods for internal flows with
      emphasis on turbomachinery
     [ NASA-TM-82764]
   Effect of tangential traction and roughness on
      crack initiation/propagation during rolling
      contact
                                               DO 103 A82-30022
50L ( /), F. R.
    A experimental study of airfoil icing
      characteristics
       NASA-TH-82790]
                                               P0001 N82-17083
SOLOROW, A. S. P. Atomization and combustion properties of flashing
      injectors
      [AIAA PAPER 82-0300]
                                               P0092 A82-17880
    Investigation of spray characteristics for
      flashing injection of fuels containing dissolved
      air and superheated fuels
                                               p0027 N82-26295
      [ NASA-CR-3563]
SOLTIS, D. G.
Light weight nickel battery plague
[NASA-CASE-LEW-13349-1]
                                               p0121 H82-22673
SONOMO, R. B.,
Raman study of the improper ferroelectric phase
      transition in iron iodine boracite
                                                       182-30297
SOSOKA, D. J.
   Cauchy integral method for two-dimensional
      solidification interface shapes
                                               p0089 A82-39899
```

SOTOS. R. G.

An experimental study of airfoil icing

```
characteristics
[NASA-TH-82790] p0001 N82-17083
SOVEY, J. S.
Ion beam textured graphite electrode plates
[NASA-CASE-LEW-12919-2] p0050 N82-26386
   Texturing polymor surfaces by transfer casting poocs NS2-28440
   Surface texturing of fluoropolymers [ KASA-CASE-LEW-13028-1]
                                                   p0070 N82-33521
SOVIE, H. J.
   Comparative analysis of the conceptual design
      studics of potential carly commercial MHD power plants (CSPEC) [NASA-TM-82897] p0123 N82-27
                                                   p0 123 N82-27838
SPADACCINI, L. J.
Deposit formation in hydrocarbon fuels
[ASME TAPER 82-GT-49] p
                                                   P0075 A82-35307
SPALVIES, T.
   Tribological properties and XPS studies of ion plated gold on nickel and iron [MASA-TM-82814] p0059 W82
                                                   p0059 N82c 22344
    Morphological and frictional behavior of sputtered
      Fos2 films
      [ NASA-TH-82809]
                                                   p0076 N82-22387
SPEAR, D. A.
    Study of controlled diffusion stator blading. 1.
      Perodynamic and mechanical design report [ NASA-CF-165500] p0024
                                                   p0024 N82-16081
SPERA, D. A.
Applications of the DOE/NASA wind turbine
      engineering information system
   po 122 N82-23696 Calculation of quaranteed mean power from wind
      turbine generators
                                                   n0 122 N82-23699
SPITZER. M. B.
    Development of a large area space solar cell
      nssembly
       r Hasa-cr- 1679291
                                                   p0137 NB2-30706
SRIWIVASAN, M.
    Tribological properties of sintered polycrystalline and single crystal silicon carbide
       T NASA-TH-828291
                                                   p0068 N82-24343
SRIVATSA, S. K.
    Computations of soot and and NO sub x emissions
      from gas turbine combustors
      [ NASA-CR-167930]
ST. GEORGE, E.
    Development of a dual-field heteropoplar power
      converter
      [ NASA-CF- 165168]
                                                   D0084 H82-24424
ST.JOHW, G. A.
Oxidation and formation of deposit precursors in
      hydrocarbon fuels
      [ NASA-CR- 165534]
                                                   p0073 N82-18402
STAHARA, S. S.
    Rapid approximate determination of nonlinear
      nolations - Application to aerodynamic flows and design/optimization problems
                                                   p0012 A82-35571
STRIGER, P. J.
    New Zeatures and applications of PRESTO, a
      computer code for the performance of
       regenerative, superheated steam turbine cycles
      [ NASA-TP- 1954]
                                                   p0 119 N82-16477
   Summary and evaluation of the conceptual design study of a potential early commercial MHD power plant (CSPEC)
[NASA-TH-82734]
p0119 N82-16
                                                   p0119 N82-16481
    Integrated quasifier combined cycle polygeneration
      system to produce liquid hydrogen [NASA-TH-82921]
                                                   p0 125 N/32-30 713
STALLORE, R. J.
Blade loss transient dynamic analysis of
      turlowachinery
[NIAM PAPER 82-1057]
                                                   p0030 A82-34982
STANG, D. B.
    Comparison of NASCAP modelling results with lumped
      circuit analysis
                                                    p0037 N82-14255
     "Berimental verification of a computational locedure for the design of TWT-refocuser-MDC
                                                   p0082 A82-16128
    Computer modeling of multiple-channel input
      signals and intermodulation losses caused by
      nonlinear traveling wave tube amplifiers
```

[NASA-TP- 1999]

```
STANBARD, P. R.
   Validation of the MASCAP model using spaceflight
      data
      [AIAA PAPER B2-0269]
                                                 D0038 A82-17872
    *Bootstrat* charging of sumfaces composed of multiple materials
   Representation and material charging response of
      quoplasma environments
                                                 P0039 N82-14249
   Simulation of charging response of SCATHA (P78-2)
      satellite
                                                 D0039 N82-14250
   Additional extensions to the NASCAP computer code,
      volume 1
      [ NASA-CR-167855]
                                                 p0146 N82-25810
    Additional extensions to the NASCAP computer code,
      volume 2
      [ NASA-CR-167856]
                                                 p0040 N82-26377
STAPLES, D. Market assessment of photovoltaic power systems
      for agricultural applications in Nigeria
      [ NASA-CR- 165511]
                                                 p0 133 NB2-18698
STAPLETON, R. E.
   Development of an 1100 deg P capacitor
                                                 p0083 N82-15315
STARK, B.
   Requirements for optimization of electrodes and electrolyte for the iron/chromium Redox flow cell [NASA-CR-165218] p0 136 M82-2564
                                                 p0 136 N82-25640
STASKUS, J.
   SCATHA SSPH charging response: NASCAP predictions
      compared with data
                                                 p0037 N82-14251
   First results of material charging in the space
      environment
      [NASA-TM-84743]
                                                 p008 | N82-2443 |
STASKUS, J. V.
Testing of a spacecraft model in a combined
      environment simulator
                                                 p0033 A82-18310
   Testing of a spacecraft model in a combined
      environment simulator [NASA-TH-82723]
                                                 p0037 N82-11106
STATOM, D. V.
Propulsion study for Small Transport Aircraft
      Technology (STAT) [NASA-CR-165499]
                                                 p0022 N82-10037
STAUTER, R. C.
   The design and instrumentation of the Purdue
annular cascade facility with initial data
acquisition and analysis
      [ NASA-CR-167861]
STEADES, T. Cost/benefit studies of advanced materials
      technologies for future aircraft turbine
      engines: Materials for advanced turbine engines
                                                 p0026 N82-25254
      TNASA-CR-1678497
STECURA, S. Improved thermal barrier conting system [NASA-CASE-LEW-13324-1] p0
                                                 P0060 N82-26431
    Propeller flow visualization techniques
                                                 p0096 N82-32672
STRIGELHANN, W.
   Market assessment of photovoltaic power systems for agricultural applications in Mexico
      [NASA-CR-165441]
                                                 p0128 N82-10506
    Market assessment of photovoltaic power systems
      for agricultural applications in Coleabia
      [NASA-CR-165524]
                                                 p0134 N82-22770
STRIN, C. K.
   Subsystems design and component development for the parabolic dish module for solar thermal
      power systems
      [ NASA-CR-168941]
                                                 p0135 N82-24646
STRIBBERG, R.
   The NASA HERIT program - Developing new concepts for accurate flight planning [AIAA PAPER 82-0340] p0014 A82-1
                                                 p0014 A82-17894
STRIBER, G.
   Developing a scalable inert gas ion thruster [AIAA PAPER 82-1275] p0047 A
                                                 p0047 A82-37713
STEIRGASS, H.,
Harket assessment of photovoltaic power systems
      for agricultural applications in Morocco
      [NASA-CR-165477]
                                                 p0130 #82-14627
   Market assessment of photovoltaic power systems
      for agricultural applications in Nigeria
```

p0082 N82-25441

```
[ NASA-CF- 1655 11 ]
                                                     p0133 N82-18698
STEINE, R. J.
SIGSTK: A computer code for predicting multistage axial flow compressor performance by a meanline
      stage stacking methol
      [ NASA-TP-2023 ]
STEINHAGEL, K. H.
Worldwide satellite market demand forecast
                                                     pC079 NB2-25423
      : NASA -CE- 167918]
STENCEL, R. E.
   Ultraviolet observations of the 1980 eclipse of
the symbiotic star CI Cycni
                                                             AB2-27331
STEMERSEM, K. Optically pumped high-pressure DF-CO2 transfer laser
                                                             A82-10193
STEPBENS, J. R.
   A status review of NASA's COSAM (Conservation Of
Strategic Aerospace Haterials) program
[NASA-TM-82852] p0060 N82-2
                                                     D0060 N82-24326
STEPRA, To So.
Thermal and flow analysis of a convection,
      air-cooled caragic coated porous metal concept
      for turbine vanes
      [ASMR PAPER 01-HT-46]
                                                     p0020 A82-10952
STERM, B. A.
Hybridized polymer matrix composite [NASA-CR-165340]
                                                     p0051 N82-12139
STRISON. A. R.
    Advanced ceramic coating development for industrial/utility gas turbines
      [ NASA-CR- 169852]
                                                     00065 NR2-33494
STETZ, T. T.
    Flow through axially aligned sequential apertures of the orifice and Borda types
[ASHE PAPER 6]-HT-79] p0089 A82-10
                                                     D0089 A82-10964
    Flow through aligned sequential orifice type inlets [NASA-TP-1967] p0087 N82-20467
    Flows through sequential orifices with heated
      spacer reservoirs
      [ NASA-TM-82355 ]
                                                     D0088 NB2-24455
STEVENS, N. J.
    Voltage gradients in solar array cavities as possible breakdown sites in spacecraft-charging-induced discharges
                                                     p0038 A82-18317
    Voltage gradients in solar array cavities as
      possible breakdown sites in
      spacecraft-charging-induced discharges [NASA-TM-82710] p00
                                                     p0037 N82-11107
    Analytical modeling of satellites in geosynchronous environment
                                                     p0037 N82-14258
    Agreement for NASA/OAST - USAF/AFSC space
       interdependency on spacecraft environment
       interaction
                                                     p0038 N82-14271
    Design practices for controlling spacecraft
      charging interactions [NASA-TE-82781]
                                                     DCC38 N82-18311
    Environmentally induced discharges on satellitas
      [ NASA -TY-82849 ]
                                                     p0038 N82-23261
    First results of material charging in the space
       environment
       [NASA-TM-84743]
                                                      p0081 N82-24431
STRVES, N. J.

Use of charging control quidelines for quosynchronous satellite design studies non3:
                                                      p0037 N82-14263
    Conversion and matched filter approximations for
       serial minimum-shift keyed modulation
                                                      p0080 A82-26713
STITT, L. E.
NASA research in supersonic propulsion: A decade
      of progress [NASA-TM-82862]
                                                      pn019 N82-26300
STOCHL, B. J.
    Assessment of steam-injected gas turbine systems
       and their potential application [NASA-TM-82735]
                                                      p0119 N82-18694
STOCKERER, F. J.
Experimental study of fuel heating at low
    temperatures in a wing tank model, volume 1
[NASA-CR-165391] p0073 N82-11224
Experiments on fuel heating for commercial aircraft
       [ NASA -TM-82878]
                                                      p0072 N82-26483
    Additional experiments on flowability improvements
       of aviation fuels at lcw temperatures, volume 2
```

```
p0074 N82-31546
      [NASA-CR-167912]
STOLOFF, W. S. Fatigue of Ni-Al-No aligned eutectics at elevated
      temperatures
                                                   p0052 A82-13403
STOLP, P. C.
Propulsion study for Small Transport Aircraft
      Technology (STAT) [NASA-CR-165499]
                                                  p0022 N82-10037
STORE, J. R.
WASA research in supersonic propulsion: A decade
      of progress
[NASA-TM-82862]
                                                  p0019 N82-26300
STOURERT, P.
Survey on aging on electrodes and electrocatalysts
      in phosphoric acid fuel cells [NASA-CR-165505]
                                                   p0128 N82-11545
    Preparation and evaluation of advanced
      electrocatalysts for phosphoric acid fuel cells
[NASA-CR-165519] p0129 N82-12
                                                  p0 129 N82-12573
    Preparation and evaluation of advanced
      electrocatalysts for phosphoric acid fuel cells
                                                  p0 132 #82-17615
      [ NASA-CR-165594]
STORESIFER, R. B.
On a study of the /Delta T/c and C/asterisk/
integrals for fracture analysis under non-steady
      Creep
                                                  p0115 A82-36782
    Moving singularity creep crack growth analysis with the /Delta T/c and C/asterisk/ integrals
                                                  p0116 182-40066
    Creep crack-growth: A new path-independent T sub
o and computational studies
[NASA-CR-168930] p0113 N82-245
    Creep crack-growth: A new path-independent integral (T sub c), and computational studies [NASA-CR-167897] p0114 H82-
                                                   p0114 #82-29619
STORACE, A. F. Blade loss transient dynamic analysis of
      turbomachinery
[AIAA PAPER 82-1057]
                                                   D0030 A82-34982
STORM, R. S.
Progress in ceramic component fabrication technology
                                                  p0071 A82-35064
       [AIAA PAPER 82-1211]
    Net shape fabrication of Alpha Silicon Carbide
       turbine components
                                                   P0071 A82-35403
       [ASHE PAPER 82-GT-216]
STRACK, W. C.
    Puture propulsion opportunities for commuter airplanes
       [NASA-TM-82880]
                                                   p0018 N82-24203
    Propulsion opportunities for future commuter
       aircraft
       [ NASA-TM-82915]
STRAIGHT, D. M.
    Performance of a 2D-CD nonaxisymmetric exhaust
nozzle on a turbojet engine at altitude
                                                   p0005 N82-26241
       [NASA-TH-82881]
STRAISAR, A. J.
Comparison of two and three dimensional flow
       computations with laser anemometer measurements
       in a transonic compressor rotor
                                                   p0004 N82-15020
       [NASA-TM-82777]
    High-speed laser anemometer system for intragotor
       flow mapping in turbomachinery [NASA-TP-1663]
                                                   D0095 NB2-19521
STREAT, K. J.
Permanent magnet properties of Mn-Al-C between -50
       C and +150 C
    Modeling the full-bridge series-resonant power
       converter
                                                   p0086 A82-46385
STOCKAS, K. J.
Exhaust emissions reduction for intermittent
       combustion aircraft engines
       [NASA-CR-167914]
                                                   p0029 N82-33392
 STUNEZSS, G. J. Advanced Low-Emissions Catalytic-Combustor
       Program, phase 1 [NASA-CR-159656]
                                                   p0025 N82-22265
 SULLIVAE, R. B. Small que turbine combustor primary zone development
       [ AIAA PAPER 82-1159]
                                                   p0103 AR2-35036
 SULLIVAN, T. L.
    A review of resonance response in large
       horizontal-axis wind turbines
                                                   p0122 N82-23711
```

SUTCU, M.	A82-18370
The influence of Coriolis forces on gyroscopic motion of spinning blades	TRALEMENT, J., L., Traction contact performance evaluation at high
(ASME PAPER 82-GT-163] p0030 A82-35384 SWALLOW, D. W. MHD channel performance for potential early	speeds [MASA-CR-165226] [MASA-CR-165226] Stress evaluations under rolling/sliding contacts
commercial MHD power plants p0 58 A82-20750	[MASA-CR-165561] p0 113 N6 2-1752 1 23VHLDB, J., A.,
SUARTZ, C. K. Effects of processing and depart on radiation	Experimental study of external fuel vaporization [ASME PAPER 82-GT-59] p0075 A82-35312
damage removal in silicon solar cells [NASA-TH-82892] p0042 N82-31443	External fuel vaporization study p0073 N82-14371
SYBBEG, J., Aerodynamic analysis of VTOL inlets and definition	THALLER, L. N. NASA Redox cell stack shunt current, pumping
of a short, blowing-lip inlet	power, and cell performance tradeoffs
[NASA-CR-165617] p0007 N82-22211 SYVHBSOM, H ₂ T.	Performance mapping studies in Redox flow cells
Fuel quality processing study, volume 1 [NASA-CR-165327-VOL-1] p0135 N82-24649	[MASA-TM-82707] p0 120 N82-20668 Synthetic battery cycling techniques
SEATKOWSKI, G. P. Design and verification of a multiple fault	[MASA-TM-82945] p0 125 M82-30715 Mickel-hydrogen bipolar battery systems
tclerant control system for STS applications using computer simulation	[NASA-TH-82946] p0 125 N82-30716 Design flexibility of Redox flow systems
[ATAA 61-2173] p0035 A82-10124 Real-time computer simulation/emulation for	[NASA-TM-82854] p0054 N82-31459
verification of multi-fault-tolerant control of	Jet impingement heat transfer enhancement for the
Centaur-in-Shuttle [AIAA 81-2283] p0040 A82-13494	GPU-3 Stirling engine [NASA-TM-82727] p0163 N82-11993
Real-time microcomputer simulation for space Shuttle/Centaur avionics	THOMAS, R. L. The NASA Lewis large wind turbine program
p0033 A82-48245 SZETELA, E. J.	[NASA-TM-82761] p0119 N82-16495 THOMPKINS, W. T., JR.
A heat exchanger computational procedure for temperature-dependent fouling	A FORTRAN program for calculating three dimensional, inviscid and rotational flows with
[NSME PAPER 81-HT-75] p0092 A82-10961 Tube entrance heat transfer with deposit formation	shock waves in axial compressor blade rows: User's manual
[AIAA FAPER 82-0918] p0093 A82-31908	[NASA-CR-3560] p0008 N82-26230
Deposit formation in hydrocarbon fuels [ASME PAPER 82-GT-49] p0075 A82-35307	THOMPSON, R. L. Nonlinear constitutive theory for turbine engine
Experimental study of external fuel vaporization [ASME_PAPER 02-GT-59] p0075 &82-35312	structural analysis poll2 82-33744
External fuel vaporization study p0073 N82-14371	THOREM, R., J., Development report: Automatic System Test and
SZUCH, J. R. Advancements in real-time engine simulation	Calibration (ASTAC) equipment [NASA-CR-165403] p0129 N82-13505
technology [AIAA PAPER 82-1075] p0021 A82-34995	THRESHER, R. W., Wind turbine dynamics
Advancements in real-time engine simulation technology	[NASA-CP-2185] p0122 N82-23684 THURLIN, R.
[NASA-TH-82825] p0147 N82-22915 Automated procedure for developing hybrid computer	Energy efficient engine: Turbine transition duct model technology report
simulations of turbofan eagines. Part 1: General description	[NASA-CR-167996] p0029 N82-33394
[NASA-TP-1851] p0146 882-33020	Effects of cobalt on structure, microchemistry and properties of a wrought nickel-base superalloy
т	p0065 A82-34973
TABAKOFF, W.	Creep and rupture of an ODS allow with high stress rupture ductility
A study of viscous flow in stator and rotor passages [ASME PAPER 82-GT-248] p0011 A82-35427	p0065 A82-40335
Three dimensional flow measurements in a turbine scroll	Transient catalytic combustor model [NASA-CR-165324] p0129 N82-13507
[NASA-CE-167920] p0009 N82-32310	TIPTON, D. L. AGT100 turbonachinery
Catalytic combustion of residual fuels [NASA-TH-82731] p0118 N82-13504	[AIAA PAPER 82-1207] p0 10 8 A82-35061 TOBIASON, A. R.
TAFT, W. J. Fideband, high speed switch matrix development for	NASA research programs responding to workshop recommendations
SS-TDMA applications	N82-21146
TANNANI, A. S.	High temperature durable catalyst development p0056 A82-20739
fvidence for Pu-244 fission tracks in hibonites from Murchison carbonaceous chendrite	Development of a high-temperature durable catalyst
p0166 A82-29316 TARTAGLIA, J. H.	for use in catalytic combustors for advanced automotive gas turbine engines
Fatique of Ni-Al-No aligned extectics at elevated temperatures	[NASA-CR-165396] p0 130 N82-13510 Computer model of catalytic combustion/Stirling
p0052 A82-13403	engine heater head [NASA-CR-165378] p0154 N82-22666
Overview study of Space Power Technologies for the advanced energetics program	TORSTEWSSON, J. R., On a free-electron-laser in a uniform magnetic
[NASA-CR-165269] p0132 N82-17606	field - A solution for arbitrarily strong electromagnetic radiation fields
Validation of the NASCAF model using spaceflight	A82-28409
data [AIAA PAPER 82-0269] p0038 A82-17872	On the solution of creep induced buckling in
THRISHNYI, A. S. The use of a structural method to calculate the	general structure p0115 A82-39514
electrostatic field of a magnetion	

```
Solf-adaptive closed constrained solution algorithms for nonlinear conduction
                                                       D0094 A82-45157
TOWNSEND, D. P.
    Optimal tooth numbers for compact standard spur
      gear setu
      [ASME PAPER BI-DET-115]
                                                       PO 103 A82-19335
    The optimal design of involute gear teeth with
      unequal addenda
    [ NASA-TH-82866] p0 10 1 N82-28645
Effect of shot peening on surface fatigue life of
carburized and hardened AISI 9310 spur gears
       [ NASA-TP- 2047 ]
                                                      p0102 N82-32736
TRESSLEM, R. B.
Strength distributions of SiC ceramics after
      oxidation and oxidation under load [ACS PAPER 9-C-80C]
                                                       p0071 A82-20143
    Effects of exidation and exidation under load on strength distributions of Si3N4
      [ACS PAPER 69-8-80]
                                                       D0077 A82-35871
TROTH, D. L.
LOW NOX heavy fuel combustor concept program
addendum: Low/mid heating value gaseous fuel
   [NASA-CP-165615] p0055 N
Low NOw heavy fuel combustor concept program
[NASA-CP-165367] p0136 N
                                                       p0055 N82-25338
                                                       p0 136 N82- 25635
TRYON, H. B.
    Summary of electric vehicle do actor-controller
      tests
      [ NASA-TH-82863]
                                                       p0082 N82-33636
TSARRY, B. K.
    Dynamics of snow cover in mountain regions of the
Aral Sea basin, studied using satellite
      photographs
    Detection of a change in the oridation state on
aluminum sufface using angular correlation of
positron annihilation radiation
TSUCHIYA, T.
    Water ingestion into jet engine axial compressors
      [AIAA PAPER 82-0196]
                                                       p0030 A82-17836
TUCKER, J. R.
    Exhaust emissions reduction for intermittent
      combustion aircraft engines [NASA-CR-167914]
                                                      pCC29 N82-33392
TONSTALL, B.
   Communications satellite systems capacity analysis [NASA-CH-167911] p0034 N82-273
                                                       p0034 N82-27331
TURNEY, G. E.
    Comparison of two parallel/series flow turbofau
      propulsion concepts for superscric V/STOL [AIAA PAPER 81-2637] p00 20
                                                      p00 20 A82- 19214
   Comparison of two parallel/series flow turbofan propulsion concepts for supersonic V/STOL
      [ NASA-TH-82743]
                                                      p0004 N82-18178
VADYAK. J.
    Three-dimensional flow calculations including
      boundary layer effects for supersonic inlets at angle of attack
      TAINA PAPER B2-0061]
    Calculation of the flow field including boundary
      layer offects for supersonic mixed compression inlets at angles of attack [NASA-CP-167941] p0009 M82-2
                                                       p0009 N82-29269
VALCO, G. J.
    Multi-function high voltage concentrator solar cells
                                                      p0043 A82-11796
    Fabrication of multijunction high voltage
      concentrator solar cells by integrated circuit
       technology
                                                       p0 127 A82-44957
VALGORA. H.
    High power solar array switching regulation
                                                      p0043 A82-11736
    Secondary effects in combustion instabilities
      leading to flashback
[ATAA PAPER 82-0037] p0056 A82-1776
TANFOSSEM, G. J., JR.
An experimental investigation into the feasibility
of a thermoelectric heat flux gage
                                                       p0056 A82-17746
```

[NASA -TM-82755]

```
Effect of location in an array on heat transfer to
      a cylinder in crossflow [NASA-TH-82797]
                                                   p0087 M82-19493
VARY. A.
    Metal honeycoah to porous vireform substrate
      diffusion bond evaluation
      [ HASA-TH-82793]
                                                   DOILD N82-18612
    Interrolation of material microstructure,
ultrasonic factors, and fracture toughness of
two phase titanium alloy
      [NASA-TH-82810]
                                                   p0110 N82-20551
VASTA, V. M.
Turbofan forced mixer-nozzle internal flowfield.
      Volume 2: Computational fluid dynamic predictions [NASA-CR-3493]
VATISTAS, G. M. .
Bluff-body flameholder wakes - A simple numerical
      Bolution
      [AIAA PAPER 82-1177]
                                                   p0093 A82-35043
VELUSARY, T. Hagnetic structure of a flaring region producing
      impulsive microwave and hard X-ray bursts
                                                   p0167 A82-27323
TERMES, G.

LOW NOR heavy fuel combustor concept program.

Phase 1: Combustion technology generation
[NASA-CR-165482] p0136 NE
                                                  p0136 N82-24725
VISSER, T.

Hybridized polymer matrix composite
[NASA-CR-165340]
                                                   p0051 NB2-12139
VITERDA, L. A.

Hethol for predicting impulsive noise generated by wind turbing rotors
[NASA-TH-82794]

p0 121 N82-217
                                                   DO121 N82-21714
    The NASA-Lenc wind turbine sound prediction code
                                                  p0123 #82-23730
    Theoretical and experimental power from large
      horizontal-axis wind turbinus
      ( Masa-In-82944 )
                                                   p0 127 182-33830
VITTAL, B. V. R.

Three dimensional flow measurements in a turbine
      scroll
      [ NASA-CR-167920]
                                                   p0009 NB2-32310
VOGAN, J. W.
    Advanced ceramic coating development for
      industrial/utility gas turbines
      [NASA-CR-169852]
                                                   P0065 N82-33494
VOLKOMIRSKAIA, L. B.
    An attempt at magnetic-variation sounding in the
      Antarctic
VORRES, C. L.
    Acoustic microscopy of silicon carbide materials
                                                   p0075 A82-33031
WADE, R. F.
    Wideband, high speed switch matrix development for
      SS-TDMA applications
WAITE, W. A.
    Anion permselective membrane [NASA-CR-167872]
                                                   p0137 N82-30711
NAMABAYASHI, I.
Low-thrust chemical propulsion system propellant
      expulsion and thermal conditioning study.
      Executive summary
      [ NASA-CR-165622]
    Low-thrust chemical propulsion system propellant expulsion and thermal conditioning study
      [ NASA-CR-167841]
                                                  p0045 N82-24288
WARRFIRLD, R. A.
    An assessment of alternative fuel cell designs for
      residential and connercial cogeneration
                                                   p0 138 A82-24695
Development of a locally mass flux conservative computer code for calculating 3-D viscous flow in turbomachines
      [ NASA-CR-3539]
                                                   p0007 N82-22214
WALKER, B.
    Analytical and experimental investigation of the
      propagation and attenuation of sound in extended reaction lined ducts
[AIAA PAPER 81-2014] p0 153 A82-104
                                                   p0 153 A82-10454
WALKER, B. R. .
The velocity field near the orifice of a Helsholtz
      resonator in grazing flow
```

p0095 N82- 14494

[NASA-CF- 168548]	p0153	N82- 18994
Propeller flow visualization technique	105	
WALKER, K. P.		N82-32672
Remearch and development program for	non-1	near
structural modeling with advanced time-temperature dependent constitu	utive	
relationships		N82- 16080
[NASA-CR-165533] BALKER, B. D.	•	
Design study of a continuously varial cone traction CVT for electric veh	ble rol	lor
[NASA - CR- 15984 1]	p0105	N82-12445
WALSH, P. Cathode catalyst for primary phospho	ric fue	el cells
[NASA-CR- 165198] WALSH, K.		N82-22675
In-flight acoustic results from an ad	ivance	ur job-l
rropoller at mach numbers to C.B	p0021	A82-35017
WALTER, R. J.	•	
Test results and facility description 4C-kilowatt stirling engine	n ror a	
[NASA-TH-82620] WANAG, S. S.	p0 163	NB2-13013
Boundary-layer effects in composite		tes:
Free-edge stress singularities, par [NASA-CR-165440]		N82-26718
WANG, A. J.	,	
Vibrations of cantilevered shallow constant shalls of rectangular planform		
Vibrations of twisted rotating blade		A82-11298
[ASME PAGER 81-DET-127]		A82- 19341
Optically pumped high-pressure CF-CO	2 trans	fer laser
WANG, S. T.		X82- 10 193
Interlaminar crack growth in fiber re	infor	ed
composites during fatigue, part 3 [NASA-CR-165434]	n0 1 14	N82-26715
WANG, S. S.	•	
Interface cracks in adhesively bounded	ed rab.	-shear
Boundary-layer effects in composite		A82-46109
Froe-edge stress singularities, IT	- Pres	edde
stress solutions and tasic characte	eristic	182-46806
Boundary layer thermal stresses in a		
composite laminates, part 1 [NASA-CR-165412]	p0 113	N82-26713
Analysis of cracks emanating from a in unidirectional fiber reinforced	circula	r hole
part 2		-
[NASA-CP-165433] Interlaminar crack growth in fiber re		N82-26714
composites during fatigue, part 3		
[NASA-CP-165434] Analysis of interface cracks in adhe-	pull4 sively	N82-26715 bond ed
Inp shear joints, part 4 (NASA-CF-165438]		N82-26716
Edge delamination in angle-ply compos	site	40°- 64110
laminates, part 5 [NASA-CR-165439]		N82-26717
WANG, S. Y.	. =	
End region and current consolidation the performance of an MHD channel :		
conceptual design [AIAA PAPER 82-9325]		A82-17889
End region and current consolidation	effect	s upon
the performance of an hill channel conceptual design	tor the	ETF
[NASA-TM- 82744]		N82-12943
Effect of vacuum exhaust pressure on performance of MHD ducts at high D	the -field	
[NASA-TH- 82750]	p0 157	N82-13908
WANG, SY. Effect of vacuum exhaust pressure on	the	
performance of MHD ducts at high E- [AIAA PAPER 82-0396]		X82-20292
WARD, J. W.		
30-cm mercury ion thruster technolog		A82- 15434
Advanced turboprop testbed systems s	•	

1: Testbed program objectives and priorities,

drive system and mircraft design studies,

```
evaluation and recommendations and wind tunnel
     test plans
     [ @ASA-CR-167928-VOL-1 ]
                                           p0028 N82-32370
WATSON, G. K.
Ultrasonic velocity for estimating density of
     structural ceramics
     [ HASA-TH-82765 ]
                                           D0066 ME2-14359
Tests of a D vented thrust deflecting nozzle
     behind a simulated turbofan engine
     [ NASA-CR-3508]
                                           p0006 N82-17122
MANRO, S. W.
MC carbide structures in M(lc2) ar-M247
     [NASA-CR-167892]
                                           P0064 N82-30374
MESER, R. E.
   Development of battery separator composites
     [ NASA-CR-165508]
                                           p0128 M82-11547
WEDER, E. J.
NASA research activities in aeropropulsion
     [ NASA-TH-82788]
                                           p0017 N82-16084
WEDEVEN, L. D.
   Effects of artificially produced defects on film
     thickness distribution in sliding EHD point
     contacts
                                           p0099 H82-16412
     [ NASA-TH-82732]
   The influence of surface dents and grooves on
traction in sliding EHD point contacts
     [ NASA-TH-82943]
                                           p0 10 2 N82-32734
WEEKS, W. P.
   Ground-truth observations of ice-covered North
     Slope Lakes imaged by radar
     [ NASA-TM-84127]
                                           p0 117 N82-18664
URIGAND, A. J.
   Texturing polymer surfaces by transfer casting [NASA-CASE-LEW-13120-1] p0068 N82
                                           p0068 N82-28440
WEIMER, D.
   Pockels-effect cell for gas-flow simulation
     [NASA-TP-2007]
WEIMBERG, I.
   Gallium arsenide solur cells-status and prospects
     for use in space
                                           D0043 A82-11765
   A theory of the n-i-p silicon solar cell
                                           p0128 A82-45055
   Effects of processing and dopant on radiation
     damage removal in silicon solar cells
     [NASA-TH-82892]
                                           p0042 N82-31443
WEINBERGER, S. M.
   Preliminary design development of 100 KW rotary
     power transfer device
     [ NASA-CR-165431]
                                           p0084 N82-23395
UBINBRT, H.
   Cesiation of W/001/ - Work function lowering by
     multiple dipole formation
                                                  A82-30002
WEINCART, O.
   Winding for the Wind
                                           p0138 A82-37078
   Design, evaluation, and fabrication of low-cost
     composite blades for intermediate-size wind
     turbines
     [ NASA-CR-165342]
UBINSTRIN, M.
   Numerical analysis of confined turbulent flow
                                           p0093 A82-24748
URILER. V. G.
   On the cause of the flat-spot phenomenon observed
     in silicon solar cells at low temperatures and
     low intensities
                                           p0043 A82-39599
   Advances in high output voltage silicon solar cells
                                           PO 127 A82-44942
   On the cause of the flat spot phenomenon observed in silicon solar cells at low temperatures and
     low intensities
   On the cause of the flat-spot phenomenon observed
     in silicon solar cells at low temperatures and
     low intensities
     [NASA-TM-82903]
                                           p0126 N82-31777
WELTI, G. R.
   Microwave intersatellite links for communications
     satellites
WEEDELL, J. H.
   Review of analysis methods for rotating systems
     with periodic coefficients
                                           p0135 #82-23702
```

```
WENZEL, L. H. halytical investigation of nonrecoverable stall
                                                                                     [NASA-CR-167909]
                                                                                                                                 p0052 N82-29363
                                                                               WILLER, H. S.
                                                                                  Kevlar/PMR-15 polyimide matrix composite for a
     [ HASA-TH-82792]
                                                   p0018 N82-21195
                                                                               complex shaped DC-9 drag reduction fairing
[AIAA PAPER 82-1047] p0002 A82-37678
WILLIAMS, F. J.
Performance of PTFE-lined composite journal bearings
VERLE, M. J.
   Turbofan forced mixer-nozzle internal floofield.

Volume 2: Computational fluid dynamic medictions
[NASA-CP-3493] p0091 N82-22459
                                                                                     [ASLE PREPRIET 82-AH-IA-I]
WHEELER, D. R.
                                                                                                                                 p0104 A82-37854
                                                                                  Performance of PTFE-lined composite journal bearings [NASA-TM-82779] p0048 N82-17263
    Refractory coatings and method of producing the same [NASA-CASE-LEW-13169-1] p0060 N82-29415
    Refractory continus
[ MASA - CASE-LEW-13169-27
                                                                               WILLIAMS, J. H., JR.
                                                                                  Ultrasonic input-output for transmitting and receiving longitudinal transducers coupled to
                                                   p0061 N82-30371
UNIPPLE, D. L.

Development of a laser velocimeter for a large transcric wind tunnel
                                                                                     same face of isotropic elastic plate [NASA-CR-3506]
                                                                                                                                 p0110 N82-18613
                                                                               WILLIAMS, J. R.
Combustor development for automotive gas turbines
                                                   pC096 N82-32688
    Potentials of surfaces in space
                                                                                     [AIAA PAPER 82-1208]
                                                                                                                                 p0 104 A82-35062
                                                   p0 165 A82-23750
                                                                               WILLIAMS, M. . H.
                                                                                  Diffraction by a finite strip
   LOW NOX heavy fuel combustor concept program
[NASA-CR-167876] P0074 NO
LOW NOX heavy fuel combustor concept program
[NASA-CR-165481] P0138 NO
                                                                                                                                 p0150 A82-33605
                                                   P0074 N82-26482
                                                                                  Solution of the unsteady subsonic thin airfoil
                                                   p0138 N82-33827
                                                                                                                                 P0012 A82-41267
WHITE, J. W.
Application of steady state finite element and transient finite difference theory to sound
                                                                               WILLIAMS, P. F.
                                                                                  Environmental effects on solar concentrator mirrors
propagation in a variable area duct: A comparison with experiment [NASA-TM-82678] pols
WHITELEY, S. R.
Impedance conversion using quantum limit
                                                                               Low speed testing of the inlets designed for a
                                                                                     tamden-fan V/STOL nacelle
[NASA-TH-82728]
                                                   p0 151 N82-15847
                                                                                                                                 p0003 N82-11042
                                                                               WILLIAMS, R., T.
Effects of condensation and surface motion on the
      nonreciprocity for
      superconductor-insulator-superconductor mixer
                                                                                     structure of steady-state fronts
                                                   p0159 A82-31276
                                                                               WILLIS, E. A.
                                                                                  Development potential of Intermittent Combustion
   Stationary state model for normal metal tunnel
      junction phenomena
                                                                                     (I.C.) aircraft engines for commuter transport
                                                   DO 159 182-42912
                                                                                     applications
WHITLOW, J. B., JR.
NASA research in supersonic propulsion: A decade
                                                                                     [NASA-TM-82869]
                                                                                                                                 p0019 N82-26297
                                                                               WILSON, C. A.
YF 102 in-duct combustor noise measurements with a
      of progress
                                                                                     turbine nozzle, volume 1 [NASA-CR-165562-VOL-1]
      [ NASA-TM-82862]
                                                   p0019 N82-26300
WHITTEBERGER, J. D.

