1978

Ames Research Center Publications: A Continuing Bibliography
1978
Ames Research Center Publications: A Continuing Bibliography
FOREWORD


The Bibliography is divided into two sections: Section I contains citations and abstracts of published works listed by directorate, type of publication (NASA formal report, NASA contractor report, journal article, meeting paper, book or chapter of a book, and patents); Section II is comprised of subject, author, contract number and report number indexes.

Information for ordering publications cited may be obtained by referring to NASA's STAR, LSTAR, and IAA. The NASA unlimited reports are available in either hard copy or microfiche through the National Technical Information Service (NTIS), Springfield, VA 22151, or through the Government Printing Office (GPO), Washington, D.C. 20402. Items identified with an X accession number are often limited or classified and available only to certain individuals or organizations. These documents must be ordered from the NASA center or from the institution which produced them. Patents are available through the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231.

The Library Branch Staff is available to advise Ames requestors which form, ARC 80 "Library Resource Request" or ARC 81 "Published Material Request," should be used to order copies of published works from either the Ames Technical Library, 202-3, extension 5157, or the Life Sciences Library, 239-13, extension 5387.

Because this edition of Ames Research Center Publications: A Continuing Bibliography is the first to be based upon the indexing services of STAR, LSTAR, and IAA, some published work may not be included. If this is the case, send two copies of the published work to Betty Sherwood, 202-3, and the citation will appear in the next annual bibliography.

Betty Sherwood, Compiler
TABLE OF CONTENTS

SECTION I — PUBLICATIONS

ORGANIZATION

Office of the Director (D) .................................................... 1
Administration (A) .......................................................... 3
Aeronautics and Flight Systems (F) ........................................ 4
Astronautics (S) .............................................................. 22
Life Sciences (L) ............................................................. 51
Research Support (R) ....................................................... 59
Federal Aviation Administration ......................................... 61
U.S. Army Research and Technology Laboratories and
Aeromechanics Laboratory (X, Y) ..................................... 62

SECTION II — INDEXES

INDEXES

Subject Index ................................................................. 65
Personal Author Index ..................................................... 125
Corporate Source Index .................................................. 147
Contract Number Index ................................................... 154
Report/Accession Number Index ....................................... 156
SECTION I

PUBLICATIONS
FLIGHT DEPARTURE ANXIETY

A multidisciplinary systems analysis of airport access to the major airports of the San Francisco Bay Area was made. Basically, it was found that there is no major airport access problem. The argument of the report is that commonly perceived airport access problems are either minor inconveniences magnified out of proportion by a combination of the traveler's unreasonable expectations, anxiety over flight departure and lack of information, or not subject to solutions which do not consider the entire urban transit system. Nine specific conclusions and recommendations for improvement are presented and discussed.

NASA CONTRACTOR REPORTS

NASA-CP-2044, A-7247

FORMAL REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.

NASA CONTRACTOR REPORTS

NASA-CP-2044 (NASA-CP-2044, A-7347)

A unified framework for comparing intercity passenger and freight transportation systems is presented. Composite measures for cost, service, demand, energy, and environmental impact were determined. A set of 14 basic measures were articulated to form the foundation for computing the composite measures.
The components of an educational system based on, and perhaps enhanced by, space industrialization communications technology are considered. Satellite technology has introduced a synoptic distribution system for various transmittable educational media. The cost of communications satellite distribution for educational programming has been high. It has, therefore, been proposed to utilize Space Shuttle related technology and Large Space Structures (LSS) to construct a system with a quantum advancement in communication capability and a quantum reduction in user cost. LSS for communications purposes have three basic advantages for both developed and emerging nations, including the ability to distribute signals over wide geographic areas, the reduced cost of satellite communications systems versus installation of land based systems, and the ability of a communication satellite system to create instant educational networks.
National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif
AMES RESEARCH CENTER PUBLICATIONS-1976
Betty Sherwood, May 1978 168 p., refs
(NASA-TM-78498; A-7340) Avail. NTIS HC A08/MF A01
CSCL 059
Bibliography of the publications of Ames Research Center
authors and contractors, which appeared in formal NASA,
publications, journal articles, books, chapters of books, patents,
and contractor reports. Covers 1976 Author-
AERONAUTICS AND FLIGHT SYSTEMS

FORMAL REPORTS

N78-10019‡ National Aeronautics and Space Administration Ames Research Center Moffett Field, Calif. LOW SPEED AERODYNAMIC CHARACTERISTICS OF AN 0.075-SCALE F-15 AIRPLANE MODEL AT HIGH ANGLES OF ATTACK AND SIDESLIP


An 0.075 scale model representative of the F-15 airplane was tested in the Ames 12 foot pressure wind tunnel at a Mach number of 0.16 to determine static longitudinal and lateral directional characteristics at span attitudes for Reynolds numbers from 1.48 to 16.4 million per meter (0.45 to 5.0 million per foot) Angles of attack ranged from 0 to +90 deg and from -40 deg to -80 deg while angles of sideslip were varied from -20 deg to +30 deg. Data were obtained for nozzle inlet ramp angles of 0 to 11 deg with the left and right stabulators deflected 0, -25 deg, and differentially 5 deg and -5 deg. The normal pointed nose and two alternate nose shapes were also tested along with several configurations of external stores. Analysis of the results indicate that at higher Reynolds numbers there is a slightly greater tendency to spin inverted than at lower Reynolds numbers. Use of a hemispherical nose in place of the normal pointed nose provided an over correction in simulating yawing moment effects at high Reynolds numbers. Author

N78-17999' National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. TWO-DIMENSIONAL TRANSONIC TESTING WITH SPLINTER PLATES

Sanford Davis and Bodapati Sanyanarayana Feb 1978 24 p refs (NASA-TP-1153 A-7221) Avail: NTIS HC A02/MF A01 CSCL 01A