Comparative thermal fatique resistance of several oxide dispersion strengthened alloys
                                                                                                                                 p0153 N82-21031
                                                                                   YF 102 in-duct combustor noise measurements with a
                                                                                     turbine nozzle, volume 2 [NASA-CR-165562-VOL-2]
                                                   p0062 A82-11399
                                                                                                                                 p0153 N82-21032
   Effects of madic ester concentration and
                                                                                  YF 102 in-duct combustor noise measurements with a turbine nozzle, volume 3
      processing on physical and mechanical properties of PMR/Celion 6000 composites
                                                                                     [ NASA-CR-165562-VOL-3 ]
                                                                                                                                 p0 155 N82-21033
                                                   p0051 A82-27440
                                                                               WILSON, J. H.
                                                                                  Advanced turboprop testbed systems study.
    Long-term high-velocity oxidation and hot
      corrosion testing of several NiCrAl and FeCrAl
                                                                                     1: Testbed program objectives and priorities,
      base oxide dispersion strengthened alloys
                                                                                     drive system and aircraft design studies,
   p0062 A82-37151
Cn determination of fibre fraction in continuous
                                                                                     evaluation and recommendations and wind tunnel
                                                                                     test plans
      fibre composite materials
                                                                                     INASA-CR-167928-VOL-11
                                                                                                                                 p0028 N82-32370
                                                                               WILSON, P. M.
High-frequency high-voltage high-power DC-to-DC
                                                   P0051 A82-38133
   Crystallographic texture in
      oxide-dispersion-strengthened alloys
                                                                                     converters
                                                   p0062 A82-40041
   Application of a gripping system to test a uniaxial graphite fiber reinforced composite /FMR 15/Celion 6000/ in tension at 316 C
                                                                                  Analysis of transistor and snubber turn-off
                                                                                     dynamics in high-frequency high-voltage
                                                                                     high-power converters
                                                                                     [NASA-CR-168760]
                                                   p0051 A82-40796
                                                                                                                                  p0084 N82-22438
                                                                               WILSON, R. M. Fatique tests with a corrosive environment
   Structure and creep rupture properties of
      directionally solidified eutectic
      gamma/gamma-prime-alpha alloy
                                                                               WILSOW, T. G.
High-frequency high-voltage high-power DC-to-DC
                                                   D0062 A82-42774
WIGGINS, J. V.
    Primary propulsion/large space system interaction
                                                                                     converters
      study
                                                                                                                                 p0083 NB2-12347
      FNASA-CP- 1652771
                                                   p0044 N82-18315
                                                                                  Analysis of transistor and snubber turn-off
WILBERS, L.
                                                                                     dynamics in high-frequency high-voltage
    Cost/benefit studies of advanced materials
                                                                                     high-power converters
      technologies for future aircraft turbine
                                                                                     [NASA-CR-168760]
                                                                                                                                 p0084 N82-22438
      engines: Materials for advanced turbine engines [ NASA-CP- 167849] p0026 NB2-25
                                                                               WIMMER, E.
                                                   p0026 N82-25254
                                                                                  Cesiation of W/001/ - Work function lowering by
WILCOCK, D. F.
Proliminary study of temperature measurement
techniques for Stirling engine reciprocating seals
                                                                                     multiple dipole formation
                                                                                                                                         A82-30002
                                                                               WINERR, J. H.
                                                                                  Analytical and experimental evaluation of biaxial
      [ NASA-CP- 165479]
                                                   p0104 N82-11466
WILHELMSSON, H.
                                                                                     contact stress
    On a free-electron-laser in a uniform wagnetic
                                                                                                                                  p0071 A82-20741
      field - A solution for arbitrarily strong
                                                                               WINCHESTER, D. C.
      electromagnetic radiation fields
                                                                                  Buoyancy effects on the temperature field in
```

downward spreading flames

p0094 A82-41203

A82-28409

Pyrolytic graphite collector development program

Timesiller, J. R.	scroll	009 N82-32310
Effect of rotor configuration on guyed tower and foundation designs and estimated costs for	[NASA-CR-167920] p0 **MOODCOCK, G.,	005 R02-32310
Intermediate site horizontal axis wind turbines [NASA-TM-82804] [NASA-TM-82804]	Overview study of Space Power Technolog advanced energetics program	ies for the
NINER, W. O. Regimes of traction in concentrated contact		132 182-17606
lubrication	40-kw phosphoric acid fuel cell field t	est -
[ASHE PAPER 81-LUB-16] P0107 A82-18431 Some observations in high pressure rhoology of	Project plan p0	128 182-45325
lubricants	WOODWARD, R. P.	
[ASHE PAPER 8 -LUB-17] p0070 A82-18432 Some observations in high pressure rheology of lubricants	Forward acoustic performance of a model designed for a high specific flow (QF (MASA=TP=1968) p0	
[ASME PAPER 81-LUB-17] p0070 A82-10432	HOOLLETT, R. R.	132 802-21030
Proliminary study of temperature measurement	Thrust modulation methods for a subsoni	C V/STOL
techniques for Stirling engine reciprocating seals	aircraft	
[NASA-CR-165479] p0104 N82-11466	[WASA-TM-82747] p0	1003 N82-13112
WIWSA, E. A. Tungsten fiber reinforced superalloy composite	Quantitative separation of tetralin hyà	roperoxide
high temperature component design considerations [NASA-TM-82811] p0049 N82-21259	from its decomposition products by hi performance liquid chromatogyaphy	
WINTER, J. N.		048 A82-15696
Experimental performance of the regenerator for the Chrysler upgraded automotive gas turbine	Deposit formation in liquid fuels. II - of selected compounds on the storage	
engine [NASA-TM-82671] p0120 N82-21712	of Jet A turbine fuel	074 A82-22240
Comparative analysis of the conceptual design	Deposit formation in liquid faels. I -	
studies of potential early commercial MHD power plants (CSPEC)	coal-derived Lewis bases on storage s Jet A turbine fuel	
[NASA-TH-82897] p0123 N82-27838		074 482-22241
WINTUCKY, E. G.	Deposit formation in liquid fuels. III	
Ion beam textured graphite electrode plates	effect of selected nitrogen compounds	on diesel
[NASA-CASE-LEW-12919-2] p0050 N82-26386 WIRSCHING, P. H.	fuel	074 A82-23238
The application of probabilistic design theory to high temperature low cycle fatique	## ## ## ## ## ## ## ## ## ## ## ## ##	
[NASA-CR-165488] p0112 N82-14531	(MAPPS). Volume I: Technical report	
Structure and creep rupture properties of directionally solidified eutectic	Modeling and Analysis of Power Processi (MAPPS). Volume 2: Appendices	
qamma/qamma-prime-alpha alloy p0062 A82-42774		145 N82-16748
WISANDER, D. W.	A new approach to the minimum weight/lo	ss design
Fully plasma-sprayed compliant backed ceramic	of switching power converters	
turbine seal [NASA-CASE-LEW-13268-2] point NB2-26674	WU, J. C.	1082 A82-16831
Fully plasma-sprayed compliant backed ceramic turbine seal	Solutions of the compressible Wavier-St equations using the integral method	OKes
[NASA-CASE-LEW-13268-1] p0069 N82-29453		093 A82-23832
WISEHAU, G.	A new numerical approach for compressib	
Numerical simulation of plasma insulator	flows	
interactions in space. Part 1: The self consistent calculation	[NASA-CR-168842] p0	1090 N82-22455
p0039 N82-14272	V	
Numerical simulation of plasma insulator	Y	
interactions in space. Part 2: Dielectric	TAMAHOTO, To	
effects	Effect of tangential traction and rough	
p0039 N82-14273	crack initiation/propagation during r	coffred
Core compressor exit stage study. Volume 4: Data		103 A82-30022
and performance report for the best stage	Plastic deformation and wear process at	
configuration	during unlubricated sliding	
[NASA - CR - 165357] p0023 N82-14092		1102 N82-32735
Core compressor exit stage study. Volume 5: Design and performance report for the Rotor	Wear mechanism based on adhesion [NASA-TP-2037] p0	103 N82-32737
C/Stator B configuration	YANG, S. H.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
[NASA-CF- 165358] p0023 N82- 14093	Indentation law for composite laminates	
Core compressor exit stage study, volume 6		1952 N82-15123
[NASA-CR- 165553] pn027 N82-27310	YAU, J. Ye	1
Dynamic switch matrix for the TDMA satellite	Interface cracks in adhesively bounded joints	Tap-snear
switching system		116 A82-46109
[AIAA 82-0458] p0065 A82-23494	Analysis of cracks emanating from a cir	
WOLF, N.	in unidirectional fiber reinforced co	eposites,
Overview study of Space Power Technologies for the	part 2	111% 3000-00010
advanced energetics program [NASA-CP-165269] p0132 N82-17606	[NASA-CR-165433] p0 Analysis of interface cracks in adhesive	114 N82-26714
WONG, E. L.	lap shear joints, part 4	wal bonded
Effect of hydrocarbon fuel type on fuel		114 N82-26716
[NASA-TM-82916] p0072 N82-38460	TBARRA, A. H.	
WONG, B. Y.	Low speed testing of the inlets designe	ed for a
Cold-air performance of a 15 41-cm-tip-diameter	tamden-fan V/STOL nacelle	1003 NOT-11085
axial-flow power turbine with variable-area stator designed for a 75-kW automotive gas	[NASA-TM-82728] p0	0003 N82-11042
turbine engine	Effect of aluminum phosphate additions	on
[NASA-TH-82644] p0024 N82-21193	composition of three-component plasma	
Three dimensional flow measurements in a turbine	solid lubricant [NASA-TP-1990] p0	059 N82-21298

Method of protecting a sufface with a silicon-slurry/aluminide coating [NASA-CASE-LEW-13343-1] [NASA-CASE-LEW-13343-1] p0068 N82-28441 A study of the nature of solid particle impact and shape on the erosion acrphology of ductile metals [NASA-TH-82933] p0061 N82-33493 TU, P. W. Undoped semi-insulating LEC Gals - A model and a nechanism p0 159 AB2- 1375% Compensation mechanism in liquid encapsulated Czochralski Gaks Importance of mult stoichiometry Pover system design optimization using Lagrange multiplier techniques p0085 A82-20743 Analysis and design of a standardized control module for switching regulators P0083 A82-46388 Modeling and Analysis of Power Processing Systems (MAPPS). Volume 1: Technical report DO083 N82-14447 Hodeling and Analysis of Power Processing Systems (HAPPS), Volume 2: Appendices [NASA-CR- 165539] p0.145 NB2-16748 Acoustic microscopy of silicon carbide materials p0075 A82-33031 YURKOVICH, S. A tensor approach to modeling of nonhomogeneous nonlinear systems p0148 A82-19064 ZAPRAM, S. Integrated propulsion for near-Earth space missions. Volume 1: Executive summary [NASA-CR-167889-VOL-1] p0045 p0045 N82-33424 Integrated propulsion for rear-Earth space

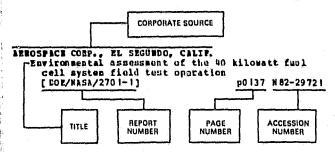
mission Volume 2: Technical NASA-CR-167889-VOL-2 p0046 N82-33425 ZAPLATIESKY, I.

Castable high temperature fractory materials
[NASA-CASE-LEW-13080-2] p0066 NE
Review of NASA progress in thermal barrier
coatings for stationary gas turbines p0066 N82-11210 [NASA-TM-81716] p0058 N82-17335 Performance of laser glazed ZrO2 TBCs in cyclic oxidation and corrosion burner test rigs [NASA-TM-82830] p0059 N82-22346 Method and apparatus for coating substrates using lasers [NASA-CASE-LEW- 13526- 1] p0059 N82-22347 ZARZISKY, E. V. Development of high-speed rolling-element hearings. A historical and technical perspective [NASA-IM-82884] p0100 N82-2449 p0 100 N82-24497 Advances in high-speed rolling-element bearings [NASA-TM-82910] p0101 N82-28644 Precision of spiral-bevel gears [NASA-TH-82888] p0102 N82-30552 Kinematic precision of gear trains [NASA-TH-82887] p0 102 N82-32733 Effect of shot peening on surface fatigue life of carburized and hardened AISI 9310 spur gears [NASA-TP-2047] p0 102 N82-32736 ZEID, I. Engine dynamic analysis with general nonlinear finite element codes. II - Bearing element implementation, overall numerical characteristics and benchmarking [ASMR PAPER 82-GT-292] p0 108 A82-35462 Engine dynamic analysis with general nonlinear finite element codes. Part 2: Bearing element implementation overall numerical characteristics and benchmaking [NASA-CE- 167944] p0028 N82-33390 EBLLER, J. The role of modern control theory in the design of controls for aircraft turbine engines [NASA-TM-82815] p0018 N82-22262 ZICKWOIF, H. C., JR.
Proliminary study, analysis and design for a power switch for digital engine actuators [NASA-CR- 159559] p0085 N82-23394 ZIEMER, R. E. Conversion and matched filter approximations for

serial minimum-shift keyed modulation p0080 A82-26713 Near optimum delay-line detection filters for serial detection of MSK signals p0086 A82-43867 ZIBB, D. T. An iterative finite element-integral technique for predicting sound radiation from turbofan inlats in steady flight [AIAA PAPER 82-0124] p0030 A82-17796 Prediction of sound radiation from different practical jet engine inlets [NASA-CR-165120] p0 153 N82-16810 Acoustic properties of turbofan inlets
[NASA-CR-169016] p0153 N82-27090 Development of a spinning wave heat engine [NASA-CR-1656 11] P0028 N82-31328 Evaluation of the potential of the Stirling engine for heavy duty application [NASA-CR-165473] p0128 #82-10505 SHROCESK, L., A. Advanced general aviation engine/airframe integration study [NASA-CR-165565] p002 p0025 N82-22268 TOLETT, B. A., Propulsion study for Small Transport Aircraft Technology (STAT) [NASA-CR-165499] p0022 N82-10037

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



The title of the document is used to provide a brief description of the subject matter. The page number and NASA or AIAA accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the docu-

ACUREX CORP., HOUNTAIN VIEW, CALIF. High temperature durable catalyst development p0056 A82-20739
Development of a high-temperature durable catalyst for use in catalytic combustors for advanced automotive gas turbine engines polso w82-13510 Computer model of catalytic combustion/Stirling engine heater head [NASA-CR- 165378] AEROJET LIQUID ROCKET CO., SACEAMENTO, CALIF. Propulsion system options for low-accoloration orbit transfer [AIAA PAPER B2-1196] p0047 182-35056 Puel/oxidizer-rich high-pressure preburners [NASA-CF- 165404] p0073 N82-10245 Low-thrust Isp sensitivity study [NASA-CR- 165621] p0045 N82-22309 Testing of fuel/oridizer-rich, high-pressure preburners PREDICTIONS

[NASA-CF-165609] p0074 N82

ABROJET NUCLEAR SYSTEMS Co., SACRAHENTO, CALIF.

LOW-thrust chemical propulsion system pump P0074 N82-24353 technology [NASA-CE-165219] p0105 N82-13427 AEROSPACE CORP., EL SEGUNDO, CALIF. Environmental assessment of the 40 kilowatt fuel cell system field test operation [DOK/NASA/2701-1] p0137 N82-; AIR FORCE ACADEMY, COLO.
Comparison of beam and shell theories for the p0137 N82-29721 vibrations of thin turbomachinery blades [ASME PAPER 82-GT-223] p0115 A p0115 A82-35408 AIR FORCE GROPHYSICS LAB., HANSOON AFE, MASS.
Validation of the NASCAP model using spaceflight [ATAM PAPER 82-0269] p0038 AB2-17
ATRESEARCH CASTING CO., TORRANCE, CALIF.
Oxidation stability of advanced reaction-bonded P0038 A82-17872 Si3N4 materials [ACS PARER 52-B-809] p0074 A82-330;
AIRESEARCH HFG. CO., PHOEMIX, ARIZ.
Pollution reduction technology program small jet p0074 X82-33030 aircraft engines, phase 3 [NASA-CE-165386] p0023 N82-14095 ERBS fuel addendum: Pollution reduction technology program small jet aircraft engines, phase 3 [NASA-CB- 165387] p0024 N82-14096 Advanced Gas Turbine (AGT) powertrain system initial development report

po 132 NB2-16485 Advanced Gas Turbine (AGT) powertrain system development for autoactive applications [NASA-CA-165175] p0 163 p0 163 N82-16937 Optimal tooth numbers for compact standard spur qear sets [ASME PAPER BI-DET-115] p0 103 A82-19335 [ASME PAPER 81-DET-115] p0 103 A82-19
Engine dynamic analysis with general nonlinear
finito element codes. II - Bearing element
implementation, overall numerical
characteristics and benchmarking
[ASME PAPER 82-GT-292] p0 108 A82-35
On the solution of crosep induced buckling in p0 108 A82-35462 general structure Self-adaptive closed constrained solution algorithms for nonlinear conduction p0094 A82-45157 Engine dynamic analysis with general nonlinear finite element codes. Part 2: Bearing element implementation overall numerical characteristics and benchmaking [NASA-CR-167944] p0028 N82-33390 ALABAMA UNIV., HUNTSVILLE. Modification of spacecraft potentials by thermal electron emission on ATS-5 p0040 A82-16194 Field-aliqued ion streams in the earth's midnight region p0140 A82-31009 The hidden ion population of the magnetosphere p0 140 A82-32630 ANDRESON (WILLIAM J.), WORTH OLESTED, OHIO. Bearings: Technology and needs point NB2-2667 NASA-CF .67908 POINT OF INDUSTRY, CALIF. p0106 NB2-26679 Thin foil silicon solar cells with coplanar back contacts DO 127 AB2-44944 Development of thin wrapsround junction silicon solar cells [NASA-CR-165570] p0133 N82-180
ARINC RESEARCH CORP., ANNAPOLIS, ND.
The 30/20 GHz communications satellite trunking network study p0133 NB2-18689 [NASA-CR-165467] p0078 N82 ARIZOMA STATE UNIV., TEMPE. Flow distributions and discharge coefficient p0078 N82-13302 effects for jet array impingement with initial crossflow [ASHR PAPER 82-GT-156] pDOI1 AB2-35379 Nonlinear analysis of rotor-bearing systems using component mode synthesis [ASME PAPER 82-GT-303] p0 104 A82-Socioeconomic impact of photovoltaic power at DO 104 A82-35468 Schuchuli, Arizona [NASA-CR-165551] ARIZONA UNIV., TUCSON. The application of probabilistic design theory to high temperature low cycle fatique [NASA-CR-165488] p0 112 N82-14531 ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND, CLEVELAND, OHIO. The effect of rotor blade thickness and surface finish on the performance of a small axial flow turbine p0003 N82-13114 [NASA-TH-82726] Multiroller traction drive speed reducer: Evaluation for automotive gas turbine engine p0101 N82-26678 [NASA-TP-2027] Tooth profile analysis of circular-cut, spiral-bevel gears [MASA-TH-82840] p0 10 1 N82-26681

Earth-to-space electromagnetic (Railgun)

launchers.

[NASA-CP-167886]

```
BECHTEL MATIONAL, INC., SAN PRANCISCO, CALIF.
Comparative analysis of CCHHD power plants
    Reliability model for planetary gear
       [NASA-TF-82859] p0 101 N82-28643
finite element stross analysis of spur gears
                                                                                                                                          p0 158 A82-20747
                                                                                    BERCH AIRCRAFT CORP., WICHITA, KANS.
Advanced general aviation engine/airframe
       including fillet radii and ris thickness effects
[NASA-TH-82865] p0101 N82-286 ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND, 5T.
                                                     p0101 N82-28646
                                                                                           integration study
LOUIS, HO.
Computer program for derodynamic and blading design of multistage axial-fice compressors
                                                                                           [ NASA-CR- 165565 ]
                                                                                                                                          p0025 N82-22268
                                                                                    BEERS ASSOCIATES, INC., RESTON, VA.
Internal breakdown of charged spacecraft
       [ NASA-TP- 1946]
                                                     p0016 N82-15039
                                                                                            dielectrics
    Geometry and starvation effects in hydrodynamic
                                                                                                                                          p0041 A82-18312
                                                                                    BOEING ARROSPACE CO., SEATTLE, WASH.
Study of electrical and chemical propulsion
       lubrication
       [ NASA-TH-828071
                                                      p0042 N82-20240
                                                                                           systems for auxiliary propulsion of large
space systems. Volume 1: Executive summary
[NASA-CR-165502-VOL-1] p0046 N82-1
ARMY COLD REGIONS RESEARCH AND ENGINEERING LAB.,
HANOVER, W. H.
    Ground-truth observations of ice-covered North
                                                                                                                                          p0046 N82-11110
      Tlore lakes imaged by radar [NASA-TH-84127]
                                                                                         Study of electrical and chemical propulsion
                                                                                    systems for auxiliary propulsion of large
space systems, volume 2
[NASA-CR-165502-VOL-2] p0044 N82-
BORING CO., SEATTLE, WASM.
The supply of lunar oxygen to low earth orbit
                                                      p0117 N82-18664
ARMY MATERIALS AND MECHANICS RESEARCH CENTER.
WATERTOWN, HASS,
On determination of fibre fraction is continuous
                                                                                                                                          D0044 N82-11111
       fibre composite materials
p0051 A82-38133
BRRY PROPULSION LAB., CLEVELAND, OHIO.
Surface genetry of Cartenand, OHIO.
                                                                                                                                          p0032 A82-35618
                                                                                         Testing of solar cell covers and encapsulants
                                                                                           conducted in a simulated space environment [NASA-CR-165475] p0129 N8
    Surface geometry of circular cut spiral bevel
                                                                                                                                          p0 129 N82-1257 I
       gears
                                                                                    BOBING COMMERCIAL AIRPLANE Co., SEATTLE, WASH.
Aerodynamic analysis of VTOL inlets and
definition of a short, blowing-lip inlet
       [ASHE FAPER RI-DET-114]
                                                      p0108 A82-19334
    Optimal tooth numbers for compact standard spur
       gear sets
                                                                                            [ NASA-CR-165617]
                                                                                                                                          P0007 NB2-22211
       TASHE PAPER 91-DET-1151
                                                     p0103 A82-19335
    The effect of rotor blade thickness and surface
                                                                                         B747/JT9D flight loads and their effect on
                                                                                            engine running clearances and performance deterioration; BCAC NAIL/P and WA JT9D engine
       finish on the performance of a small axial
       flow turbine
[ ASME PAPER 82-GT-222 ]
                                                                                    diagnostics programs
[NASA-CR-165573] p0027 N82
BORING COMPUTER SERVICES CO., TUKNILA, WASH.
Hybrid and electric advanced vehicle systems
                                                     p0022 A82-35409
    Nonlinear analysis of rotor-bearing systems
                                                                                                                                          p0027 N82-28298
using component mode synthesis
[ASHE PAPER 82-CT-303] p0 104 A82-35
ASSOCIATES IN BURAL DEVELOPMENT, INC., EURLINGTON,
                                                     p0 104 A82-35468
                                                                                            (heavy) simulation
                                                                                            [ NASA-CR- 165536 ]
    Market assessment of photovoltaic power systems
                                                                                     BORING HILITARY AIRPLANE DEVELOPMENT, SEATTLE, WASH.
       for agricultural applications in Colombia
                                                                                         Environmental effects on defect growth in
    [NASA-CR-1655241 p0 34 N82-22770 Application of photovoltaic electric power to the rural education/communication needs of
                                                                                           composite materials [NASA-CR-165213]
                                                                                                                                          p0052 N82-20248
                                                                                    BORING VERTOL CO., PHILADELPHIA, PA.
Performance degradation of propeller/rotor
       developing countries
       [ NASA-CR- 167894]
                                                      p0137 N82-29720
                                                                                           systems due to rime ice accretion [AIAA PAPER 82-0286]
AUSTRALIAN NATIONAL UNIV., CANBERRA,
Feasibility of an earth-to-space rail launcher
                                                                                                                                          p0014 A82-28322
                                                                                         On the automatic generation of PEM models for complex gears - A work-in-progress report
       system
FINE PAPER P2-46] p0033 A8:
AVCO-EVERETT RESEARCH LAB., MASS.
MHD channel performance for potential early
commercial MHD power plants
                                                      D0033 A82-44659
                                                                                                                                          p0 109 A82-48243
                                                                                    BURMS AND ROE, INC., MOODBURY, N. Y.

HHD oxidant intermediate temperature ceramic
                                                                                            heater study
                                                                                           [ NASA-CR-165453]
                                                     p0158 A82-20750
                                                                                                                                          p0 13 1 N82-15527
AVCO LYCOMING DIV., STRATFORD, CONN.

Development of improved high temperature coatings for IN-792 + HY
       [ NASA-CR- 165395 ]
                                                                                    CAIRO UNIV. (EGYPT).

Effects of internal heat transfer on the structure of self-similar blast waves
                                                      p0063 N82-14333
    YF 102 in-duct combustor noise measurements with
      a turbine nozzle, volume 1
[NASA-CR-165562-VOL-1]
                                                                                                                                          p0093 A82-32225
                                                      p0153 N82-21031
        102 in-duct combustor noise measurements with
                                                                                     CALIFORNIA STATE UNIV., LOS ANGELES.
      a turbine mozzle, volume 2
[NASA-CK-165562-VOL-2]
                                                                                         Electrostatic fuel conditioning of internal
                                                      p0153 N82-21032
                                                                                            combustion engines
                                                                                    [NASA-CR-169029] p0 106 N82-
CALIFORNIA UNIV., BERKELEY.
Secondary effects in combustion instabilities
leading to flashback
    YF 102 in-duct combustor noise measurements with
                                                                                                                                          p0 106 N82-26680
       a turbine nozzle, volume 3 [NASA-C2-165562-Vol-3]
                                                      p0155 N82-21033
     Small axial turbine stator technology program
       [ NASA -CR- 165692]
                                                      p0028 N82-32367
                                                                                            [AIAA PAPER 82-0037]
                                                                                                                                          p0056 A82-17746
                                                                                         Numerical modeling of turbulent combustion in
                                                                                            premixed gases
                                                                                                                                          p0056 A82-28708
BABCOCK AND WILCOX Co., BARBERTON, OHIO.
Comparative analysis of CCMHD power plants
                                                                                         Impedance conversion using quantum limit
                                                                                           nonreciprocity for superconductor mixer
                                                     p0158 A82-20747
BALES-MCCOIN TRACTIONNATIC, INC., EL PASO, TEX.
Design study of a continuously variable roller
cone traction CVT for electric vehicles
                                                                                            compensation
                                                                                                                                          p0 159 A82-31276
                                                                                         Effects of internal heat transfer on the
[ NASA-CR- 159841]
BATTELLE COLUMBUS LABS., ORIO.
                                                     p0105 N82-12445
                                                                                            structure of self-similar blast waves
                                                                                                                                          p0093 A82-32225
    Feasibility of an earth-to-space rail launcher
                                                                                         On stability of premixed flames in stagnation -
       system
                                                                                            Point flow
       FIAF PAPER 82-461
                                                      D0033 A82-44659
                                                                                                                                          p0057 A82-37574
    Stress evaluations under rolling/sliding contacts [NASA-CF-165561] p0113 #82-17521
                                                                                         Stationary state model for normal metal tunnel
                                                                                            junction phenomena
    Preliminary feasibility assessment for
                                                                                                                                          p0 159 A82-42912
```

p0033 N82-29345

Current legal and institutional issues in the

[NASA-CR-167867]

commercialization of phosphoric acid fuel cells

p0136 N82-29719

The control design of the second segment that

COLUMBIA UNIV.,

p0065 A82-40335

[NASA-CR-165353] p0 105 N82-CINCINNATI UNIV., ONIO. Surface geometry of circular cut spiral beyel no 105 MR2-12444 dears [ASHE PAPER 81-DET-114] Numerical analysis of confined turbulent flow p0093 182-24748 Multigrid simulation of asymptotic curved-duct flows using a semi-implicit numerical technique P0010 A82-29003 A study of viscous flow in stator and rotor Damsages [ASME PAPER 82-GT-248] p0011 A82-35427 High temperature low cycle fatigue mechanisms for nickel base and a copper base alloy [WASA-CR-3543] p0064 #82-26436 Microstructural effects on the room and elevated temperature low cycle fatigue behavior of Waspaloy
[NASA-CR-165497]
POY13 M62-26702
Mechanisms of deformation and fracture in high
temperature low cycle fatigue of Rene 80 and IM 100 [MASA-CR-165498] p0 113 NB2-26706 On finite element stress analysis of spur quars [MASA-CR-167938] p0 107 M82-29607 Three dimensional flow measurements in a turbine scroll [NASA-CR-167920] P0009 NB2-CITY COLL., OF THE CITY UNIV. OF NEW YORK.
Numerical analysis of confined turbulent flow p0009 N82-32310 p0093 A82-24748 CITY COLL. RESEARCH FOUNDATION, NEW YORK. Experimental study of turbulence in blade end vall corner region [NASA-CR-169283] p0091 H82-31639 CLEVELAND STATE UNIV., OHIO.

Characteristic dynamic energy equations for Stirling cycle analysis p0138 A82-11816 A theory of the n-i-p silicon solar cell p0 128 A82-45055 A multi-purpose method for analysis of spur gear tooth loading [NASA-CR-165163] p0104 N82-1040 LEADA-UK-165163] p0104 N82-10401 CLIMAX MOLYBDENUM CO. OF MICHIGAN, ANN ARBOR. Patique of Ni-Al-Mo aligned eutectics at elevated temperatures p0052 A82-13403 COLORADO SCHOOL OF HINES, GOLDEN. Quantitative separation of tetralin hydroperoxide from its decomposition products by high performance liquid chromatography p0048 A82-15696
Deposit formation in liquid fuels. II - The effect of selected compounds on the storage stability of Jet A turbine fuel p0074 A82-22240
Deposit formation in liquid fuels. I - Effect of
coal-derived Lewis bases on storage stability
of Jet A turbine fuel p0074 A82-22241 Deposit formation in liquid fuels. III - The effect of selected nitrogen compounds on diesel fuel p0074 A82-23238 COLORADO STATE UNIV., FORT COLLINS. Surface diffusion activation energy determination using ion beam microtexturing p0 159 A82-21965 Quasi-liquid states observed on ion beam microtextured surfaces Ion-beam-induced topography and surface diffusion p0 160 A82-46426 Experimental simulation of biased solar arrays with the space plasma [NASA-CR-165485] DO157 N82-10880 Electric thruster research [NASA-CR-165603] p0045 N82-24285 Electric and magnetic fields [NASA-CR-165604] p0045 N82-28350 Ion beam microtexturing and enhanced surface diffusion [NASA-CR-167948] p0065 N8:
COLUMBIA UNIV., NEW YORK.
Creep and rupture of an ODS alloy with high
stress rupture ductility p0065 N82-31509

CORPORATE SOURCE INDEX

The second secon

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Numerical modalling of turbulent flow in a
combustion tunnel p0093 A82-27000 CALIFORNIA UNIV., LA JOLLA.

Potentials of surfaces in space p0165 182-23750 Shuttle to GEO propulsion tradeoffs

[ATAN PAPER 82-1245] p0034 A62-3506

CALIFORNIA UNIV., LOS ANGELES.

Analytical and experimental investigation of the propagation and attenuation of sound in extended reaction lined ducts

[ATAN PAPER 82-1245] p0034 A02-35082 catended reaction lined ducts
[AIAA PAPER BI-2014] p0153 A82-(
The velocity field near the orifice of a
Helmholtz resonator in grazing flow
[NASA-CR-168548] p0153 M82-(
CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND).
Acoustic transmission in lined flow ducts "A
finite element eigenvalue problem
n0154 A82-(p0 153 A82-10454 p0153 N82-18994 CARBORUMBUM CO., MIAGARA FALLS, N. Y. Net shape fabrication of Alpha Silicon Carbide turbing components [ASME PAPER 82-GT-216] p0071 A82-35/CARMEGIE INSTITUTION OF WASHINGTON, D. C. Evidence for Pu-244 fission tracks in hibonites p0071 A82-35403 from Eurchison carbonaceous chondrite p0166 A82-29316 CARRIER CORP., STRACUSE, N.I. Heasurement of oil film thickness for application to elastoweric Stirling engine rod seals [ASME PAPER 8 1-LUN-9] p0 107 A62-18426 CASE WISTERN RESERVE UNIV., CLEVELAND, ONIO.
Multijunction high voltage concentrator solar Dilution jet behavior in the turn section of a reverse flow combustor [ATAA PAPER 82-0192] p0021 A82-20291 Natural convection with combined driving forces p0093 A82-31445 Electron beam induced damage in ITO coated Kapton Pahrication of multijunction high voltage concentrator solar cells by integrated circuit p0127 A82-44957 The influence of cobalt on the tensile and stress-rupture properties of the nickel-base superalloy MAR-M247 p0063 A82-47399 The influence of cohalt on the microstructure of the nickel-base superalloy MAR-M247 p0063 A82-47400 Transient catalytic combustor model [NASA-CR-165324] p0129 N82-13507 Secondary electron emission yields p0038 N82-14226 Investigation and evaluation of a computer program to minimize three-dimensional flight time tracks T MASA-CR- 1684 191 Shaded computer graphic techniques for visualizing and interpreting analytic fluid flow models [NASA-CR-168418] p0145 N82-Fatigue life prediction in bending from axial fatigue information p0145 N82-17880 [NASA-CR- 165563] p0113 N82-20564 Coaxial prime focus feeds for paraboloidal reflectors [NASA-CR- 167934] p0078 N82-31585 CELAMESE RESEARCH CO., SUMMIT, N.J.
Creep and rupture of an ODS alloy with high
stress rupture ductility p0065 A82-40335 CBSSWA AIRCRAFT CO., VANDALIA, OHIO.

Impact of advanced propeller technology on aircraft/mission characteristics of several general aviation aircraft qeneral aviation alterate
[NASA-CR-167984] p00
CESSMA ATECRAFT CO., WICHITA, KANS.
Advanced general aviation comparative
engine/airframe integration study p0009 N82-33347 [NASA-CR- 165564] CHRYSLER CORP., DETROIT, HICHp0025 NB2-22263

AGT-102 automotive gas turbine

```
COMMUNICATIONS SATELLITE CORP., CLARKSBURG, MD. High- and low-resistivity silicon solar cells
                                                                                                       P0046 A82-11762
        Microwave intersatellite links for communications satellites
                                                                                                       p0036 A82-36925
         Advances in high output voltage silicon solar
                                                                                                       p0127 A82-44942
COMPOSITES HORIZONS, POMONA, CALIF.
COMPOSITES HORIZONS, POHONA, CALIE.

Hybridized polymer matrix composite
[NASA-CR-165340] p0051

CONCORDIA UNIV., HONTREAL (QUEBEC).

Bluff-body flameholder wakes - A simple
numerical solution
[AIAA PAPER 82-1177] p0093

COMMECTICUT UNIV., STORMS.

Turbine endwall single cylinder program
[NASA-CR-169278] p0099
                                                                                                       p0051 N82-12139
                                                                                                       P0093 A82-35043
              [ NASA-CR- 169278]
                                                                                                       p0091 N82-31638
CORNELL UNIV., ITHACA, M. Y.
         Time resolved density measurements in premixed turbulent flames
[AIAA PAPER 82-0036] p0056 A82-2
                                                                                                       p0056 A82-22033
        Flame structure in a swirl stabilized combustor inferred by radiant emission measurements
                                                                                                       p0056 A82-28694
         Exhaust gas measurements in a propane fueled
              swirl stabilized combustor
              [ NASA-CR- 169293]
                                                                                                       p0091 N82-31641
Flow process in combustors
[NASA-CR-169294] p0092 NE
CURTISS-WRIGHT CORP., WOOD-BIDGE, W.J.
Advanced stratified charge rotary aircraft
                                                                                                       p0092 NB2-31642
             engine design study
              T NASA-CR- 1653981
                                                                                                       p0107 N82-27743
DARTHOUTH CCLL., HAWOVER, W.H.
Single pass rub phenomena - Analysis and
              experiment
             [ ASME PAPER 81-LUB-55]
                                                                                                       p0107 A82-18449
        Becrystallization and grain growth in NiAl
                                                                                                       p0065 A92-44529
DAYTON UNIV., OHIO.

Permanent magnet properties of Mn-A1-C between
-50 C and +150 C
                                                                                                       p0085 A82-20505
         Mathematical modeling of ice accretion on airfoils
                                                                                                       p0014 A82-27098
             [AIAA PAPER 82-0284]
         Effect of heavy rain on aircraft
A preliminary study of crack initiation and growth at stress concentration sites [NASA-CR-169358] DEPARTMENT OF ENERGY, WASHINGTOE, D. C. Development of a dual-field heteropoplar power
              converter
[NASA-CR-165168] POOB4 NB DEPARTMENT OF TRANSPORTATION, CAMBRIDGE, HASS.
                                                                                                       p0084 N82-24424
        Puel economy and exhaust emissions
characteristics of diesel vehicles:
              results of a prototype fiat 131TC 2.4 liter
              automobile
             [ NASA-CR- 165535 ]
                                                                                                      p0164 N82-18068
DETROIT DIESEL ALLISON, INDIANAPOLIS, IND.
Propulsion study for Small Transport Aircraft
Technology (STAT)
[NASA-CR-165499] p0022 N82-
                                                                                                       p0022 NB2-10037
        Propulsion study for Small Transport Aircraft
Technology (STAT), Appendix B
[NASA-CR-165499-APP-B] p0022 N82-1
                                                                                                       p0022 N82-10038
        Low NOx heavy fuel combustor concept program
              addendum: Low/mid heating value gaseous fuel
        evaluation
[NASA-TR-165615]

Low NOx heavy fuel combustor concept program
[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]

[NASA-CR-165367]
poleum Nata-ce-165197] poleu N82-311
DEUTSCHE FORSCHUMGS- UND VERSUCHSANSTALT FUER LUFT-
UND RAUMFAHRT, COLOGNE (WEST GERHANY).
Structure and creep rupture properties of
directionally solidified eutectic
                                                                                                     p0164 N82-31158
              gamma/gamma-prime-alpha alloy
                                                                                                       p0062 A82-42774
             CORP. SOURCE FOR DV468724INACTIVE
        Harket assessment of photovoltaic power systems
```

for agricultural applications in Mexico

```
[NASA-CR-165441] p0 128 NB 2-105
Market assessment of photovoltaic power systems
for agricultural applications in Morocco
[NASA-CR-165477] p0 130 NB 2-146
Market assessment of photovoltaic power systems
                                                           p0 128 N82-10506
                                                           p0 130 NB2-14627
        for agricultural applications in Nigeria
                                                           p0 133 NB2-18698
        [ NASA-CR-165511]
     Market assessment of photovoltaic power systems
for agricultural applications in Colombia
     [NASI-CR-165524] p0 134 N82-22770
Application of photovoltaic electric power to
        the rural education/communication needs of
        developing countries [NASA-CR-167894]
[NASA-CR-167894] p0 137 N82-29720

DOUGLAS AIRCRAFT CO., IMC., LONG BEACH, CALIF.

Kevlar/FMR-15 polyimide matrix composite for a complex shaped DC-9 drag reduction fairing [ATAA PAPER 92-1047] p0002 A82-37678

Kevlar/FMR-15 reduced drag DC-9 reverser stang
        [ NASA-CR-165448]
                                                           p0052 N82-31448
     Advanced turboprop testbed systems study [NASA-CR-167895] p0014
                                                           p0014 #82-33375
DREXEL UNIV., PHILADELPHIA, PA.
Work of fracture in aluminum metal-matrix
        composites
     Formation of oxides of nitrogen in monodisperse
        spray combustion of hydrocarbon fuels
                                                           p0057 A82-37571
     Tensile properties of SiC/aluminum filamentary composites - Thormal degradation effects
                                                           p0053 A82-46220
Numerical comparisons of monlinear convergence
     High-frequency high-voltage high-power DC-te-DC
        converters
     p0083 N82-12347
Analysis of transistor and snubber turn-off
        dynamics in high-frequency high-voltage
dynamics in high-frequency migh-voltage high-power converters
[MASA-CR-168760] p0084 1
DYNAMICS TECHNOLOGY, INC., TORRANCE, CALIF.