The use of splitter plates for two dimensional transonic testing in wind tunnels was investigated on a 12% biconvex airfoil section over the Mach number range 0.6 to 1.0 Measured pressure distributions were compared to transonic theory and to other experiments, including an investigation in the same facility without splitter plates. The results of the experiment show the best agreement with theory over the entire transonic Mach number range. Author

N78-18380‡ National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. PHENOMENOLOGICAL ASPECTS OF QUASI-STATIONARY CONTROLLED AND UNCONTROLLED THREE-DIMENSIONAL FLOW SEPARATIONS

David J. Peake In AGARD Three Dimensional and Unsteady Separation at High Reynolds Numbers Feb 1978 52 p refs (For availability see N78-18375) Avail: NTIS HC A11/MF A01 CSCL 20D

Interest in three dimensional flow separation is linked closely with wings of high leading edge sweep and bodies of fineness ratio operating at large angles of incidence or yaw, that are typical of many high speed aircraft and missile layouts. The quasi-steady three dimensional separated flows about practical flight vehicles are discussed as well as the general character of the three dimensional attached boundary layer, the concept of limiting streamlines, and the present understanding of the physics of three dimensional separation and reattachment. The advantages of swept, sharp edges that generate controlled (or fixed) three dimensional flow separations on a vehicle because of the qualitatively unchanging flow field developed throughout the range of flight conditions are promoted in preference to allowing for uncontrolled (or unfixed) separations. Author

N78-18882‡ National Aeronautics and Space Administration Ames Research Center Moffett Field, Calif. EXCHANGE AND RELAXATION EFFECTS IN LOW-ENERGY RADIATIONLESS TRANSITIONS


The effect on low-energy atomic inner-shell Coster-Kronig and super Coster-Kronig transitions that is produced by relaxation and by exchange between the continuum electron and bound electrons was examined and illustrated by specific calculations for transitions that deexcite the [3p] vacancy state of Zn. Taking exchange and relaxation into account is found to reduce, but not to eliminate the discrepancies between theoretical rates and measurements. Author

N78-19142‡ National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. EVALUATION OF THE TILT ROTOR CONCEPT: THE XV-15'S ROLE

James H Brown, Jr, H Kipling Edensorough (Textron Bell Helicopter, Fort Worth, Tex), and Kenneth G Wernick In AGARD Helicopter Design Jan 1978 9 p refs (For availability see N78-19126 10-05) Avail: NTIS HC A15/MF A01 CSCL 01C

The need for an aircraft combining the efficient vertical takeoff and landing capability of a helicopter with the efficient high speed characteristics of a fixed wing turboprop is examined. The ability of the tilt rotor concept to fulfill this requirement and examples as to its potential usefulness in both military and civil missions are discussed. Author

N78-19708‡ National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. FUTURE REQUIREMENTS AND ROLES OF COMPUTERS IN AERODYNAMICS

Thomas J Gregory In its Future Computer Requirements for Computational Aerodynamics Feb 1978 p 102-107 (For availability see N78-19778 10-59) Avail: NTIS HC A22/MF A01 CSCL 09B

While faster computers will be needed to make solution of the Navier-Stokes equations practical and useful, most all of
the other aerodynamic solution techniques can benefit from faster computers. There is a wide variety of computational and measurement techniques, the prospect of more powerful computers permits extension and an enhancement across all aerodynamic methods, including wind-tunnel measurement. It is expected that, as in the past, a blend of methods will be used to predict aircraft aerodynamics in the future. These will include methods based on solution of the Navier-Stokes equations and the potential flow equations as well as those based on empirical and measured results. The primary flows of interest in aircraft aerodynamics are identified, the predictive methods currently in use and/or under development are reviewed and two of these methods are analyzed in terms of the computational resources needed to improve their usefulness and practicability. Author

N78-19794# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif. COMPUTING VISCOUS FLOWS J. D. Murphy In Its Future Computer Requirements for Computational Aerodynamics Feb. 1978 p 209-220 refs (For availability see N78-19778 10-59) Avail NTIS HC A22/MF A01 CSCL 20D

Although the goals and techniques of computational aerodynamics and computational fluid dynamics differ, advancement in the physical and mathematical aspects of the latter are required for progress in aerodynamic computation. The most attractive approach is the use of hybrid methods where both the equations treated and the solution algorithms reflect the local character of the flow. A working general turbulence model that is only peripherally related to the availability of large fast computers would provide a significant breakthrough in computational aerodynamics. There is no unanimity of opinion as to what may be the optimum algorithm or family of algorithms in the next decade. While it is premature to develop an optimum processor, such a machine dedicated to study the structure of solutions to the three-dimensional time-dependent Navier-Stokes equations and to the computability of turbulence would be very valuable. A.R.H.


Flight test results of minimum autorotative descent rate are compared with calculations based on the minimum power required for steady level flight. Empirical correction factors are derived that account for differences in energy dissipation between these two flight conditions. A method is also presented for estimating the minimum power coefficient for level flight for any helicopter for use in the empirical estimation procedure of autorotative descent rate. Author

N78-20176# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif. STATIC AND DYNAMIC STABILITY ANALYSIS OF THE SPACE SHUTTLE VEHICLE-ORBITER Wei J. Chyi, Ralph K. Cavin (Texas A and M Univ., College Station), and Larry L. Erickson Mar 1978 62 p refs (NASA-TP-1179; A-7217) Avail NTIS HC A04/MF A01 CSCL 22B

The longitudinal static and dynamic stability of a Space Shuttle Vehicle-Orbiter (SSV Orbiter) model is analyzed using the FLEXSTAB computer program. Nonlinear effects are accounted for by application of a correction technique in the FLEXSTAB system; the technique incorporates experimental force and pressure data into the linear aerodynamic theory. A flexible Orbiter model is treated in the static stability analysis for the flight conditions of Mach number 0.9 for rectilinear flight (1 g) and for a pull-up maneuver (2.5 g) at an altitude of 15 24 km. Static stability parameters and structural deformations of the Orbiter are calculated at trim conditions for the dynamic stability analysis, and the characteristics of damping in pitch are investigated for a Mach number range of 0.3 to 1.2. The calculated results for both the static and dynamic stabilities are compared with the available experimental data. Author