Hean flowfields in axisymmetric combustor geometries with swirl
[AIAA PAPER 82-0177] p0092 1
                                                           p0092 A82-17824
     Turbulence measurements in a confined jet using a six-orientation hot-wire probe technique
        [AIAA PAPER 82-1262]
                                                           p0094 A82-37710
BATON CORP., SOUTHFIELD, MICH.
     Small passenger car transmission test:
Chevrolet Malibu 200C transmission with lockup
        [ NASA-CR-165182]
                                                           p0105 N82-16410
EATON ENGINEERING AND RESEARCH CENTER, SOUTHFIELD,
MICH.
     A PWM transistor inverter for an ac electric
        vehicle drive
                                                           p0085 A82-20744
     The ac propulsion system for an electric
        vehicle, phase (
[NASA-CR-165480]
                                                           p0129 N82-13506
     Straight and chopped DC performance data for a
        reliance EV-250AT motor with a General
Electric EV-1 controller
[NASA-CR-165447] p0 132
                                                           p0132 N82-17608
     Straight and chopped DC performance data for a General Electric 587436A! DC shunt motor with a General Electric EV-1 controller
        [ NASA-CR-165507]
                                                           P0085 N82-24425
     Small passenger car transmission test: Hercury
        Lynx ATX transmission
        [ NASA-CR-165510 ]
                                                           p0 106 N82-24496
ECO, INC., CARBEIDGE, MASS.
Cathode catalysts for primary phosphoric acid
        fuel cells
        [ NASA-CR-165578]
                                                           p0134 N82-21709
     Cathode catalyst for primary phosphoric fuel cells
[NASA-CR-165198] p0134 M82-22675
ECOLE NATIONALE SUPERIEURE DE MECHANIQUE ET
D'ARROTECHNIQUE, POITIERS (FRANCE).
     On stability of premixed flames in stagnation -
        Point flow
```

p0057 A82-37574

EDDE (BONARD), INC., BELLEVUE, WASH.
Collection and dissemination of thermal energy storage system information for the pulp and
paper industry
p0136 N82-24686
Moderate temperature Na cells, III - Riectrochemical and structural studies of
Cr0,5VC.5S2 and its Na intercalates
p0055 A82-15732 Noderate temperature Na cells IV - VS2 and
NbS2C12 as rechargeable cathodes in molten
NaA1C14 p0055 %82-15743
EMERGY RESEARCH CORP., DAMEURY, COMM.
Technology development for thosphoric acid fuel cell powerplant, phase 2
[NASA-CP-165426] p0131 N82-16482 EMGREHARD INDUSTRIES, INC., EDISON, N.J.
Develop and test fuel cell powered on-site
integrated total energy system. Phase 3: Full-scale power plant development
[NASA-CR-165328] p0117 N82-13490
Develop and test fuel cell powered on-site integrated total energy systems. Phase 3:
Pull-scale power plant development [NASA-CR-165455] p0131 N82-16483
Develop and test fuel cell povered on-site
integrated total energy systems: Phase 3: Full-scale power plant development
[NASA-CR-165568] p0135 N82-24648 Development and test fuel cell revered on-site
integrated total energy systems. Phase 3:
Fuli-scale power plant development [NASA-CR-167898] p0137 N62-30705
ENGINEERING SOCIETIES COMMISSION ON BURNGY, INC.,
WASHINGTON, D. C. Barriers to the utilization of synthetic fuels
for transportation
[HASA-CR-165517] p0073 N82-13243 ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC.,
CONCORD, MASS.
A review of transhorizon propagation phynomena
A review of transhorizon propagation phonomena p0079 182-10679
p0079 N82-10679
p0079 882-10679
p0079 A82-10679 FLOW RESPARCE, INC., KENT, WASE. Pinite volume calculation of three-dimensional
PLOW RESPARCE, INC., RENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller LATAL PAPER 82-98571
PLOW RESPARCE, INC., RENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] P0010 A82-31933 PLUIDYNE BUGINEBRING CORP., HINNEAPCLIS, HINN.
PLOW RESEARCH, INC., RENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] PLUIDYNE ENGINEERING CORP., HIMMARCLIS, HIMM MID oxidant intermediate temperature ceramic heater study
PLOW RESEARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] p0010 A82-31933 PLUIDYNE ENGINEERING CORP., HIMMEAPOLIS, HIMM. MID oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N82-15527
PLOW RESEARCH, INC., RENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] PLUIDYNE BEGINEBRING COBP., HIWBAPCLIS, HIWE. HIMD exidant intermediate temperature ceramic heater study [NASA-CR-165453] PORD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIF.
PLOW RESEARCH, INC., RENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] p0010 A82-31933 PLUIDYNE ENGINEERING CORP., HINNEAPOLIS, HINN. HID oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N82-15527 PORD ARROSPACE AND COMMUNICATIONS CORP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna
PLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] PLUIDYNE BUGINEBRING COBP., HIMMEAPOLIS, HIMM. HIMD exidant intermediate temperature ceramic heater study [NASA-CR-165453] p0 131 N82-15527 PORD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] pc079 A82-23486
PLOW RESEARCH, INC., KENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] p0010 A82-31933 PLUIDYNE ENGINEERING CORP., HINNEAPOLIS, HINN MHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0131 N82-15527 FORD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIP. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] pC079 A82-23486 Synamic 'switch matrix for the TDNA satellite switching system
PLOW RESEARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA 82-0957] PLUIDYNE BEGINEBEING COBP., HIMMEMPOLIS, HIMM HIMM HIMM HIMMEMPOLIS, HIMMEMP
PLOW RESEARCH, INC., KENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [ATAA PAPER 82-0957] p0010 A82-31933 PLUIDYNE ENGINEERING CORP., HINDEAPOLIS, HINE. MHD oxidant intermediate temperature coramic heater study [NASA-CR-165453] p0131 N82-15527 PORD ARROSPACE AND COMMUNICATIONS CORP., PALO ALTO, CALIF. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] p0079 A82-23486 Dynamic 'switch matrix for the TDNA satellite switching system [AIAA 82-0458] p0085 A82-23494 PORD MOTOR CO., DEARBORN, HICH. Advanced Gas Turbine (AGT) powertrain system
PLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] PLUIDYNE ENGINEERING COBP., HIMMERPLIS, HIMM. HIMD exidant intermediate temperature ceramic heater study [NASA-CR-16545] pol31 N82-15527 PORD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] pc079 A82-23486 Dynamic 'switch matrix for the TCHA satellite switching system [AIAA 82-0458] pol065 A82-23494 FORD MOTOR CO., DEARBORN, HICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] pol32 N82-16485
PLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] PLUIDYNE ENGINEERING COBP., HIMMERPLIS, HIMM. HIMD exidant intermediate temperature ceramic heater study [NASA-CR-16545] pol31 N82-15527 PORD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] pc079 A82-23486 Dynamic 'switch matrix for the TCHA satellite switching system [AIAA 82-0458] pol065 A82-23494 FORD MOTOR CO., DEARBORN, HICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] pol32 N82-16485
PLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] PLUIDYNE ENGINEERING CORP., HINNEAPCLIS, HINN. MHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] PORD ARROSPACE AND COMMUNICATIONS CORP., PALO ALTO, CALIP. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] Dynamic 'switch matrix for the TDNA satellite switching system [AIAA 82-0458] PORD MOTOR CO., DEARBORN, HICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] PUTURE SISTEMS, INC., GAITHERSBURG, MD. Cross-impact study of foreign satellite communications on NASA'S 30/20 GHz program
PLOW RESEARCH, INC., KENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] POOLO A82-31933 PLUIDYNE ENGINEERING CORP., HINDEAPOLIS, HINE. MHD oxidant intermediate temperature coramic heater study [NASA-CR-165453] PO 131 N82-15527 PORD ARROSPACE AND COMMUNICATIONS CORP., PALO ALTO, CALIP. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] POOP A82-23486 Dynamic 'switch matrix for the TDNA satellite switching system [AIAA 82-0458] POOE5 A82-23494 FORD MOTOR CO., DEARBORN, HICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] FUTURE SYSTEMS, INC., GAITHERSBURG, MD. CCOSS-impact study of foreign satellite
PLOW RESEARCH, INC., KENT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] POO10 A82-31933 PLUIDYNE ENGINEERING CORP., HINDEAPOLIS, HINE. MHD oxidant intermediate temperature coramic heater study [NASA-CR-165453] PO 131 N82-15527 PORD ARROSPACE AND COMMUNICATIONS CORP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] PO079 A82-23486 Dynamic 'switch matrix for the TDNA satellite switching system [AIAA 82-0458] PO065 A82-23494 PORD HOTOR CO., DEARRORN, HICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] POTURE SYSTEMS, INC., GAITHERSBURG, HD. CCOSS-impact study of foreign satellite communications on NASA'S 30/20 GHz program [NASA-CR-165154] POG ASSOCIATES, INC., TULLAHOMA, TENN. Design of prototype charged particle fog
PLOW RESEARCH, INC., RENT, WASE. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] PLUIDYNE ENGINEERING COBP., HIMMERCLIS, HIMM HAD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] p0 131 N82-15527 POBD ARROSPACE AND COMMUNICATIONS COBP., PALO ALTO, CALIN. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] pC079 A82-23486 Dynamic 'switch matrix for the TDNA satellite switching system [AIAA 82-0458] p00065 A82-23494 PORD HOTOR CO., DEARBORN, HICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] PUTURE SISTEMS, INC., GAITHERSBURG, HD. Cross-impact study of foreign satellite communications on NASA'S 30/20 GHz program [NASA-CR-165154] pC078 N82-17420 PNG ASSOCIATES, INC., TULLAHOHA, TENH.
PLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] POO10 A82-31933 PLUIDYNE EMERINE CORP., MINNEAPOLIS, MINN MHD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] PO 131 N82-15527 PORD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] PO 132 N82-23486 Dynamic 'switch matrix for the TCNA satellite switching system [AIAA 82-0458] PORD MOTOR CO., DEARBORN, MICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] PO 132 N82-16485 POTURE SISTEMS, INC., GAITHERSBURG, MD. Cross-impact study of foreign satellite communications on NASA'S 30/20 GHz program [NASA-CR-165154] PC 78 N82-17420 PMG ASSOCIATES, INC., TULLAHOMA, TERM. Design of prototype charged particle fog dispersal unit [NASA-CR-3481] PO 141 N82-16659
PLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] POO10 A82-31933 PLUIDYNE EMCINEERING CORP., MIMMEMPOLIS, MINM MED oxidant intermediate temperature ceramic heater study [NASA-CR-165453] POBD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] POO79 A82-23486 Dynamic 'switch matrix for the TDNA satellite switching system [AIAA 82-0458] PORD MOTOR CO., DEARBORM, MICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] POTORE SYSTEMS, INC., GAITHERSBURG, MD. Cross-impact study of foreign satellite communications on NASA'S 30/20 GHz program [NASA-CR-165154] POC78 N82-17420 FMG ASSOCIATES, INC., TULLAHONA, TENN. Design of prototype charged particle fog dispersal unit [NASA-CR-3481] PO141 N82-16659
PLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] PLUIDYNE ENGINEBRING CORP., HINNEAPCLIS, MINN. MHD oxidant intermediate temperature ceramic heater study [NASA-CR-16545] PORD ARROSPACE AND COMMUNICATIONS CORP., PALO ALTO, CALIP. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] Dynamic 'switch matrix for the TDNA satellite switching system [AIAA 82-0458] PORD MOTOR CO., DEARBORN, HICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] PUTURE SISTEMS, INC., GAITHERSBURG, MD. Cross-impact study of foreign satellite communications on NASA'S 30/20 GHz program [NASA-CR-165154] PNG ASSOCIATES, INC., TULLAHOHA, TENN. Design of prototype charged particle fog dispersal unit [NASA-CR-3481] GARRETT TURBINE ENGINE CO., PHOENIX, ABIZ. Analytical and experimental evaluation of
FLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] POO10 A82-31933 PLUIDYNE EMCINEERING CORP., MIMMEAPOLIS, MINM MED oxidant intermediate temperature ceramic heater study [NASA-CR-165453] POBD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] POO79 A82-23486 Dynamic 'switch matrix for the TCHA satellite switching system [AIAA 82-0458] POO85 A82-23494 FORD MOTOR CO., DEARBORM, MICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] PO132 N82-16485 FOTURE SYSTEMS, INC., GAITHERSBURG, MD. Cross-impact study of foreign satellite communications on NASA'S 30/20 GHz program [NASA-CR-165154] POC78 N82-17420 FMG ASSOCIATES, INC., TULLAHOMA, TENN. Design of prototype charged particle fog dispersal unit [NASA-CR-3481] PO141 N82-16659 GARRETT TURBINE ENGINE CO., PHOENIX, ANIZ. Analytical and experimental evaluation of biaxial contact stress
PLOW RESPACE, INC., RENT, WASE. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] POO10 A82-31933 PLUIDYNE ENGINEERING COBP., HIMMERCLIS, HIMM MRD oxidant intermediate temperature ceramic heater study [NASA-CR-165453] PO 131 N82-15527 POBD ARROSPACE AND COMMUNICATIONS COBP., PALO ALTO, CALIN. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] PC079 A82-23486 Dynamic 'switch matrix for the TDNA satellite switching system [AIAA 82-0458] PORD MOTOR CO., DEARBORN, HICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] POTORE SISTEMS, INC., GAITHERSBURG, MD. Cross-impact study of foreign satellite communications on NASA's 30/20 GHz program [NASA-CR-165154] PCC78 N82-17420 PMG ASSOCIATES, INC., TULLAHOMA, TENN. Design of prototype charged particle fog dispersal unit [NASA-CR-3481] PO 141 N82-16659 GARRETT TURBINE ENGINE CO., PHCENIX, ARIZ. Analytical and experimental evaluation of biaxial contact stress PO071 A82-20748 Oxidation stability of advanced reaction-bonded
FLOW RESPARCH, INC., REMT, WASH. Pinite volume calculation of three-dimensional potential flow around a propeller [AIAA PAPER 82-0957] POO10 A82-31933 PLUIDYNE EMCINEERING CORP., MIMMEAPOLIS, MINM MED oxidant intermediate temperature ceramic heater study [NASA-CR-165453] POBD ARROSPACE AND COMMUNICATIONS COMP., PALO ALTO, CALIR. 30/20 GHz communications satellite multibeam antenna [AIAA 82-0449] POO79 A82-23486 Dynamic 'switch matrix for the TCHA satellite switching system [AIAA 82-0458] POO85 A82-23494 FORD MOTOR CO., DEARBORM, MICH. Advanced Gas Turbine (AGT) powertrain system initial development report [NASA-CR-165130] PO132 N82-16485 FOTURE SYSTEMS, INC., GAITHERSBURG, MD. Cross-impact study of foreign satellite communications on NASA'S 30/20 GHz program [NASA-CR-165154] POC78 N82-17420 FMG ASSOCIATES, INC., TULLAHOMA, TENN. Design of prototype charged particle fog dispersal unit [NASA-CR-3481] PO141 N82-16659 GARRETT TURBINE ENGINE CO., PHOENIX, ANIZ. Analytical and experimental evaluation of biaxial contact stress

The AGT 101 advanced automotive gas turbine

[ASNE PAPER 82-GT-72]

```
Design and development of a ceramic radial turbine for the AGT101 [AIAA PAPER 82-1209] p0109 A
     Applications of high-temperature powder metal
       aluminum alloys to small gas turbines
                                                     p0065 A82-48244
    Cooled variable-area radial turbine technology
       [ MASA-CR-165408]
                                                     p0024 N82-19221
    Transport Aircraft Technology (STAT) program
[NASA-CR-165610] p0026 N02-24202
Computations of soot and and NO sub x emissions
       from que turbine combustors
       [ NASA-CR-167930 ]
                                                      p0139 N82-29777
GAS RESEARCH INST., CMICAGO, ILL.
40-kW phosphoric acid fuel cell field test -
       Project plan
p0 128 A82-45325
GENERAL APPLIED SCIENCE LABS., INC., WESTBURY, N. Y.
Experimental study of the effects of secondary
air on the emissions and stability of a lean
       premised combustor
TATAA PAPER 82-1072] p0021
GRUERAL DYNAHICS/CONVAIR, SAG DIEGO, CALIF.
    Design and verification of a multiple fault
tolerant coatrol system for STS applications
       using computer simulation [AIAA 81-2173]
     [AIAA 81-2173] p0035 A82-10124
Real-time computer simulation/emulation for
       verification of multi-fault-tolerant control
       of Centaur-in-Shuttle
       [AINA 81-2283]
                                                      p0040 A82-13494
    Centaur capabilities for communications
       satellite launches
                                                      p0034 A82-36286
       [AIAA PAPER 82-0558]
     Real-time microcomputer simulation for space
       Shuttle/Centaur avicaics
                                                      D0033 A82-48245
     Study of multi-megawatt technology needs for
       photovoltaic space power systems. Volume 1:
       Executive summary
                                                     p0130 N82-14636
       [ NASA-CR-165323-VOL-1]
    tudy of multi-mayawatt technology needs for photovoltaic space power systems, volume 2 [NASA-CR-165323-VOL-2] p0130 N82-14637 Low-thrust chemical propulsion system propellant
       expulsion and thermal conditioning study.
       Executive summary
    [MASA-CR-165622] p0045 N82-2428
Low-thrust chemical propulsion system propellant
expulsion and thermal conditioning study
[WASA-CR-167841] p0045 NB2-24288
GENERAL ELECTRIC CO., CINCINNATI, OHIO.
Effects of vane/blade ratio and spacing on fan
       noise
       [AIAA PAPER 81-2033]
    Thermal expansion accommodation in a jet engine
                                                      p0029 182-11999
    V/STOL propulsion control technology
[ATAL PAPER 81-2634] p0029 A8:
Turbine blade nonlinear structural and life
                                                      p0029 A82-16909
       analysis
       [AIAA PAPER 82-1056]
     Blade loss transient dynamic analysis of
       turbomachinery
    [AIAA PAPER 82-1057] p0030 A62-34982
WASA/General Electric broad-specification fuels
combustion technology program - Phase I
       results and status
[AIAA PAPER 82-1089]
     Progress in the development of energy efficient
       engine components
       ASME PAPER 82-GT-275]
                                                      p0030 A82-35450
    Optical tip clearance sensor for aircraft engine
       controls
       FAIAA PAPER 82-1131]
                                                     p0015 182-37691
     Core compressor exit stage study.
       Data and performance report for the best stage
       configuration
       F WASA-CR-1653571
     Core compressor exit stage study. Volume 5:
       Design and performance report for the Rotor
       C/Stator B configuration [WASA-CR-165358]
    [WASA-CR-165358] p0023 M82-14093
Demonstration of catalytic combustion with
       residual fuel
       [ MASA-CR-165369]
                                                      p0131 N82-16484
```

Some observations in high pressure rheology of

```
CF6 jet engine performance improvement: High pressure turbine roundness
        | NASA-CR-165555]
                                                          p0024 N82-17174
    CP6 Jet Engine Diagnostics Program: High
        pressure compressor clearance investigation [NASA-CR-165580] p0025 N82-
                                                          p0025 N82-21197
    Thrust reverser for a long duct fan engine [NASA-CASE-LEW-13199-1] p0019 NECore compressor exit stage study, colume 6
                                                          p0019 N82-26293
    Core compressor exit stage study, clume 6
f NASA-CR-1655531 p0027 N82-27310
CF6 1et engine performance improvement: High
       pressure turbine active clearance control [NASA-CR-165556] p0027 N8
                                                          p0027 N82-28297
     The CF6 jet engine performance improvement: Low
       pressure turbine active clearance control [NASA-CP-165557] p0029 N8
                                                          P0059 N85-33393
GENERAL ELECTRIC CO., EVENDALE, ONIC.