The thickness noise theory is discussed. Two full-scale rotors were tested in a wind tunnel with several tips involving changes in chord, thickness, and sweep. Impulsive noise peak pressures as a function of advancing tip Mach number are compared, showing good correlation for all rotors considered. Author

N78-21054# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif. EFFECT OF HIGH LIFT FLAP SYSTEMS ON THE CONCEPTUAL DESIGN OF A 1985 SHORT-HAUL COMMERCIAL STOL TILT ROTOR TRANSPORT Michael D. Shovlin and Bruno J. Gambucci Apr. 1978 29 p refs (NASA-TM-78474; A-7364) Avail NTIS HC A03/MF A01 CSCL 01C

The performances of a derivative concept of a 1985 STOL tilt rotor transport, and of a second concept having a complex mechanical flap system similar to a short field 8737 aircraft were compared for a 370 kilometer (200 nautical mile) short haul mission. The flap system of the latter allowed lift to be shifted from the rotor system to the wing, permitting a 26 percent reduction in dynamic component weight, while also permitting the use of a smaller wing. The wing and disc loading of this concept were 5746 (120 psi) and 1915 (40 psi) newtons per square meter, respectively. The high-lift wing tilt rotor showed slightly improved fuel usage over its entire operating range and about 5 to 8 percent improvement in direct operating costs, resulting from its improved cruise efficiency and reduced weight. Other advantages include improved reliability with correspondingly reduced maintenance and better riding quality. Author

N78-21159# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif. A NOTE ON MULTICYCICAL CONTROL BY SWASHPLATE OSCILLATION James C. Biggers and John L. McCauld, Ill Apr. 1978 11 p refs (NASA-TM-78475; A-7367) Avail NTIS HC A03/MF A01 CSCL 01C

It was shown that for two, three, or four bladed rotors, simple oscillation of the nonrotating swashplate controls can produce prescribed blade pitch schedules of the sort which were suggested for vibration alleviation. Equations were given which relate the swashplate motions to the resulting blade pitch schedules. Author
A methodology for investigating the reduction of community noise impact is reported. This report is concerned with the development of two models to provide data a guidance generator and an aircraft control generator suitable for various current and advanced types of aircraft. The guidance generator produces the commanded path information from inputs chosen by an operator from a graphic scope display of a land-use map of the terminal area. The guidance generator also produces smoothing at the junctions of straight-line paths. The aircraft control generator determines the optimal set of the available controls such that the aircraft will follow the commanded path. The solutions for the control functions are given and shown to be dependent on the class of aircraft to be considered, that is, whether the thrust vector is rotatable and whether the thrust vector affects the aerodynamic forces. For the class of aircraft possessing a rotatable thrust vector, the solution is redundant; this redundancy is removed by the additional condition that the noise impact be minimized from both the guidance generator and the aircraft control generator is used by the footprint program to construct the noise footprint.

N78-23100* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.
OPTIMAL GUIDANCE AND CONTROL FOR INVESTIGATING AIRCRAFT NOISE-IMPACT REDUCTION

A program was developed to calculate trajectories for both military and commercial aircraft for use in the aircraft synthesis program, ACSYNT. The function of the trajectory module was to calculate changes in the vehicle's flight conditions and weight, as fuel is consumed, during the flying of one or more missions. The trajectory calculations started with a takeoff, followed by up to 12 phases chosen from among the following: climb, cruise, acceleration, combat, loiter, descent, and paths. In addition, a balanced field length was computed. The emphasis was on relatively simple formulations and analytic expressions suitable for rapid computation since a prescribed trajectory had to be calculated many times in the process of converging an aircraft design, or finding an optimum configuration. The trajectory module consists of about 2500 cards and operational on a CDC 7600 computer.

G G.
operating range of 85 to 160 knots as required when the SAS is functioning. With the SAS inoperative, poor turn coordination and spiral instability are primary deficiencies contributing to marginal handling qualities in the landing approach. The powered elevator control system enhanced the controllability in pitch, particularly in the landing flare and stall recovery.


The step input and sinusoidal response characteristics of a pneumatically driven computer controlled G seat are examined in this study. The response data show that this system can be modeled as a first order system with an 0.08 sec time lag and a 0.53 sec time constant.

**N78-27043** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. APPLICATION OF A COST/PERFORMANCE MEASUREMENT SYSTEM ON A RESEARCH AIRCRAFT PROJECT. James J. Gehl. Jun 1978 24 p refs (NASA-TM-78498; A-7488) Avail NTIS HC A02/MF A01 CSCL 05A

The fundamentals of the cost/performance management system used in the procurement of two tilt rotor aircraft for a joint NASA/Army research project are discussed. The contractor's reporting system and the GPO's analyses are examined. The use of this type of reporting system is recommended. Recommendations concerning the use of like systems on future projects are included.

**N78-27113** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. APPLICATION OF SPECIAL-PURPOSE DIGITAL COMPUTERS TO ROTORCRAFT REAL-TIME SIMULATION. D. Brain Mackie and Seth Michelson (Computer Sci Corp Mountain View, Calif.) Jul 1978 37 p refs (NASA-TM-12057; A-7343) Avail NTIS HC A03/MF A01 CSCL 01C

The use of an array processor as a 'computational engine' in rotorcraft real-time simulation is studied. A multi-looping scheme was considered in which the rotor would loop over its calculation, a number of times while the remainder of the model cycle once on a host computer. To prove that such a method would realistically simulate rotorcraft, a FORTRAN program was constructed to simulate a typical host-array processor computing configuration. The multi-looping of an expanded rotor model, which included appropriate kinematic equations, resulted in an accurate and stable simulation.

**N78-28059** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. WING ANALYSIS USING A TRANSONIC POTENTIAL FLOW COMPUTATIONAL METHOD. P. A. Hanne (McDonnell Douglas Corp, Long Beach, Calif.) and R. M. Hicks. Jun 1978 60 p refs (NASA-TM-78464; A-7308) Avail NTIS HC A04/MF A01 CSCL 01A

The ability of the method to compute wing transonic performance was determined by comparing computed results with both experimental data and results computed by other theoretical procedures. Both pressure distributions and aerodynamic forces were examined, and it was indicated that the method is a significant improvement in transonic wing analysis capability. In particular, the computational method generally calculated the correct development of three-dimensional pressure distributions from subcritical to transonic conditions. Complicated, multiple shocked flows observed experimentally were reproduced computationally. The ability to identify the effects of design modifications was demonstrated both in terms of pressure distributions and shock drag characteristics.


This report presents the results of an investigation into some of the hardware difficulties experienced with the accordion shelter during field tests. The accordion shelter is a prototype rigid-wall, general purpose, expandable military shelter. In the closed, transportation configuration the shelter serves as its own shipping container and conforms to the dimensional and strength requirements of the International Organization for Standardization Type IC freight container. In the inflated mode the container expands from both sides to form an enclosed, environmentally controlled, lighted shelter approximately 2.4 metres high by 2.4 metres wide by 15.2 metres long. The main problem areas are identified as container jacks, floor jacks, leveling system and expansion system. The specific causes of the problems are identified and solutions to the problems are proposed.

**N78-28402** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. PHENOMENOLOGICAL ASPECTS OF QUASI-STATIONARY CONTROLLED AND UNCONTROLLED THREE-DIMENSIONAL FLOW SEPARATIONS. David J. Peake. In AGARD Three Dimensional and Unsteady Separation at High Reynolds No. Feb 1978 52 p refs (for primary document see N78-28397 19-34) Avail NTIS HC A11/MF A02 CSCL 20D. Quasi-steady three-dimensional separated flows about bodies of large fineness ratio operating at large angles of incidence or yaw are discussed. The general character of the three dimensional attached boundary layer, the concept of limiting streamlines, and the physics of three dimensional separation and reattachment are among the factors considered. Specific examples are given. The advantages of swept, sharp edges that generate controlled (or fixed) three dimensional flow separations on a vehicle, due to the qualitatively unchanging flow field developed throughout the range of flight conditions, are emphasized.


A relatively simple, consistent, and reasonable methodology for performing cost-benefit analyses which can be used to justify and explain investments in aeronautical research and technology is presented. The elements of this methodology (labeled ABC-ART for the Analysis of the Benefits and Costs of Aeronautical Research and Technology) include estimation of aircraft market, manufacturer costs and return on investment versus aircraft price, airline costs and return on investment versus aircraft price and passenger yield, and potential system benefits-fuel savings, cost savings, and noise reduction. This application of this methodology is explained using the introduction of an advanced turboprop powered transport aircraft in the medium range market in 1978 as an example.
The results of the reduced energy for commercial air transportation studies on aerodynamic efficiency of advance turboprop powered transport aircraft. The application of this research to short-haul transonic is discussed. The results of several recent turboprop aircraft design are included. The potential fuel savings and cost savings for advanced turboprop aircraft are significant, particularly at shorter ranges.

Symmetrical and asymmetrical separations about a yawed cone were investigated in the Mach number range 0.6 - 1.8. The cone was tested in the Ames 18 ft by 18 ft wind tunnel. Reynolds numbers based on the cone length from 4,500,000 to 13,500,000 under nominally zero heat transfer conditions. Results indicate that (1) the lee-side separated flow develops from initially symmetrically disposed and near-conical separation lines at angle of incidence/cone semiangle equal to approximately 1, with the free shear layers eventually rolling up into tightly coiled vortices at all Mach numbers, (2) the onset of asymmetry of the lee-side separated flow and the direction of pitch change was sensitive to Mach number, Reynolds number, and the nose bluntness; and (3) as the Mach number is increased beyond 1.8, the critical angle of incidence for the onset of asymmetry increases until at about Mach = 2.75 there is no longer any significant side force development.

A comparison was made of two contrasting G-seat cueing schemes. The G-seat, an aircraft simulation subsystem, created aircraft acceleration cues via seat contour changes. Of the two cueing schemes tested, one was designed to create skin position cues and the other was designed to create body position cues. Each cueing scheme was tested and evaluated subjectively by five pilots regarding its ability to cue the appropriate accelerations in each of four simple maneuvers: a pullout, a pushover, an S-turn maneuver, and a thrusting maneuver. A divergence of pilot opinion occurred, revealing that the perception and acceptance of G-seat stimuli is a highly individualistic phenomena. The creation of one acceptable G-seat cueing scheme was, therefore, deemed to be quite difficult.

Computational results which show the effects of angle of attack on supercritical mixed compression inlet performance at four different locations about a hypersonic forebody were obtained. These results demonstrate the power of the computational method to predict optimum inlet location, orientation, and centerbody control schedule for design and off design performance. The effects of inlet location and a forward canard on the angle of attack of a normal shock inlet at transonic speeds were studied. The data show that proper integration of inlet location and a forward canard can enhance the angle-of-attack performance of a normal shock inlet. Two lower lip treatments for improving the angle-of-attack performance of rectangular inlets at transonic speeds are discussed.