Thron-diensional flow field in the tip region of a compressor rotor passage. I - Mean velocity profiles and annulus wall boundary
    TASHE PAPER 82-GT-11]
Three-dimensional flow field in the tip region of a compressor rotor passage. II - Turbulence
                                                          p0011 A82-35285
        proporties
        FASHE PAPER 82-GT-2341
                                                          p0011 A82-35416
     Cost/benefit studies of advanced materials
        tachnologies for future aircraft turbine
        engines; Materials for advanced turbine engines
[NASA-CR-167849] p0026 N82-2525
                                                         p0026 N82-25254
GENERAL ELECTRIC CO., FAIRFIELD, COM.
Wideband, high speed switch matrix development
for SS-TDMA applications
                                                          p0086 A82-43784
GENERAL ELECTRIC CO., LYNN, MASS.
     Effects of vane/blade ratio and spacing on fan
        ncise
        FAIAA PAPER 81-2033]
                                                          p0029 A82-10457
    TF34 Convertible Engine System Technology Program p0022 A82-40521 Effect of a part span variable inlet quide vane
on TP34 fan performance
(NASA-CR-165458) p0023 HE
[NASA-CR-165458] p0023 HE
Comparative analysis of CCMHD power plants
                                                          p0 158 182-20747
    Adaptive rain fade compensation
    p0080 A82-27178
Preliminary design development of 100 KW rotary
        power transfer device
        [ NASA-CP- 16543 1]
                                                          pC084 N82-23395
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
     Optical tip clearance sensor for aircraft engine
        centrols
        [ AIAA FAPER 82-1131]
                                                          p0015 A82-37691
     Low NOx heavy fuel combustor concept program,
        T NASA-CR- 1654497
| NASA-CR- 165449 | p0135 N
| GENERAL ELECTRIC CO., ST. PETEFSBUBG, FLA.
| Thermal-barrier-coated turbine blade study [NASA-CR- 165351] p0023 N
| GENEBAL ELECTRIC CO., SYRACUSE, N.Y.
| Low NO sub x heavy fuel combustor concept program phase 1A das tests [NASA-Ck- 167877] | p0055 N
                                                          p0023 N82-10040
                                                          p0055 N82-25337
GENERAL MOTORS CORP., INDIANAPCLIS, IND.
     Acoustic microscopy of silicon carbide materials
                                                          p0C75 A82-33031
     Small gas turbine combustor primary zone
        development
[AIAA PAPER 82-1159]
                                                          p0 103 A82-35036
     AGT 100 automotive gas turbine system development
        [AIAA PAPER 82-1165]
                                                          p0108 A82-35036
     AGT 100 turbomachinery
f AIAA FAPER 82-1207] p0108 A82-3506 Combustor development for automotive das turbines [AIAA FAPER 82-1208] p0104 A82-35063 GEORGIA INST. OF TECH., ATLANTA. An iterative finite element-integral technique
                                                          p0108 A82-35061
                                                          p0104 AB2-35062
        for predicting sound radiation from turbufan
        inlets in steady flight
        [ AIAA PAPER 82-0124]
                                                          p0030 A82-17796
     Regimes of traction in concentrated contact
        1ubrication
        [ ASME PAPER 8 1-LUB- 16 ]
                                                          p0 107 A82-18431
     Some observations in high pressure rheology of
        lubricants
        [ ASME PAPER 8 1-LUB-17]
                                                          D0070 A82-18432
```

luoricants ASME PAPER 81-LUB-17] p0070 A82-18432 Solutions of the compressible Navier-Stokes equations using the integral method
[AIAA PAPER 81-0046] p0093 A82-23
Path-independent integrals in finite elasticity p0093 A82-23832 and inelasticity, with body forces, inertia, and arbitrary crack-face conditions p0115 A82-32303
On a study of the /Delta T/c and C/asterisk/
integrals for fracture analysis under non-steady creep p0 115 AB2-36782 Hoving singularity creep crack growth analysis with the /Delta T/c and C/asterisk/ integrals p0116 A82-40066 Preliminary study of temperature measurement techniques for Stirling engine reciprocating scals [NASA-CR-165479] p0 104 N82-11466 Prediction of sound radiation from different practical jet engine inlets [NASA-CR-165120] p0 153 NB2-16810 A new namerical approach for compressible Viscous flows [MASA-CR-168842] n0090 N82-22455 Creep crack-growth: A new path-independent T sub o and computational studies [MASA-CR- 168930] p0113 N82-24503 Acoustic properties of turbufan inlets [NASA-CR-169016] p0 !: p0 153 N82-27090 Creep crack-growth: A new path-independent integral (T sub c), and computational studies [NASA-CR-167897] p0114 N82-296 p0114 N82-29619 Development of a spinning wave heat engine [NASA-CR-165611] p0028 No p0028 N82-31328 GILBERT/COMMONWEALTH, READING, PA.

Flagmetohydrodynamics Hilb Engineering Test
Facility ETF 200 HWe power plant. Concept
Design Engineering Report CDER. Volume 3: Conceptual Costs and schedules [NASA-CR-165452-VOL-3] p0 128 N82-10495 Magnetohydrodynamics (MHD) Engineering Test Pacility (ETF) 200 NWe power plant. Conceptual Design Engineering Report (CDER). Volume 1: Executive summary
[NASA-CR-165452-VOL-1] p0 129 N82-12570
Magnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 NWe power plant Conceptual Design Engineering Report (CDER) p01J2 N82-17603 [NASA-CR-165452-VOL-5] Magnetohydrodynamics (MHD) Engineering Test
Facility (ETF) 200 MWe power plant.
Conceptual Design Engineering Report (CDER).
Volume 4: Supplementary engineering data
[NASA-CR-165452-VOL-4] p0133 N82-18688 Magnetohydrodynamics (MHD) Engineering Test Facility (ETF) 200 MWe power plant. Conceptual Design Engineering Report (CDER). Volume 2: Engineering. Volume 3: Costs and schedules [NASA-CR-165452-VOL-21 p0 136 N82-27837 GIMER, INC., WALTHAM, MASS.

Requirements for optimization of electrodes and electrolyte for the iron/chromium Redox flow cell [NASA-CR-165218] p0 136 N82-25640 GTE LABS., INC., MALTHAM, HASS.

Pabrication of turbine components and properties of sintered silicon nitride
[ASME PAPER 82-GT-252] p0071 A82-354 p0071 A82-35431 Fabrication c? sinterable silicon nitride by injection molding p0071 A82-37015

HAMILTON STANDARD, WINDSOR LOCKS, CONN.

Evaluation of wind tunnel performance testings of an advanced 45 deq swept 8-bladed propeller at Mach numbers from 0.45 to 0.85

[NASA-CR-3505] p0007 N82-19178

HERSH ACOUSTICAL ENGINEERING, CHATSWORTH, CALIF.

Analytical and experimental investigation of the propagation and attenuation of sound in extended reaction lined ducts

[AIAA FAFER 81-2014] p0153 &82-10454

HUGHES AIRCRAFT (7). EL SEGUEDO, CALIF.

The 30/20 GHz flight experiment system, phase 2.

Volume 1: Executive summary
[NASA-CR-165409-VOL-1] p0078 N82-203 p0078 N82-20362 The 30/20 GHz flight experiment system, phase 2. Yolume 2: Experiment system description Yolume 2: Experiment s [NASA-CR- [65409-YOL-2] p0078 N82-20363 The 30/20 GHz flight experiment system, phase 2. Volumo 3: Experiment system requirement document [NASA-CR-165409-VOL-3] p0078 N62-203
The 30/20 GHz flight experiment system, phase 2.
Yolune 4: Experiment system development plan
[NASA-CR-165409-VOL-4] p0078 N82-203
HUGHES AIRCRAFT CO., HALIBU, CALIF. p0078 N82-20364 p0078 N82-20365 A 10-kW serios resonant converter design, transistor characterization, and base-drive optimization p0086 A82-36927 HUGUES AIRCRAFT CO., TORRANCE, CALIF.
Fyrolytic graphite collector development program
[NASA-CR-167909] p0052 N82-29363 HUGHES RESEARCH LABS., NALIBU, CALIF. 30-cm mercury ion thruster technology p0046 A82-15434 Characteristics of the LeRC/Hughes J-series 30-cm engineering model thruster p0046 A82-15435 Retrofit and acceptance test of 30-cm ion thrusters [NASA-CR- 165259] p0044 N82-12133 A 10kW series resonant converter design, transistor characterization, and base-drive optimization [NASA-CR-165546] p0084 N82-17439 TIT RESEARCH INST., CHICAGO, ILL.
Thornal fatique and oxidation data of TAZ-8A and M22 alloys and variations
[NASA-CR-165407] p0063 N82-101 I MASA-CR-165407) p0063 N82-10193
International market assessment of stand-alone
photovoltaic power systems for cottage
industry applications
f NASA-CR-1652871 p0132 N82-16498
INOIS UNIV. CHICAGO ILLINOIS UNIV., CHICAGO.

Mathematical models for the synthesis and optimization of spiral bevel quar tooth surfaces p0106 N82-25516 F NASA-CR-35531 ILLINOIS ONIV. . ORBANA. Interface cracks in adhesively bounded imp-shear icints Boundary-layer effects in composite laminates. I - Free-edge stress singularities. II -Free-edge stress solutions and basic characteristics p0116 A82-46806 ILLINOIS UNIV., URBANA-CHAMPAIGH. Boundary layer thermal stresses in angle-ply composite laminates, part | pollows: 1 and to-pry composite laminates, part | pollows: 1 and to-pry [NSA-CF-165412] pollows: 1 and to-pry and the pollows: 1 and to-pry and to-pry and the pollows: 1 and to-pry and to p0113 N82-26713 composites, part ? [NASA-CP-165433] Interlaminar crack growth in fiber reinforced composites during fatigue, part 3 [NASA-CR- 165434] p0114 N82-26715 Analysis of interface cracks in adhesively bonded lap shear joints, part 4 [NASA-CR-165438] p0114 Edge delamination in angle-ply composite p0114 N82-26716 laminates, part 5 [NASA-CR-165439] p0114 N82-26717 Boundary-layer effects in composite laminates: Frue-edgo stross singularities, part 6 [NASA-CP-165440] p0114 N82-26718 NASA Adaptive Multibeam Phased Array (AMPA): An application study [NASA-CP-169125] p0079 N82-28503 INSTITUT FUER THEORETISCHE STROEMUNGSHECHANIK, GOETTINGEN (MEST GERMANY).
A computational design method for transonic turborachinery cascades
[ASME PAPER 82-GT-117] p002
INSTITUTE OF GAS TECHNOLOGY, CHICAGC, ILL. p0022 A82-35348 Stabilizing platinum in phosphoric acid fuel cells

p0 130 NB2-14628 [NASA-CR-165483] p0 130 NB2-14628 Stabilizing platinum in phosphoric acid Eucl cells [NASA-CR-165606] p0 136 NB2-29718 IONICS, INC., WATERTOWN, MASS. Anion permedicative membrane p0137 M82-30711 [NASA-CR-167872] JET PROPULSION LAR., CALIFORNIA INST. OF TECH., PASADENA. Evidence for Pu-244 fission tracks in bibonites from Murchison carbonaceous chondrite p0166 A82-29316 Raman study of the improper ferroelectric phase transition in iron iodine boracité Subsystems design and component development for the parabolic dish module for solar thermal povor systems [NASA-CR-168941] p0 135 N82-24646 EAUSAS UNIV., LAWRENCE.
Numerical simulation of sheath structure and
current-voltage characteristics of a conductor-dielectric disk in a plasma p0040 A82-15904 Numerical Eimulation of plasma insulator interactions in space. Part I: The self consistent calculation p0039 N82-14272 Numerical simulation of plasma insulator interactions in space. Part 2: Dielectric p0 039 NB 2-14273 KANSAS UNIV. CENTRE FOR RESEARCH, INC., LAWEBECK. Icing tunnel tests of a composite porous leading edge for use with a liquid anti-ico system [NASA-CR-164966] p0014 N82-11052 [NASA-CR-164966] p000 KARLSBUHR UNIV. (WEST GERMANY). Extended range stress intensity factor expressions for chevron-notched short bar and short rod fracture toughness specimens p0112 A82-40357 KENTUCKY UNIV., LEXINGTON.

Buoyancy effects on the temperature field in downward spreading flames p0094 A82-41203 KMS FUSION, INC., ANN ARBOR, HICH.
Free electron lasers for transmission of energy in space [NASA-CR-165520] p0098 N82-25499 LIFE SYSTEMS, IEC., CLEVELAND, OHIO. Alkaline regenerative fuel cell systems for energy storage p0042 A82-11706 Endurance test and evaluation of alkaline water electrolysis cells
[NASA-CR-165424]
LITTLE (ABTHUR D.), lWC., CAMBRIDGE, MASS.
An assessment of the crash fire hazard of liquid hydrogen fueled aircraft p0 130 NB2-13508 [NASA-CR- 165526] LWR COMMUNICATIONS, INC., HAUPPAUGE, M. Y.
INPATT power building blocks for 20 GHz spaceborne transmit amplifier
[AIAA 82-0498] p0086 A82-23566
LOCKHEED-CALIFORMIA CO., BURBANK.
Experimental study of fuel heating at low temperatures in a wing tank model, volume | [NASA-CR-165391] Additional experiments on flowability improvements of aviation fuels at low 00074 N82-31546 priorities, drive system and aircraft design studies, evaluation and recommendations and wind tunuel test plans [NASA-CR-167928-VOL-1] p0028 N82-32370

Effect of gamma irradiation on the friction and

LOWELL UNIV., MASS.

wear of ultrahigh molecular weight polyethylene P0062 A82-10674

MARTIN MARIETTA ABROSPACE, DENVER, COLO, An experiment to evaluate liquid hydrogen storage in space

A82-20748

Primary propulsion/large space system interaction study [NASA-CR- 165277]

p0044 N82-18315

MARTIN MARIETTA CORP., BETHESCA, MD. Cryoquaic fluid management experiment [NASA-CP-165495]

P0039 N82-15117

MARYLAND UNIV., COLLEGE PARK.

VLA observations of solar active regions at 6 cm wavelength

p0 167 A82-10 156

Toward the use of similarity theory in two-phase choked flows

P0089 A82-16570 Time variability and structure of quiet sun sources at 6 cm wavelength

p0167 A82-26003

Magnetic structure of a flaring region producing impulsive microwave and hard X-ray bursts p0167 A82-27323

MASSACHUSETTS INST. OF TECH., CARBRIDGE.

Hodeling parameter influences on HHD swirl
combustion nozzle lesign
[AIAA FAPER 82-0984] p0011 A

P0011 A82-31947

Aerodynamic damping measurements in a transonic compressor FASHE PAPER 82-GT-2871 p0012 A82-35459

In-plane inertial coupling in tuned and severely mistuned bladed disks [ASMR PAPER 82-GT-288]

p0012 182-35460 Flow aerodynamics modeling of an MHD swirl combustor - Calculations and experimental verification

p0094 A82-44782 Conceptual design of superconducting magnet system for Magnetohydrodynamic (MHD) Engineering Test Facility (ETF) 200 MWe power

plant [NASA-CR-165053] p0105 N82-14520 Ultrasonic input-output for transmitting and receiving longitudinal transducers coupled to same face of isotropic elastic plate [NASA-CR-3506] pol

p0110 N82-18613 Review of analysis methods for rotating systems with periodic coefficients

p0135 N82-23702 A FORTRAN program for calculating three dimensional, inviscid and rotational flows with shock waves in axial compressor blade

rows: User's manual [NASA-CR-3560] p0008 N82-26230 MATHEMATICAL SCIENCES NORTHWEST, INC., BELLEVUE, WASH.

Overview study of Space Power Technologies for the advanced energetics program

p0132 N82-17606 [NASA-CP-1652691 MAX-PLANCK-INSTITUT FUER STROEBUNGSFORSCHUNG, GOETTINGEN (WEST GERNANY).

Conversion of acoustic energy by lossless liners

p0154 A82-36195 MCDONNELL-DOUGLAS CORP., ST. LOUIS, NO. Tests of a D vented thrust deflecting nozzle

behind a simulated turbofan engine [NASA-CP-3508] p0006 N82-17122

MECHANICAL TECHEOLOGY, INC., LATHAM, N. Y.
Development of CdO-graphite-Ag coatings for gas
bearings to 427 C

p0108 A82-27079 Preliminary study of temperature measurement techniques for Stirling engine reciprocating

[NASA-CR-165479]

Automotive Stirling engine development program [NASA-CR-167907] p0164 N82-2 p0164 N82-29235 Automotive Stirling Engine Mod | Design Review, volume 1

[NASA-CE- 1679351 p0164 N82-34311 Automotive Stirling Engine Hod | Design Review,

[NASA-CR-167397] p0164 N82-34312 MICHIGAN STATE UNIV., PAST LAWSING.
Standing waves along a microwave generated surface wave plasma

p0 158 A82-26952 MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON.
Solute transport during the cyclic oxidation of

Ni-Cr-Al alloys [NASA-CR-165544] p0064 N82-27462

MINESOTA UNIV., MINERAPOLIS.

Turbulent boundary layer heat transfer experiments - A separate effects study on a convexly-curved wall

[ASME PAPER 81-HT-78]

The acoustical structure of highly porous open-cell foams

p0 154 AB2-45 165

MISSOURY UNIV., ROLLA., Methods for the calculation of axial wave

numbers in lined ducts with mean flow

p0 153 A82-14044

Acoustic transmission in lined flow ducts - A finite element eigenvalue problem

p0 154 A82-17663 Conversion and matched filter approximations for serial minimum-shift keyed modulation

P0080 A82-26713 Conversion of acoustic energy by lossless liners p0 154 A82-36195

HOTOROLA, INC., SCOTTSDALE, ARIZ. Baseband-processed SS-TDNA communication system architecture and design concepts

[AIAA 82-0482] p0079 A82-23508 Near optimum delay-line detection filters for

serial detection of MSK signals

p0086 A82-43867 NUMISING PAPER DIV., WERNAH, WIS.

Development of battery separator composites
[NASA-CR-165508] p0128 N8 p0 128 N82-11547

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH

COUNCIL, WASHINGTON, D. C. Nicral ternary alloy having improved cyclic oxidation resistance

[NASA-CASE-LEW-13339-1] POOG! NO WATIONAL ARRONAUTICS AND SPACE ADMINISTRATION, p0061 N82-31505

WASHINGTON, D. C.
Bibliography of NASA published reports on

general aviation, 1975 to 1981 [WASA-TM-83307]

p0001 NB2-19132 NASA research programs responding to workshop recommendations

N82-21146 MATIONAL ABBONAUTICS AND SPACE ADMINISTRATION, AMES RESEARCH CENTER, MOFFETT FIRLD, CALIF. A theory of the n-i-p silicon solar cell

p0128 A82-45055

NATIONAL ARRONAUTICS AND SPACE ADMINISTRATION. LYMPON B. JOHNSON SPACE CENTER, HOUSTON, TEX. **Blectromechanical** actuators

N82-19148 MATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C. Non-noble catalysts and catalyst supports for

phosphoric acid fuel cells [MASA-CR-165289]

WAVAL AIR PROPULSION TEST CENTER, TRENTON, M.J. Rotor fragment protection program: Statistics on aircraft gas turbine hine rotor failures that occurred in U.S. commercial aviation during 1978

[NASA-CR-165388] p0027 N82-27316

NEW MEXICO UNIT., ALBUQUERQUE. Study of the photovoltaic effect in thin film barium titanate

[NASA-CA-165081] p0 131 N82-NIELSEN ENGINEERING AND RESEARCH, INC., HOUNTAIN p0131 N82-16479 VIBU, CALIF.

Rapid approximate determination of nonlinear solutions - Application to aerodynamic flows and design/optimization problems

p0012 A82-35571

p0 108 A82-35462

BORTHERASTERN UNIV., BOSTON, MASS.

Engine dynamic analysis with general nonlinear finite element codes. II - Bearing element implementation, overall numerical characteristics and benchmarking

[ASHE PAPER 82-GT-292]

TABELLA CARA HICERARY ALTER	
MORTHROP CORP., HAWTHORNE, CALIF.	verification
Tangential blowing for control of strong normal	
shock - Boundary layer interactions on inlet	Investigations of flowfields (
ramps	combustor geometries
[ATAN PAPER 82-1082] p0005 A82-37684	[NASA-CF- 1650 E 1]
MORTHWESTERN UNIV., RVANSTON, ILL.	
	Investigations of flowfields i
Lean-limit extinction of propane/air mixtures in	combustor geometries
the stagnation-point flow	[NASA-CR-160585]
p0057 A82-28736	
Effects of heat loss, preferential diffusion.	Investigations of flowfields t
	combustor quometries
and flame stretch on flame-front instability	[NASA-CE- 169295]
and extinction of propane/air mixtures	OPERATIONS RESEARCH, INC., SILVE
p0057 A82-32877	OF LEATIONS RESERVED, INC., SILVE
	Planning satellite communicati
On the opening of premixed Bunsen flame tips	spectrum-orbit utilization
p0057 A82-37570	[AIAA 82-0526]
On stability of premixed flames in stagnation -	• •
Point flow	
	Р
p0057 A82-37574	, I
On finite deformation elasto-plasticity	PANELVISION COBP., PITTSBUBGH, P.
p0116 A82-45869	Development of an 1100 deg P of
MOTRE DAME UNIV., IND.	peremphasine of an 1100 ded 1 s
Sound generated in a cascade by	PARAGON PACIFIC, INC., EL SEGUNDO
three-dimensional disturbances convected in a	Development report: Automatic
subsonic flow	Calibration (ASTAC) equipmen
[AIAA PAPER 81-2046] p0 153 A82-10460	
A common approach to maintain of perhapsing of	[NASA-CP- 1654037
A tensor approach to modeling of nonhomogeneous	PARSONS (RALPH M.) CO., PASADENA,
nonlinea <i>r</i> systems	Fuel quality processing study,
p0148 A82-19064	f Wara-cr- 165337-por-17
	[NASA-CE- 165327-VOL-1]
Alternatives for jet engine control	Fuel quality/processing study
[NASA-CR-168894] p0026 N82-23247	Appendix. Task literature
NTL, INC., COLHNACK, N.Y.	[NASA-CR- 165327-VOL-2]
A new antenna concept for satellite communications	TOWNSHIP CAN TO THE CANADA
	PENNSYLVANIA STATE UNIV., UNIVERS
[NASA-CR-167924] p0079 N82-31584	The three-dimensional boundary
	rctating helical blade
\mathbf{O}	**************************************
Alignment van benderting bis biskulling in	Atomization and combustion pro
O'DONNELL AND ASSOCIATES, IEC., PITTSBURGH, PA.	flashing injectors
A simplified design procedure for life	[NIAN PAPER 82-0300]
prediction of rocket thrust chambers	Characteristics of the flow in
[AIAA PAPER 82-1251] p0043 A82-35087	region of an axial-flow comp
Development of a simplified procedure for thrust	passage
chamber life prediction	[AIAN PAPER 82-0413]
[NASA-CP-165585] p0044 N82-21253	
	Interaction of compressor roto
OHIO STATE UNIV., COLUMBUS.	wall boundary layer/vortex i
Vibrations of cantilevered shallow cylindrical	region
shells of rectangular planform	[ASME PAPER 81-GR/GT-1]
p0115 A82-11298	
Without one of tules a station billion	Strength distributions of Sic
Vibrations of twisted rotating blades	oxidation and oxidation unde
[ASME PAPER 81-DET-127] p0115 A82-19341	[ACS PAPER 9-C-80C]
Aerodynamic characteristics of airfoils with ice	Anaerobic polymers as high vac
accretions	anderopic portable de migh vac
[AIAN PAPER 82-0282] p0010 A82-22081	Effects of blade loading and r
Comparison of heam and shell theories for the	compressor rotor wake in end
vibrations of thin turbomachinery blades	[AIAA PAPER 82-0193]
	Measurement and prediction of
On ultrasonic factors and fracture toughness	turbulence structure in the
	airfoil
p0116 A82-42863	#22.44.2
p0116 A82-42863 Rime ice accretion and its effect on airfoil	
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance	Three sensor hot wire/film tec
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166	
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166	Three sensor hot wire/film ted dimensional mean and turbule
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and	Three sensor hot wire/film tec
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pclycrystalline aluminum and copper, volume !	Three sensor hot wire/film tec dimensional mean and turbule measurement
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] The orthogonal in-situ machining of single and pclycrystalline aluminum and copper, volume I [NASA-CR-168929] p0076 N82-24361	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CP-168929] p0076 N82-24361 The transmission or scattering of elastic waves	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pclycrystalline aluminum and copper, volume 1 [NASA-CP-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pclycrystalline aluminum and copper, volume 1 [NASA-CP-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006]
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pclycrystalline aluminum and ccpper, volume 1 [NASA-CP-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A ccmparison of theories	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and cepper, volume I [NASA-CR-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A ccmparison of theories [NASA-CR-169034] p0079 N82-26526	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006]
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CP-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CP-169034] p0079 N82-26526 OKLAHOMA STATE UNIV., STILLWATER.	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor b
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CP-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CP-169034] p0079 N82-26526 OKLAHOMA STATE UNIV., STILLWATER.	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor h [AIAA PAPER 82-1007]
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume ! [NASA-CR-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CR-169034] p0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flowfields found	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor b [AIAA PAPER 82-1007] Three-dimensional flow field i
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pclycrystalline aluminum and copper, volume I [NASA-CR-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] p0079 N82-26526 OKLAHOMA STATE UNIV., STILLWATER, On the prediction of swirling flowfields found in axisymmetric combustor geometries	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor b [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passag
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and cepper, volume 1 [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flewfields found in axisymmetric combustor geometries P0029 A82-12120	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor b [AIAA PAPER 82-1007] Three-dimensional flow field i
p0116 A82-42863 Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pclycrystalline aluminum and copper, volume I [NASA-CR-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] p0079 N82-26526 OKLAHOMA STATE UNIV., STILLWATER, On the prediction of swirling flowfields found in axisymmetric combustor geometries	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor b [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passag
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CP-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CP-169034] p0079 N82-26526 OKLAHOMA STATE UNIV., STILLWATER. On the prediction of swirling flowfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor b [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passag welocity profiles and annulu layer
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume 1 [NASA-CR-168929] The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CR-169034] p0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flowfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow con [AIAA PAPER 82-1006] Three dimensional turbulent bed development on a fan rotor in [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passag welocity profiles and annulu layer [ASME PAPER 82-GT-!!]
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER. On the prediction of swirtling flewfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] P0030 A82-17788	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent be development on a fan rotor be [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passag velocity profiles and annulu layer [ASME PAPER 82-GT-11] Investigation of the tip-clear
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and cepper, volume 1 [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flewfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] P0030 A82-17788 Mean flowfields in axisymmetric combustor	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared in the film of a low speed axial flow compared in the film of a low speed axial flow compared in the film of a compressor rotor passag welocity profiles and annululayer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor and a compressor and a compressor and a compressor compared in the tip-clear and at the exit of a compressor and at the exit of a compressor.
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER. On the prediction of swirtling flewfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] P0030 A82-17788	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared in the film of a low speed axial flow compared in the film of a low speed axial flow compared in the film of a compressor rotor passag welocity profiles and annululayer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor and a compressor and a compressor and a compressor compared in the tip-clear and at the exit of a compressor and at the exit of a compressor.
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] p0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CP-168929] p0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CR-169034] p0079 N82-26526 UKLAHOMA STATE UNIV., STILLWATER. On the prediction of swirling flowfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [AIAA PAPER 82-0109] p0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared to film the dimensional turbulent by development on a fan rotor in a fall for the dimensional flow field i of a compressor rotor passage welocity profiles and annulus layer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compress I - Mean velocity field
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER. On the prediction of swirling flewfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [AIAA PAPER 82-0109] P0030 A82-17788 Hean flowfields in axisymmetric combustor geometries with swirl [AIAA FAPER 82-0177] P0092 A82-17824	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared as a low speed axial flow compared turbulent be development on a fan rotor in [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passage welocity profiles and annuluslayer [ASHE PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor i - Hean welocity field [ASME PAPER 82-GT-!2]
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER. On the prediction of swirling flowfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] p0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl [ATAA FAPER 82-0177] p0092 A82-17824 Modeling parameter influences on MHD swirl	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor be [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passag velocity profiles and annulu layer [ASME PAPER 82-GT-!1] Investigation of the tip-clear and at the exit of a compress I - Mean velocity field [ASME PAPER 82-GT-12] Three-dimensional flow field i
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and cepper, volume 1 [NASA-CR-168929] P00076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flewfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [AIAA PAPER 82-0109] P0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl [AIAA FAPER 82-0177] P0092 A82-17824 Modeling parameter influences on MHD swirl combustion nozzle design	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared as a low speed axial flow compared turbulent be development on a fan rotor in [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passage welocity profiles and annuluslayer [ASHE PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor i - Hean welocity field [ASME PAPER 82-GT-!2]
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER. On the prediction of swirling flowfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] p0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl [ATAA FAPER 82-0177] p0092 A82-17824 Modeling parameter influences on MHD swirl	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared to fall the film of a low speed axial flow compared to fall turbulent be development on a fan rotor in [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passage velocity profiles and annulus layer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compress I - Mean velocity field [ASME PAPER 82-GT-!2] Three-dimensional flow field i of a compressor rotor passage
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKLAHOMA STATE UNIV., STILLWATER. On the prediction of swirling flowfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [AIAA PAPER 82-0109] P0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl [AIAA FAPER 82-0177] P0092 A82-17824 Modeling parameter influences on MHD swirl combustion nozzle design [AIAA FAPER 82-0984] P0011 A82-31947	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared to a fan rotor be development on a fan rotor be a fall of a compressor rotor passage welocity profiles and annulus layer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor rotor passage to a compressor rotor passage to a compressor rotor passage to a compressor rotor passage to a compressor rotor passage to a compressor rotor passage rotor passage properties
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] P0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 UKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flowfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [AIAA PAPER 82-0109] P0030 A82-17788 Mean flowfields in axisymmetric combustor qeometries with swirl [ATAA FAPER 82-0177] P0092 A82-17824 Modeling parameter influences on MHD swirl combustion nozzle design fATAA FAPER 82-0984] P0011 A82-31947 Bluff-body flamcholder wakes - A simple	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor be [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passag velocity profiles and annulu layer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compress I - Mean velocity field [ASME PAPER 82-GT-!2] Three-dimensional flow field of a compressor rotor passag properties [ASME PAPER 82-GT-234]
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] F0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and cepper, volume 1 [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [HASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flewfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] P0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl [AIAA FAPER 82-0177] P0092 A82-17824 Modeling parameter influences on MHD swirl combustion nozzle design [ATAA FAPER 82-0984] Bluff-body flameholder wakes - A simple numerical solution	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared in the film of a low speed axial flow compared in the film of a low speed axial flow compared in the film of a compressor of the film of a compressor rotor passage welocity profiles and annulus layer [ASHE PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor i - Mean welocity field [ASME PAPER 82-GT-!2] Three-dimensional flow field of a compressor rotor passage properties [ASME PAPER 82-GT-234] Effects of oxidation and oxida
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] The orthogonal in-situ machining of single and pclycrystalline aluminum and ccpper, volume I [NASA-CR-168929] The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A ccmparison of theories [NASA-CR-169034] CKLAHOMA STATE UNIV., STILLWATER. On the prediction of swirling flowfields found in axisymmetric combustor geometries A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] Mean flowfields in axisymmetric combustor qeometries with swirl [ATAA FAPER 82-0177] Modeling parameter influences on MHD swirl combustion nozzle design [ATAA FAPER 82-0984] Bluff-body flamcholder wakes - A simple numerical solution [ATAA PAPER 82-1177] p0093 A82-35043	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow co [AIAA PAPER 82-1006] Three dimensional turbulent bo development on a fan rotor be [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passag velocity profiles and annulu layer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compress I - Mean velocity field [ASME PAPER 82-GT-!2] Three-dimensional flow field of a compressor rotor passag properties [ASME PAPER 82-GT-234]
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] F0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and cepper, volume 1 [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [HASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flewfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] P0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl [AIAA FAPER 82-0177] P0092 A82-17824 Modeling parameter influences on MHD swirl combustion nozzle design [ATAA FAPER 82-0984] Bluff-body flameholder wakes - A simple numerical solution	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared to film the dimensional turbulent by development on a fan rotor in [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passage welocity profiles and annulusayer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor i - Mean welocity field [ASME PAPER 82-GT-!2] Three-dimensional flow field i of a compressor rotor passage properties [ASME PAPER 82-GT-234] Effects of oxidation and oxidation strength distributions of Si
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [NASA-CR-169034] P0079 N82-26526 OKIAHOHA STATE UNIV., STILLWATER. On the prediction of swirling flowfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [AIAA PAPER 82-0109] Nean flowfields in axisymmetric combustor geometries with swirl [AIAA FAPER 82-0177] Modeling parameter influences on MHD swirl combustion nozzle design fATAA FAPER 82-0184] P0011 A82-31947 Bluff-body flamcholder wakes - A simple numerical solution fATAA PAPER 82-11771 P0093 A82-35043 Turbulence measurements in a confined jet using	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared axial flow field i of a compressor rotor passage welocity profiles and annulusayer [ASME PAPER 82-GT-11] Investigation of the tip-clear and at the exit of a compressor in the field in the field of a compressor rotor passage axial flow field in the field in
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] F0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume ! [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [HASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flowfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] P0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl [AIAA FAPER 82-0177] P0092 A82-17824 Modeling parameter influences on MHD swirl combustion nozzle design [AIAA FAPER 82-0984] Bluff-body flamcholder wakes - A simple numerical solution [AIAA PAPER 82-1177] Turbulence measurements in a confined jet using a six-orientation hot-wire probe technique	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared to film the dimensional turbulent by development on a fan rotor in [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passage welocity profiles and annulusayer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor i - Mean welocity field [ASME PAPER 82-GT-!2] Three-dimensional flow field i of a compressor rotor passage properties [ASME PAPER 82-GT-234] Effects of oxidation and oxidation strength distributions of Si
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] The orthogonal in-situ machining of single and pclycrystalline aluminum and ccpper, volume I [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of simple geometry: A ccmparison of theories [NASA-CR-169034] CKLAHOMA STATE UNIV., STILLWATER. On the prediction of swirling flowfields found in axisymmetric combustor geometries P0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] Mean flowfields in axisymmetric combustor qeometries with swirl [ATAA FAPER 82-0177] Modeling parameter influences on MHD swirl combustion nozzle design [ATAA FAPER 82-0984] Bluff-body flamcholder wakes - A simple numerical solution [ATAA PAPER 82-1177] Turbulence measurements in a confined jet using a six-orientation hot-wire probe technique [ATAA PAPER 82-1262] P0099 A82-37710	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared to fall the film of a low speed axial flow compared to fall turbulent be development on a fan rotor in [AIAA PAPER 82-1007] Three-dimensional flow field i of a compressor rotor passage velocity profiles and annulus layer [ASME PAPER 82-GT-!!] Investigation of the tip-clear and at the exit of a compressor i - Mean velocity field [ASME PAPER 82-GT-!2] Three-dimensional flow field i of a compressor rotor passage properties [ASME PAPER 82-GT-234] Refects of oxidation and oxidation strength distributions of Simple sure pulsations above turb
Rime ice accretion and its effect on airfoil performance [NASA-CP-165599] F0008 N82-24166 The orthogonal in-situ machining of single and pelycrystalline aluminum and copper, volume ! [NASA-CR-168929] P0076 N82-24361 The transmission or scattering of elastic waves by an inhomogeneity of sixple geometry: A comparison of theories [HASA-CR-169034] P0079 N82-26526 OKLAHOHA STATE UNIV., STILLWATER, On the prediction of swirling flowfields found in axisymmetric combustor geometries p0029 A82-1212C A simple finite difference procedure for the vortex controlled diffuser [ATAA PAPER 82-0109] P0030 A82-17788 Mean flowfields in axisymmetric combustor geometries with swirl [AIAA FAPER 82-0177] P0092 A82-17824 Modeling parameter influences on MHD swirl combustion nozzle design [AIAA FAPER 82-0984] Bluff-body flamcholder wakes - A simple numerical solution [AIAA PAPER 82-1177] Turbulence measurements in a confined jet using a six-orientation hot-wire probe technique	Three sensor hot wire/film ted dimensional mean and turbule measurement Three dimensional flow field i of a low speed axial flow compared axial flow field i of a compressor rotor passage welocity profiles and annulusayer [ASME PAPER 82-GT-11] Investigation of the tip-clear and at the exit of a compressor in the field in the field of a compressor rotor passage axial flow field in the field in

pC094 A82-44782 found in typical p0090 N82-15360 found in typical p0090 N82-19495 found in typical p0092 N82-31643 R STRING, MD. ion services and p0080 A82-23538 capacitor p0083 N82-15315 System Test and p0129 N82-13505 CALIF. volume 1 p0135 N82-24649 Voluma 2: e survey p0135 N82-24650 SITY PARK. y layer on a p0009 A82-15459 perties of p0092 A82-17880 the annulus-wall pressor rotor blade p0009 A82-17933 or blade wake with in the end-wall p0010 A82-19301 ceramics after er load p0071 A82-20143 cuum leak sealants p0 108 A82-21967 otation on wall regions
p0010 A82-22063
mean velocity and near wake of an p0010 A82-26137 chnique for three ence flow field p0097 182-30300 inside the passage p0011 182-31964 undary layer olade p0011 A82-31965 in the tip region ge. I - Mean IS wall boundary p0011 A82-35280 cance flow inside sor rotor passage. p0011 A62-35281 in the tip region ye. II - Turbulence p0011 A82-35416 ation under load on p0071 A82-35871 ponolecular pumps poo76 A82-46430 ission from charged dielectronics p0039 N82-14227

Numerical analysis and FORTRAN program for the	Energy efficient engine: High pressure turbine
computation of the turbulent wakes of	uncooled rig technology report
turbomachinery rotor blades, isolated airfoils	[NASA-CF- 165149] p0031 N82-32383
and cascade of airfoils	Structural tailoring of engine blades (STAEBL)
[NASA-CR-3509] p0006 N82-18184	[NASA-CR-167949] p0028 N82-33391
Secondary electron emission from a charged dielectric in the presence of normal and	Energy efficient engine: Turbine transition duct model technology report
oblique electric fields	[NASA-CP-167996] p0029 N82-33394
[NASA-CR-168558] p0084 N82-18507	PRATT AND WHITMEY AIRCRAFT GROUP, WEST PALE BEACH,
Mapping of electrical potential distributions	YLA.
with charged particle beams	Computer modeling of fan-exit-splitter spacing
[NASA-CR-168556] p0084 N82-18508 Application of an airfoil stall flutter computer	effects on P100 response to distortion
prediction program to a three-dimensional	[NASA-CF-167879] p0025 N82-23246 PRC SYSTEMS SCIENCES CO., TUCSON, ABIZ.
wing: Prediction versus experiment	Gallium arsenide solar array subsystem study
[MASA-CR-168586] p0007 N82-19169	[NASA-CF- 167869] p0138 N82-32855
Three dimensional mean velocity and turbulence	PRINCETON UNIV., N. J.
characteristics in the annulus wall region of	Hass Driver Two - 1 status report
an axial flow compressor rotor passage [NASA-CR-169003] p0026 M82-25252	p0046 A82-18191 Mass driver reaction engine characteristics and
Investigation of the tip clearance flow inside	performance in earth orbital transfer missions
and at the exit of a compressor rotor passage	p0046 A82-18199
[NASA-CR-169004] p0026 N82-25253	A small scale lunar launcher for early lunar
Investigation of spray characteristics for	material utilization
flashing injection of fuels containing dissolved air and superheated fuels	p0032 A82-35617
[NASA-CR-3563] p0027 N82-26295	The supply of lunar oxygen to low earth orbit p0032 A82-35618
Three dimensional flow field inside compressor	PURDUE UNIV., LAPAYETTE, IND.
rotor, including blade boundary layers	Model degradation effects on sensor failure
[NASA-CR-169120] p0091 N82-27686	detection
Investigation into the role of NaCl deposited on	p0148 A82-13143
oxide and metal substrates in the initiation	Water ingestion into jet engine axial compressors [AIAA FAPIR 82-0196] p0030 A82-17836
of hot corrosion	Three-dimensional flow calculations including
[NASA-CR-165029] p0063 N82-13217	boundary layer effects for superscric inlets
POWER TRANSISTOR CO., TORRANCE, CALIF.	at angle of attack
Fast recovery, high voltage silicon diodes for AC motor controllers	[AIAA PAPER 82-0061] p0005 A82-19778
p0086 A82-36926	Diffraction by a finite strip p0150 A82-33605
PRATT AND WHITHEY AIRCRAFT, EAST HABTFORD, CONN.	Solution of the unsteady subsonic thin airfoil
Tailored plasma sprayed MCrAlY coatings for aircraft gas turbine applications	protlem p0012 A82-41267
[NASA-CF-165234] p0064 N82-19360	Indentation law for composite laminates
PRATT AND WHITNEY AIRCRAFT GROUP, EAST HARTFORD,	[NASA-CR-165460] p0052 N82-15123
CONN.	The design and instrumentation of the Purdue
Improved plasma sprayed MCrAly coatings for	annular cascade facility with initial data
aircraft gas turbine applications p0065 A82-20742	acquisition and analysis [NASA-CR-16786] p0008 N82-26237
JIBC high pressure compressor performance	Effects of cobalt on the microstructure of
improvement	Udimet 700
[NASA-CF- 1655317 p0104 N82-11467	[NASA-CR-165605] p0064 N82-28409
Low NO sub x heavy fuel combustor concept program	Calculation of the flow field including boundary
[NASA-CE-165512] p0129 H82-12572 Sensor failure detection system	layer effects for supersonic mixed compression inlets at angles of attack
[NASA-CP-165515] p0023 N82-13145	[NASA-CR-167941] p0009 N82-29269
Study of controlled diffusion stator blading.	MC carbide structures in M(1c2) ar-M247
1. Aerodynamic and mechanical design report	[NASA-CR-167892] p0064 N82-30374
[NASA-CF-1655001 p0024 N82-16081	PURDUE UNIV. SCHOOL OF SCIENCE AT INDIANAPOLIS, IND.
JTON ceramic outer air seal system refinement program	Application of a finite element algorithm for the solution of steady transonic Euler equations
[MASA-CE-165554] P0106 N82-18603	[AIAA PAPER 82-0970] p0010 A82-31939
Energy efficient engine shroudless, hollow fan	Investigation of rotational transonic flows
blade technology report	through ducts using a finite element scheme
[NASA-CP-1655861 p0024 N82-21196	[AIAA PAPER 82-1267] p0012 A82-37711
Energy efficient engine exhaust mixor model technology	
[NASA-CF-165459] p0025 N82-22264	
Alvanced Low-Emissions Catalytic-Combustor	QUESISBOROUGH COMMUNITY COLLEGE, BAYSIDE, N. Y.
Program, phase 1	The influence of gamma prime on the
NASA-CP-1596561 p0025 N82-22265	recrystallization of an oxide dispersion
Thin file temperature sensors, phase 3 [NASA-CP-165476] p0097 N82-22479	strengthened superalloy - MA 6000E p0062 A82-47393
Analysis of high load dampers	LAGOM WAS ASSESSED.
[NASA-CH-165523] p0026 N82-23248	~
vantaninam atute manlania and danier for a	ĸ
Freliminary study, analysis and design for a	PAGOD ACCOCTAMBE THE CHUNGUALD CAVID
power switch for digital engine actuators	RASOR ASSOCIATES, INC., SUNNYVALE, CALIP.
power switch for digital engine actuators [NASK-CP-159559] p0085 N82-23394	RASOR ASSOCIATES, INC., SUMNYVALE, CALIF. Jet impingement heat transfer enhancement for
power switch for digital engine actuators [NASK-CP-159559] Performance deterioration due to acceptance testing and flight loads; JT90 jet engine	RASOR ASSOCIATES, INC., SUMNIVALE, CALIF. Jet impingement heat transfer enhancement for the GPU-3 Stirling engine [NASA-TM-82727] p0 163 N82-11993
power switch for digital engine actuators [NASK-CP-159559] p00.005 N82-23394 Performance deterioration due to acceptance testing and flight loads; JT90 jet engine diagnostic program	RASOR ASSOCIATES, INC., SUMNYVALE, CALIF. Jet impingement heat transfer enhancement for the GPU-3 Stirling engine [NASA-TM-82727] p0 163 N82-11993 REWSSELAER POLYTECHNIC INST., TROY, N. Y.
power switch for digital engine actuators [NASK-CP-159559] p00.05 N82-23394 Performance deterioration due to acceptance testing and flight loads; JT90 jet engine diagnostic program [NASA-CP-165572] p00.27 N82-27309	RASOR ASSOCIATES, INC., SUMNYVALE, CALIF. Jet impingement heat transfer enhancement for the GPU-3 stirling engine [NASA-TM-82727] p0 163 N82-11993 REMSSELARE POLYTECHNIC INST., TROY, N. Y. Fatigue of Ni-Al-Mo aligned eutectics at
power switch for digital engine actuators [NASK-CP-159559] p0005 N82-23394 Performance deterioration due to acceptance testing and flight loads; JT90 jet engine diagnostic program [NASA-CP-165572] p0027 N82-27309 F747/JT9D flight loads and their effect on	RASOR ASSOCIATES, INC., SUMNYALE, CALIF. Jet impingement heat transfer enhancement for the GPU-3 stirling engine [NASA-TM-82727] PO 163 N82-11993 REMSELARE POLYTECHNIC INST., TROY, N. Y. Fatigue of Ni-Al-No aligned eutectics at elevated temperatures
power switch for digital engine actuators [NASK-CP-159559] p00.05 N82-23394 Performance deterioration due to acceptance testing and flight loads; JT90 jet engine diagnostic program [NASA-CP-165572] p00.27 N82-27309	RASOR ASSOCIATES, INC., SUMNYVALE, CALIF. Jet impingement heat transfer enhancement for the GPU-3 stirling engine [NASA-TM-82727] p0 163 N82-11993 REMSSELARE POLYTECHNIC INST., TROY, N. Y. Fatigue of Ni-Al-Mo aligned eutectics at
power switch for digital engine actuators [NASK-CP-159559] Performance deterioration due to acceptance testing and flight loads; JT90 jet engine diagnostic program [NASK-CP-165572] p0027 N82-27309 F747/JT9D flight loads and their effect on engine running clearances and performance deterioration; ECKC NAIL/F and WA JT9D engine diagnostics programs	RASOR ASSOCIATES, INC., SUMMYVALE, CALIF. Jet impingement heat transfer enhancement for the GPU-3 stirling engine [NASA-TM-82727] p0 163 N82-11993 REWSSELARE POLYTECHNIC INST., TROY, N. Y. Fatigue of Ni-Al-No aligned eutectics at elevated temperatures p0052 A82-13403 Alignment of fluid molecules in an EHD contact [ASLE PREPRINT 81-LC-5C-1] p0 107 A82-18407
power switch for digital engine actuators [NASK-CP-159559] Performance deterioration due to acceptance testing and flight loads; JT90 jet engine diagnostic program [NASA-CP-165572] P747/JT9D flight loads and their effect on engine running clearances and performance deterioration; ECRC NAIL/F and WA JT9D engine	RASOR ASSOCIATES, INC., SUMMYVALE, CALIF. Jet impingement heat transfer enhancement for the GPU-3 Stirling engine [NASA-TH-82727] p0 163 N82-11993 REMSSELARR POLYTECHNIC INST., TROY, N. Y. Fatigue of Ni-Al-No aligned eutectics at elevated temperatures p0 052 A82-13403 Alignment of fluid molecules in an EHD contact

```
p0056 A82-21431
                                                                                                                                  transmission system
       Low temperature growth and electrical
                                                                                                                                 [ NASA-CR- 165366]
                                                                                                                                                                                                   p0146 N82-31970
characterization of insulators for Gals HISPETS [MASA-CR-164972] p0 159 M82-1195; BICS UNIV., HOUSTON, TEX.
Direct conversion of light to radio frequency
                                                                                                                        SOLAR EMERGY TEMENOLOGY, INC., BYDFORD, HASS.
                                                                            p0 159 N82-11959
                                                                                                                              Pocal surfaces of offset dual-reflector antennas
                                                                                                                                                                                                    p0080 182-36265
                                                                                                                        SOLAR TUBBINES INTERNATIONAL, SAN DIEGO, CALLY.
                                                                                                                              LOW NOX heavy fuel combustor concept program [NASA-CR-167876] p0074 N82-26482 Advanced ceramic coating development for industrial/utility gas turbines [NASA-CR-160852]
          energy
                                                                            p0 138 A82-11712
BOCKETDIER, CAROGA PARK, CALIF.

Advanced superposition methods for high speed
      turbopump vibration analysis
[NASA-CR-165379]
Liquid oxygen turbopump technology
[NASA-CR-165487]
                                                                                                                                  [ NASA-CR- 169852]
                                                                                                                                                                                                    p0065 NB2-33494
                                                                            p0104 N82-11465
                                                                                                                              Low NOx heavy fuel combustor concept program [NASA-CR-165481] p0138 N82-33827
                                                                                                                        [MASA-CR-165481]
SOMOSCAW, INC., BENSENVILLE, ILL.
Acoustic microscopy of silicon carbide materials
p0075 A82-33031
                                                                            p0105 882-11468
       Reusable rocket engine maintenance study
[MASA-CR-165569] p0044 M82-1

BOCKWELL INTERNATIONAL CORP., LOS ANGELES, CALIF.

Performance of PTFE-lined composite journal
                                                                            p0044 N82-16172
                                                                                                                        SOUTH CAROLINA UNIV., COLUMBIA.
Digital imaging techniques in experimental stress analysis
          bearings
[ASLE PREPRINT 82-AM-1A-1] p0 104 A82-37854

BOCKWELL INTERNATIONAL CORP., THOUSAND OAKS, CALIP.

Undoped semi-insulating LEC GaAs - A model and a
                                                                                                                              Experimental boundary integral equation
                                                                                                                                  applications in speckle interferometry
          mechanism
                                                                                                                                                                                                   p0097 A82-36987
                                                                                                                        SOUTHWEST RESPARCH INST., SAN ANTONIO, TEX.
Study of vapor flow into a capillary acquisition
       Stoichiometry-controlled compensation in liquid
           encapsulated Czochralski Gals
                                                                                                                                  device
                                                                            p0158 A82-17585
                                                                                                                                 [ NASA-CR- 167883]
                                                                                                                                                                                                    p0091 N82-24452
      Compensation mechanism in liquid encapsulated Czochralski Gals Importance of melt
                                                                                                                        SPIRE CORP., BEDFORD, MASS.
Processing of silicon solar cells by ion
          stoichiometry
                                                                                                                                  implantation and laser annealing [NASA-CR-165283]
                                                                            p0086 A82-40403
                                                                                                                                                                                                    p0 128 N82-11546
       Effect of melt stoichiometry on twin formation
                                                                                                                              Development of a large area space solar cell
           in LEC Gals
                                                                                                                                  assembly
                                                                            p0 160 A82-46517
                                                                                                                                  [ NASA-CR- 167929]
                                                                                                                                                                                                    p0137 N82-30706
High purity low dislocation GaAs single crystals [NASA-CR-165593] p0159 N82-23030 ROYAL AVECRAFY ESTABLISHMENT, FARMHOROUGH (ENGLAND). Fatigue tests with a corrosive environment
                                                                                                                        SRI INTERNATIONAL CORP., MENLO PARK, CALLY.
Oxidation and formation of deposit precursors in
                                                                                                                                  hydrocarbon fuels [NASA-CR-165534]
                                                                                        N82-13282
                                                                                                                              First results of material charging in the space
RUTGERS UNIV., MEN BRUNSWICK, N. J.
Turbulence in argon shock waves
                                                                                                                                  environment
                                                                                                                                  [ NASA-TM-84743]
                                                                                                                                                                                                    p0081 N82-24431
                                                                            p0 158 A82-11117
                                                                                                                        STANFORD UNIV. , CALIF.
                                                                                                                              Turbulent boundary layer heat transfer
                                                                                                                                  experiments - A separate effects study on a
                                                                                                                                   convexly-curved vall
                                                                                                                                   [ASME PAPER 81-HT-78]
                                                                                                                                                                                                    p0092 A82-10963
SCIENTIFIC RESEARCH ASSOCIATES, INC., GLASTONBURY,
                                                                                                                              Turbulent boundary layer heat transfer experiments: Convex curvature effects including introduction and recovery [NASA-CR-3510] p0090
      Turbofan forced mixer-nozzle internal flowfield.
          Volume 3: A computer code for 3-D mixing in
                                                                                                                                                                                                    p0090 NB2-17456
          a sisymmetric nozzles
                                                                                                                        STRVENS INST. OF TECH., HOBOKEN, N. J.
The influence of Coriolis forces on gyroscopic
          f NASA-CR-3494 1
                                                                            p0091 N82-22460
SHD ASSOCIATES, INC., EVANSTON, III.
Eigenvalues of the Rayleigh-Benard and Marangoni
                                                                                                                        motion of spinning blades

[ASHE PAPER 82-GT-163] p0030 A82

STIRLING THERNAL MOTORS, INC., ANN ARBOR, HICH.

Evaluation of the potential of the Stirling
engine for heavy duty application

[NASA-CR-165473]

STOWNER ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIATION 180 GARAGES OF THE PARENT ASSOCIA
                                                                                                                                                                                                     p0030 A82-35384
          problems
                                                                            p0092 182-13396
       Nonlinear Marangoni convection in bounded
          layers. I - Circular cylindrical containers.
                                                                                                                                                                                                     p0 128 N82-10505
          II - Rectangular cylindrical containers
                                                                                                                        STONEHART ASSOCIATES, INC., MADISON, COMM.
Survey on aging on electrodes and
                                                                            :0094 A82-39501
      Surface-tension induced instabilities: Effects
                                                                                                                                   electrocatalysts in phosphoric acid fuel cells
          of lateral boundaries
                                                                                                                                   [ NASA-CR-165505 ]
                                                                                                                                                                                                   p0 128 N8 2- 11545
          [ NASA-CR- 165530]
                                                                            p0092 N82-11390
                                                                                                                               Preparation and evalvation of advanced
SKP TECHNOLOGY SERVICES, KING OF PRUSSIA, PA.
Spherical roller bearing analysis. SKF computer
program SPHERBEAN. Volume 1: Analysis
                                                                                                                                  electrocatalysts for phosphoric acid fuel cells [NASA-CR-165519] p0 129 N82-1257
                                                                                                                                                                                                    P0129 N82-12573
      [NASA-CR-165203]
Spherical roller bearing analysis. SKF computer program SPHERBEAN. Volume 2: User's manual polog NB2-20541
                                                                                                                               Preparation and evaluation of advanced
                                                                                                                                   electrocatalysts for phosphoric acid fuel cells
                                                                                                                                   [ NASA-CR-165594 ]
                                                                                                                                                                                                    PO 132 N82-17615
                                                                                                                        STRUCTURAL COMPOSITES INDUSTRIES, INC., AZUSA, CALIF.
                                                                                                                               Winding for the wind
      Spherical roller bearing analysis. SKF computer program SPHERBEAN. Volume 3: Program correlation with full scale hardware tests
                                                                                                                                                                                                     P0 138 A82-37078
                                                                                                                               Design, evaluation, and fabrication of low-cost composite blades for intermediate-size wind
           F NASA-CF- 165205]
                                                                            p0106 N82-20542
                                                                                                                                   turbines
      High speed cylindrical roller bearing analysis.
SKF computer program CYBEAN. Volume 2:
                                                                                                                                   [ NASA-CR-165342]
                                                                                                                                                                                                     p0133 N82-18693
                                                                                                                         SYSTEMATICS GENERAL CORP., STERLING, VA.
Communications satellita systems capacity analysis
          User's manual
      [NASA-CR-165364] p0146 N82-31968
Research report: User's manual for computer
program AT819003 SHARERTH. Steady state and
                                                                                                                                   [NASA-CR-167911]
                                                                                                                                                                                                     p0034 N82-27331
                                                                                                                         SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
                                                                                                                               Sensor failure detection system [NASA-CR-165515]
           transient thermal analysis of a shaft bearing
                                                                                                                                                                                                     p0023 N82-13145
          system including hall, cylindrical and tapered
                                                                                                                         SYSTEMS SCIENCE AND SOFTWARE, LA JOLLA, CALTP.
          reller tearings
                                                                                                                              Space Shuttle Orbiter charging [AIAA PAPER 82-0119]
      [ NASA-CR-165365] p0146 N82-31969 Research report: User's manual for computer program AT817005. PLANBISYS, a computer program for the steady state and transient thermal analysis of a planetary power
                                                                                                                                                                                                     P0040 A82-17793
                                                                                                                               Validation of the NASCAP model using spaceflight
```

data

[AIAA PAPER 82-0269]

P0038 A82-17872

Bootstrap charging of surfaces composed of multiple materials WASCAP simulation of laboratory charging tests using multiple electron guns p0033 A82-18319 [NASA-CP-165607] Differential charging of high-voltage spacecraft
- The equilibrium potential of insulated speeds [NASA-Cr- 165226] Representation and material charging response of geoplasma environments Simulation of charging response of SCATHA (P78-2) satellite p0039 N82-14250 SYSTEMS SCIENCE AND SOFTWARE, SAN DIEGO, CALIF. Charging of a large object in low polar Earth p0039 N82-14275 orbit utilization Additional extensions to the WASCAP computer code, volume 1 [NASA-CR-167855] p0 146 NB 2-25810 Additional extensions to the NASCAP computer code, volume 2 [NASA-CR-167856] p0040 N82-26377 Additional extensions to the NASCAP computer code, volume 3 [NASA-CR-167857] D0040 N82-26378 TANKSLEY (W. L.) AND ASSOCIATES, INC., BROOK PARK, Vibration analysis of three guyed tower designs for intermediate size wind turbines [NASA-CR- 165224] p0137 N82-30709 [HASA-CR-165589] p0 137 N82-307
TATA INST. OF PUNDAMENTAL RESEARCH, BOMBAY (INDIA). Evidence for Pu-244 fission tracks in hibonites from Burchison carbonaceous chondr/te p0 166 A82-29316 TECHNION - ISRAEL INST. OF TECH., HAIFA. Modified face seal for positive film stiffness [NASA-CASE-LEW-12989-1] p0099 N82-1 p0099 N82-12442 TEL-AVIV UNIV. (ISRAEL). systems [AIAA PAPER 82-1246] On stability of premixed flames in stagmation -Point flow D0057 A82-37574 TELEDITE CAE, TOLEDO, OHIO.

Cooled variable nozzle radial turbine for rotor craft applications systems [NASA-CR- 165397] p0028 N82-29323 [NASA-CR-167885.] TELEDYNE CONTINENTAL HOTORS, HOBILE, ALA. Exhaust emissions reduction for intermittent combustion aircraft engines [NASA-CR-167914] [NASA-CR-167914] p0029 N82-33392 TELEDYNE CONTINENTAL HOTORS, HUSKEGCH, HICH. Lightweight diesel engine designs for commuter type aircraft [NASA-CR-165516] [NASA-CR- 165470] p0023 NB2-11068 TENNESSEE UNIV. SPACE INST., TULLAHOMA. 'Coriolis resonance' within a rotating duct p0012 182-37938 TEXAS ACH UNIV., COLLEGE STATICH,
Performance degradation of propeller/rotor
systems due to rime ice accretion
[AIAA PAPER 82-0286] p0014 A p0014 A82-28322 THERMO ELECTRON CORP., WALTHAM, MASS. Evaluation of left ventricular assist device pump bladders cast from icn-sputtered polytetrafluorethylene mandrels p0 142 N82-23 976 [NASA-CR- 167904] THERMO MECHANICAL SYSTEMS CO., CAMOGA PARK, CALIF.,
Development of a locally mass flux conservative computer code for calculating 3-D viscous flow in turkomachines [NASA-CR-3539] p0007 N82-22214 TORYO UNIV. (JAPAN).
Effect of tangential traction and roughness on crack initiation/propagation during rolling energy storage contact p0103 A82-30022 TOLIDO UNIV., OHIO.
Aeroelastic characteristics of a cascade of wistuned blades in subsonic and supersonic flows space station [ASME FAPER BI-DET-122] p0021 A82-19337 [NASA-CR-165436] The effects of centrols and centrellable and storage loads on the rerfermance of stand-alone photovoltaic systems

Modeling the full-bridge series-resonant power p0086 182-46385 Numerical simulation of one-dimensional heat transfer in composite bodies with phase change p0002 N82-22142 TRANSMISSION RESEARCH, INC., CLEVELAND, ONTO. Traction contact performance avaluation at high p0105 N82-16409 TRIBEN BEARING CO., CLEVELAND, ONIO. Effects of ultra-clean and centrifugal filtration on rolling-element bearing life [ASHE PAPER 8 1-LUB-35] p0 10 3 A82-18436 TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONNO BRACH, High power solar array switching regulation p0043 A82-11736
30/20 GHz demonstration system for improving Cpen-loop nanosecond-synchronization for wideband satellite communications p0036 A82-27224 Brushfire arc discharge model Integrated propulsion for near-Earth space missions. Volume 1: Executive summary p0045 NB2-33424 D0038 N82-14224 Integrated propulsion for near-Earth space missions. Volume 2: Technical [NASA-CR-1678B9-VOL-2] p0046 N82-33425 INC., CLEVELAND, OHIO. Development of materials and process technology for dual alloy disks p0063 N82-18370 TRH, INC., REDOMBO BEACH, CALIF.
Shuttle to GEO propulsion tradeoffs
[AIAA FAPER 82-1245] p0034 A82-35082 Chopper-controlled discharge life cycling studies on lead-acid tatteries
[NASA-CR-165616] p0134 N92-206
TUSKEGEE INST., ALA.
Characterization of advanced electric propulsion p0134 N82-20661 p0071 A82-35083 A comprehensive method for preliminary design optimization of axial gas turbine stages
[ATAA PAPER 82-1264] p0030 A p0030 A82-35091 Characterization of advanced electric propulsion p0045 N82-26381 ULTRASYSTERS, INC., IRVINE, CALIF.
Thermal oxidative degradation reactions of perfluoroalkylethers p0048 N82-12135 UNITED AIR LINES, INC., SAN FRANCISCO, CALIF.
An automated system for global atmospheric sampling using B-747 airliners
[NASA-CR-165264] p0139 N p0 139 N82-13554 UNITED TECHNOLOGIES CORP., EAST HARTFORD, COMB.
A heat exchanger computational procedure for temperature-dependent fouling [ASME PAPER 61-HT-75] p0092 A82-10961 NASA Broad Specification Puels Combustion Technology program - Pratt and Whitney Aircraft Phase I results and status [AIAA PAPER 82-1088] p0021 p0021 A82-34999 Practure mechanics criteria for turbine engine hot section components [NASA-CR-167896] p0027 N82-25257 Hot isostatically pressed manufacture of high strength MERL 76 disk and seal shapes [NASA-CR-165549] p0064 N82p0064 N82-26439 UNITED TECHNOLOGIES CORP., SOUTH WINDSOR, COWN.
Alkaline regenerative fuel cell systems for p0042 A82-11706 Low NO sub x heavy fuel combustor concept program [NASA-CR-165512] p0 129 NB2-12572 Electrochemical energy storage for an orbiting p0 132 N82-17607 Low NO subx heavy fuel combustor concept program. Phase IA: Coal gas addendum [NASA-CR-165577] p0133 N82-1 UNITED TECHNOLOGIES CORP., WEST PALH BEACH, FLA. p0133 N82-18690

p0127 A82-45027

```
A real time Pegasus propulsion system model for
       VSTOL piloted simulation evaluation [AIAA PAPER 81-2563] p0
                                                    p0020 A82-19221
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD.
COMM.
    Tube entrance heat transfer with deposit formation
      [AIAA PAPER 82-0918]
                                                    p0093 A82-31908
    Evaluation of fuel injection configurations to
       control carbon and soot formation in small GT
       combustors
       [AIAA PAPER 82-1175]
                                                     p0021 A82-35041
    Deposit formation in hydrocarbon fuels
[ASME PAPER 82-GT-49]
Panerisental about of the poor
    [ASME PAPER 82-GT-49] p0075 A82-35307
Experimental study of external fuel vaporization
    (ASME PAPER 82-GT-59) p0075 A82-35312
Development of low modulus material for use in
       ceramic gas path seal applications
[NASA-CR-165469] p
                                                     p0022 NB2-10039
    External fuel vaporization study [NASA-CR-165513]
                                                    p0073 N82-14371
    Research and development program for non-linear structural modeling with advanced
       time-temperature dependent constitutive
       relationships
       [ NASA-CR- 165533]
                                                    p0024 N82-16080
    An experimental investigation of gapwise
    periodicity and unsteady aerodynamic response in an oscillating cascade. Volume 2: Data report. Part 1: Text and mode 1 data [NASA-CR-165457-VOL-2-PT-1] p0006 N82-18 Hass and momentum turbulent transport
                                                   p0006 N82-18180
       experiments with confined coaxial jets
       [ NASA-CR-165574]
                                                    p0090 N82-19496
    Investigation of soot and carbon formation in
    small gas turbine combustors
[NASA-CR-167853] p0025 N82-222
Turbofan forced mixer-nozzle internal flowfield.
Volume 1: A benchmark experimental study
[NASA-CR-3492] p0090 N82-224
                                                    p0025 N82-22267
                                                   p0090 N82-22458
    Turbofan forced mixer-nozzle internal flowfield.
       Volume 2: Computational fluid dynamic
       predictions
       [ MASA-CR-3493]
                                                     p0091 N82-22459
    Turbofan forced sixer-nozzle internal flowfield.
       Volume 3: A computer code for 3-D mixing in
       axisymmetric nozzles
       [ NASA-CR-3494]
                                                    p0091 N82-22460
    An experimental investigation of gapwise
                                                                                          turbines
       periodicity and unsteady aerodynamic response
in an oscillating cascade. I: Experimental
       and theoretical results
       [ NASA-CR-3513]
UNIVERSITIES SPACE RESEARCH ASSOCIATION, COLUMBIA,
   CAS22 - FORTEAN program for fast design and
analysis of shock-free airfoil cascades using
       fictitious-qus concept
                                                                                          engines
       [ NASA-CR-35071
                                                     p0006 N82-16044
    Design of supercritical cascades with high
       sclidity
       [ NASA-CF- 165600]
                                                     p0007 N82-22210
    GRID3C: Computer program for generation of C
    type multilevel, three dimensional and houndary conforming periodic grids
[NASA-CE-167846] p0008 N62-26239
Fast generation of three-dimensional
                                                                                          flows
       computational houndary-conforming periodic
       grids of C-type
[NASA-CR-165596]
                                                     pC009 N82-28253
                                                                                          nechanisa
```

VARIAN ASSOCIATES, PAIO ALTO, CALIF.

CM-VPE growth of Nq-doped GaAs

p0 159 A82-3841;

VIRGINIA POLYTECHNIC INST. AND STATE UNIV.,

ELACKSBURG.

A new approach to the minimum weight/loss design of switching power converters

p0082 A82-1683;

Power system design optimization using Lagrange multiplier techniques

p0085 A82-20743

Analysis and design of a standardized control module for switching regulators

p0083 A82-46388

Modeling and Analysis of Fower Processing

Systems (MAPPS). Volume 1: Technical report [NASA-CR-165538]

Modeling and Analysis of Power Processing Systems (MAPPS), Volume 2: Appendices [NASA-CF-165539] INASA-CP-1655391 p0145 N82-16748 Finite-element modeling of layered, anisotropic composite plates and shells: A review of recent recent positions. recent research p0113 N82-19563 Input filter compensation for switching regulators [NASA-CR-169005] p0085 N82-25442 VIRGINIA UNIV., CHABLOTTES VILLE. A pad perturbation method for the dynamic coefficients of tilting-pad journal bearings p0110 A82-14400 VOUGHT CORF., DALLAS, TEX.
V/STOL Tandem Fan transition section model test
[NASA-CF-165587] p0007 N82-21 p0007 N82-21158 WESTERN UNION TELEGRAPH CO., HCLEAN, VA. Worldwide satellite market demand forecast [NASA-CR-167918] p0079 N82-25423
WESTINGHOUSE ELECTRIC CORP., CCNCCEDVILLE, PA.
LOW NC sub x heavy fuel combustor concept
program. Phase 1A: Combustion technology generation coal gas fuels p0055 N82-22326 [NASA-CP- 165614] Low NCx heavy fuel combustor concept program.

Phase 1: Combustion technology generation
[NASA-CE-165482] p0136 N82-24725 WESTINGHOUSE ELECTRIC CORP., LIMA, CHIO.
High voltage DC switchgear development for
multi-kW space power system: Aerospace multi-kW space power system: Merospace technology development of three types of solid state power controllers for 200-1100VDC with current ratings of 25, 50, and 60 amperes with one type utilizing an electromechanical device [NASA-CR-165413] p0083 N82-13357 WESTINGHOUSE ELECTRIC CORP., HADISON, PA.

Low and medium heating value coal gas catalytic combustor characterization [NASA-CR-165560] [NASA-CR- 165560] p0138 N82-32856 WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA. Development of an 1100 deg F capacitor p0083 N82-15315 Evaluation of present thermal barrier coatings for potential service in electric utility gas [NASA-CR- (65545] p0063 N82-18368 High voltage power transistor development [NASA-CR-165547] p0084 P0084 N82-18506 Cell module and fuel conditioner development PO 134 N82-21713
WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER,
PITTSBURGH. PA. PITTSBURGE, PA. Ceramic thermal barrier coatings for gas turbine [ASME PAPER 82-GT-265] p0071 A82-35441 Cell module and fuel conditioner development [NASA-CR-165462 . p0 130 N82-13511 Cell module and fuel conditioner development [NASA-CR-165193] WICHITA STATE UNIV., KANS. p0 137 N82-30712 Numerical modeling of three-dimensional confined I NASA-CR-165583 1 p0 158 N82-24078 WILLIAMS RESPARCE CORP., WALLED LAKE, HICH.
AGT-102 autocotive gas turbine [WASA-CR-165353] p0 105 N82-12444 WRIGHT STATE UNIV., DAYTON, OHIO. Undoped semi-insulating LEC GaAs - A model and a p0 159 A82-13754 Compensation mechanism in liquid encapsulated Czochralski Gals Importance of melt stoichiometry p0086 A82-40403 WYONING UNIV., LARANIE.
Analysis of crack propagation as an energy absorption mechanism in metal matrix composites [NASA-CR-165051] p0052 N82-1428

[NASA-CR-165051] p0052 M82-14288

Micromechanical predictions of crack propagation and fracture energy in a single fiber boron/aluminum model composite [NASA-CR-168550] p0052 M82-18326

CORPORATE SOURCE INDEX

ERBOX CORP., EL SECUEDO, CALIF.
Power system design optimization using Lagrange multiplier techniques

p0085 A82-20743

Analysis and design of a standardized control module for switching regulators

p0083 A82-46388

***EZOX RLECTRO-OPTICAL SYSTEMS, PASADERA, CALIF.

Developing a scalable inert gas ica thruster
[AIAA PAPER 82-1275] p0047 A82-37713

Inert gas ion thruster
[MASA-CR-165521] p0044 W82-21252

YALE UNIV., BRE HAVES, COME.
Experimental and theoretical studies of the laws
governing condensate deposition from combustion gases

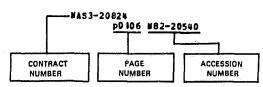
p0057 A82-28709 Two dimensional stagnation point flow of a dusty gas near an oscillating plate

p0012 A82-37535

p0 132 N82-17608

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order with the *IAA* accession numbers appearing first. Preceding the accession number is the page number in the abstract section in which the citation may be found.

AP-AFOSR-78-3473

AP-A POSR-78-3473	p0 132 N82-17608
P0107 A 82-18407	p0085 N82-24425
P0056 A82-21431	p0 106 KB2-24496
AP-AFOSR-80-0015	p0124 N82-28786
p0052 A82-13403	p0163 N82-31160
AP-AF0SR-80-0160	p0082 N82-33636
p0010 A82-29003	p0127 W82-33829
A7-A FO SR-8 1-0057	DE-AIO1-77ET-3111
p01 15 A82-32303	p0065 N82-33494
p0115 A82-36782	
AF-AFOSR-0142-81	DE-AI01-77ET-10350
	p0118 N82-13504
p0113 N82+19563	p0 118 N82-13509
DA PROJ. 111-62209-AH-76	p0124 1182-29717
P0063 N82-14333	p0061 N82-30373
P0007 N82-22214	P0125 NB2-30717
p0106 N82-26679	p0126 N82-31776
p0028 N82-29323	p0138 N82-32856
p0028 N82-32367	DE-AIO1-77ET-10769
DAAG29-79-C-0204	p0128 N82-10495
p0056 A82-21431	p0099 N82-12446
P0066 NB2-11211	p0 129 N82-12570
DAAK 11-79-M-0010	
	p0 157 N82-12943
p0056 A82-28651	p0157 N82-13908
EE-AB29-76ET-20370	p0 131 N82-15527
p0119 NB2-14633	p0119 H82-16481
DE-ACO 1-78ET-10818	p0132 N82-17603
p0158 A82-20747	p0 133 N82-18688
DE-AC01-79ET-15518	p0158 N82-24078
p0094 A82-44782	p0 123 N82-25636
DE-AC02-76CS-52749	p0 157 N82-25961
p0105 N82-12444	p0 123 N82-26790
DE-AI-01-80ET-17088	p0 136 N82-27837
p0135 N82-24648	
DE-A101-76ET-20320	p0 123 N82-27838
	DE-AIO!-77ET-13111
p0129 N82-13505	p0 129 NB2-12572
p0119 N82-16478	p0 133 N82-18690
p0110 N82-19550	p0055 N82-22326
p0121 NB2-21714	p0135 NB2-24649
p0122 N82-23679	p0135 N82-24650
p9127 N82-33830	p0135 N82-24651
DE-A 10 1-76 ET-20 366	p0136 N82-24725
p0125 N82-30710	p0136 N82-25635
DE-A 15 1-76 ET-20370	p0 138 N82-33827
p0120 N82-21710	DE-AI01-79CS-20270
DE-AIO 1-77CS-1044	
	p0117 N82-14552
p0084 N82-24424	BE-A 101-79ET-20305
DE-AIO 1-77CS-51040	p0 119 N82-16495
p0104 N82-11466	DE-AIO(-79ET-20320
p0163 N82-13013	p0133 N82-18693
p0003 H82-13114	DE-AIO1-79ET-20485
p0129 N82-13507	p0128 N82-10506
p0130 H82-13510	p0 130 N82-14627
p0066 N82-14359	p0132 N82-16494
P0119 N82-18691	p0133 N82-18698
p0024 NB2-21193	p0 133 N82-19669
p0120 N82-21712	p0134 N82-22770
p0134 N82-22666	
	DE-AIO1-80AL-12726
p0163 N82-26051	p0054 N82-19333
p0061 #82-30372	p0123 N82-25637
p0164 N82-34311	DE-AI01-80CS-50194
p0164 N82-34312	p0164 NB2-18068
DE-AIO 1-77CS-51044	DE-AIO1-80ET-17088
p0118 N82-10503	p0 130 N82-135!1
p0129 NB2-13506	p0131 N82-16483
p0105 #82-16410	p0120 N82-19670
p0163 NB2-16938	p0 134 N82-21709
Anima men taska 1	60.1.2 - 20t act and