Author: Thomas W. Showalter
Ames Research Center, Moffett Field, Calif.
For larger radii, the vorticity depended on the distance from the wing. Upstream of the merger, a multicell vorticity pattern was found. Author

NASA CONTRACTOR REPORTS

N78-13765** Stanford Univ., Calif. Joint Inst for Aeronautics and Acoustics
MULTI-CALCULATION RATE SIMULATIONS Final Report
J. David Powell and Mahboob Akhter Nov. 1977 59 p refs (Grant NaG-2250) (NASA-CR-155335) Avail. NTIS HC A04/MF A01 CSL 06E

It is common in real time simulations of large aerospace systems to separate the high and low frequency subsystems within the simulation and perform the integrations of the subsystems at different calculation rates. This is done to strike a balance between accuracy of calculation and capacity of the digital computer. Questions arising as to the accuracy of this structure compared to single calculation rates were studied using a linear aircraft model. Also investigated were interactions arising to cause errors worse than those expected. Problems are specifically identified and guidelines are given for selection of sample rates for multiple rate simulations. Author

N78-14016** Stanford Univ., Calif. Dept of Civil Engineering
Jaw S. Dajani Nov. 1977 34 p refs (Grant NaG-2203) (NASA-CR-155356) Avail. NTIS HC A03/MF A01 CSDL 01C

The role of air cargo in the current transportation system in the United States is explored. Methods for assessing the future role of this mode of transportation include the use of continuous-time recursive systems modeling for the simulation of different components of the air freight system, as well as for the development of alternative future scenarios which may result from different policy actions. A basic conceptual framework for conducting such a dynamic simulation is presented within the context of the air freight industry. Some research needs are identified and recommended for further research. The benefits, limitations, pitfalls, and problems usually associated with large scale systems models are examined. Author


The static and dynamic rotor blade stresses of the three stage compressor were measured. Data are presented in terms of total blade stress for the complete operational range of compressor speeds and tunnel total pressures. Modal frequencies and variations with tunnel conditions were measured. Phase angles and coherences between various gage combinations are also presented. Recommendations for improvements are given for future rotor blade experimental investigations. Author

N78-17062** Boeing Co., Seattle, Wash.
LOW SPEED TEST OF A HIGH-BYPASS-RATIO PROPULSION SYSTEM WITH AN ASYMMETRIC INLET DESIGNED FOR A TILT-NACELLE V/STOL AIRPLANE

A large scale model of a high/bypass fan inlet designed for a tilt nacelle V/STOL airplane was tested with a high bypass ratio turbofan. Testing was conducted at low freestream velocities with inlet angles of attack ranging from 0 deg to 120 deg. The operating limits for the nacelle were found to be related to inlet boundary layer separation. Small separations originating in the inlet diffuser cause little or no performance degradation. However, at sufficiently severe freestream conditions the separation changes abruptly to a lip separation. This change is associated with a significant reduction in nacelle net thrust as well as a sharp increase in fan blade vibratory stresses. Consequently, the onset of lip separation is regulated as the nacelle operating limit. The test verified that the asymmetric inlet design will provide high performance and stable operation at the design forward speed and angle of attack conditions. At some of these, however, operation near the lower end of the design inlet airflow range is not feasible due to the occurrence of lip separation. Author

N78-19094** McDonnell-Douglas Corp., St. Louis, Mo.
CONCEPTUAL DESIGN STUDY OF A HARRIER V/STOL RESEARCH AIRCRAFT

MAAIR recently completed a conceptual design study to define modifications approaches to, and derive planning prices for the conversion of a two place Harrier to a V/STOL control, display and guidance research aircraft. Control concepts such as rate damping, attitude stabilization, velocity command, and cockpit controllers are to be demonstrated. Display formats will also be investigated, and landing, navigation, and guidance systems flight tested. The rear cockpit is modified such that it can be quickly adapted to faithfully simulate the controls, displays and handling qualities of a Type A or Type B V/STOL. The safety pilot always has take command capability. The modifications studied fell into two categories: basic modifications and optional modifications. Technical descriptions of the basic modifications and of the optional modifications are presented. The design plan and schedule as well as the test plan and schedule are presented. The failure mode and effects analysis, aircraft performance, aircraft weight, and aircraft support are discussed. Author

STUDY, OPTIMIZATION, AND DESIGN OF A LASER HEAT ENGINE Final Report

Laser heat engine concepts, proposed for satellite applications, were analyzed to determine which engine concepts best meet the requirements of high efficiency (50 percent or better) continuous operation in space. The best laser heat engine for a near-term experimental demonstration, selected on the basis of high overall operating efficiency, high power-to-weight characteristics, and availability of the required technology, is an Otto/Diesel cycle piston engine using a diamond window to admit CO2 laser radiation. The technology with the greatest promise of scaling to megawatt power levels in the long term is the energy exchanger/gas turbine combination. Author
handling qualities of a dynamically combined main rotor and blade tip shape changes on a full scale helicopter rotor in a wind tunnel. The tip shapes were tested using a wind tunnel. The results showed that the tip shapes were symmetric at moderate Mach numbers, changing to a sawtooth shape at high advancing tip Mach numbers. Based on the amplitude of the impulsive noise, it appeared that swept-tapered tips were the quietest, swept-tapered tips were the second, and swept tip third and square tip the most noisy. The data presented in this report should be useful as data bases for modeling and evaluating helicopter impulsive noise.

A brief historical background of the technology and economics of aircraft replacement and retirement in the jet era is presented to see whether useful insights can be obtained applicable to the jet era. Significant differences between the two periods were demonstrated. Current technological and operational economic perspectives were investigated in detail. Some conclusions are drawn to aircraft retirement policies.

The use of leaning vanes for tone noise reduction was examined in terms of their application in a typical two-stage high pressure ratio fan. In particular for stages designed with outlet guide vanes and zero swirl between stages, leaning the vanes of the first stage stator was studied, since increasing the number of vanes and the gap between stages do not provide the desired advantage. It was shown that noise reduction at higher harmonics of blade passing frequency can be obtained by leaning the vanes.

A major difficulty in the practical application of linear-quadratic regulator theory is how to choose the weighting matrices in quadratic cost functions. The control system design with optimal weighting matrices was applied to a helicopter in the hover and approach phase. The weighting matrices were calculated to
extremize the closed loop total system damping subject to constraints on the determinants. The extremization is really a minimization of the effects of disturbances, and interpreted as a compromise between the generalized system accuracy and the generalized system response speed. The trade-off between the accuracy and the response speed is adjusted by a single parameter, the ratio of determinants. By this approach an objective measure can be obtained for the design of a control system. The measure is to be determined by the system requirements.  