```
p0134 ¥82-21713
        p0136 N82-29718
p0136 N82-29719
        p0137 #82-29721
p0137 #82-30705
        p0137 N82-30712
p0137 N82-30722
DE-AI01-81CS-50006
        p0073 M82-13243
DE-A103-79ET-11272
        p0131 N82-16482
   AI03-80ET-17088
        p0129 N82-12573
p0132 N82-17615
DE-A104-80AL-12726
p0 188 N82-12574
        p0120 N82-20668
p0136 N82-25640
p0137 N82-30711
        p0054 N82-31459
         p0055 N82 33463
DE-AT04-8 |AL-16228
p0 135 N82-24646
DE-A101-77CS-51040
        P0060 N82-24323
DE-A 10 1-77ET-10350
        p0131 N82-16484
   -FG20-80PC-30197
p0056 A82-28651
DE-QC01-79ET-15518
        P0011 A82-31947
DE-1101-80ET-17088
        p0130 N82-14628
        p0075 A82-33031
        P0071 A82-35064
        p0071 A82-35403
        p0071 182-35431
        p0071 A62-37015
        p0164 #82-31158
DEN3-22
        p0 107 A82-18426
DEN 3-32
        p0164 N82-29235
        p0164 N82-34311
        p0164 N82-34312
        p0105 N82-16409
        p0 132 882-16485
        p0108 182-27079
        p0133 N82-19669
        p0158 A82-20750
p0131 N82-16482
DEN3-83
        p0056 A82-20739
        p0130 NB2-13510
DEN3-88
        p0134 N82-20661
DEN 3-89
        p0 138 A82-24695
        p0136 N82-25640
        p0138 A82-37078
        p0133 N82-18693
DEN 3-107
        p0131 N82-15527
        p0065 N82-33494
        p0071 A82-35441
        p0 105 N82-12445
DEN3-123
        p0132 N82-17608
        p0085 N82-24425
DEN3-124
        p0105 N82-16419
        p0106 N82-24496
```

DEN3-825 P0085 A82-20744 P0129 N82-13506 DE#3-135 P0158 A82-20747 DEN3-145 p0074 #82-26482 P0138 N82-33827 DEN3-146 P0055 N82-22326 p0136 N82-24725 p0135 N82-24651 p0055 N82-25337 DEM3-148 p0055 N82-25338 P0136 N82-25635 DEN3-149 p0129 N82-12572 p0 133 182-18690 DEN3-150 p0134 N82-21709 p0134 N82-22675 DEN3-15 p0163 N82-16938 p0131 N82-16484 DEN3-161 p0130 N82-13511 p0 134 N82-21713 p0137 NB2-30712 DEN3-167 p0107 A82-11783 P0071 A82-20741 P0074 A82-33030 PO 108 A82-35039 p0071 382-35064 P0108 A82-35321 p0071 A82-35403 P0109 A82-35480 P0065 A82-48244 p0163 N82-16937 DEN3-168 p0108 A82-35038 P0108 A82-35061 P0 104 A82-35062 P0071 A82-35064 P0071 A82-35403 DEN3-176 p0128 N82-11545 p0129 N82-12573 p0132 N82-17615 DEN3-180 p0 128 N82-10506 P0130 N82-14627 p0133 N82-18698 p0134 NB2-22770 DEN3-183 p0135 N82-24646 p0135 N82-24650 DEN3-186 p0134 N82-22666 DEN3-189 p0085 A82-20505 P0083 A82-20745 DEN3-190 p0 | 36 N82-24686 p0132 N82-16494 p0129 N82-13505 DEN3-204 P0137 N82-30711 DEN3-208 p0 130 N82-14628 p0136 N82-29718 DEN3-224 p0128 N82-10495 p0129 N82-12570 p0 132 N82-17603 p0133 N82-18688 P0136 N82-27837 DEN3-227 p0104 N82-11466

CONTRACT HOUSER INDEX

DEN3-241	NRG3-53	NASH-3336	WAS3-21285
P0117 N82-13490	p0057 A82-28736	p0079 A82-10679	p0107 M82-27743
p0131 NE2-16483 p0135 NE2-24648	p0057	NASI-15325 p0027 N82-28296	MAS3-21287
p0137 N82-30705	p0057 A82-37574	P0027 #82-28296 WAS2-9281	p0130 N82-13508 NAS3-21293
DEN3-248 p0137 N82-29720	NAG3-54 no.115 hep-30514	p0005 A82-37684	p0 132 N82-17607
DE#3-277	p0115	NAS3-2253 p0007 N82-22210	NAS3-21345 p0044 N82-21252
p0138 x82-32856	HAG3-57	NAS3-6465	NAS3-21351
DI-DM-JO-100026 p0125 N82-30714	p0065	p0083 M82-15315 NAS3-10941	p0063 N82-1837C
DNA001-79-C-0079	HAG3-59	p0083 M82-15315	NAS3-21356 p0105 N82-11461
P0033 A 62-18319 EC-77- A-31-1011	p0064 N82-30374 NAG3-62	NAS3-17787	NAS3-21357
P0105 N82-16409	p0030 A82-17836	p0063 M82-10193 NAS3-17867	P0044 N82-12131
EC-77-A-31-1040 p0164 N82-31158	KAG3-65	p0 139 N82-13554	p0071 A82-35441
EC-77-1-31-1044	p0014 A82-27098 NAG3-67	NAS3-18547 p0 104 M82-10401	p0063 M82-18366 MA53-21384
p0105 N82-12445	PO 153 NB2-16810	NAS3-19755	p0051 N82-12139
EC-77-1-21-10040 p0164 N82-29235	NAG3-71 p0014 NB2-11052	p0029 M82-33392 NAS3-20070	NAS3-21500
EP-76-5-01-2479	NAG3-72	p0023 #82-14092	p0078 N82-17420 NAS3-21591 A82-20748
P0110 A82-14400 EF-77-A-01-2593	p0002 N82-22142 NAG3-73	p0023 N82-14093	p0039 N82-15117
P0058 NB2-17335	p0 106 N82-26680	P0027 N82-27310 NAS3-20072	NAS3-21609 p0011 A82-35427
FPA-68-02-3122 p0056 A82-20739	NAG3-74	p0064 M82-26439	MAS3-21624
EY-76-C-02-2749	p0029 A82-12120 p0030 A82-17788	NAS3-20074 p0026 N82-25254	p0023 N82-12075
p0108 A82-27079	p0092 A82-17824	NAS3-20102	p0009 N82-33347#
EX-76-C-04-3737 X82-23394	p0011 A82-31947 p0093 A82-35043	p0083 A82-46388 NAS3-20405	NAS3-21726
F04701-77-C-0062	p0094 A82-37710	p0052 N82-2024B	p0055 A82-1573;* p0055 A82-1574;
p0165 A82-23750 p0140 A82-32630	p0094 A82-44782	₩AS3-20583	NAS3-21727
F04701-80-C-0081	p0090 N82-15360 p0090 N82-19495	p0128 M82-11547 NAS3-20629	p0023 NB2-1004/ NAS3-21730
p0081 N82-24431	p0092 NB2-31643	p0024 N82-17174	p0065 A82-2074
F33615-77-C-5171 p0074 A82-33030	NAG3-75 p0097 A82-34231	p0027 N82-28297 p0029 N82-33393	p0064 N82-193€
733615-78-C-2401	p0097 AB2-36987	NAS3-20630	NAS3-21733 p0006 NB2-1712
p0030 A62-17636 F33615-80-C-1182	NAG3-76 p0071 A82-35083	p0104 #82-11467	#AS3-21745
P0086 A82-23566	p0045 NB2-26381	p0106 N82-18603 NAS3-20631	p0080 A82-2713 WAS3-21753
F33615-81-C-1406	NAG3-81	p0025 N82-21197	p0073 N82-1026
P0086 182-40403 F49620-76-C-0020	p0085 N82-25442 NAG3-86	NAS3-20632 p0027 M82-27309	NAS3-21755 p0083 N82-133
p0057 A82-28709	p0012 A82-37938	p0027 N82-28296	NAS3-21762
NAGH-38 p0166 A82-29316	NAG3-88 p0159 A82-31276	NAS3-20643	p0039 N82-142
NAG1-95	p0 159 A82-42912	p0029 A82-11999 p0030 A82-35450	p0039 N82-142 p0039 N82-142
p0131 N82-16479 NAG3-1 p0057 A82-37571	NAG3-96	NAS3-20646	NA53-21763
NAG3-3 p0092 A82-10963	p0028 N82-31328 NAG3-100	p0024 N82-21196 p0025 N82-22264	p0052 N82-314 NAS3-21809
P0090 N82-17456 NAG3-6 P0104 A82-35468	p0 105 N82-14520	p0031 M82-32383	p0085 N82-233
NAG3-6 P0104 A82-35468 NAG3-13	NAG3-101 p0145 N82-17879	p0029 N82-33394 NAS3-20769	NAS3-21843 p0015 A82-376
pC065 A82-44529	NAG3-109	p0007 N82-19178	NAS3-21900
NAG3-22 p0052 A82-13403	p0014 A82-28322 NAG3-111	NAS3-20817	p0137 H82-307
NAG3-26	p0 136 N82-29719	p0084 N82-24424 NAS3-20819	WAS3-21933 p0080 A82-271
p0009 N82-32310 NAG3-26	NAG3-122 p0091 NB2-31639	p0023 N82-14095	WAS3-21940
p0010 A82-22081	NAG3-131	p0024 N82-14096 NAS3-20821	p0047 A82-350 NAS3-21949
p0008 N82-24166 NAG3-29	p0093 A82-32225	p0025 ¥82-22265	p0084 #82-185
p0138 A82-11712	NAG3-134 p0116 A82-45869	NAS3-20824 p0106 N82-20540	NAS3-21951 p0130 N82-14(
NAG3-36	NAG3-144	p0 106 M82-20541	p0130 NB2-146
p0115 A82-11298 p0115 A82-19341	p0 128 A82-45055 NAG3-149	p0106 N82-20542 NAS3-20834	MAS3-21952
p0115 A82-354C8	p0079 N82-28503	p0007 ¥82-22214	p0046 N82-111
NAG3-38 p0115 A82-32303	NAG3-152 p0 165 A82-23750	NAS3-20 836	NAS3-21955
p0115 A82-36782	NAG 3-16 1	p0012 A82-35571 NAS3-20951	p0044 N82-183
p0116 A82-40066 p0113 N82-24503	p0154 A82-45165	p0090 N82-22458	p0105 N82-134∰
p0114 N82-29619	NAG3-175 p0 159 NB2-11959	p009 1 N82-22459 p009 1 N82-22460	NAS3-21961 p0038 N82-142
NAG3-39	NAG3-208	NAS3-21040	NAS3-21971
P0113 N82-20564	p0113 N82-19563 NAG3-242	p0046 A82-15434 NAS3-21051	p0092 A82-105
p0112 N82-14531	p0014 A82-28322	p0082 182-16831	p0093 A82-319 p0075 A82-353
NAG3-43 p0159 A82-21965	NAG3-246 DO 115 NB2-33738	p0085 A82-20743	NAS3-21974
p0159 λ82-30335	PO 115 N82-33738 NASA ORDER C-32817-D	p0083 N82-14447 p0145 N82-16748	p0153 N82-21(/ p0153 N82-21(/
p0160 A82-46426	p0164 N82-18068	NAS3-21052	p0 155 N82-21
p0065 N82-31509	NASA CRDER C-41581-B p0027 N82-27316	p0046 A82-15435 NAS3-21227	NAS3-21975 p0153 A82-10
p0063 N82-13217	NASA CROER C-4270 ID	p0127 A82-44942	NAS3-21977_
NAG3-47 p0030 A82-35384	p0137 N82-29721 NASA ORDER C-46229-D	NAS3-21276 p0128 NB2-11546	p0073 N82-11
NAG3-48	p0137 N82-30722	NAS3-21280	p0074 N82-3 C NAS3-21995
p0106 N82-25516	NASA ORDER C-57307-D p0073 N82-13243	p0046 A82-11762	p0022 N82-10
•	pours maz=13243	•	P0022 N82-10

CONTRACT MUMBER INDEX

NAS 3-2 1957	MAS3-22444	NAS3-22739	p0097 A82-30300
p0026 N82-24202	p0047 A82-37713	p0025 N82-23246	p0006 N82-18184
HA53-22002 p0097 HB2-22479	NAS3-22461	NAS3-22762	NSG-3016
NAS3-22004	p0079 NB2-25423 NA53-22471	p0 10 3 A82-350 36 NAS3-2277 I	p0071 A82-20143
p0024 NB2-19221	p0086 A82-36927	p0090 N82-19496	p0071 AB2-35B71 NSG-3019
NA53-22005	p0084 N82-17439	NA53-22808	P0056 A82-22033
p3028 NB2-29323	NA53-22476	p0113 N82-17521	p0056 A82-28694
NAS3-22008	ph 142 N82-23976	NAS3-22876	p0091 N82-31641
p0024 #82-16081 NAS3-22019	NAS3-22477 P0 132 N82-17606	p0047 A82-37713	p0092 N82-31642
p0006 N82-18180	NAS3-22480	NAS3-22882 p0033 A82-44659	NSG-3032 p0097 A82-30300
P0008 N92-26229	p0104 N82-11465	p0033 NB2-29345	NSG-3036
NAS3-22053	NAS3-22481	NAS3-22885	p0030 A82-17796
p0030 882-34982	p0023 N82-13145	p0080 A82-23538	p0153 NB2-27090
HAS3-22055 P0024 NB2-16082	NAS3-22482 p00 t3 N82-19196	NAS3-22887	NSG-3044
NAS3-22057	NAS3-22491	p0079 N82-31584 NAS3-22888	P0 116 A82-46109
p0029 A82-16909	p0086 A82-23566	p0034 N82-27331	p0116 A82-46806 p0113 N82-26713
NAS 3-22762	NAS3-22496	NAS3-22901	p0114 N82-26714
p0029 A82+10457	p0078 NB2-13302	p0034 A82-36286	p0114 N82-26715
NAS3-22109	NAS3-22498	NAS3-22905	p0114 NB2-26716
pnn28	p9079 A82-23486 MAS3-22500	p0036 A82-36925	p0114 NB2-26717
P0104 A82-37854	p0086 A82-43784	NAS3-22914	p0114 N82-26718
หรุก 3-22134	NAS3-22501	p0034 A82-36286 NAS3-22950	NSG-3048 p0148 A82-19064
p0022 H82-10039	p0085 A82-23494	p0083 A82-41845	p0026 N82-23247
NAS 3-22143	4AS3-22502	NAS3-23157	NSG-3050
P0109 A82-48243	p0079 A82-23508	p0106 NB2-26679	p0065 A82-40335
NAS3-22148	pC080 A82-26713	NAS3-33541	NSG-3075
PAGE 10 A 82-31933 NASE-22149	PN086 A82-43867	p0141 N82-16659	p0011 A82-35379
p0023 N82-11068	NAD3-22505 p0052_N82-29363	NAS5-23481	NSG-3079
NAS3-22155	NAS3-22510	p0040 A82-16194 p0140 A82-32630	p0012 A82-35459
p0007 882-21158	p0073 N82-18402	NAS7-10	p0012 A82-35460 NSG-3084
NAS7-22171	NAS3-22517	p0135 N82-24646	p0148 A82-13143
p0056 A82-28651	p0048 N82-12135	NAS8-30563	MSG-3105
NAS3-22217	NAS3-22518	p0140 A82-31009	p0110 A82-14400
p0046 ≯82-11762 NAS3-22220	P0026 W82-23248 MAS3-22524	WASS=33982	MSG=3106
P0025 N82-22268	p0025 N82-22267	р0140 A82-32630 NBS-на-1008	p0107 A82-18431 p0070 A82-18432
NAS3-2221	NAS3-22525	p0056 A82-28651	p0070 A82-18432
p0075 N82-22263	p0028 N82-33391	NGL-05-005-007	NSG-3107
NAS3-22222	NAS3-22530	p0165 A82-23750	p0057 A82-28709
P0129 182-12571 NAS3-22224	p0041 A92-18312	NGL-39-009-007	p0012 A82-37535
p0159 A82-13754	NAS3-22532	p0097 A82-30300	NSG-3114
p0158 A82-17585	p0006 N82-16044 p0008 N82-26239	NGR-21-002-199	p0094 A82-41203
P00 86 AB2-40 403	p0009 N82-28253	p0167	NSG-3122 p0048 A82-15696
p0160 A82-46517	NAS3-22536	NGR-21-022-199	p0074 A82-22240
PC159 NB2-23030	p0040 A82-17793	p0167 A82-26003	p0074 A82-22241
NAS3-22226	P0038 A82-17872	NBC A-7435	p0074 A82-23238
P0128 N82-10505 NAS3-22228	p0085 182-18318	p0093 A82-35043	NSG-3124
p0127 A82-44944	p0033	NSF ATH-76-22415	P0092 A82-10963
p0133 H82-18689	p0 146 N82-25810	p0167 A82-26003 NSF ATM-77-14821	P0090 N82-17456 NSG-3128
NAS3-22232	p0040 N82-26377	A82-19360	p0053 A82-31339
p0159 A82-38411	p0040 N82-26378	NSP ATM-78-2176	p0053 A82-46220
NAS3-22236	NAS3-22539	p0167 A82-27323	NSG-3150
p0137 N82-30706	p9086 A82-36926	NSF ATH-78-21762	p0040 A82-16194
NAS3-22266 p0084 N82-23395	NAS3-22542 p0 139 N82-29777	p0167 A82-10156	PO 140 AB2-31009
NAS3-22274	NAS3-22550	NSF ATH-80-13153 A82-19360	p0140 A82-32630 NSG-3157
p0092 A82-13396	p0027 N82-25257	NSF CPE-79-23680	p0083 N82-12347
p0094 A82-39501	NAS3-22647	p0056 A82-28651	p0084 N82-22438
p0092 NB2-11390	p0074 N82-24353	NSF DMR-79-23573	NSG-3160
NAS3-22277 p0075 AB2-35307	NAS3-22649	A82-30002	p0 149 A82-3 1438
NASE-22324	p0044 N82-21253 NAS3-22650	NSF ECS-79-23877 p0159 A82-31276	NSG-3164 p0076 N82-24361
p0935 A82-10124	p0045 N82-24287	p0159 A82-42912	NSG-3166
p0040 A82-13494	p0045 NB2-24288	NSP ENG-76-10232	p0039 N82-14227
p00 33 % E2-48245	NAS3-22652	p0057 A82-37571	P0084 N82-18507
NAS3-22340	p0044 NB2-16172	NSF ENG-78-12372	P0084 N82-18508
p0078 N82-20362 p0078 N82-20363	NRS3-22659 p0098 N82-25499	p0093 182-32225	NSG-3169
p0078 N82-20364	NAS3-22661	NSF MEA-80-11362 p0 154 A82-45165	p0057 A82-28709 NSG-3170
PC078 N82-20365	p0034 A82-35082	NSG-317	p0107 A82-18407
NAS3-22341	p0045 N82-33424	p0148 A82-13143	p0056 A82-21431
p0036 A82-27224	p0046 NB2-33425	NSG-330	NSG-3171
NAS3-22342	NAS3-22664	p0063 A82-47400	p0148 A82-13143
p0078 N82-31585 NAS3-22343	P0091 N82-24452	NSG-398	NSG-3174
p0080 A82-36265	NAS3-22665 p0047 A82-35056	p0167 A82-10156	P0093 A82-24748
NAS3-22346	p0047 R82-33036	p0167 \ \text{\chi} \chi	NSG-3176
p0028 N82-32370	NAS3-22667	MSG-3011	p0046 A82-18191 p0046 A82-18199
NAS3-22347	p0 138 N82-32855	p0045 N82-24285	p0032 A82-35617
p00 14 N82-33375	NAS3-22690	p0045 N82-28350	P0032 A82-35618
NAS3-22369 p0007 N82-22211	p0146 NB2-31968	NSG-3012	NSG-3185
NAS3-22371	p0146 N82-31969 p0146 N82-31970	p0010 182-19301	p0052 N82-15123
p0063 N82-14333	PA 140 102-213/0	p0010 A82-22063 p0010 A82-26137	NSG-3186
	· ·	Poor o Borneois	p0158 M82-24078

COSTRACT MORDER INDEX

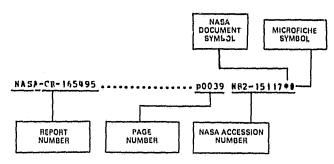
waa 3146			
N3G-3168	P0076 A82-46430	p0152 M82-21036	505-33-52
p0108 A82-19334	H5G-3303	po 152 M82-22951	p0111 982-21604
p0107 N82-296C7	p0135 W82-23702	p0152 M82-31068	505-33-62
NSG-3195	HEG-3304	p0 152 N82-32082	p0049 NB2-14287
p0153 A82-10460	p0007 N82-19169	p0089 182-32634	p0052 N82-15123
N9G-3196	NSG-3306	505-32-12	p0049 NB2=16181
p0157 N82-10890	p0092 A82-17880	p0016 N82-13146	p0018 NB2-22266
NSG-3197	p0027 N82-26295	p0090 #82-22458	p0050 NB2-24300
p0159 A82-41546	NSG-3307	p0091 N82-22459	p0113 NB2-26713
p0038 N82-14226	p0093 A82-23832	p009 1 N82-22460	p0114 BB2-2671
NSG-32C7	p0090 N82-22455	505-32-22	p0114 N82-26715
p0145 N82-17880	NSG-3311	p0018 N82-25250	p0 114 N82-26716
NSG-3212	p0005 A02-19778	505-32-32	p0 114 N82-26715
p0110 N82-18613	p0009 N82-29269		p0114 NB2-26718
NSG-1212	WSG-5320	p0016 H82-13143	
		p0016 N82-15040	p0 112 M82-31707
p0009 182-17933	p0167 A82-10156	p0087 N82-19494	p0112 N82-31706
p00 11 A82-35280	p0 167 A92-27323	p0072 NB2-32504	p0028 W82-33391
p00 11 A82-35281	N0014-80-C-0586	505-32-42	505-36-22
p0011 A82-35416	p0057 A82-37570	p0022 N82-10039	p0087 NB2-22453
p00 26 N82-25252	N00014-78-C-0547	p0066 N82-15198	505-41-22
p0026 N82-25253	p0071 A82-20741	p0066 H82-15199	p0018 N82-24203
NSG-3215	#00014-78-C-0636	p0099 N82-16411	p0019 N82-26297
p0064 NB2-27462	p0 115 λ 82-32303	p0099 N82-16412	p0019 N82-26298
NSG-3217	N000 14-80-C-0586	p0099 N82-16413	p0069 W82-29459
pro52 Ne2-14268	P0057 A82-32877	p0143 N82-16743	505-42-62
p0052 NE2-18326	p0057 A82-37574	P0048 N82-17263	p0006 N82-17122
NSG-3221	N00014-80-G-0079	p0067 N82-20313	p0004 N82-1817E
p0093 A82-31445	p0056 A82-28651	p0059 N82-21300	p0004 NB2-2416
NSG-3227	NCC014-81-K-0438	p0068 N82-21332	p0004 N82-2521
P0056 X82-17746			■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
* i = i = '\	A82-30002	p0060 N82-24322	P0019 N82-2731
pCO93 A82-27000	N00024-76-C-5352	p0088 N82-24455	p0020 N82-2932
p0056 A82-28708	p0074 A82-33030	p0100 N82-25514	505-43-02
NSG-3230	N00173-80-H-4575	p0100 N82-25518	p0005 N82-2824
p0129 NB2-13507	p0056 A82-21431	p0100 N82-25519	505-43-22 措
NSG-323!	W-7405-ZNG-48	p0068 N82-2646B	p0005 N82-2624 ₽
p0153 A82-14044	p0056 A82-17746	p0 10 1 M82-28644	505-43-43
p0154	p0093 A82-27000	p0101 N82-28645	p0020 MB2-3132
p0154 A 62-36195	p0056 A82-28708	p0101 N82-38646	505-44-12
MSG-3234	A82-30002	p0107 ¥82-29607	p0008 N82-2416
P0008 N82-26230	p0093 A82-32225	p0102 W82-30552	p0013 N82-302
WSG-3236	146-40-18	p0089 W82-32633	505-55-32
p0153 N82-18994	p0 1 17 N82- 14552	p0 10 2 N82-32733	p0033 N82-293
NSG-3238	307-90-00	P0102 N82-32734	505-61-22
p0091 N82-31638	p0016 M82-14090	505-32-52	P0081 N82-233
MSG-3246	500-42-62	p0004 N82-15020	506-52-12
p0062 A82-47397	p0003 N82-11043	p0006 M82-16044	P0105 N82-134
NSG-3253	500-55-12	p0149 N82-22922	p0045 N82-223
p0107 A82-18449	p0003 NB2-12043	p0149 N82-24859	p0088 N82-266
NSG-3257	503-04-72	p0008 #82-26239	506-52-42
p0138 A 22-11816	p0009 N92-33347	p0005 #82-28247	p0042 NB2-242
NSG-3263	505-03-22	P0009 N82-28253	506-53-12
p0064 N82-26436	p0025 N82-22265	p0005 #82-29270	p0058 N82-111
p0113 N82-26702	505-04-82	505-32-68	P0099 NB2-145
p0113 N82-26706	p0007 N82-22214	p0018 W82-21195	p0120 N82-19€ ₹
NSG-3265	505-15-22	505-32-72	p0058 N82-207
p0009 A82-15459	p0017 N82-19220	p0017 N82-15041	p0067 N82-203 \$
N5G-3266	505-31-32	p0017 #82-16084	p0059 N82-213
p0011 A82-31964	p0068 N82-24342	p0072 N82-27519	p0067 N82-213
p0011 A82-31965	505-32 p0016 N82-15039	D0072 N82-28460	p0059 N82-22: \$
p0091 182-27686	505-32-2	p0 16 1 N82-32186	n0060 N82-22-4
NSG-3267	p0 152 N82-24942	p0 16 1 N82-32187	P0068 N82-22
P00 10 A82-29003	p0020 N82-33389	p0161 N82-32188	p0050 NB2-24:
NEG-3269	505-32-2A	p0 16 1 N82-32189	P0068 NB2-243
p0116 A82-42863	p0024 N82-16081	505-32-82	p0050 N82-30.
p0079 N82-26526	p0017 N82-19222	p0095 N82-22481	p0069 N82-304
NSG-3280	p0018 N82-22269	p0095 N82-28605	
P0158 A82-11117	p0017 N82-22209	p0095 N82-28605	p0102 N82-316 d
			p0069 N82-324
NSG-3281	505-32-2B	505-33-12	p0 102 NB2-327
p0086 A82-46365 NSG-3283	p0003 N82-14051	P0058 N82-10195	p0103 N82-327,#
	p0095 N82-14494	p0058 N82-11182	p0061 N82-334
P0108 A82-35462	p0087 N82-19493	P0048 N82-15119	506-53-16
P0028 V82-33390	p0004 N82-26234	p0066 N82-15197	p0066 N82-162
NSG-3285	p0004 N82-26240	p0059 N82-22346	506-53-22
P0008 N82-26237	p0005 N82-28250	p0064 N82-27462	p0076 N82-223
nsg-3290	p0088 N82-30498	p0061 N82-32461	506-55-42
p0040 A82-15904	p0028 NB2-32367	505-33-22	p0128 N82-115%
p0039 #82-14272	505-32-6A	p0111 N82-16419	p0118 N82-115
p0039 N82-14273	p0017 N82-18222	p0110 NB2-18613	p0042 N82-29:
NSG-3292	p0019 N82-25255	p0 110 N82-20551	p0042 N82-31(
p0150 A82-33605	505-32-6B	p0111 N82-20565	p0126 N82-31
p00 12 A82-41267	p0076 NB2-20339	p0111 N82-20566	p0 126 N82-32
KSG-3294	p0 147 N82-22915	p0111 N82-24501	p0126 N82-32
p0009 A82-17759	p0 148 N82-30992	p0112 N82-24502	506-55-52
p00 10 A82-31939	p0 146 NB2-31971	p0064 N82-26436	
p00 12 A82-37711			p0130 N82-131
NSG-3295	p0146 N82-33020 505-32-02	p0113 N82-26702	p0054 N82-22
		p0113 N82-26706	p0123 N82-24
p0030 A82-35091	p0151 N82-12890	505-33-32	p0 125 N82-3(
NSG-3299	n0151 N82=12891	p0110 M82-18612	506-55-72
p1158 x82-26952	p0 151 N82-14881	p0049 N82-21259	p0037 N82-1
NSG-3301	P2151 N82-15847	p0051 N82-30336	P0037 N82-13
p0108 A82-21967	1 p0006 N82-18184	The state of the s	I p0083 N82-15
			Ďį.

CONTRACT NUMBER ZUDEN

PC00q BC00q	NE2-18311 NE2-23261
p0069 p0082	
506-56-12 p0049	N82-21260
506-61-22 p0081	N82-22439
508-52-12 p0074	N82-2435
\$10-53-12 p0026	N82-25254
p0064 510-55-12	N82-26439
p0006 p0008	N82-18180 N82-26229
510-57-1B p0060	N82-24326
£11-58-12 p0106	N82-25516
p0100 p0101	N82-25520 N82-26678
p0101 p0101	N82-26681 N82-28643
p0146 p0146	NB2-31969 NB2-31970
532-05-12 p00 18	N82-24201
533-01-32 p0019	N82-26300
535-03-12 p0151	N82-16808
p0151 p0007	K92-16809
p0152 p0001	N82-19178 N82-21998 N82-26219
p0095 541-02-12	N82-31663
p0082 560-60-26	N82-25441
p0079 643-10-01	N82-25423
p0034 643-10-02	N82-27331
p0036	N82-25290
p01 19 p01 19	N82-14633 N82-16495
p0120 p0123	N82-21710
776-33-41	H82-26807 N82-30710
p0119 p0133	N 82-16478 N 82-18693
p0121	N82-21714
p0122 p0127 776-42-51	N82-23679 N82-33830
p0132 776-52-41	N82-16494
p0130 p0133	NE2-14627 NE2-19669
776-54-01 p0137	N82-29720
p0126 776-72-41	N82-33828
p0118 p0123	N82-12574 N82-25637
p0137 p0054	N82-3C711 N82-31459
p00 55 776-81-62	N 82-33463
p0135 778-11-05	N E2-24646
p#099 p0157	N82-12446 N82-12943
p0157 p0131	N 82-139C8 N 62-15527
pC156 pO123	N82-24C7B N82-25636
69123 778-11-86	N82-26790
p0118 p0131	NB2-13509 NB2-16484
pC058 p0072	N82-17335 N82-21415
p0124 p0061	N82-29717 N82-30373
778-14-40 p2135	N82-24651
p0125	N82-30717

ORIGINAL PAGE IS OF POOR QUALITY

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The page number indicates the page in the abstract section in which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche

VC EE	-22-FR-	-1699A		p0014	N82-33375+#
ACS I	PAPER 9	9-C-80C		p0071	N82-20143*
ACS I	PAPER 4		******	>0070	A82-42366*
		2-n-80P	**********	p0074	A82-33030*
				p0071	A82-35871*
				Part .	
A 0 - 1	108342			20117	N82-18664*#
	113767			00027	N82-273 16+4
nu-n	114191		••••••	270061	NOL-2/5 (0 · W
ADL-	85 16 1	*******	•••••	p0013	N82-19196*#
AFGL:	-TR-814	0270		p0037	N82-14213*#
ATTA	PAPER	81-0046	*********	p0093	A82-23832*#
AKIK	PAPER	81-0273		p0002	A81-32548*#
ALAR	PAPER	81-2014	***********	p0 153	A82-10454*#
ATRA	PAPER	81-2033	******	p0029	A82-10457*#
ATAA	PAPER	81-2046		p0 153	A82-10460*#
ATAA	PAPER	81-2634		p0029	A82-16909*#
ALAA	PAPER	B 1- 2637		p0020	A82-19214*#
ALLA	PAPER	81-2663	**********	p0020	A82-19221*#
ATAA	PAPER	82-0036		p0056	A82-22033*#
ALAA	PAPER	82-0037		p0056	A82-17746*#
AIAA	PAPER	82-0061	***********	p0005	182-19778+4
ALAA	PAPER	82-0062		n0009	A82-17759*#
ATAA	PAPER	82-0109	******	p0030	A82-17788**
ATAS	PAPIR	82-0119		p0040	A82-17793**
AIAA	PAPER	82-0124		p0030	AB2-17796*#
ATAA	PAPER	82- 1177	******	p0092	A82-17824*#
RIAR	PAPER	82- 1192	*************	p0021	182-20291*#
ALAA	PAPER	82-0193	******	p0010	AB2-22063*#
ATAA	PAPER	82-0196		p0030	382-17836*#
AIAA	PAPER	82-0269		p0038	182-17872+1
ATAA	PAPER	82-0282		p0010	A82-22081##
ALLA	PAPER	82-0284		p0014	182-27098*#
ATAR	PAPER	82-0286		p0014	A82-28322*#
ATAA	PAPER	82-0300		p0092	A82-17880*#
ATAA	PAPER	82-0325	***********	p0157	182-17889**
AKAA	PAPER	82-0340		p0014	182-17894*#
ATAA	PAPER	82-0396		p0157	A82-20292*#
ATAA	PAPER	82-0413	***********	p0009	182-17933*#
ATAA	PAPER	82-0423		p0 157	A82-17941*#
ATTA	PAPER	82-0558		p0034	A62-36286*#
ATAN	PAPER	82-0918		p0093	A82-31908*#
ATAA	PAPER	02-0957		p0010	A82-31933##
ATAA	PAPER	£2-0970	******	p0010	182-31939*#
ALIA	PAPER	£2-0984	*************	p0011	182-31947+#
AIRA	PAPER	82-1006	******	p0011	A82-31964*#
ALAA	PAPER	82-1007		p0011	182-31965*#
ATAA	PAPER	82-1047	************	p0002	AB2-37678*#
MIAN	PAPER	82-1056		p0021	182-34981*#

AYAA PAPER 82-1057	p0030 A82	-34982**
AIAA PAPER 82-1072		-34992*4
AIAA PAPER 82-1075	P0021 A82	-34995*#
ATAA PAPER 82-1082		-37684 * #
AIAA PAPER 82-1084		-35195*# -34999*#
AIAA PAPER 82-1088		~35000++
AIAA PAPER 82-1120		-35017**
AIAA PAPZR 82-1131		-37691+4
AIAW PAPER 82-1159		-35036*#
AIAA PAPER 02-1165		-35038+#
AIAA PAPER 82-1166		-35039*# -35041*#
AIAA PAPER 82-1177		-35043+#
AIAA PAPBR 82-1196		-35056*#
ATAA PAPER 82-1207		~35061*#
ATAA PAPER 82-1208		-35062+0
AIAA PAPER 82-1209		-35480## -35064##
AIAA PAPER 82-1245		-35082**
AIAA PAPER 82-1246		-35083*#
AIAA PAPER 82-1251		-35087*4
AIAA PAPER 82-1262		-37710*#
ATAA PAPER 82-1264 ************************************		-35091*# -37711≑#
AIAA PAPER 82-1275		-37713*#
AIAA PAPER 82-1288		-37716+#
AIAA 81-2173		-10124+#
AIAA 81-2283		-13494*#
AIAA 82-0449		-23486*# -23494 * #
AIAA 82-0458		-23508*#
AIAA 82-0498		-23566*#
AIAA 82-0526	p0080 A82	-23538*#
5 T 3 4 _ D 5 D 7 D _ 0 7 (-0161 NOT	
AIAA-PAPER-82-0122 ***********************************	P0151 N82	I≠14881 ## .
ATAA-81-2627		-11042*
AIAA-81-2637		-18178*#
AIAA-81-2663 AIAA-82-0192		-13144*# -19220*#
AIAA-82-0192	pooti Noz	-13220**
AIRESEARCH-21-3615		-14095**
AIRESEARCH-21-3619		-14096*#
AIRESEARCH-31-3725	p0163 N82	-16937**
ASLE PREPRINT 81-LC-5C-1	p0107 A82	-18407+
ASLE PREPRINT 82-AM-IA-1	p0104 A02	!-37854*
ASME PAPER 81-DET-114	p0108 A82	-19334*#
ASHE PAPER 81-DET-115		- 19335**
ASBE PAPER 81-DET-122		-19337**
ASHE PAPER 61-DET-127		-19341*#
ASME PAPER 81-GR/GT-1		!-1930!*# !-10952*#
ASHE PAPER 81-HT-75		-10961*#
ASME PAPER 81-HT-78		-10963*#
ASHE PAPER BI-HT-79		-10964*#
		2-18426*
ASME PAPER 81-LUB-9		
ASHE PAPER 81-LUB-16	p0107 AB2	2-18431+#
ASHE PAPER 81-LUB-16 ASHE PAPER 81-LUB-17	p0107 A82	2-18431*# 2-18432*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35	p0107 A82 p0070 A82 p0070 A82 p0103 A82	2-18431*# 2-18432*# 2-18432*# 2-18436*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-55	p0107 A82 p0070 A82 p0070 A82 p0103 A82 p0107 A82	2-18431*# 2-18432*# 2-18432*# 2-18436*# 2-18449*8
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-55 ASME PA 'ER 82-GT-11	p0107 AB2 p0070 AB2 p0070 AB2 p0103 AB2 p0107 AB2 p0011 AB2	2-18431*# 2-18432*# 2-18432*# 2-18436*# 2-18449*8 2-35280*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-35 ASME PAPER 82-GT-11 ASME PAPER 82-GT-12	P0107 A82 P0070 A82 P0070 A82 P0103 A82 P0107 A82 P0011 A82	2-18431*# 2-18432*# 2-18432*# 2-18436*# 2-18449*8 2-35280*# 2-35281*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-55 ASME PAPER 82-GT-11 ASME PAPER 82-GT-12 ASME PAPER 82-GT-49	P0107 A82 P0070 A82 P0070 A82 P0103 A82 P0107 A82 P0011 A82 P0011 A82 P0075 A83	2-18431*# 2-18432*# 2-18436*# 2-18449*8 2-35280*# 2-35281*# 2-35307*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-35 ASME PAPER 82-GT-11 ASME PAPER 82-GT-12 ASME PAPER 82-GT-59 ASME PAPER 82-GT-59 ASME PAPER 82-GT-72	P0107 A82 P0070 A82 P0070 A82 P0103 A82 P0107 A82 P0011 A82 P0011 A82 P0075 A82 P0075 A82 P0108 A83	2-18431*# 2-18432*# 2-18432*# 2-18436*# 2-18449*8 2-35280*# 2-35281*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-55 ASME PAPER 82-GT-11 ASME PAPER 82-GT-12 ASME PAPER 82-GT-49 ASME PAPER 82-GT-72 ASME PAPER 82-GT-72 ASME PAPER 82-GT-72 ASME PAPER 82-GT-71	P0107 A82 P0070 A82 P0070 A82 P0103 A82 P0107 A82 P0011 A82 P0011 A82 P0075 A82 P0075 A82 P0108 A82 P0108 A82	2-18431*# 2-18432*# 2-18432*# 2-18449*# 2-35280*# 2-35281*# 2-35312*# 2-35321*# 2-35348*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-55 ASME PAPER 82-GT-11 ASME PAPER 82-GT-12 ASME PAPER 82-GT-72 ASME PAPER 82-GT-72 ASME PAPER 82-GT-73 ASME PAPER 82-GT-74 ASME PAPER 82-GT-117 ASME PAPER 82-GT-147	P0107 A82 P0070 A82 P01070 A82 P0103 A82 P0107 A82 P0011 A82 P0011 A82 P0075 A82 P0075 A82 P0022 A82 P0022 A82	2-18431*# 2-18432*# 2-18436*# 2-18449*# 2-185280*# 2-35281*# 2-35307*# 2-35312*# 2-35321*# 2-35321*# 2-35373*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-55 ASME PAPER 82-GT-11 ASME PAPER 82-GT-12 ASME PAPER 82-GT-49 ASME PAPER 82-GT-59 ASME PAPER 82-GT-72 ASME PAPER 82-GT-17 ASME PAPER 82-GT-149 ASME PAPER 82-GT-149 ASME PAPER 82-GT-149 ASME PAPER 82-GT-156	P0107 A82 P0070 A82 P0107 A82 P0107 A82 P0101 A82 P0011 A82 P0075 A82 P0075 A82 P0022 A82 P0022 A82 P0011 A83	2-18431** 2-18432** 2-18432** 2-18449** 2-18449** 2-35281** 2-35312** 2-35312** 2-35379**
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-55 ASME PAPER 82-GT-11 ASME PAPER 82-GT-12 ASME PAPER 82-GT-72 ASME PAPER 82-GT-72 ASME PAPER 82-GT-73 ASME PAPER 82-GT-74 ASME PAPER 82-GT-117 ASME PAPER 82-GT-147	P0107 A85 P0070 A85 P0103 A85 P0107 A85 P0101 A85 P0011 A85 P0075 A85 P0075 A86 P0108 A85 P0022 A85 P0022 A85 P0011 A85 P0030 A85	2-18431*# 2-18432*# 2-18436*# 2-18449*# 2-185280*# 2-35281*# 2-35307*# 2-35312*# 2-35321*# 2-35321*# 2-35373*#
ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-17 ASME PAPER 81-LUB-35 ASME PAPER 81-LUB-35 ASME PAPER 82-GT-11 ASME PAPER 82-GT-12 ASME PAPER 82-GT-59 ASME PAPER 82-GT-72 ASME PAPER 82-GT-72 ASME PAPER 82-GT-147 ASME PAPER 82-GT-147 ASME PAPER 82-GT-145 ASME PAPER 82-GT-1463	P0107 A82 P0070 A02 P0103 A02 P0103 A02 P0107 A03 P0011 A03 P0011 A03 P0075 A03 P00108 A03 P0022 A03 P0011 A03 P0022 A03 P0011 A03 P0022 A03 P0030 A03 P0030 A03 P0032 A03	2-18431*# 2-18432*# 2-18432*# 2-18436** 2-18449*6 2-35280*# 2-35307*# 2-35312*# 2-35373*# 2-35373*# 2-35373*# 2-35373*#

ORIGINAL PAGE IS OF POOR QUALITY

	p0022 182-35409*#	DOE/NASA/0149-1 p0129 NB2-12572*#
ASSE PARES 82-GT-223	p0115 A82-35408*#	DOE/NASA/0149-2
ASME PAPER 82-GT-234	p0011 A82-35416*#	DOE/NASA/0150-80/5
	P0011 A82-35427*#	DOE/NASA/0151-1 p0163 NB2-16938**
	p0071 A82-35431**	DOE/NASA/0155-1
	p0071 A82-35441*#	DOE/NASA/0167+9
Pilon luni de la compania del compania del compania de la compania del compania de la compania de la compania del compania de la compania della compania de la compania della compania della compania della compania della compania della compania della compania del		
- Garage E. C	P0030 A82-35450**	DOE/NASA/0161-9A
	p0022 A82-35456*#	DOE/WASA/0161-10
	p0012 A82-35459*#	DOE/NASA/0167-80/1 p0163 N82-16937*#
ASME PAPER 82-GT-288	p0012 A82-35460*#	DOE/NASA/0176-81/3 ********** p0128 N82-11545**
ASHE PAPER 82-GT-292	p0 108 A82-35462*#	DOE/NASA/0176-81/4
	PO 104 A82-35468**	DOE/NASA/0176-81/5 p0132 N82-17615*#
Name - 11 - 11 - 11 - 11 - 11 - 11 - 11 -	1.0 10 1 10 10 10 10 10 10 10 10 10 10 10	DOE/NASA/0180-2 p0130 N82-14627##
AT81D006-VOL-1	-C106 900 005 0044	
		DOE/NASA/0180-3
AT81D007-VOL-2		DOE/WARA/0180-4
AT810008-VOL-3	p0106 N82 20542*#	DOE/NASA/0180-5
	· · · · · · · · · · · · · · · · · · ·	DOE/NASA/0183-1
AVEACCON-TR-SO-C-21	p0016 N82-15039**	DOE/NASA/0183-1
	P0050 N82-30335**	
	p0016 N82-14090*#	DOE/WASA/0197-1 p0132 N82-16494*4
	p010 N82-26678*#	DOB/NASA/0203-1
AV RADC CM-T R-8 2-C-2	p0049 N82-21260*#	DOB/NASA/0204-1 p0137 N82-30711**
AVRACCOM-TR-82-C-3	pCO68 N82-24342*#	DOE/NASA/0208-3
AVRAECCM-TR-82-C-6	p0 10 1 N82-28643*#	DOE/WASA/0208-4
AVRACCOM-TR-82-C-7	p0101 982-28645*#	DOE/NASA/0224-1
	p0 10 1 N82-286-6*#	DOE/NASA/0224-1-VOL-1 p0129 N82-12570**
	p0 100 N82-25520*#	DOR/NASA/0224-1-VOL-3
	p0 10 1 N82-266 81 *#	DOE/NASA/0224-1-VOL-4 p0133 N82-18688*#
	p0 10 2 N82-32733*#	DOE/NASA/0224-1-VOL-5
	p0 10 2 N8 2-30 552 * #	DOE/NASA/0227-1
	p0019 N82-26299*#	DOE/NASA/0241-1 p0117 N82-13490*#
	P0042 N82-20240*#	DOE/NASA/0241-2 p0131 N82-16483**
	poorta not gotto	DOE/NASA/0241-3
BALES-MCCOIN-80-BMT-002	NO 105 NOD-12885+4	
TWITT- MCCOTH-OO-DUIT-OOF \$ 666666666	PO 103 162-12445+#	DOE/NASA/0241-4 p0137 N82-30705**
		DOE/NASA/0277-1 p0 138 N82-32856*4
BCS-40357	p0163 N82-16938*#	DUE/NASA/1011-35 p0058 N82-11184*#
		DOE/NASA/1900-1
C//SSNA-AD-217	p0025 N82-22263*#	DOE/NASA/2593-24
		DOE/NASA/2593-25
CML-81-1	n0052 N82-15123##	DOE/NASA/2701-1
	P0032 NG2-13123-4	
CONF-810226	-0100 100 03600+4	DOE/NASA/2749-81/1
	P0122 237723084*#	DOE/NASE/2817-2
CONF-8 10316	DOOR! NOZ-15311##	DOE/NASA/3230-1
61 16		DOE/NASA/6229-2
CRREL-81-19	P0117 N82-18664*#	DOE/NASA/7307-1
	i	DOE/NASA/10350-32
CW-WR-81.021	p0107 N82-27743*#	DOE/NASA/10350-33-E-1313 p0124 N82-29717+#
	1	DOE/NASA/10350-34
C4100-50	DO130 NR2-14627**	DOE/NASA/10769-20-REV-3 p0099 N82-12446**
C4100-50		
C-100-00 - 00000000000000000000000000000	PO 133 NOZ-10030+#	DOE/NASA/10769-21 p0119 N82-16481**
DDA-ADR-10086	-0.130 200 164.05+1	DOB/NASA/10769-22
nnu-unu-iondo essesses es es es es es	PU 132 182-16485*# .	DOE/NASA/10769-23 p0157 N82-13908*#
		DOE/NASA/10769-24
DDA-EDR-10470	p0022 N82-10037*#	DOE/NASA/10769-25
CDA-EDR-10470-APP-B	p0022 N82-10038*#	DOE/NASA/10769-26
DDA-EDR-10594	D0136 N82-25635*#	DOE/WASA/10769-27 p0123 N82-26790**
	1	DOE/NASA/12726-9
DE81-025058	20001 NO2-15211##	
		DOE/WASA/12726-11 p0054 R82-19333*#
DE82-003288	POTEN NOS-SOCCA##	DOE/NASA/12726-13
DOD 4707 1050 51		DOE/NASA/12726-15
DOB/JPI-1060-51	PU135 N82-24646*#	DOE/NASA/12726-16
DOE/NASA/150-81/7		DOE/NASA/12726-17
EOE/NASA/0032-15		DOE/NASA/17088-3
	p0164 N82-34311*#	DOE/NASA/20270-1 p0117 N82-14552*#
DOE/NA SA/0032-18-VOL-3		DOE/MASA/20305-7
DOE/NA SA/0 035-1	n0 (05 N82=160 00±#	
DOE /NA 51 /0.037 80 /2	MILTO NODE TOPOTE	
DOE/NASA/0037-80/2	-0122 NO2 100000	DOE/NASA/20320-34
DOE/NASA/0050-1		DOE/NASA/20320-36
DOE/NASA/0067-79/7		DOE/NASA/20320-37 p0122 N82-23679*#
DOE/NASA/0083-1	p0130 N82-13510*#	DOE/NASA/20320-38
DOE/NASA/0097-80/1	p0136 N82-25640*#	DOE/NASA/20320-39
DOE/NASA/0100-1		DOE/NASA/20320-41 p0127 N82-33830*4
DOE/NASA/OICT-3		DOE/NASA/20366-2
DCE/NESA/0109-1		
		DOB/NASA/20370-20
		DOE/NASA/20370-22
	p0 105 N82-12445*#	DOE/HASA/51040-27 p0163 N82-13013*#
DOE/NASA/0123-3		DOB/NASA/51040-30
DOE/NASA/0123-4		DOE/NASA/51040-32
DOE/NASA/0124-6	p0105 N82-16410*#	DOE/WASA/51040-33
DOE/NASA/0124-7		DOE/NASA/51040-34
DOE/NASA/0125-1		DOE/WASA/51040-35
DO E/ NA SA/O 145-1		
DOE/NA SA/0 145-2		
		DOE/NASA/51040-38
		DOE/NASA/51040-39
DOE/NASA/0146-2		DOE/NASA/51040-40 p0163 N82-26051*#
DOE/NASA/0147-1		DOB/NASA/51044-22 p0118 N82-10503*#
DOZ/NASA/0147-2	p0055 N82-25337*#	DOE/NASA/51044-24 p0124 N82-28786*#
DOE/HASA/0148-1		DOE/NASA/51044-25 p0127 182-33829*4
DOB/NASA/0148-2		DOE/NASA/51044-26

BEPORT/ACCESSION BURBER INDEX

DOE/NASA/51044-27	
DOLY RESERVED TO THE STATE OF T	E-1023 p0048 N82-15119*#
DOT-TSC-NASA-81-2 p0164 N82-180684	# E-1024
nc E(u.to	B- 1025
D180-2595-4-VOL-2	
D180-25956-3-VOL-1	
D180-26590-1	
	E-1031
E-82-4	
E-116 p0049 N82-212603 E-209 pCC99 N82-164134	
E-2C9	
E-259p0017 N82-19222	
F-276 p0095 NB2-19521	
E-280 p0016 NB2-150394	
E-334p0918 N82-22269	
E-556	
P-559 p0020 N82-333894	# E-1050, p0066 N82-15199*#
E-573	
E-621 p0087 N82-11397	
E-626 p0111 NB2-205664 E-638 p0058 NB2-20291	
E-646p0 15) N82-199444	
E-648 p0016 N82-13143	
E-654 p0067 N82-19374	
E-668	
E-678p0059 N82-21300	
E-687	
F-708 p0081 N82-15313	# E-1069
E-709 p0066 N82-11211	
E-709	
E-713 EFFERENCE DOUGO NO 2-122 TO	
E-719	
E-721 p0119 NB2-16477	# E-1076
E-722p0082 N82-25441	
E-732 p0016 N82-140904	
E-749	
E-757pC095 N82-22481	
E-758 p0067 N82-19373	
E-777, p0152 N82-21036	
E-775 p0 146 N82-330 20: E-828 p0 117 N82-14552:	
E-830	
E-871	
E-876 p0004 N82-26234	
E-899 p0 100 N82-2551//2	
E-899p0024 N82-21193: E-915	
F-916	
E-919p0059 N82-21301	# E-1111
E-921 p0066 N82-15197	
E-936 p0 102 N82-32736	
E-941 p0004 N82-25213	
E-946p0161 N62-32186	# E-1118
E-947 p0161 N82-32187	
E-948 polici N82-32188	
E-949	
E-955p0019 N82-25255	
E-959 p0110 N82-18612	# E-1131
E-960 poli51 N82-15847	
E-962p0118 N82-11551 E-967p0054 N82-19333	
E-972	
E-975 p0067 NB2-20316	# E-1141 p0054 N82-22327*#
E-976	
F-982 p0017 N82-18222 E-985 pC058 N82-10195	
E-985p0058 N82-10195	
E-991	
E-993	# E-1147
E-995	
E-999 pool not pool n	
E-1002	
E-1093 p0037 N82-11107	E-1155 p0050 N82-24300*#
E-1004 p0016 N82-13144	E-1156
F-1005	
E-1007	
E-1017 p0081 N82-22439	
E-1018 p0081 N82-233 97	

E-1175	*******************			E-1345
Z-1176	******************			E-1346
Z-1177 Z-1178	*****************			E-1351
E-1181				B- 1352
E-1182	** * * * * * * * * * * * * * * * * * * *			EDR-10383
F-1185				EDR-10950
E-1186	***********************			and division and an analysis of the same and an analysis of
E-1189	**********			EE-273 (82) NASA-931-1
E-1191	***********			
E-1192	** * * * * * * * * * * * * * * * * * * *			ERC-TR-8101
E-1194 E-1195	•			ERC-TR-8125
E-1196				ERC-TR-8175
E-1198				ERC-TR-8186
E-1199				DEC 12 0131 STATES STATES STATES SOLD NOT TANSO.
E-1200	**********			ERC41054.36FR
E- 1201	********************	p0087	N82-22453*#	
E-1202	******************			ESL-TR-79-23 ************* p0025 #82-22265*#
E-1204	** ******************			
E-1205	***********************			E82-10247
E-1207 E-1209	4			75 NMY_NAG
E-1210				FBNML-NAS-E-2 ++++,++++++++++++++++++++++++++++++++
E-1211	**********************			FCR-3142
E-1212				Total Division of the Control of the
E-1213	***********************			PR-81-75/EE
E-1214	***********	p0123	N82-24647*#	PR-10C00
F-1215	•••••••			PR-10081
E-1216	**********			FR-15596
E-1217	******************			
E-1218 E-1219				PSI-251 p0078 H82-17420**
E-1221				GARRETT-21-3911 p0026 N82-24202**
E-1222	********************			GW BUDIT - 51-3311
E-1223	************			GDC-AST-81-019-VOL-2
E-1224	***************************************			
E-1225				GDC-NAS-82-001
E-1226	******************			GDC-NAS-82-002
E-1228 E-1229	*********************			an matawagaa
E-1229	***************			GE-R81AEG288 p0027 N92-27310**
E- 1233	•••••••••••••••••			GE-81SDS4215 ,
E-1234	***********************			#*CCCC22011 - PO.004. P. P. P. P. P. P. P.
E-1235	***************************************			GTR-3932
E-1236	*********************			
E-1238	*******************	p0050	NB2-30335*#	G7782 p0113 N82-17521*#
E- 1245	***********			
E-1246	****************			HHT-32
E-1247 E-1249	******************			707 71 77 70 70 40 40 40 40 40 40 40 40 40 40 40 40 40
E-1250				IAF PAPER 82-46
F-1254	********************			THE BURDA OZ-400 ************ PUU45 AOZ-447507#
E-1255	******************			IGT-61051
E-1256	*****************	p0018	N82-24203*#	The same of the sa
E-1257	*******************	p0005	NB2-26241*#	IITRI-J06519
2-1260	**********			
E-1263	*************************			IITRI-#06001-89 p0063 N82-10193**
E-1264 E-1265	********************			ITR-1
E- 1269				TTR-1 -0
E-1270	*************************			JPL-PUB-82-22 % p0135 N82-24646**
E-1272	***************************************	p0014	N82-26240*#	
E-1273	*********************	p0163	NB2-31160*#	KMSF-U-1185 p0098 N82-25499*#
E-1276	******************			
E~1280	*******************			KU-FRI-464-3
E-1282 E-1283	***********************			LG81ER0202-VOL-1 p0028 N82-32370**
E-1284				TG91ER0707-A0T-1 ************************************
E-1285				LR-29935-VOL-1
E-1236	*************************			ny costo ton t secondended contract tor 11554-4
E-1288	*******************	p0042	N82-27358*#	LYC-81-32-VOL-1
E-1289	***************************************			LYC-81-32-VOL-2
E-1293	******			LYC-81-32-VOL-3
E-1294	********************			LYC-82-15
E-1295 E-1298	********************			MCR-81-597 p0039 N82-15117*#
E- 1304				Hen-01-331 **********************************
E-1305				MCR81-504
E-1307		p0013	N82-30297*#	
P-1308		p0 125	N82-30713*#	MDC-A6930
E-1310	******************			
E-1316	•••••••••			ME-TSPC-TR-82-11
E-1318 E-1322				MCNU_1160
E-1324		P0082	NG2~3U4/4**	HSNW-1169
E-1326		p0 125	NB2-30717##	MTI-80ASE142DR1-VOL-1 p0164 N82-34311**
E-1332	*********************	p0152	N82-31068*#	MTI-91ASE229QT13
E-1335	*********	p0.144	NB2-30949*#	
		-		

		NAS	1. 15:82865	••••••	p0101	N82-28646*#
HT182-TR-4	p0104 NB2-114664			*************	p0101	N82-28645*#
M364	-0101 R02-16650+	MAS	1. 15: 82 867 1. 15: 82 868			
Ujo4 ississississississississississississi	ho141 wes-186334	HAS		**********		
MAPC-PI-23	p0027 N82-273 16+	A NAS	1. 15:82871	*****************		
		HAS		**********	p0 126	N82-31776*#
NAS 1. 15:81694					p0069	N82-28445*#
MAS 1. 15:81767				*************		
NAS 1. 15:82644				• • • • • • • • • • • • • • • • • • • •		
WAS 1. 15:82671						
WAS 1, 15:82691						
MAS 1. 15:82707						
NAS 1. 15:82708			1. 15:82881	**************		
MAS 1. 15:82711			1. 15:82882	**********		
MAS 3, 15:82721			1. 15: 82863	*********		
NAS 1. 15:82736			1. 15:82884 1. 15:82885			
NAS 1. 15:82784				*************		
NAS 1. 15:82785			3.2 14 - 3 11 11 11 11 11			182-32733**
NAS 1. 15:82787	p0019 N82-25255*	MAS	1. 15:82888			N82-30552**
NAS 1. 15:82789				.,,,,		
NAS 1, 15:82792				••••		
NAS 1. 15:82794						
NAS 1. 15:82799						
NAS 1.15:82801				***************************************		
NAS 1, 15:82802			27 227 27 262			
NAS 1. 15:82804						
MAS 1- 15:82805				***************		
NAS 1, 15:82806				*******		
NAS 1-15:82807						
NAS 1, 15:82809				-4-4		
MAS 1. 15:82810						
NAS 1, 15:82811	p0049 N82-21259*	* NAS	1. 15:82906	*************	p0123	NB2-26807**
NAS 1. 15:82812				***************		
NAS 1. 15:82813				**************		
NAS 1.15:82814				************		
NAS 1-15:82816				*********		
NAS 1. 15:82817				*****************		
NAS 1. 15:82819	p0067 N82-203144	H NAS	1. 15: 82914			
NAS 1. 15:82820				• • • • • • • • • • • • • • • • • • • •		
NAS 1. 15:82821			1 1 1 1 1 1 1 1 1 1 1 1 1			N82-28460*#
NAS 1. 15:82822				•••••••		
NAS 1. 15:82824						
NAS 1. 15:82825				******************		
NAS 1. 15:82826				*********		
NAS 1. 15:82827				***************		
NAS 1, 15:82828						
NAS 1. 15:82829				************		N82-304/4**
NAS 1. 15:82831						
NAS 1. 15:82E32						
NAS 1. 15:82833			1. 15:82933	*******		
NAS 1. 15:82834						
NAS 1. 15:82835			1. 15: 82937			
NAS 1. 15:82836			1. 15: 82942 1. 15: 82943			
NAS 1. 15:82838			1. 15:82944			
MAS 1. 15:82839			1. 15:82945			
NAS 1. 15:82840 ,			1. 15:82946			
WAS 1. 15:82841			1. 15:84194	• • • • • • • • • • • • • • • • •		
MAS 1. 15:82842			1. 15:84207			
NAS 1. 15:82843						
NAS 1. 15:82845			1. 26:3494	*************		
NAS 1. 15:82646			1.26:3513	**************		
NAS 1, 15:82847			1. 26:3539			
NAS 1, 15:82848				*********		
WAS 1.15:82849			1. 26:3553	••••••		
NAS 1. 15:82850			1.26:3560 1.26:3563	•••••••		
NAS 1. 15:82851			1. 26:3503			
NAS 1. 15:82853			1. 26: 15965			
NAS 1. 15:82854						
MAS 1. 15:82855	p0088 N82-24455*	*# NAS		••••••	P0084	N82-24424*#
NAS 1. 15:82856						
WAS 1.15:82857						
NAS 1. 15:82858			1.26:16520			
NAS 1. 15:82860			1. 26: 16520			
NAS 1. 15:82861						
NAS 1. 15:82862	P0019 N82-263004	MAS	1. 26: 16521	3		
NAS 1. 15:82863			1. 26:16528	9	p0137	N82-30722*#
NAS 1. 15:82864	PUIS/ N82-259614	F# I NAS	1. 26: 16532	7-VOL-1	p0.135	N82-24649*#

BEPORT/ACCESSION MURRER INDEX

NAS 1.26:165327-VOL-2	1 NEC 1 26-167077
NAS 1.26:165364	NAS 1.26:167877
NAS 1.26:165365	NAS 1.26:167883
NAS 1. 26:165366 p0146 NB2-31970*#	NAS 1.26:167885
NAS 1.26:165367	NAS 1.26:167886 p0033 N82-29345**
NAS 1. 26:165378	NAS 1.26:167889-VOL-1 p0045 N82-33424**
NAS 1. 26:165388	NAS 1. 26:167889-VOL-2
	NAS 1.26:167892
NAS 1.26:165398	NAS 1.26:167894
NAS 1.26:165409-VOL-1 p0078 N82-20362*#	NAS 1.26:167895
NAS 1-26:165409-VOL-2 p0078 N82-20363*#	NAS 1.26:167896
NAS 1. 26:165409-VOL-3 p0078 N82-20364*#	NAS 1.26:167897p0114 N82-29619*#
NAS 1. 26:165409-VOL-4	
	NAS 1. 26: 167898 p0137 N82-30705**
NAS 1-26:165412	NAS 1.26:167904 p0142 N82-23976*#
NAS 1. 26:165431 p0084 N82-23395**	NAS 1.26:167907
NAS 1.26:165433 p0114 N82-26714*#	NAS 1.26:167908
NAS 1.26:165434	NAS 1.26:167909
NAS 1. 26: 165438 p0114 NB2-26716*#	NAS 1. 26:167911
	Land to waster the control of the co
	NAS 1.26:167912
NAS 1. 26:165440	NAS 1.26:167914 p0029 N82-33392*#
NAS 1.26:165448 p0052 N82-31448*#	NAS 1.26:167918 p0079 NB2-25423*#
NAS 1, 26:165449	NAS 1.26:167920
NAS 1. 26:165452-VOL-2	NAS 1.26:167924
NAS 1.26:165452-VOL-3 p0136 N82-27837*#	HAS 1.26: 167928-VOL-1 p0028 N82-32370*#
NAS 1. 26:165459	NAS 1.26:167929
The second of th	
NAS 1.26:165476	NAS 1.26:167930
NAS 1. 26:165481	NAS 1.26:167934
NAS 1. 26:165482	NAS 1.26:167935
NAS 1.26:165497	NAS 1.26:167937
NAS 1.26:165498	NAS 1.26:167938
NAS 1.26:165503 p0026 N82-23248*#	NAS 1.26:167941
NAS 1.26:165507	
	NAS 1.26:167944
NAS 1-26:165510	NAS 1.26:167948 p0065 N82-31509**
NAS 1. 26:165520 p0098 N82-25499*#	NAS 1.26:167949
NAS 1.26:165521	NAS 1.26:167984
NAS 1. 26:165544 p0064 N82-27462##	NAS 1. 26:167996
HAS 1.26:165549	NAS 1.26:168760
NAS 1.26:165554	
	NAS 1.26:168842
NAS 1. 26:165556	NAS 1. 26:168894 p0026 N82-23247*#
NAS 1. 26:165557	NAS 1.26:168929
WAS 1.26:165560	NAS 1.26:168930
NRS 1, 26:165562-VOL-1 p0153 N82-21031**	NAS 1. 26: 168941
NAN 1-26:165562-VOL-2 p0153 N82-21032*#	NAS 1. 26:169003
NAS 1. 26:165562-VOL-3 p0155 N82-21033**	
NAS 1. 26:165563	NAS 1.26:169005 p0085 N82-25442*#
NAS 1.26:165564 p0025 N82-22263*#	NAS 1.26:169016
NAS 1.26:165565	NAS 1.26:169029
NAS 1.26:165568	NAS 1. 26: 169034
NAS 1.26:165572	NAS 1. 26:169120
NAS 1.26:165573	
The state of the s	NAS 1. 26: 169125
the state of the s	NAS 1.26:169278
NAS 1. 26:165580	NAS 1.26:169283
NAS 1.26:165583 p0158 N82-24078*#	NAS 1.26:169293
NAS 1-26:165585	NAS 1.26:169294
NAS 1.26:165586	NAS 1. 26:169295
NAS 1.26:165587	NAS 1. 26: 169358
NAS 1-26:165589 p0137 N82-30709*#	NAS 1.26:169852
NAS 1.26:165593	
	NAS 1. 26:185193
The second secon	NAS 1.55:2185
NAS 1. 26:165599	NAS 1.60:1851
NAS 1.26:165600 p0007 N82-22210*#	NAS 1.60:1868
NAS 1.26:165602 pno28 N82-32367*#	NAS 1.60:1882
NAS 1.26:165603	NAS 1.60:1884
NAS 1.26:165604	
	NAS 1.60:1906
NAS 1. 26:165605 p0064 N82-28409*#	NAS 1.60:1906
NAS 1. 26:165605	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1908
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165607	NAS 1.60:1906
NAS 1. 26:165605 NAS 1. 26:165606 WAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165609 NAS 1. 26:165609	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1908
NAS 1. 26:165605 NAS 1. 26:165606 RAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165610 P0074 NB2-22142*# NAS 1. 26:165610	NAS 1.60:1906
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1967
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165611	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1973
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165614 NAS 1. 26:165614	NAS 1.60:1906
NAS 1. 26:165605	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1982 NAS 1.60:1982 NAS 1.60:1982 NAS 1.60:1985
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165610 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165614 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165616 NAS 1. 26:165618	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1982 NAS 1.60:1982 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1986
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165610 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165614 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165617	NAS 1.60:1906
NAS 1. 26:165605	NAS 1.60:1906
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165614 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1986 NAS 1.60:1986 NAS 1.60:1986 NAS 1.60:1985 NAS 1.60:1986 NAS 1.60:1986 NAS 1.60:1988 NAS 1.60:1988 NAS 1.60:1988 NAS 1.60:1988 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1999 NAS 1.60:1991
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165610 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165614 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165618 NAS 1. 26:165618 NAS 1. 26:165618 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165620 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165622 NAS 1. 26:165622	NAS 1.60:1906
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165614 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621	NAS 1.60:1906
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165610 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165614 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165618 NAS 1. 26:165618 NAS 1. 26:165618 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165620 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165622 NAS 1. 26:165622	NAS 1.60:1906
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1982 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1988 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1990 NAS 1.60:1990 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1994 NAS 1.60:1995 NAS 1.60:1995
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165622 NAS 1. 26:165622 NAS 1. 26:167841 NAS 1. 26:167841 NAS 1. 26:167849 NAS 1. 26:167849 NAS 1. 26:167849	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1986 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1986 NAS 1.60:1987 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165614 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165616 NAS 1. 26:165617 NAS 1. 26:165618 NAS 1. 26:165618 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165620 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165621 NAS 1. 26:165622 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:165629 NAS 1. 26:16589 NAS 1. 26:167849 NAS 1. 26:167849 NAS 1. 26:167853	NAS 1.60:1906
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165616 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165621 NAS 1. 26:16583 NAS 1. 26:167855 NAS 1. 26:167855	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1980 NAS 1.60:1980 NAS 1.60:1980 NAS 1.60:1981 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1990 NAS 1.60:1990 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1992 NAS 1.60:1994 NAS 1.60:1995 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:2001 NAS 1.60:2002
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165610 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165625 NAS 1. 26:167846 NAS 1. 26:167845 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167855	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1982 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1986 NAS 1.60:1988 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1990 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1992 NAS 1.60:1999 NAS 1.60:2006 NAS 1.60:2006
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165616 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165621 NAS 1. 26:165621 NAS 1. 26:165623 NAS 1. 26:167849 NAS 1. 26:167849 NAS 1. 26:167855 NAS 1. 26:167857 NAS 1. 26:167857 NAS 1. 26:167857	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1980 NAS 1.60:1980 NAS 1.60:1980 NAS 1.60:1981 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1990 NAS 1.60:1990 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1992 NAS 1.60:1994 NAS 1.60:1995 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:2001 NAS 1.60:2002
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165616 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165652 NAS 1. 26:167851 NAS 1. 26:167881 NAS 1. 26:167884 NAS 1. 26:167885 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167857 NAS 1. 26:167857 NAS 1. 26:167857 NAS 1. 26:167857 NAS 1. 26:167861	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1982 NAS 1.60:1982 NAS 1.60:1985 NAS 1.60:1986 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1999 NAS 1.60:1991 NAS 1.60:1992 NAS 1.60:1992 NAS 1.60:1999 NAS 1.60:2001 NAS 1.60:2006 NAS 1.60:2007
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165616 NAS 1. 26:165616 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165821 NAS 1. 26:165821 NAS 1. 26:165821 NAS 1. 26:165825 NAS 1. 26:167841 NAS 1. 26:167841 NAS 1. 26:167845 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167856 NAS 1. 26:167857 NAS 1. 26:167861 NAS 1. 26:167861 NAS 1. 26:167861	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1968 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1986 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1990 NAS 1.60:1990 NAS 1.60:1990 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1992 NAS 1.60:1992 NAS 1.60:1994 NAS 1.60:1994 NAS 1.60:1999 NAS 1.60:1995 NAS 1.60:1995 NAS 1.60:1996 NAS 1.60:1996 NAS 1.60:1997 NAS 1.60:1998 NAS 1.60:1998 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:2001 NAS 1.60:2002 NAS 1.60:2002 NAS 1.60:2008 NAS 1.60:2008
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165616 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165821 NAS 1. 26:167841 NAS 1. 26:167845 NAS 1. 26:167846 NAS 1. 26:167855 NAS 1. 26:167857 NAS 1. 26:167857 NAS 1. 26:167867 NAS 1. 26:167867 NAS 1. 26:167867 NAS 1. 26:167867	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1909 NAS 1.60:1968 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1986 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1990 NAS 1.60:1990 NAS 1.60:1991 NAS 1.60:1991 NAS 1.60:1992 NAS 1.60:1992 NAS 1.60:1994 NAS 1.60:1994 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:2006 NAS 1.60:2007 NAS 1.60:2008 NAS 1.60:2008 NAS 1.60:2008 NAS 1.60:2008 NAS 1.60:2018
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165618 NAS 1. 26:165618 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165622 NAS 1. 26:167841 NAS 1. 26:167849 NAS 1. 26:167849 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167857 NAS 1. 26:167857 NAS 1. 26:167861 NAS 1. 26:167858 NAS 1. 26:167857 NAS 1. 26:167861 NAS 1. 26:167861 NAS 1. 26:167861 NAS 1. 26:167855 NAS 1. 26:167867 NAS 1. 26:167861 NAS 1. 26:167867 NAS 1. 26:167867 NAS 1. 26:167869 NAS 1. 26:167869	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1968 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1982 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1986 NAS 1.60:1988 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1990 NAS 1.60:1990 NAS 1.60:1991 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:2000 NAS 1.60:2006 NAS 1.60:2007 NAS 1.60:2008 NAS 1.60:2008 NAS 1.60:2008 NAS 1.60:2018 NAS 1.60:20200 NAS 1.60:2018 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165616 NAS 1. 26:165617 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:167851 NAS 1. 26:167846 NAS 1. 26:167849 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167857 NAS 1. 26:167856 NAS 1. 26:167857 NAS 1. 26:167861 NAS 1. 26:167867 NAS 1. 26:167861 NAS 1. 26:167867 NAS 1. 26:167861 NAS 1. 26:167867 NAS 1. 26:167872 NAS 1. 26:167872 NAS 1. 26:167872 NAS 1. 26:167872	NAS 1.60:1906
NAS 1. 26:165605 NAS 1. 26:165606 NAS 1. 26:165607 NAS 1. 26:165607 NAS 1. 26:165609 NAS 1. 26:165610 NAS 1. 26:165611 NAS 1. 26:165611 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165615 NAS 1. 26:165617 NAS 1. 26:165618 NAS 1. 26:165618 NAS 1. 26:165619 NAS 1. 26:165619 NAS 1. 26:165617 NAS 1. 26:165620 NAS 1. 26:165621 NAS 1. 26:165622 NAS 1. 26:167841 NAS 1. 26:167849 NAS 1. 26:167849 NAS 1. 26:167855 NAS 1. 26:167855 NAS 1. 26:167857 NAS 1. 26:167857 NAS 1. 26:167861 NAS 1. 26:167858 NAS 1. 26:167857 NAS 1. 26:167861 NAS 1. 26:167861 NAS 1. 26:167861 NAS 1. 26:167855 NAS 1. 26:167867 NAS 1. 26:167861 NAS 1. 26:167867 NAS 1. 26:167867 NAS 1. 26:167869 NAS 1. 26:167869	NAS 1.60:1906 NAS 1.60:1907 NAS 1.60:1908 NAS 1.60:1909 NAS 1.60:1968 NAS 1.60:1967 NAS 1.60:1968 NAS 1.60:1968 NAS 1.60:1973 NAS 1.60:1982 NAS 1.60:1985 NAS 1.60:1985 NAS 1.60:1986 NAS 1.60:1988 NAS 1.60:1988 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1989 NAS 1.60:1990 NAS 1.60:1990 NAS 1.60:1991 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:1999 NAS 1.60:2000 NAS 1.60:2006 NAS 1.60:2007 NAS 1.60:2008 NAS 1.60:2008 NAS 1.60:2008 NAS 1.60:2018 NAS 1.60:20200 NAS 1.60:2018 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200 NAS 1.60:20200

· · · · · · · · · · · · · · · · · · ·	
HAS 1.60:2029 ###################################	NASA-CR-165224
NAS 1.60:2030	NASA-CR-165226
NAS 1.60:2037 p0103 NB2-32737*#	NASA-CR-165234
NAS 1.60:2040	
NAS 1.60:2047	NASA-CR-165264
NAS 1.60:2048	MASA-CR-165269
NAS 1.60:2049	MASA-CR-165277
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	HASA-CR-165283
NASA-CASE-LEW- 12131-3 p0099 N82-19540*	
	The same of the sa
MASA-CASE-LEW-12296-1 p0082 N82-26568+	NASA-CR-165289
NASA-CASE-LEW-12358-2 p0054 N82-21268#	NASA-CR-165323-VOL-1 p0130 M82-14636*#
WASA-CASE-LEW- 12508-3 p0088 R82-24449**	NASA-CR-165323-VOL-2 p0130 H82-14637**
NASA-CASE-LEW- 12582-1	NASA-CR-165324 p0129 N82-13507*#
NASA-CASE-LEN-12919-2 p0050 N82-26386+#	NASA-CR-165327-VOL-1
NASA-CASE-LEW-12938-1 p0020 N82-32366*	MASA-CR-165327-VOL-2
NASA-CASE-LEW- 12950-1 pG087 N82-11399+#	NASA-CR-165328
NASA-GASE-LEW- 12989-1 p0099 N82-12442+	NASA-CR-165340
- Story rune entre later in the story of the	The second secon
NASA-CASE-LEW-13080-2 p0066 N82-11210*#	NASA-CR-165351
NASA-CASI-LEW-13120-1 p0068 N82-28440*	NASA-CR-165353
NASA-CASE-LEW- 13169-1 p0060 N82-29415*	NASA-CR-165357
NASA-CASE-LEW-13169-2 p0061 NB2-30371*	NASA-CR-165358
NASA-CASE-LEW-13171-1 p0124 N82-29708*	NASA-CR-165364
NASA-CASE-LEW-13199-1 p0019 N82-26293*	NASA-CR-165365
NASA-CASE-LEW-13268-1 p0069 N82-29453*	NASA-CR-165366
NASA-CASE-LEW-13268-2 p0101 N82-26674+4	NASA-CR-165367
NASA-CASP-LEW-13282-1	NASA-CR-165369
- richa richa - ani 155 h i sariarritaria kabita men militari	
NASA-CASE-LEW-13334-1 p0060 N82-26431*#	NASA-CR-165378
NASA-CASE-LEN- 13339-1 p0061 N82-31505*	NASA-CR-165379 p0104 N82-11465*#
NASA-CASE-LEW- 13343-1 p0068 N82-28441+	NASA-CR-165386
NASA-CASE-LEW-13349-1	NASA-CR-165387
NASA-CASE-LEW-13490-1 p0125 N82-31764*	NASA=CR=1653BB
NASA-CASE-LEW-13401-1 p0124 N82-29709*	NASA-CR-165391
NASA-CASE-LEW-13401-2 p0123 N82-24717*#	NASA-CR-165395 p0063 N82-14333*#
NASA-CASE-LEW-13426-1	NASA-CR-165396
NASA-CASE-LEW-13450-1 p0088 N82-25463*#	NASA-CR-165397
NASA-CASE-LEW- 13495-1 p0082 N82-24432*#	
	NASA-CR-165398
NASA-CASE-LEN-13526-1	NASA-CR-165403,
NASA-CASE-LEW- 13622-1	NASA-CR-165404
NASA-CASE-LEW-13639-1	NASA-CR-165407
NASA-CASE-LEW-13653-1 p0121 N82-22672**	NASA-CR-165400
NASA-CASE-LEW- 13826-1 p0050 N82-26385**	
MUNE - CURE - FRA	NASA-CR-165409-VOL-1
	NASA-CR-165409-VOL-2 p0078 N82-20363**
NASA-CP-2182 p0037 N82-14213*#	NASA-CR-165409-VOL-3
NASA-CF-2185	NASA-CR-165409-VOL-4
	NASA-CR-165412
NASA-CR-348!	
	NASA-CR-165413
NASA-CB-3492	NASA-CR-165424
NASA-CR-3493	NASA-CR-165426
NASA-CR-3494	NASA-CR-165431 p0064 N82-23395*#
NASA-CB-3505	NASA-CR-165433
NASA-CE-3506	
	NASA-CR-165434
NASA-CR-3507	NASA-CR-165436 p0132 N82-17607**
NASA-CR-3508	NASA-CR-165438
NASA-CR-3509	NASA-CA-165439
NASA-CR-3510	NASA-CR-165440
NASA-CR-3513	NASA-CR-165441
NASA-CR-3539	HASA-CR-165447
NASA-CF-3543 p0064 N82-26436**	NASA-CR-165448
NASA-CR-3553	NASA-CR-165449
NASA-CR-3560	NASA-CR-165452-VOL-1 p0129 N82-12570*#
NASA-C5-3563	NASA-CR-165452-VOL-2
NASA-CR-159559	NASA-CR-165452-VOL-3
NASA-CF-159656	NASA-CR-165452-VOL-3 p0136 H02-27837*#
NASA-CF-159841	NASA-CR-165452-VOL-4
NASA-CF-164966	NASA-CR-165452-VOL-5 p0132 N82-17603*#
NASA-CF-164972	NASA-CR-165453
NASA-CR-165029	
	NASA-CR-165455
NASA-CE-165051	NASA-CR-165455
NASA-CE-165053 p0105 N82-14520 #	NASA-CR-165455
	NASA-CR-165455
NASA-CE-165061	NASA-CR-165455
NASA-CE-165053	NASA-CR-165455
NASA-CR-165053	NASA-CR-165455 NASA-CR-165457-VOL-2-PT-1 NASA-CR-165450 NASA-CR-165450 NASA-CR-165450 NASA-CR-165460 NASA-CR-165460 NASA-CR-165460 NASA-CR-165462 NASA-CR-165462
NASA-CE-165053	NASA-CR-165455 NASA-CR-165457-VOL-2-PT-1 NASA-CR-165458 NASA-CR-165459 NASA-CR-165460 NASA-CR-165460 NASA-CR-165462 NASA-CR-165467 NASA-CR-165467
NASA-CE-165053 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165081 NASA-CE-165081 NASA-CE-165080 NASA-CE-165080 NASA-CE-165080 NASA-CE-165130 NASA-CE-165149 NASA-CE-165149	NASA-CR-165455
NASA-CE-165053	NASA-CR-165455 NASA-CR-165457-VOL-2-PT-1 NASA-CR-165458 NASA-CR-165459 NASA-CR-165460 NASA-CR-165460 NASA-CR-165462 NASA-CR-165467 NASA-CR-165467
NASA-CE-165053 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165081 NASA-CE-165081 NASA-CE-165080 NASA-CE-165080 NASA-CE-165080 NASA-CE-165130 NASA-CE-165149 NASA-CE-165149	NASA-CR-165455
NASA-CE-165053 NASA-CE-165061 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165081 NASA-CE-165120 NASA-CE-165130 NASA-CE-165130 NASA-CE-165154 NASA-CE-165154 NASA-CE-165154 NASA-CE-165163 NASA-CE-165163	NASA-CR-165455 NASA-CR-165457-VOL-2-PT-1 NASA-CR-1654570 NASA-CR-165459 NASA-CR-165459 NASA-CR-165460 NASA-CR-165462 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165470 NASA-CR-165473 NASA-CR-165473 NASA-CR-165473
NASA-CE-165061 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165081 NASA-CE-165081 NASA-CE-165080 NASA-CE-165080 NASA-CE-165180 NASA-CE-165180 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168	NASA-CR-165455 p0131 N82-16483*# NASA-CR-165457 VOL-2-PT-1
NASA-CE-165061 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165081 NASA-CE-165081 NASA-CE-165081 NASA-CE-165081 NASA-CE-165130 NASA-CE-165149 NASA-CE-165163 NASA-CE-165163 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165168 NASA-CE-165175 NASA-CE-165175	NASA-CR-165455 p0131 N82-16483*# NASA-CR-165457-VOL-2-PT-1 p0006 N82-18180*# NASA-CR-165459 p0023 N82-12075*# NASA-CR-165460 p0025 N82-22264*# NASA-CR-165460 p0052 N82-13123*# NASA-CR-165467 p0078 N82-13302*# NASA-CR-165469 p0078 N82-1302*# NASA-CR-165470 p0023 N82-11068*# NASA-CR-165473 p0023 N82-11068*# NASA-CR-165475 p0129 N82-12571*# NASA-CR-165476 p0097 N82-22479*#
NASA-CE-165053 NASA-CE-165061 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165120 NASA-CE-165120 NASA-CE-165130 NASA-CE-165149 NASA-CE-165154 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165164 NASA-CE-165165 NASA-CE-165165 NASA-CE-165165	NASA-CR-165455
NASA-CE-165061 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165081 NASA-CE-165081 NASA-CE-165080 NASA-CE-165120 NASA-CE-165130 NASA-CE-165130 NASA-CE-165154 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165182 NASA-CE-165182 NASA-CE-165182 NASA-CE-165193 NO 105 N82-16410*#	NASA-CR-165455 p0131 N82-16483*# NASA-CR-165457-VOL-2-PT-1
NASA-CE-165053 NASA-CE-165061 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165120 NASA-CE-165120 NASA-CE-165130 NASA-CE-165149 NASA-CE-165154 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165163 NASA-CE-165164 NASA-CE-165165 NASA-CE-165165 NASA-CE-165165	NASA-CR-165455
NASA-CE-165061 NASA-CE-165061 NASA-CE-165061 NASA-CE-165081 NASA-CE-165081 NASA-CE-165081 NASA-CE-165080 NASA-CE-165120 NASA-CE-165130 NASA-CE-165130 NASA-CE-165154 NASA-CE-165163 NASA-CE-165164	NASA-CR-165455 p0131 N82-16483*# NASA-CR-165450 p0023 N82-12075*# NASA-CR-165450 p0023 N82-22264*# NASA-CR-165460 p0025 N82-22264*# NASA-CR-165460 p0052 N82-15123*# NASA-CR-165460 p0078 N82-13302*# NASA-CR-165467 p0078 N82-13302*# NASA-CR-165470 p0022 N82-10039*# NASA-CR-165473 p0023 N82-11068*# NASA-CR-165475 p0129 N82-12571*# NASA-CR-165477 p0129 N82-12571*# NASA-CR-165477 p0129 N82-12571*# NASA-CR-165477 p0129 N82-12571*# NASA-CR-165479 p0130 N82-1466*# NASA-CR-165480 p0129 N82-13506*#
NASA-CR-165053 NASA-CR-165061 NASA-CR-165061 NASA-CR-165081 NASA-CR-165081 NASA-CR-165081 NASA-CR-165130 NASA-CR-165130 NASA-CR-165154 NASA-CR-165163 NASA-CR-165163 NASA-CR-165163 NASA-CR-165163 NASA-CR-165163 NASA-CR-165163 NASA-CR-165175 NASA-CR-165175 NASA-CR-165182 NASA-CR-165182 NASA-CR-165183 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165198 NASA-CR-165198 NASA-CR-165198 NASA-CR-165198 NASA-CR-165198 NASA-CR-165198	NASA-CR-165455
NASA-CR-165053 NASA-CR-165061 NASA-CR-165061 NASA-CR-165081 NASA-CR-165081 NASA-CR-165080	NASA-CR-165455
NASA-CR-165053 NASA-CR-165061 NASA-CR-165061 NASA-CR-165081 NASA-CR-165081 NASA-CR-165080 NASA-CR-165080 NASA-CR-165120 NASA-CR-165130 NASA-CR-165149 NASA-CR-165154 NASA-CR-165154 NASA-CR-165163 NASA-CR-165168 NASA-CR-165168 NASA-CR-165168 NASA-CR-165189 NASA-CR-165189 NASA-CR-165182 NASA-CR-165182 NASA-CR-165183 NASA-CR-165183 NASA-CR-165184 NASA-CR-165185 NASA-CR-165185 NASA-CR-165185 NASA-CR-165197 NASA-CR-165198 NASA-CR-165203 NASA-CR-165204 NASA-CR-165204	NASA-CR-165455 p0131 N82-16483*# NASA-CR-165457 VOL-2-PT-1
NASA-CR-165061 NASA-CR-165061 NASA-CR-165061 NASA-CR-165081 NASA-CR-165120 NASA-CR-165130 NASA-CR-165149 NASA-CR-165163 NASA-CR-165163 NASA-CR-165168 NASA-CR-165168 NASA-CR-165175 NASA-CR-165193 NASA-CR-165194 NASA-CR-165204 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205	NASA-CR-165455
NASA-CR-165053 NASA-CR-165061 NASA-CR-165061 NASA-CR-165081 NASA-CR-165081 NASA-CR-165080 NASA-CR-165080 NASA-CR-165120 NASA-CR-165130 NASA-CR-165149 NASA-CR-165154 NASA-CR-165154 NASA-CR-165163 NASA-CR-165168 NASA-CR-165168 NASA-CR-165168 NASA-CR-165189 NASA-CR-165189 NASA-CR-165182 NASA-CR-165182 NASA-CR-165183 NASA-CR-165183 NASA-CR-165184 NASA-CR-165185 NASA-CR-165185 NASA-CR-165185 NASA-CR-165197 NASA-CR-165198 NASA-CR-165203 NASA-CR-165204 NASA-CR-165204	NASA-CR-165455
NASA-CR-165053 NASA-CR-165061 NASA-CR-165061 NASA-CR-165081 NASA-CR-165081 NASA-CR-165120 NASA-CR-165130 NASA-CR-165130 NASA-CR-165154 NASA-CR-165163 NASA-CR-165163 NASA-CR-165163 NASA-CR-165164 NASA-CR-165165 NASA-CR-165175 NASA-CR-165182 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165194 NASA-CR-165198 NASA-CR-165198 NASA-CR-165198 NASA-CR-165203 NASA-CR-165204 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165207 NASA-CR-165205 NASA-CR-165207	NASA-CR-165455 NASA-CR-165457 NASA-CR-165459 NASA-CR-165459 NASA-CR-165460 NASA-CR-165460 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165469 NASA-CR-165470 NASA-CR-165470 NASA-CR-165470 NASA-CR-165475 NASA-CR-165476 NASA-CR-165476 NASA-CR-165476 NASA-CR-165476 NASA-CR-165478 NASA-CR-165478 NASA-CR-165478 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165480 NASA-CR-165480 NASA-CR-165480 NASA-CR-165480 NASA-CR-165481 NASA-CR-165483 NASA-CR-165483 NASA-CR-165483 NASA-CR-165483 NASA-CR-165487 NASA-CR-165487
NASA-CR-165053 NASA-CR-165061 NASA-CR-165061 NASA-CR-165081 NASA-CR-165081 NASA-CR-165080 NASA-CR-165080 NASA-CR-165080 NASA-CR-165080 NASA-CR-165080 NASA-CR-165080 NASA-CR-165180 NASA-CR-165183 NASA-CR-165184 NASA-CR-165188 NASA-CR-165188 NASA-CR-165188 NASA-CR-165188 NASA-CR-165189 NASA-CR-165189 NASA-CR-165189 NASA-CR-165203 NASA-CR-165204 NASA-CR-165205 NASA-CR-165213 NASA-CR-165218 NASA-CR-165218 NASA-CR-165218 NASA-CR-165218	NASA-CR-165455 NASA-CR-165456 NASA-CR-165456 NASA-CR-165459 NASA-CR-165460 NASA-CR-165460 NASA-CR-165460 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165470 NASA-CR-165473 NASA-CR-165476 NASA-CR-165477 NASA-CR-165477 NASA-CR-165478 NASA-CR-165478 NASA-CR-165478 NASA-CR-165478 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165480 NASA-CR-165480 NASA-CR-165480 NASA-CR-165480 NASA-CR-165481 NASA-CR-165482 NASA-CR-165483 NASA-CR-165488 NASA-CR-165488
NASA-CR-165053 NASA-CR-165061 NASA-CR-165061 NASA-CR-165081 NASA-CR-165081 NASA-CR-165120 NASA-CR-165130 NASA-CR-165130 NASA-CR-165154 NASA-CR-165163 NASA-CR-165163 NASA-CR-165163 NASA-CR-165164 NASA-CR-165165 NASA-CR-165175 NASA-CR-165182 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165193 NASA-CR-165194 NASA-CR-165198 NASA-CR-165198 NASA-CR-165198 NASA-CR-165203 NASA-CR-165204 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165205 NASA-CR-165207 NASA-CR-165205 NASA-CR-165207	NASA-CR-165455 NASA-CR-165457 NASA-CR-165459 NASA-CR-165459 NASA-CR-165460 NASA-CR-165460 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165467 NASA-CR-165469 NASA-CR-165470 NASA-CR-165470 NASA-CR-165470 NASA-CR-165475 NASA-CR-165476 NASA-CR-165476 NASA-CR-165476 NASA-CR-165476 NASA-CR-165478 NASA-CR-165478 NASA-CR-165478 NASA-CR-165479 NASA-CR-165479 NASA-CR-165479 NASA-CR-165480 NASA-CR-165480 NASA-CR-165480 NASA-CR-165480 NASA-CR-165481 NASA-CR-165483 NASA-CR-165483 NASA-CR-165483 NASA-CR-165483 NASA-CR-165487 NASA-CR-165487

NASA-CR-165497	NASA-CR-167853
NASA-CP-165498	WASA-CR-167855
NASA-CR-165499	NASA-CR-167856
NASA-CB-165499-APP-B p0022 N82-10038*#	NASA-CR-167857
NASA-CB-165500	NASA-CR-167861 p0008 N82-26237*#
NASA-CR-165502-VOL-1 p0046 N82-11110**	WASA-CR-167867 p0136 W82-29719*#
NASA-CR-165502-VOL-2 p0044 N82-11111+#	HASA-CR-167869 p0138 N82-32855*#
NASA-CR-165503	NASA-CR-167872
NASA-CR-165505	MASA-CR-167876
NASA-CB-165507	NASA-CR-167877
NASA-CH-165508	MASA-CR-167879
NASA-CB-165510	MASA-CR-167883
NASA-CR-165511	NASA-CR-167885
HASA-CR-165512 p0129 N82-12572*6	NASA-CR-167886
NASA-CR-165513	MASA-CR-167889-VOL-1
NASA-CR-165515	WASA-CR-167889-VOL-2
NASA-CF-165516	WASA-CR-167892
NASA-CR-165517, p0073 N82-13243*#	MASA-CR-167894
NASA-CR-165519 p0129 N82-12573*#	NASA-CR-167895 p0014 N82-33375*#
NASA-CR-165520	NASA-CR-167896
NASA-CB-165521	NASA-CR-167897 p0114 N82-29619**
NASA-CE-165524	NASA-CR-167898 p0137 N82-30705*#
NASA-CF-165526 p0013 N82-19196*#	HASA-CR-167904
NASA-CR-165530	NASA-CR-167907 p0164 N82-29235**
NASA-CF-165531	NASA-CR-167908
NASA-CE-165533	NASA-CR-167909
NASA-CR-165534	NASA-CR-167911
NASA-CR-165535 p0164 N82-18068**	NASA-CR-167912
	NASA-CR-167914
NASA-CR-165538	NASA-CR-167918 p0079 N82-25423**
NASA-CF-165539	NASA-CR-167920 p0009 NB2-32310*#
NASA-CR-165544	NASA-CR-167923 p0137 N82-29721*#
NASA-CR-165545	NASA-CR-167924 p0079 N82-31584*#
NASA-CE-165546 p0084 N82-17439*#	NASA-CR-167928-VOL-1 p0028 N82-3237€**
NASA-CR-165547	NASA-CR-167929
NASA-CR-165549	NASA-CR-167930
NASA-CE-165551	MASA-CR-167934
NASA-CR-165553	NASA-CR-167935
NASA-CE-165554 p0106 N82-18603**	NASA-CR-167938
NASA-CF-165555	NASA-CR-167941
NASA-CR-165556	
	NASA-CR-167948
NASA-CR-165560	NASA-CR-167949, p0028 N82-33391*6
NASA-CR-165561	NASA-CR-167984 p0009 N82-33347*#
NASA-CB-165562-VOL-1 p0153 N82-21031*#	NASA-CR-167996 p0029 N82-33394*#
NASA-CR-165562-VOL-2 p0153 N82-21032**	NASA-CR-\$68418
NRSA-CR-165562-VOL-3 p0155 NB2-21033*#	NASA-CR-168419
NASA-CR-165563	NASA-CR-168548
NASA-CR-165564	NASA-CR-168550
NASA-CE-165565	NASA-CR-168556
NASA-CF-16556B	NASA-CR-168558
NASA-CE-165569	NASA-CR-168585
NASA-CR-165570	NASA-CR-168586
NASA-CR-165572	NASA-CR-168760
NASA-CR-165573	HASA-CR-168842
NASA-CB-165574	NASA-CR-168894
NASA-CR-165577	NASA-CR-168929
NASA-CR-165578	NASA-CR-168930
NASA-CR-165580	
	NASA-CR-168941
NASE-CR-165583	NASA-CR-169003
NASA-CE-165585 + p0044 N82-21253*#	NASA-CR-169004
NASA-CR-165586	NASA-CR-169005
N/SA-CR-165587	NASA-CR-169016
NASA-CR-165589	NASA-CR-169029
NASA-CF-165593	NASA-CR-169034
NASA-CS-165594	NASA-CR-169120
NASA-CR-165596	NASA-CR-169125
NASA-CR-165599 p0008 N82-24166*#	NASA-CR-169278
NASA-CF-165600	NASA-CR-169283
NASA-CB-165602	NASA-CR-169293
NASA-CR-165603	NASA-CR-169294 p0092 N82-31642*#
NASA-CR-165604	NASA-CR-169295
NASA-CR-165605	NASA-CR-169358
NASA-CR-165606	NASA-CR-169852
NASA=CR=165607	· · · · · · · · · · · · · · · · · · ·
NASA-CE-165609	NASA-TH-81616
NASA-CF-165610	NASA-TH-81635
NASA-CR-165611	