N78-21445* Harvey Mudd Coll., Claremont, Calif. Engineering Clinic  
GENERATION OF A MONODISPERSED AEROSOL  
Final Report  
Helma Schanck Miles Mikasa, and Ralph DeVoeams  
Jun 1974  
61 p refs  
(Contract NAS2-8143)  
(NASA-CR-152133) Avail NTIS HC A04/MF A01 CSCL 20E  
The identity and laboratory test methods for the generation of a monodispersed aerosol are reported on, and are subjected to the following constraints and parameters, (1) size distribution, (2) specific gravity; (3) scattering properties, (4) costs, (5) production. The procedure called for the collection of information from the literature, commercial available processes, and experts working in the field. The following topics were investigated: (1) aerosols, (2) air pollution -- analysis, (3) atomizers, (4) dispersion, (5) particles -- optics, size analysis, (6) smoke -- generators, density measurements; (7) sprays, (8) wind tunnels -- visualization.  

DEVELOPMENT OF AUTOMATIC AND MANUAL FLIGHT DIRECTOR LANDING SYSTEMS FOR THE XV-15 TILT ROTOR AIRCRAFT IN HELICOPTER MODE  
Jan 1976  
254 p refs  
(Contract NAS2-9352)  
(NASA-CR-152040, TR-1092-1) Avail NTIS HC A12/MF A01 CSCL 01E  
The objective of this effort is to determine IFR approach path and touchdown dispersions for manual and automatic XV-15 tilt rotor landings, and to develop missed approach criteria. Only helicopter mode XV-15 operation is considered. The analysis and design sections develop the automatic and flight director guidance equations for decelerating curved and straight-in approaches into a typical VTOL landing site equipped with an MLS navigation aid. These systems design satisfy all known pilot-centered, guidance and control requirements for this flying task. Performance data, obtained from nonstationary covariance propagation analysis for the system, are used to develop the approach monitoring computer. The automatic and flight director guidance equations are programmed for the VSTOLAND 181B digital computer. The system design dispersion data developed through analysis and the 181B digital computer program are verified and refined using the fixed-base, man-in-the-loop XV-15 VSTOLAND simulation.  

Preliminary Design Dept.  
APPLIED TECHNOLOGY TO SMALL SHORT-HAUL AIRCRAFT Final Report  
1 Mar 1978  
322 p refs  
(Contract NAS2-9308)  
(NASA-CR-152089, D6-46320)  
Avail NTIS HC A15/MF A01 CSCL 01C  
The results of a preliminary design study which investigates the use of selected advanced technologies to achieve low cost design for small (50-passenger), short haul (50 to 1000 mile) transports are reported. The largest single item in the cost of manufacturing an airplane of this type is labor. A careful evaluation of advanced technology to airframe structure was performed since one of the most labor-intensive parts of the airplane is structures. Also, preliminary investigation of advanced aerodynamics, flight controls, ride control and gust load alleviation systems, aircraft systems, and turbo-propulsion systems was performed. The most beneficial advanced technology examined was bonded aluminum primary structure. The use of this structure in large wing panels and body sections resulted in a greatly reduced number of parts and fasteners and therefore, labor hours. The resultant cost of assembled airplane structure was reduced by 40% and the total airplane manufacturing cost by 16% - a major cost reduction. With further development, test verification and optimization, a considerable weight saving is also achievable. Other advanced technology items which showed significant gains are as follows: (1) advanced turboprop-reduced block fuel by 15-30% depending on range, (2) configuration revisions (wedge-tail)-empennage cost reduction of 25%, (3) leading-edge flap addition-weight reduction of 2500 pounds.  

N78-22100 Rockwell International Corp., Columbus, Ohio Aircraft Div.  
STATIC TESTS OF A LARGE SCALE SWIVEL NOZZLE THRUST DEFLECTOR  
John F. Federspiel  
Feb 1978  
44 p refs  
(Contract NAS2-9176)  
(NASA-CR-152091, N78H-10) Avail NTIS HC A03/MF A01 CSCL 21E  
Tests were conducted on a swivel nozzle thrust deflector installed on a 91 centimeter (36 inch) low pressure ratio tip turbine fan. Fan power was supplied by a J-85 hot gas generator. The configuration was typical of a vertical/short takeoff and landing (VTOL) aircraft propulsion system employing lift cruise fans. The performance data were compared to results obtained on an 0.15 scale cold flow model. Data were obtained at fan pressure ratios from 1.1 to 1.2 and at nozzle deflections from cruise to VTOL (90 deg). The nozzle thrust performance was in good agreement with small scale VTOL thrust coefficients. Configurations with increased nozzle area showed lower performance. Fan operation was routine and nozzle rotation caused no circumferential distortions of the fan exit flow. Nozzle flow characteristics did not repeat small scale model results. Measured flow coefficients were smaller on the large scale test. It was concluded that lack of simulation of pressure and temperature profiles of the tip driven fan was the most probable cause of the discrepancy.  

HIGH ANGLE CANARD MISSILE TEST IN THE AMES 11-FOOT TRANSONIC WIND TUNNEL  
Richard G. Schwind  
Jun 1978  
81 p refs  
(Contract NAS2-9211)  
(NASA-CR-2993, NEAR-TR-134) Avail NTIS HC A05/MF A01 CSCL 01A  
Four blunted ogive-cylinder missile models with a length-to-diameter ratio of 10:4 were tested at transonic speeds and large angles of attack. The configurations are body, body with tail panels, body with canards, and body with canards and tails. Forces and moments from the entire model and each of the eight fins were measured over the pitch range of 20 deg to 50 deg and 0 deg to 45 deg roll. Canard deflection angles between 0 deg and 15 deg were tested. Exploratory vapor screen flow visualization testing was also performed. Sample force and moment data are reported along with observations from the vapor screen tests.  

N78-25078* Kansas Univ Center for Research Inc., Lawrence  
A STUDY OF COMMUTER AIRPLANE DESIGN OPTIMIZATION Status Report  
Bob Van Keppele, Hans Eyssink, Jim Hammer, Kevin Hawley, Paul Meredith, and J. Roskam  
12 May 1978  
457 p refs  
(Grant NsG-2145)  
(NASA-CR-157210, KU-FRL-313-5; SR-4) Avail NTIS HC A20/MF A01 CSCL 01C  
The usability of the general aviation synthesis program (GASP) was enhanced by the development of separate computer
subroutines which can be added as a package to the assembly of computerized design methods or used as a separate subroutine program to compute the dynamic longitudinal, lateral-directional stability characteristics for a given airplane. Currently available analysis methods were evaluated to ascertain those most appropriate for the design functions which the GASP computerized design program performs. Methods for providing proper constraint and/or analysis functions for GASP were developed as well as the subroutine subroutines A-R-H.

N78-25359** Aeronautical Research Associates of Princeton, Inc., N.J
APPLICATION OF SECOND-ORDER TURBULENT MODELING TO THE PREDICTION OF RADIATED AERODYNAMIC SOUND
Alan J. Bifann and Joel E. Harsh Jun 1978 76 p refs (Contract NAS2-8532)
(NASA-CR-2994) Avail NTIS HC A05/ MF A01 CSCL 200

The Bifann formulation of the generation of aerodynamic sound is coupled with predictions of second-order velocity correlations and integral scale to estimate the sound radiated from several complicated jet flows. In particular, it is shown that the sound radiated from a cold swirling jet is greater than from its nonswirling equal thrust counterpart. The noise radiated from the flow field of a multiaxial suppressor was estimated and compared with an equal thrust diameter Gaussian jet. It is shown that the multiaxial concept is indeed quieter.

Author

N78-25824** Stanford Univ, Calif Dept of Civil Engineering
INFRASTRUCTURE DYNAMICS: A SELECTED BIBLIOGRAPHY
Jair S. Dayani and Arturo J. Bencosme Jan 1978 25 p refs (Grant NSG-2152)
(NASA-CR-152162, SU-IF5) Avail NTIS HC A02/ MF A01 CSCL 128

The term infrastructure is used to denote the set of life support and public service systems which is necessary for the development of growth of human settlements. Included are some basic references in the field of dynamic simulation, as well as a number of relevant applications in the area of infrastructure planning. The intent is to enable the student or researcher to quickly identify such applications to the extent necessary for initiating further work in the field.

Author

N78-25832** Massachusetts Inst of Tech., Cambridge Fluid Dynamics Research Lab
THE EFFECT OF TIP VORTTEX STRUCTURE ON HELICOPTER NOISE DUE TO BLADE/VORTEX INTERACTION
Thomas L. Wolff and Sheila E. Widnall Mar 1978 94 p refs (Grant NsG-2142)
(NASA-CR-152150, MIT-78-2) Avail NTIS HC A05/ MF A01 CSCL 20A

A potential cause of helicopter impulse noise, commonly called blade slap, is the unsteady lift fluctuation on a rotor blade due to interaction with the vortex trailed from another blade. The relationship between vortex structure and the intensity of the acoustic signal is investigated. The analysis is based on a theoretical model for blade/vortex interaction. Unsteady lift on the blades due to blade-vortex interaction is calculated using linear unsteady aerodynamic theory, and expressions are derived for the directivity, frequency spectrum, and transient signal of the radiated noise. An inviscid rollup model is used to calculate the velocity profile in the trailing vortex from the spanwise distribution of blade tip loading. A few cases of tip loading are investigated, and numerical results are presented for the unsteady lift and acoustic signal due to blade/vortex interaction. The intensity of the acoustic signal is shown to be quite sensitive to changes in tip vortex structure.

Author

N78-25153** Iowa State Univ of Science and Technology, Ames Dept of Mechanical Engineering
A STUDY OF TEST SECTION CONFIGURATION FOR SHOCK TUBE TESTING OF TRANSONIC AIRFOILS Final Report
William J. Cook Jun 1978 70 p refs (Grant NSC-2192; ISU Proj. 1250)

Two methods are investigated for alleviating wall interference effects in a shock tube test section intended for testing two-dimensional transonic airfoils. The first method involves contouring the test section walls to match approximate streamlines in the flow. Contours are matched to each airfoil tested to produce results close to those obtained in a conventional wind tunnel. Data from a previous study and the present study for two different airfoils demonstrate that useful results are obtained in a shock tube using a test section with contoured walls. The second method involves use of a fixed-geometry slotted-wall test section to provide automatic flow compensation for various airfoils. The slotted-wall test section developed exhibited the desired performance characteristics in the approximate Mach number range 0.82 to 0.89, as evidenced by good agreement obtained between shock tube and wind tunnel results for several airfoil flows.

Author

N78-27087** Boeing Commercial Airplane Co., Seattle, Wash
A MACH LINE PANEL METHOD FOR COMPUTING THE LINEARIZED SUPERSONIC FLOW OVER PLANAR WINGS
F. E. Ehlers and Paul E. Fl党史 May 1978 91 p (Contract NAS2-7729)
(NASA-CR-152126, D6-46373) Avail NTIS HC A05/ MF A01 CSCL 01A

A method is described for solving the linearized supersonic flow over planar wings using panels bounded by two families of Mach lines. Polynomial distributions of source and doublet strengths lead to simple, closed form solutions for the aerodynamic influence coefficients, and a nearly triangular matrix yields rapid solutions for the singularity parameters. The source method was found to be accurate and stable both for analysis and design boundary conditions. Similar results were obtained with the doublet method for analysis boundary conditions on the portion of the wing downstream of the supersonic leading edge, but instabilities in the solution occurred for the region containing a portion of the subsonic leading edge. Research on the method was discontinued before this difficulty was resolved.