	NASA-TH-81651
	NASA-TM-81693
	NASA-TM-81694
NASA-CR-165616	NASA-TH-81708
NASA-CR-165617	NASA-TM-81716
NASA-CR-165620	
N = C = _CD = TE E E D 1	NASA-TH-81746
NASA-CE-165621	NASA-TH-81766
NASA-CE-165622	NASA-TH-81766
NASA-CE-165622	NASA-TH-81766
NASA-CE-165622	NASA-TH-81766
NASA-CE-165622 NASA-CE-167397 NASA-CE-167397 NASA-CE-167841 NASA-CE-167846 NASA-CE-167846 NASA-CE-167846 NASA-CE-167846 NASA-CE-167846 NASA-CE-167846	NASA-TH-81766 NASA-TH-81767 NASA-TH-82594 NASA-TH-82620 NASA-TH-82624 NASA-TH-82644 NASA-TH-82644
NASA-CE-165622	NASA-TH-81766

ORIGINAL PAGE IS OF POOR QUALITY

MAIN-T-02671			-0100					NO. 01111644
Mist								
MAIN								
MASI-T-0-2651								
MASI-TH-02079								
### ### ### ### ### ### ### ### ### ##								
MASI-T-02707								
MAS								
MASI-TH-02777 p0120 882-205669* MASI-TH-02801 p0110 882-20558*								
MSA-TF-02709								
## ## ## ## ## ## ## ## ## ## ## ## ##								
### ### ### ### ### ### ### ### ### ##								
### ### ### ### ### ### ### ### ### ##								
NSA-TH-02713								
### ### ### ### ### ### ### ### ### ##								
### ### ### ### ### ### ### ### ### ##								
### ### ### ### ### ### ### ### ### ##								
### ### ### ### ### ### ### ### ### ##								
### ### ### ### ### ### ### ### ### ##								
MASA-TH-02725								
MASA-TH-02727								
NASA-TH-02727 D0 163 NB2-11932*								
### ### ### ### ### ### ### ### ### ##								
### ### ### ### ### ### ### ### ### ##								
### ### ### ### ### ### ### ### ### ##								
MASA-TR-02722 p0009 NB2-1011 WS.N=TR-02826 p0006 NB2-241325								
### ### ### ### ### ### ### ### ### ##								
MASA-TR-02733								
MASA-TH-02735 D0119 N02-166618 MASA-TH-02831 D016 N02-226701 MASA-TH-02735 D019 N02-236708 MASA-TH-02831 D005 N02-224558 MASA-TH-02831 D005 N02-224558 MASA-TH-02831 D005 N02-224558 MASA-TH-02831 D005 N02-223138 D005 N02-223738 D005 N02-2267866 MASA-TH-02831 D006 N02-233728 MASA-TH-02741 D003 N02-126918 MASA-TH-02833 D006 N02-233728 MASA-TH-02741 D003 N02-126918 MASA-TH-02833 D006 N02-233728 MASA-TH-02741 D006 N02-23228 MASA-TH-02838 D006 N02-233728 MASA-TH-02741 D006 N02-233728 MASA-TH-02838 D006 N02-233228 MASA-TH-02746 D015 N02-224918 MASA-TH-02838 D006 N02-233228 MASA-TH-02746 D015 N02-23228 MASA-TH-02838 D006 N02-233228 MASA-TH-02747 D006 N02-233228 MASA-TH-02747 D006 N02-233228 MASA-TH-02747 D006 N02-233228 MASA-TH-02747 D006 N02-23328 MASA-TH-02747 D006 N02-23328 MASA-TH-02747 D006 N02-23480 D015 N02-23605 MASA-TH-02838 D016 N02-236605 MASA-TH-02747 D006 N02-236605 MASA-TH-02747 D006 N02-236605 MASA-TH-02751 D015 N02-236605 MASA-TH-02751 D015 N02-236605 MASA-TH-02838 D016 N02-236605 MASA-TH-02751 D015 N02-236605 MASA-TH-02838 D016 N02-236605 MASA-TH-02751 D016 N02-236605 MASA-TH-02838 D016 N02-236605 MASA-TH-02751 D016 N02-236605 MASA-TH-0275								
### ### ### ### ### ### ### ### ### ##								
### ### ### ### ### ### ### ### ### ##								
MASA-TB-02735								
MASA-TH-022730								
MASA-TR-02741								
NASA-TH-82741								
NASA-TR-02743						***************	p0124	N82-28786*#
NASA-TH-02745 p0115 NB2-162494 NASA-TH-02839 p0006 NB2-24322** NASA-TH-02745 p0111 NB2-16194* NASA-TH-02840 p0101 NB2-26665** NASA-TH-02747 p0003 NB2-1312** NASA-TH-02747 p0003 NB2-1312** NASA-TH-02747 p0003 NB2-1312** NASA-TH-02747 p0003 NB2-1312** NASA-TH-02747 p0105 NB2-13108** NASA-TH-02750 p0157 NB2-13108** NASA-TH-02750 p0157 NB2-13108** NASA-TH-02750 p0157 NB2-13108** NASA-TH-02750 p0157 NB2-13108** NASA-TH-02751 p0157 NB2-13108** NASA-TH-02752 p0151 NB2-16108** NASA-TH-02752 p0151 NB2-16108** NASA-TH-02753 p0198 NB2-14194** NASA-TH-02753 p0198 NB2-14194** NASA-TH-02754 p019 NB2-14194** NASA-TH-02755 p0198 NB2-14194** NASA-TH-02755 p0198 NB2-14194** NASA-TH-02757 p0166 NB2-14194** NBSA-TH-02757 p0166 NB2-14194** NBSA-TH-02757 p0166 NB2-14194** NBSA-TH-02759 p0198 NB2-14194** NBSA-TH-02759 p0198 NB2-14194** NBSA-TH-02759 p0198 NB2-14194** NBSA-TH-02759 p0198 NB2-14194** NBSA-TH-02755 p0198 NB2-14194** NBSA-TH-02755 p0198 NB2-14194** NBSA-TH-02755 p0198 NB2-14194** NBSA-TH-02755 p0198 NB2-14194** NBSA-TH-02755 p0198 NB2-14194** NBSA-TH-02759 p0198 NB2-14194** NBSA-								
MASA-TR-02745					NASA-TM-82838	***********	p0163	H82=27191*#
NASA-T-8-2746 p0 149 N92-14949* NASA-TH-92841 p0055 N82-22951** NASA-T-8-2747 p0003 N82-13112** NASA-TH-92843 p0152 N82-22951** NASA-T-8-27750 p019 N82-13900** NASA-TH-92843 p019 N82-22952** NASA-TH-92755 p019 N82-13900** NASA-TH-92744 p0123 N82-24667** NASA-TH-92755 p019 N82-13900** NASA-TH-92845 p0111 N82-24502** NASA-TH-92755 p019 N82-16080** NASA-TH-92845 p0111 N82-24502** NASA-TH-92755 p019 N82-16080** NASA-TH-92845 p0111 N82-24502** NASA-TH-92755 p019 N82-16080** NASA-TH-92849 p018 N82-222665** NASA-TH-92755 p0055 N82-1499** NASA-TH-92849 p018 N82-22266** NASA-TH-92755 p0055 N82-1499** NASA-TH-92849 p018 N82-22266** NASA-TH-92850 p018 N82-22266** NASA-TH-92852 p0060 N82-23366** NASA-TH-92852 p0060 N82-23366** NASA-TH-92852 p0060 N82-23368** NASA-TH-92852 p0060 N82-23368** NASA-TH-92852 p0060 N82-23368** NASA-TH-92852 p0060 N82-23368** NASA-TH-92854 p0060 N82-23368** NASA-TH-92864 p0060 N82-23368** NASA-TH-92864 p0060 N82-23368** NASA-TH-92866 p0060 N82-23368** NASA-TH-92866 p0060 N82-23368** NASA-TH-92866 p0060 N82-23666** NASA-TH-92866 p0060 N82-								N82-24322*#
NASA-TH-62747 D0003 NB2-11287** NASA-TH-62842 D0152 NB2-2292** NASA-TH-62750 D0157 NB2-113900** NASA-TH-62844 D0123 NB2-2226467** NASA-TH-62751 D0157 NB2-13900** NASA-TH-62751 D0157 NB2-13900** NASA-TH-62844 D0123 NB2-224607** NASA-TH-62751 D0157 NB2-13900** NASA-TH-62764 D0111 NB2-26603** NASA-TH-62764 D0111 NB2-25502** NASA-TH-62764 D0111 NB2-21501** NASA-TH-62764 D0111 NB2-21501** NASA-TH-62764 D0111 NB2-21501** NASA-TH-62764 D0111 NB2-16003** NASA-TH-62764 D0111 NB2-21501** NASA-TH-62764 D0111 NB2-16003** NASA-TH-62764 D0112 NB2-22501** NASA-TH-62765 D0103 NB2-12151** NASA-TH-62764 D0103 NB2-12151** NASA-TH-62764 D0103 NB2-12151** NASA-TH-62764 D0103 NB2-12151** NASA-TH-62765 D0103 NB2-12151** NASA-TH-62765 D0103 NB2-12151** NASA-TH-62765 D0103 NB2-12151** NASA-TH-62765 D0103 NB2-12104** NASA-TH-62765 D0106 NB2-2236** NASA-TH-62765 D0106 NB2-12104** NASA-TH-62765 D0106 NB2-12104** NASA-TH-62765 D0106 NB2-2236** NASA-TH-62766 D0104 NB2-1619** NASA-TH-62765 D0106 NB2-12104** NASA-TH-62765 D0106 NB2-2236** NASA-TH-62765 D0106 NB2-12104** NASA-TH-62765 D0106 NB2-2236** NASA-TH-62766 D0104 NB2-1619** NASA-TH-62765 D0106 NB2-22550** NASA-TH-62766 D0106 NB2-12104** NASA-TH-62766 D0106 NB2-22550** NASA-TH-62766 D0106 NB2-12104** NASA-TH-62766 D0106 NB2-22550** NASA-TH-62766 D0106 NB2-12104** NASA-TH-62766 D0106 NB2-22550** NASA-TH-62766 D0106 NB2-2351** NASA-TH-62766 D0106 NB2-2350** NASA-TH-62766 D0106 NB2-2366** NASA-TH-62766 D0106 NB2-2366** NASA-TH-6276								N82-26681*#
NASA-TH-82749								
NASA-TH-02750					NASA-TM-82842	************	p0152	N82-22951*#
NSATT-02751					NASA-TH-82843		p0149	N82-22922**
MASA-TH-02752						*****************	p0123	N82-24647+#
NASATH-82753 P0099 M2-14519** NASATH-82849 P0009 M2-24165** NASATH-82755 P0095 M2-14494** P0031 M2-1294** NASATH-82755 P0095 M2-14494** NASATH-82849 P0038 M2-22619** NASATH-82757 P0066 M2-15198** NASATH-82759 P0098 M2-151184** NASATH-82552 P0096 M2-23261** NASATH-82759 P0098 M2-11184** NASATH-82852 P0096 M2-23261** NASATH-82759 P0004 M2-16049** NASATH-82852 P0096 M2-23268** NASATH-82759 P0004 M2-16049** NASATH-82853 P0076 M2-23238** NASATH-82761 P0119 M2-16495** NASATH-82855 P0068 M2-24355** NASATH-82761 P0119 M2-16495** NASATH-82855 P0068 M2-24355** NASATH-82763 P0066 M2-13133** NASATH-82855 P0068 M2-24355** NASATH-82764 P0005 M2-13133** NASATH-82855 P0068 M2-24355** NASATH-82765 P0068 M2-23519** NASATH-82856 P0069 M2-25519** NASATH-82765 P0068 M2-13133** NASATH-82856 P0069 M2-25519** NASATH-82765 P0068 M2-13133** NASATH-82856 P0069 M2-25519** NASATH-82766 P0151 M2-14881** NASATH-82856 P0009 M2-25519** NASATH-82766 P0151 M2-14881** NASATH-82856 P0100 M2-25529** NASATH-82766 P0109 M2-23519** NASATH-82860 P0109 M2-23520** NASATH-82767 P0109 M2-13519** NASATH-82860 P0109 M2-23520** NASATH-82767 P0109 M2-13519** NASATH-82860 P0109 M2-23530** NASATH-82770 P0168 M2-13144** NASATH-82860 P0109 M2-23530** NASATH-82777 P0168 M2-23144** NASATH-82860 P0169 M2-23530** NASATH-82777 P0168 M2-2119** NASATH-82860 P0169 M2-23530** NASATH-82777 P0169 M2-23630** NASATH-82860 P0169 M2-23530** NASATH-82860 P0169 M2-23530** NASATH-82777 P0169 M2-23630** NASATH-82860 P0169 M2-23530** NASATH-82777 P0169 M2-23630** NASATH-82860 P0169 M2-23630** NASATH-82777 P0169 M2-23630** NASATH-82860 P0169 M2-23630** NASATH-82779 P0169 M2-23630** NASATH-82860 P0169 M2-23630** NASATH-82786 P0169								N82-24502*#
NASA-TH-02754 D003 N02-19229** NASA-TH-02849 D016 N02-20260**					NASA-TM-82846	**********	1110g	N82-2459 *#
NASA-TH-02755					NASA-TM-82847		p0004	N82-24165*#
NASA-TH-62756 D017 N62-1504 ** NASA-TH-62851 D016 N62-24201** NASA-TH-62758 D005 N62-1204** NASA-TH-62759 D000 N62-1204** NASA-TH-62759 D000 N62-1204** NASA-TH-62759 D000 N62-1204** NASA-TH-62759 D000 N62-1204** NASA-TH-62759 D000 N62-1204** NASA-TH-62759 D000 N62-1204** NASA-TH-62759 D000 N62-1204** NASA-TH-62759 D000 N62-1314** NASA-TH-62761 D019 N62-16495** NASA-TH-62765 D006 N62-13113** NASA-TH-62766 D010 N62-25519** NASA-TH-62766 D010 N62-25519** NASA-TH-62766 D010 N62-25519** NASA-TH-62766 D010 N62-25519** NASA-TH-62766 D010 N62-25619** NASA-TH-62766 D010 N62-25619** NASA-TH-62766 D010 N62-25619** NASA-TH-62766 D010 N62-25619** NASA-TH-62766 D010 N62-26619** NASA-TH-62766 D010 N62-26619** NASA-TH-62769 D004 N62-15119** NASA-TH-62661 D003 N62-25290** NASA-TH-62770 D016 N62-21144** NASA-TH-62770 D016 N62-21144** NASA-TH-62770 D016 N62-2114** NASA-TH-62770 D016 N62-2664** NASA-TH-62770 D019 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770 D010 N62-2664** NASA-TH-62770					NA SA-TM-82848		p0163	N82-26051*#
NASA-TH-82757 p0066 N82-15199** NASA-TH-82551 p0068 N82-124201** NASA-TH-82759 p0003 N82-12043** NASA-TH-82652 p0006 N82-22326** NASA-TH-82750 p0004 N82-16099** NASA-TH-82654 p0054 N82-21459** NASA-TH-82761 p0119 N82-16495** NASA-TH-82655 p0088 N82-24455** NASA-TH-82763 p0016 N82-1094** NASA-TH-82655 p0088 N82-24455** NASA-TH-82764 p0003 N82-12113** NASA-TH-82656 p0100 N82-25519** NASA-TH-82765 p0066 N82-14359** NASA-TH-82656 p0100 N82-25520** NASA-TH-82766 p0155 N82-14881** NASA-TH-82658 p0100 N82-25520** NASA-TH-82766 p0156 N82-14881** NASA-TH-82658 p0100 N82-25520** NASA-TH-82766 p0120 N82-19673** NASA-TH-82659 p0101 N82-28643** NASA-TH-82766 p0120 N82-19673** NASA-TH-82650 p0100 N82-25520** NASA-TH-82766 p0120 N82-19673** NASA-TH-82650 p0100 N82-25520** NASA-TH-82777 p0108 N82-13144** NASA-TH-82660 p0100 N82-2850** NASA-TH-82777 p0108 N82-13144** NASA-TH-8266 p0100 N82-28520** NASA-TH-82777 p0108 N82-21194** NASA-TH-8266 p0109 N82-28646** NASA-TH-82777 p0108 N82-21194** NASA-TH-8266 p0109 N82-28646** NASA-TH-82777 p0108 N82-21194** NASA-TH-8266 p0101 N82-28646** NASA-TH-82777 p0108 N82-15020** NASA-TH-8266 p0109 N82-26359** NASA-TH-82777 p0108 N82-15020** NASA-TH-8266 p0109 N82-26359** NASA-TH-82777 p0108 N82-15020** NASA-TH-8266 p0109 N82-26364** NASA-TH-82777 p0108 N82-15020** NASA-TH-8266 p0109 N82-26364** NASA-TH-82777 p0108 N82-15020** NASA-TH-8266 p0109 N82-26369** NASA-TH-82779 p0108 N82-15020** NASA-TH-8266 p0109 N82-26369** NASA-TH-82779 p0108 N82-15020** NASA-TH-8266 p0109 N82-26369** NASA-TH-82779 p0108 N82-15020** NASA-TH-8266 p0109 N82-26369** NASA-TH-82779 p0108 N82-15020** NASA-TH-8266 p0109 N82-26369** NASA-TH-82779 p0108 N82-15020** NASA-TH-8266 p0109 N82-26369** NASA-TH-82779 p0108 N82-217608** NASA-TH-82679 p0108 N82-31746** NASA-TH-82789 p0100 N82-25508** NASA-TH-82689 p0109 N82-26649** NASA-TH-82789 p					NASA-TM-82849	********	P0038	N82-23261*#
NASA-TH-02756	NASA-TH-82756				NASA-TH-82850	**********	p0112	N82-31707*#
NASA-TH-62759 D0004 R82-12043** NASA-TH-62853 D0076 N62-22388** NASA-TH-62766 D0004 R82-16049** NASA-TH-62855 D0084 R82-31459** NASA-TH-62763 D0016 N82-14094** NASA-TH-62855 D0084 R82-31459** NASA-TH-62764 D0003 N82-13113** NASA-TH-62855 D0084 NASA-TH-62855 D0086 N82-144818** NASA-TH-62856 D0095 NASA-TH-62857 D0016 NASA-TH-62856 D0095 NASA-TH-62856 D0095 NASA-TH-62857 D0016 NASA-TH-62856 D0095 NASA-TH-62856 D0095 NASA-TH-62856 D0095 NASA-TH-62856 D0095 NASA-TH-62856 D0095 NASA-TH-62857 D0016 NASA-TH-62856 D0095 NASA-TH-62877 D0096 NASA-TH-62877 D0096 NASA-TH-62877 D0096 NASA-TH-62877 D0096 NASA-TH-62878 D0096 NASA-TH-62879 D0096 NASA-TH-62886 D0097 NASA-TH-62879 D0096 NASA-TH-62889 D0096	NESA-TM-82757		p0066	N82-15198*#	NASA-TM-82851	*****************	p0018	NB2-24201*#
NASA-TH-82760	NASA-TM-82758				NA SA-TM-82852	************	p0060	N82-24326*#
NASA-TH-82761						*************	p0076	N82-22388*#
NASA-TH-82763	NASA-TH-82760				NASA-TH-82854	****************	p0054	N82-31459*#
NASA-TH-82764 p0003 N82-13113** NASA-TH-82765 p0164 N2-14359** NASA-TH-82766 p0151 N82-14881** NASA-TH-82869 p0106 N82-29518** NASA-TH-82869 p0101 N82-28643** NASA-TH-82869 p0101 N82-2850** NASA-TH-82860 p0105 N82-2855** NASA-TH-82860 p0106 N82-2955** NASA-TH-82861 p0106 N82-2855** NASA-TH-82861 p0108 N82-2550** NASA-TH-82769 p0048 N82-15119** NASA-TH-82861 p0108 N82-26300** NASA-TH-82770 p016 N82-13144** NASA-TH-82862 p0109 N82-26300** NASA-TH-82771 p016 N82-13146** NASA-TH-82863 p0108 N82-2556** NASA-TH-82771 p016 N82-13146** NASA-TH-82866 p0107 N82-25961** NASA-TH-82773 p0143 N82-16743** NASA-TH-82865 p0101 N82-26645** NASA-TH-82776 p0107 N82-1920** NASA-TH-82866 p0108 N82-28355** NASA-TH-82776 p0107 N82-1920** NASA-TH-82866 p0050 N82-30335** NASA-TH-82779 p0048 N82-16743** NASA-TH-82866 p0050 N82-30335** NASA-TH-82779 p0048 N82-1681** NASA-TH-82869 p0108 N82-28278** NASA-TH-82781 p0138 N82-1681** NASA-TH-82781 p018 N82-26645** NASA-TH-82781 p0038 N82-16311** NASA-TH-82869 p0108 N82-2629** NASA-TH-82781 p0108 N82-1681** NASA-TH-82881 p0138 N82-1681** NASA-TH-82881 p0138 N82-1681** NASA-TH-82881 p016 N82-23679** NASA-TH-82881 p018 N82-23679** NASA-TH-82881 p018 N82-23679** NASA-TH-82881 p018 N82-23679** NASA-TH-82881 p018 N82-23679** NASA-TH-82881 p018 N82-23679** NASA-TH-82889 p010 N82-22555** NASA-TH-82889 p010 N82-22555** NASA-TH-82889 p010 N82-22555** NASA-TH-82889 p0005 N82-22644** NASA-TH-82889 p0005 N82-22639** NASA-TH-82889 p0005 N82-2360** NASA-TH-82889 p0006 N82-2360** NASA-TH-82889 p0006 N82-2360** NASA-TH-82889 p0001 N82-26219** NASA-TH-82889 p0001 N82-26219** NASA-TH-82889 p0001 N82-26219** NASA-TH-82889 p0001 N82-26219** NASA-TH-8					NASA-TM-82855	****	88 00g	N82-24455*#
NASA-TH-82765					NASA-TH-82856			
NASA-TH-B2766					NASA-TM-82857	***********	p0100	N82-25520*#
NASA-TH-82767 NASA-TH-82768 NASA-TH-82768 NASA-TH-82769 NASA-TH-82770 NASA-TH-82770 NASA-TH-82777 NASA-TH-82778 NASA-TH-82778 NASA-TH-82778 NASA-TH-82780 NASA-TH-82880 NASA-TH-82780 NASA-TH-82780 NASA-TH-82780 NASA-TH-82880 NASA-TH-82780 NASA-TH-82780 NASA-TH-82780 NASA-TH-82880 NASA-TH-82880 NASA-TH-82780 NASA-TH-82780 NASA-TH-82780 NASA-TH-82880 NASA-TH-82880 NASA-TH-82780 NASA-TH-82780 NASA-TH-82880 NA					NASA-TH-82858	*********	p0069	N82-29458*#
HASA-TH-82768 MASA-TH-82776 MASA-TH-82770 MASA-TH-82770 MASA-TH-82771 MASA-TH-82771 MASA-TH-82771 MASA-TH-82771 MASA-TH-82771 MASA-TH-82771 MASA-TH-82772 MASA-TH-82773 MASA-TH-82773 MASA-TH-82773 MASA-TH-82773 MASA-TH-82773 MASA-TH-82774 MASA-TH-82775 MASA-TH-82776 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82777 MASA-TH-82779 MASA-TH-82779 MASA-TH-82779 MASA-TH-82779 MASA-TH-82779 MASA-TH-82779 MASA-TH-82780 MASA-TH-82780 MASA-TH-82781 MASA-TH-82781 MASA-TH-82782 MASA-TH-82783 MASA-TH-82784 MASA-TH-82784 MASA-TH-82784 MASA-TH-82785 MASA-TH-82785 MASA-TH-82786 MASA-TH-82786 MASA-TH-82787 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82789 MASA-TH-82799 MASA-TH-82899 MASA-TH-82899 MASA-TH-82799 MASA-TH-82899 MASA-TH-82899 MASA-TH-82899 MASA-TH-82899 MASA-TH-82899 MASA-TH-82899 MASA-TH-82899 MASA-TH-82899 MA								
NASA-TH-82770 NASA-TH-82771 NASA-TH-82771 NASA-TH-82771 NASA-TH-82772 NASA-TH-82772 NASA-TH-82773 NASA-TH-82773 NASA-TH-82775 NASA-TH-82775 NASA-TH-82775 NASA-TH-82776 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82778 NASA-TH-82781 NASA-TH-82781 NASA-TH-82781 NASA-TH-82781 NASA-TH-82784 NASA-TH-82784 NASA-TH-82786 NASA-TH-82786 NASA-TH-82786 NASA-TH-82786 NASA-TH-82786 NASA-TH-82787 NASA-TH-82788 NASA-TH-82786 NASA-TH-82787 NASA-TH-82786 NASA-TH-82787 NASA-TH-82786 NASA-TH-82787 NASA-TH-82786 NASA-TH-82787 NASA-TH-82788 NASA-TH-82788 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82786 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82789 NASA-TH-82889 NA					NASA-TH-82860		p0005	N82-28250*#
NASA-TH-82770 NASA-TH-82771 NASA-TH-82771 NASA-TH-82771 NASA-TH-82772 NASA-TH-82773 NASA-TH-82773 NASA-TH-82773 NASA-TH-82775 NASA-TH-82775 NASA-TH-82776 NASA-TH-82776 NASA-TH-82776 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82779 NASA-TH-82779 NASA-TH-82779 NASA-TH-82780 NASA-TH-82781 NASA-TH-82781 NASA-TH-82781 NASA-TH-82783 NASA-TH-82783 NASA-TH-82784 NASA-TH-82785 NASA-TH-82785 NASA-TH-82786 NASA-TH-82786 NASA-TH-82787 NASA-TH-82787 NASA-TH-82788 NASA-TH-82789 NASA-TH-82889 NASA-TH-82889 NASA-TH-82789 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82790 NASA-TH-82889 NA	MASA-TM-82768				NASA-TH-82861	***************	p0036	N82-25290*#
NASA-TH-82771						*****	p0019	N82-26300*#
MASA-TH-82772								
NASA-TH-62773								
NASA-TH-8275 NASA-TH-82776 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82777 NASA-TH-82779 NASA-TH-82780 NASA-TH-82781 NASA-TH-82781 NASA-TH-82781 NASA-TH-82781 NASA-TH-82782 NASA-TH-82783 NASA-TH-82783 NASA-TH-82784 NASA-TH-82785 NASA-TH-82785 NASA-TH-82785 NASA-TH-82786 NASA-TH-82787 NASA-TH-82787 NASA-TH-82787 NASA-TH-82788 NASA-TH-82788 NASA-TH-82789 NASA-TH-82891 NASA-TH-82894 NASA-TH-82789 NASA-TH-82894 NASA-TH-82789 NASA-TH-82894 NASA-TH-82789 NASA-TH-82894 NASA-TH-82789 NASA-TH-82894 NASA-TH-82894 NASA-TH-82789 NASA-TH-82894 NASA-TH-82894 NASA-TH-82894 NASA-TH-82894 NASA-TH-82899 NAS			p0017	N82-21194*#				
NASA-TM-82777 NASA-TM-82777 NASA-TM-82777 NASA-TM-82777 NASA-TM-82780 NASA-TM-82781 NASA-TM-82781 NASA-TM-82781 NASA-TM-82781 NASA-TM-82782 NASA-TM-82783 NASA-TM-82783 NASA-TM-82784 NASA-TM-82784 NASA-TM-82785 NASA-TM-82785 NASA-TM-82785 NASA-TM-82785 NASA-TM-82785 NASA-TM-82786 NASA-TM-82786 NASA-TM-82787 NASA-TM-82787 NASA-TM-82788 NASA-TM-82788 NASA-TM-82788 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82790 NASA-TM-82790 NASA-TM-82791 NASA-TM-82791 NASA-TM-82892 NASA-TM-82793 NASA-TM-82793 NASA-TM-82793 NASA-TM-82793 NASA-TM-82794 NASA-TM-82795 NASA-TM-82795 NASA-TM-82796 NASA-TM-82796 NASA-TM-82796 NASA-TM-82899 NASA-TM-82899 NASA-TM-82799 NASA-TM-82899		****	p0 143	N82-16743*#				
NASA-TM-82777 NASA-TM-82779 NASA-TM-82780 NASA-TM-82781 NASA-TM-82781 NASA-TM-82781 NASA-TM-82782 NASA-TM-82784 NASA-TM-82784 NASA-TM-82784 NASA-TM-82785 NASA-TM-82785 NASA-TM-82786 NASA-TM-82787 NASA-TM-82787 NASA-TM-82788 NASA-TM-82878 NASA-TM-82878 NASA-TM-82878 NASA-TM-82878 NASA-TM-82878 NASA-TM-82878 NASA-TM-82878 NASA-TM-82887 NASA-TM-82888 NASA-TM-82788 NASA-TM-82889 NASA-TM-82889 NASA-TM-82789 NASA-TM-82889 NA			pu 16 2	N82-20006*#				
NASA-TM-82797 NASA-TM-82781 NASA-TM-82781 NASA-TM-82783 NASA-TM-82783 NASA-TM-82783 NASA-TM-82784 NASA-TM-82785 NASA-TM-82785 NASA-TM-82785 NASA-TM-82785 NASA-TM-82785 NASA-TM-82785 NASA-TM-82785 NASA-TM-82875 NASA-TM-82875 NASA-TM-82875 NASA-TM-82876 NASA-TM-82787 NASA-TM-82787 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82789 NASA-TM-82790 NASA-TM-82791 NASA-TM-82792 NASA-TM-82792 NASA-TM-82792 NASA-TM-82793 NASA-TM-82793 NASA-TM-82793 NASA-TM-82793 NASA-TM-82795 NASA-TM-82795 NASA-TM-82795 NASA-TM-82796 NASA-TM-82796 NASA-TM-82796 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82799 NASA-TM-82899								
NASA-TH-82780 NASA-TH-82781 NASA-TH-82783 NASA-TH-82783 NASA-TH-82784 NASA-TH-82785 NASA-TH-82785 NASA-TH-82787 NASA-TH-82789 NASA-TH-82789 NASA-TH-82880 NASA-TH-82881 NASA-TH-82790 NASA-TH-82791 NASA-TH-82792 NASA-TH-82881 NASA-TH-82793 NASA-TH-82883 NASA-TH-82793 NASA-TH-82793 NASA-TH-82884 NASA-TH-82795 NASA-TH-82885 NASA-TH-82795 NASA-TH-82885 NASA-TH-82795 NASA-TH-82886 NASA-TH-82795 NASA-TH-82887 NASA-TH-82889 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899								
NASA-TH-82781 NASA-TH-82783 NASA-TH-82873 NASA-TH-82875 NASA-TH-82786 NASA-TH-82876 NASA-TH-82786 NASA-TH-82787 NASA-TH-82787 NASA-TH-82788 NASA-TH-82789 NASA-TH-82789 NASA-TH-82791 NASA-TH-82791 NASA-TH-82792 NASA-TH-82792 NASA-TH-82793 NASA-TH-82794 NASA-TH-82795 NASA-TH-82795 NASA-TH-82894 NASA-TH-82795 NASA-TH-82795 NASA-TH-82894 NASA-TH-82795 NASA-TH-82894 NASA-TH-82795 NASA-TH-82894 NASA-TH-82895 NASA-TH-82895 NASA-TH-82895 NASA-TH-82895 NASA-TH-82895 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899 NASA-TH-82899								
NASA-TH-82783								
#ASA-TH-82784		********	p0038	N82-18311*#				
NASA-TH-82785								
NASA-TH-82787			pu 122	#62-23679*#				
NASA-TH-82787 NASA-TH-82788 NASA-TH-82790 NASA-TH-82791 NASA-TH-82791 NASA-TH-82791 NASA-TH-82792 NASA-TH-82792 NASA-TH-82793 NASA-TH-82794 NASA-TH-82794 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82796 NASA-TH-82796 NASA-TH-82797 NASA-TH-82797 NASA-TH-82798 NASA-TH-82798 NASA-TH-82798 NASA-TH-82799 NASA-TH-82899								
NASA-TH-82788 NASA-TH-82789 NASA-TH-82790 NASA-TH-82791 NASA-TH-82791 NASA-TH-82792 NASA-TH-82792 NASA-TH-82793 NASA-TH-82793 NASA-TH-82793 NASA-TH-82794 NASA-TH-82794 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82798 NASA-TH-82897 NASA-TH-82897 NASA-TH-82898 NASA-TH-82897 NASA-TH-82898 NASA-TH-82898 NASA-TH-82898 NASA-TH-82899								
NASA-TH-82789 NASA-TH-82791 NASA-TH-82791 NASA-TH-82792 NASA-TH-82792 NASA-TH-82793 NASA-TH-82793 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82796 NASA-TH-82796 NASA-TH-82796 NASA-TH-82797 NASA-TH-82798 NASA-TH-82797 NASA-TH-82798 NASA-TH-82798 NASA-TH-82798 NASA-TH-82899								
NASA-TH-82791 NASA-TH-82791 NASA-TH-82793 NASA-TH-82793 NASA-TH-82793 NASA-TH-82794 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82796 NASA-TH-82796 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82798 NASA-TH-82798 NASA-TH-82799 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82893 NASA-TH-82891 NASA-TH-82891 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893 NASA-TH-82893								
NASA-TH-82791 NASA-TH-82792 NASA-TH-82793 NASA-TH-82794 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82796 NASA-TH-82796 NASA-TH-82796 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82799 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82894 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82893 NASA-TH-82891 NASA-TH-82893								
NASA-TH-82792 NASA-TH-82793 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82795 NASA-TH-82796 NASA-TH-82796 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82798 NASA-TH-82798 NASA-TH-82798 NASA-TH-82798 NASA-TH-82799 NASA-TH-82799 NASA-TH-82899								
NASA-TH-82793								
NASA-TH-82794 NASA-TH-82795 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82797 NASA-TH-82798 NASA-TH-82798 NASA-TH-82799 NASA-TH-82799 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82891 NASA-TH-82893 NASA-TH-82893								
NASA-TM-82795 NASA-TM-82796 NASA-TM-82797 NASA-TM-82797 NASA-TM-82797 NASA-TM-82798 NASA-TM-82798 NASA-TM-82798 NASA-TM-82799 NASA-TM-82799 NASA-TM-82899 NASA-TM-82891 NASA-TM-82891 NASA-TM-82891 NASA-TM-82891 NASA-TM-82891 NASA-TM-82891 NASA-TM-82891 NASA-TM-82894 NASA-TM-82894 NASA-TM-82894 NASA-TM-82894								
NASA-TM-82796								
NASA-TM-82797								
NASA-TH-82798								
NASA-TH-82799 p0042 N82-22386** NASA-TH-82892 p0042 N82-31443**		••••	p0100/	102-17473年ま				
			D0074	NR 2-2034377				
ANDRI AL 12000 *********************************								
	####=# E D7 00 0		puus/	104717474747	MUDY-10-05024	***************************************	POODI	■ログニグログログ★書

ORIGINAL PAGE IS OF POOR QUALITY

NASA-TH-82895		p0 163	MB2-31160*# 1	NASA-TP-2037 p0103 N82-32737*#
	• • • • • • • • • • • • • • • • • • • •			HASA-TP-2040
	•••••••••			NASA-TP-2047
	*********			NASA-TP-2048
NASA-TH-82900 .		p0 127	N82-33829+#	NASA-TP-2049
WASA-TY-82901 .		p0089	NB2-32633#4	
				NASA-1-4-W-1-111 p0079 N82-25423*#
				MASK-1-4-H-1-211
	•••••			4
				ODAI-1403-12-81
NASA-TH-82905 .		p0061	NB2-32461+0	
	•••••••			PPT-3009-4
				Etz-phases interested to the total t
	.,,.,.,.,.,.,.			
				PR-1 p0163 NB2-16937*#
NASA-TE-82910 .		p0101	N82-28644+#	
				P5U/TURBO#81-9 p0006 N82-18184*#
NASA-TM-82912	• • • • • • • • • • • • • • • • • • • •	50126		
			N82-30700*#	PSU/TURBO-82-2
			NB2-33463*0	PFU/TURBO-82-3
NASA-TN-82914 .		n0095	N82-31664*#	PSU/TURBO-82-4
	• • • • • • • • • • • • • • • • • • • •		NR2-26298+4	The state of the s
				PWA-5512-87
				PWA-5512-88
NASA-TM-82919 ,		p0013	N82-30297*#	PUR-55 15-162
NASA-TM-82921 .		p0 125	N82-30713*#	PWA-5515-165
				PWA-5589-19
	••••••			PNA-5594-92 *********** p0031 N82-32383*#
	• • • • • • • • • • • • • • • • • • • •			PWA-5594-164 ************* p0025 N82-22264*#
NASA-TH-82927 .	*********	p0096	N82-32662*#	PWA-5594-199
	**********			PWA-5594-215
				PWA-5642-21
NASA-TH-82930 .		p0 125	NB2-30717*#	PWA-5643-6
NASA-78-82931 .		DO 149	N82-29075*#	PWA-5698-28
				PWA-5700-50
				PWA-5708-26
NASA-TM-82937 .		p0 144	N82-30949*#	PWA-5736-17 p0023 H82-13145**
NASA-TH-82942 .		p0069	N82-30401*#	PWA-5772-23
	•••••••			
				PWA-5779-10
NASA-TH-82945		pn 125	NB2-307!5*#	
NASA-TH-82946 .	*******	p0 125	NB2-30716*#	PWA/5574-123
				The state of the s
				0070 0015
	• • • • • • • • • • • • • • • • • • • •			PYU-2115 p0073 N82-18402*#
NASA-TM-84127 .		p0.117	N82-18664*#	
NASA-TH-84194 .		D0117	NB2-24525*#	QR-1 p011" H82-13490*4
				QR-2 p0131 N82-16483*#
MUSU- 143		bijo o i	NO2-24431+F	QR-3 p0130 N82-14628*#
			1	QR-3 p0135 N82-24648**
NASA-TP-1663	,	p0095	N82-19521*#	QR-4p0137 N82-30705*#
NASA-TE-1798	***************	n00 16	892-13143**	QR-7 p0129 N82-12573*#
	• • • • • • • • • • • • • • • • • • • •			
				QR-8p0132 R82-17615##
				QR-9 p0134 N62-21713*#
NASA-TP-1868		p0095	N82-22481*#	
				QTR-3236 p0129 N82-12572*#
				Mrw-2520 - energone energone energia forth upg-15235-
			N82-30498*#	
				R-1489 p0084 N82-24424*#
NASA-TP-1907	*********	p0161	N82-32187*#	
NASA-TP-1908	•••••••	00 16 1	NR2-32188*#	REPT-21-4309
NASA-TP-1909	*******	20161	NO2-22100+#	
				REPT-80ASE142DRI-VOL-3 p0164 N82-34312*#
NASA-TD-1942		pu016	#42-14090*#	REPT-81-9D1-MARED-R1 p0130 N82-13511+#
NASA-TP-1943		p0003	N82-14051*#	REPT-81-9D6-NASAC-R3 p0063 N82-18368*#
				REPT-81-9F5-HTEAN-R5 p0084 H82-18506*#
				- ware filtipliman and analysis bases are being a
	• • • • • • • • • • • • • • • • • • • •			REPT-111-2401-204 p0130 N82-14636*#
	• • • • • • • • • • • • • • • • • • • •			REPT-995
	*********			REPT-1759 p0028 N82-29323*#
				REFT-2372-5009
	********			REPT-61051
	•••••			RF-05438
	• • • • • • • • • • • • • • • • • • • •	p0017	N82-19222*#	
NASA-TP-1982		p0111	N82-20565**	RI/RD81-149
	*********			RI/RDB1-199
	********			RI/RD81-226

				R80AEG314-VOL-4
				R81-912929
	******			R81-914618-27
				20 1-31 VU 10-27
	*********			R81-914618-28-VOL-2-PT-1 p0006 N82-18180*#
				R8 I-915 188-13
NASA-TP-1999		p0082	NB2-25441+#	R81-915540-9
				R8 IAEG 030 p00 23 N82-12075+4
NASA-TP-2001			11 U & C & C & C & C & C & C & C & C & C &	
NASA-TP-2002		p0068	N82-22366*#	R8 1AEG287-VOL-5
NASA-TP-2002 NASA-TP-2006	••••••••••••••	p0068 p0060	N82-22366*# N82-22349*#	R81AEG590
NASA-TP-2002 NASA-TP-2006 NASA-TP-2007	• • • • • • • • • • • • • • • • • • •	p0068 p0060 p0095	N82-22366*# N82-22349*# N82-23515*#	R81AEG590
NASA-TP-2002 NASA-TP-2006 NASA-TP-2007	• • • • • • • • • • • • • • • • • • •	p0068 p0060 p0095	N82-22366*# N82-22349*# N82-23515*#	R81AEG590
NASA-TP-2002 NASA-TP-2006 NASA-TP-2007 NASA-TP-2008	••••••••••••••••••••••••••••••••••••••	p0068 p0060 p0095 p0081	N82-22366*# N82-22349*# N82-23515*# N82-23397*#	R81AEG590
NASA-TP-2002 NASA-TP-2006 NASA-TP-2007 NASA-TP-2008 NASA-TP-2018	••••••••••••••••••••••••••••••••••••••	p0068 p0060 p0095 p0081 p0004	N82-22366** N82-22349** N82-23515** N82-23397** N82-26234**	R81AEG590
NASA-TP-2002 NASA-TP-2006 NASA-TP-2007 NASA-TP-2008 NASA-TP-2018 NASA-TP-2020		p0068 p0060 p0095 p0081 p0004 p0018	N82-223 66*# N82-223 49*# N82-235 15*# N82-233 97*# N82-262 34*# N82-252 50*#	R81AEG590
NASA-TP-2002 NASA-TP-2006 NASA-TP-2007 NASA-TP-2018 NASA-TP-2018 NASA-TP-2020 NASA-TP-2027		p0068 p0060 p0095 p0081 p0004 p0018 p0101	N82-223 66 * # N82-223 49 * # N82-235 15 * # N82-233 97 * # N82-262 34 * # N82-252 50 * # N82-266 78 * #	R81AEG590 R82AEB115 R82AEB189 R82AEB198 R82AEB462 R82AEB462
NASA-TP-2002 NASA-TP-2006 NASA-TP-2007 NASA-TP-2018 NASA-TP-2018 NASA-TP-2020 NASA-TP-2027		p0068 p0060 p0095 p0081 p0004 p0018 p0101	N82-223 66 * # N82-223 49 * # N82-235 15 * # N82-233 97 * # N82-262 34 * # N82-252 50 * # N82-266 78 * #	R81AEG590 R82AEB115 R82AEB189 R82AEB198 R82AEB462 R82AEB462
HASA-TP-2002 MASA-TP-2006 HASA-TP-2007 MASA-TP-2018 HASA-TP-2018 NASA-TP-2027 NASA-TP-2027		p0068 p0060 p0095 p0081 p0004 p0018 p0101 p0020	N82-223 66 * # N82-223 49 * # N82-233 15 * # N82-233 97 * # N82-262 34 * # N82-252 50 * # N82-266 78 * # N82-313 29 * #	R81AEG590 R82AEB115 R82AEB189 R82AEB198 R82AEB462 R82AEB462 R82AEB462
NASA-TP-2002 NASA-TP-2006 NASA-TP-2007 NASA-TP-2008 NASA-TP-2018 NASA-TP-2020 NASA-TP-2027 NASA-TP-2027 NASA-TP-2028 NASA-TP-2029		P0068 P0060 P0095 P0081 P0004 P0018 P0101 P0020 P0005	N82-223 66 * # N82-223 49 * # N82-235 15 * # N82-233 97 * # N82-262 3 4 * # N82-252 50 * # N82-266 78 * # N82-267 78 * # N82-292 70 * #	R81AEG590 R82AEB115 R82AEB189 R82AEB198 R82AEB462 R82AEB462

SASR-3 p0090 N82-19	495*# US-PATENT-APPL-SN-393586 p0126 N82-31769*#
SASR-4	
*	US-PATENT-APPL-SN-403378 p0070 N82-33522*8
SCG-810338P	
SCG-8103398	
SCG-810340R	
SCG-810341P	365*# US-PATENT-APPL-SN-931090 p0099 #82-19540*
5CG-8103411P	365♦♦
	US-PATENT-CLASS-29-572 p0124 N82-29709*
SCI-81520 p0 133 #82-18	693*# US-PATENT+CLASS-60-39.07 p0020 #82-32366*
mar place and property for the party of the	
	US-PATENT-CLASS-60-39.29 p0020 #82-32366+
SERI/CE-635-1238 p0122 N82-23	
	US-PATENT-CLASS-60-726
SKF-AT810040 p0146 N82-31	969*# US-PATENT-CLASS-136-249 p0124 N82-29709*
SKF-AT810044	
SKF-AT810049-VOL-2 p0.146 N82-31	
SWILWIGHTALACTIC SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS	
	US-PATENT-CLASS-148-428 5 p0061 #82-31505*
SN-1020-11-F	135+# US+PATENT-CLASS-204-38B
	US-PATENT-CLASS-204-192C p0060 N82-29415*
SR-34 p0007 N82-22	214*6 US+PATENT-CLASS-204-192C p0061 N82-30371*
	US-PATENT-CLASS-204-192E p0066 N82-28440*
SRD-81-083	
Skhiciinos esessessessessesses banks was in	
	US+PATENT-CLASS-204-192EC
SR81-R-4761-21	827*# US+PATENT-CLASS-204-192EC p0070 N82-33521*
SR82-R-4792-28	494*# US+PATENT-CLASS-244-110B p0019 NB2-26293*
SR82-R-4994-08	482*# US-PATENT-CLASS-264-22 p0068 N82-28440*
, ಅದರ ಜನಾ ಜನಾಜನಾಗಿಕೆ ಕಾರ್ಯಕ್ಷಣೆಗೆ ಕಾರ್ಡಿಕೆ ಕಾರ್ಡಿಕೆ ಬಿಡಿಕೆ ಕಾರ್ಡಿಕೆ ಕಾರ್ಡಿಕೆ ಬಿಡಿಕೆ ಬಿಡ	US+PATENT-CLASS-264-53 p0054 N82-21268*
SSS-F-E1-5140	
SSS-R-82-5218	
SSS-R-82-5249-REV	
	US-PATENT-CLASS-277-27 p0099 N82-12442+
SU-RIO2-6369 p0091 N82-24	
The same and a restriction of bear of the same and	US-PATENT-CLASS-277-93R
TE209-230-82	
TUTON- NON- DE	
	US-PATENT-CLASS-315-3.6 p0081 M82-24415+
TOR-0081 (6506-1)-1	431*0 US-PATENT-CLASS-315-3.6 p0082 N82-26568*
	US-PATENT-CLASS-315-5.36 p0081 N82-24415+
TPR-12 p0026 N82-23	
The state of the s	
TR-8 I-C-29	
TR-104 p0079 M82-26	
TR-376-16	508*# US-PATENT-CLASS-415-174 p0099 N82-19540*
	US-PATENT-CLASS-415-174
TRW-ER-8001-F	370** US-PATENT-CLASS-415-178 p0020 N82-32366*
The second secon	US-PATENT-CLASS-415-196 p0099 N82-19540+
TRW-32660-6001-RU-01 p0083 N82-14	
TRW-32660-600 [-RU-01	
TRW-37255-6001-UT-VOL-1, p0045 N82-33	424 * US-PATENT-CLASS-420-588
TRW-37255-6002-UT-VOL-2	425** US-PATENT-CLASS-427-34 p0069 N82-29453*
	US-PATENT-CLASS-427-115 p0054 N82-21268*
TR 2-52 200/2R-53 085	
UAL-C-80-31-33	
000-0-00-01-03	
	US-PATENT-CLASS-427-253 pU068 N82-28441*
UCLA-ENG-81-101	994*# US-PATENT-CLASS-427-405 p0068 N82-28441*
	US-PATENT-CLASS-427-423 p0069 N82-29453*
UDR-TR-92-119	738** US-PATENT-CLASS-428-141 p0068 N82-28440*
	US-PATENT-CLASS-428-141 p0070 N82-33521*
US-PATENT-APPL-SN-025301 00019 N82-26	
US-PATENT-APPL-SH-060449	
US-PATENT-APPL-SN-073573 p0081 N82-24	
US-PATENT-APPL-SN-092145 pC099 N82-12	
US-PAMENT-APPL-SN-096255 p0099 NB2-19	
US-PATENT-APPL-SN-102003 p0060 N82-29	415* US-PATENT-CLASS-429-251 p0124 N82-29708*
US-FATENT-APPL-SN-102003 p0061 N82-30	
US-PATENT-APPL-SN-122966 p0082 N82-26	
US-PATENT-APPL-SN-145209 pC069 N82-29	
US-PATENT-APPL-SN-161254 p0068 N82-28	
US-PATENT-APPL-SN-191746 p0061 N82-30	
US-PATENT-AFPL-SN-199769 p0061 N82-31	
US-PATENT-APPL-SN-202228 p0087 N82-11	
US-PATENT-APPL-SH-218587 p0068 N82-28	440* US-PATENT-4,291,887 p0099 N82-12442*
US-PATENT-APPL-SN-218588 p0070 N82-33	
US-PATENT-APPL-SN-219677 p0125 N82-31	12 4 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	.4 = 0
US-PATENT-APPL-SH-219678 p0124 N82-29	
US-PATINT-APPL-SN-235868 pC088 N82-24	
US-PATENT-APPL-SN-238790 pe 30 N82-29	708* US-PATENT-4,329,114 p0020 N82-32366*
US-PATENT-APPL-SN-310713 125/6 1102-11	210*# US-PATENT-4,329,385 p0068 N82=28440*
US-PATENT-APPL-SN-325931 pG :-1 N82-26	
US-FATENT-AFPL-SN-328760 p0088 N82-25	
US-PATENT-APPL-SN-350473 p0019 NB2-26	4 4 7 7 7 7 1 7 7 7 7 7 7 7 7 7 7 7 7 7
US-PATENT-APPL-SN-350476	
US-PATENT-APPL-SN-352821 p0 121 N82-22	■ L = J D D D T T D D D D D D D D D D D D D D
US-PAIFNT-APPL-SN-358398 p0059 N82-22	
US-PATENT-APPL-SN-359388 p0123 N82-24	
US-PATENT-APPL-SN-364072 p0050 N82-26	
	386*# US-PATENT-4.344.996
US-PATENT-APPL-SN-368188	
US-PATENT-APPL-SN-368188 p0082 N82-24	432*#
US-PATENT-APPL-SN-371354 p0050 N82-26	432*# UTRC/R81-915326-15
	432*# 385*# UTRC/R81-915326-15

UWRE-DE-101-102-1	p0052	#82-14288+8 #82-18326+6
H-09170	p0052	W82-29363*#
WAED-RI-CSF	p0083	MA2-13357**
WEC-82-901-MARED-R1	p0 137	#82-30712+6

ORIGINAL PAGE IS OF POOR QUALITY