Author

N78-27094** California Univ., Berkeley Institute of Transportation Studies
AN INVESTIGATION OF SHORT HAUL AIR TRANSPORTATION IN THE SOUTHEASTERN UNITED STATES
Abh Kanafani and Huoy-Shen Yuan Jul 1977 202 p ref (Grant NsG-2127)
(NASA-CR-152166, UCS-ITS-RR-77-6) Avail NTIS HC A10/ MF A01 CSCL 05C

The specific objectives of this stage of the study are numerous. First, an attempt is made to characterize the travel patterns in the study region, both in terms of origin-destination pairs, and connecting and through trip patterns. Second, the structure of the air service in the region is characterized in an attempt to develop an understanding of the evolution of the short haul air transportation network. Finally, a look is taken at the socioeconomic environment of Atlanta and the region in order to seek an explanation for the historic evolution of short

Author

N78-27105** Analytical Mechanics Associates, Inc., Mountain View, Calif
DEVELOPMENT AND FLIGHT TESTS OF A KALMAN FILTER FOR NAVIGATION DURING TERMINAL AREA AND LANDING OPERATIONS
Stanley F. Schmidt, Paul F. Flanagan, and John A. Sorenson Jul 1978 136 p refs (Contract NAS2-8862)
(NASA-CR-30155) Avail NTIS HC A07/ MF A01 CSCL 17G

A Kalman filter for aircraft terminal area and landing navigation was implemented and flight tested in the NASA Ames STOLAND avionics computer onboard a Twin Otter aircraft. This
N78-27128 Hamilton Standard, Windsor Locks, Conn
PROP-FAN DATA SUPPORT STUDY Final Report
(Contract NAS2-9750)
(NASA-CR-152141) Avail NTIS HC A06/MF A01 CSLC 05C
Updated parametric prop-fan data packages are presented and the rationale used in developing the new prop-fan data is detailed These data represent Hamilton Standard’s projections of prop-fan characteristics for aircraft that are expected to be in-service in the 1985 to 1990 time frame The basic prop-fan configuration was designed for efficient cruise operation at 0.8 Mach number and 10 668 ft altiude The design blade tip speed is 244 mps and the design power loading is 301 kW/ft squared

N78-28083 Goham Associates, Thousand Oaks, Calif
STUDY TO DETERMINE OPERATIONAL AND PERFORMANCE CRITERIA FOR STOL AIRCRAFT OPERATING IN LOW VISIBILITY CONDITIONS
John A Goham May 1978 63 p refs
(Contract NAS2-8780)
(NASA-CR-152164) Avail NTIS HC A04/MF A01 CSLC 01C
The operational and performance criteria for civil CTOL passenger-carrying airplanes landing in low visibilities depend upon the characteristics of the airplane, the nature and use of the ground and airborne guidance and control systems, and the geometry and lighting of the landing field Based upon these criteria, FAA advisory circulars, airplane and equipment design characteristics, and airline operational and maintenance procedures were formulated The documents are selected, described and discussed in relationship to the potential low weather minimum operation of STOL aircraft An attempt is made to identify fundamental differences between CTOL and STOL aircraft characteristics which could impact upon existing CTOL documentation Further study and/or flight experiments are recommended

N78-28998 Washington Univ, Seattle Dept of Civ Engineering
Lonnie E Haefner 31 Mar 1978 37 p ref
(Grant NsG2170)
(NASA-CR-152154-1) Avail NTIS HC A03/MF A01 CSLC 05C
The benefits and costs that would result from an intra-regional air service operation in the San Francisco Bay area were determined by utilizing an iterative statistical decision model to evaluate combinations of commuter airport sites and surface transportation facilities in conjunction with service by a given commuter aircraft type in light of area regional growth alternatives and peak and off-peak regional travel patterns The model evaluates such transportation options with respect to criteria of airline profitability, public acceptance, and public and private non-user costs In so doing, it incorporates information on modal split, peak and off-peak use of the air commuter fleet, terminal and airport costs, development costs and uses of land in proximity to the airport sites, regional population shifts, and induced zonal shifts in travel demand The model is multimodal in its analytic capability, and performs exhaustive sensitivity analysis

N78-30070 Aeronautical Research Foundation, Cambridge, Mass
REQUIREMENTS FOR REGIONAL SHORT-HAUL AIR SERVICE AND THE DEFINITION OF A FLIGHT PROGRAM TO DETERMINE NEIGHBORHOOD REACTIONS TO SMALL TRANSPORT AIRCRAFT
(Contract NAS2-9800)
(NASA-CR-152151) Avail NTIS HC A08/MF A01 CSLC 05C
An evaluation of the current status and future requirements of an intraregional short haul air service is given A brief definition of the different types of short haul air service is given This is followed by a historical review of previous attempts to develop short haul air service in high density urban areas and an assessment of the current status The requirements for intraregional air service, the need for economic and environmental viability and the need for a flight research program are defined A detailed outline of a research program that would determine urban community reaction to frequent operations of small transport aircraft is also given Both the operation of such an experiment in a specific region (San Francisco Bay area) and the necessary design modifications of an existing fixed wing aircraft which could be used in the experiment are given An estimate is made of overall program costs

N78-33113 General Dynamics/Fort Worth, Tex
AN INVESTIGATION OF WING BUFFETING RESPONSE AT SUBSONIC AND TRANSONIC SPEEDS: PHASE I: F-111A FLIGHT DATA ANALYSIS VOLUME 1: SUMMARY OF TECHNICAL APPROACH, RESULTS AND CONCLUSIONS
David B Benepe, Atlee M Cunningham, Jr., and W David Dunmyer 1978 188 p refs
(Contract NAS2-7091)
(NASA-CR-152109) Avail NTIS HC A09/MF A01 CSLC 01C
The structural response to aerodynamic buffet during moderate to high-g maneuvers at subsonic and transonic speeds was investigated The investigation was reported in three volumes This volume presents a summary of the investigation with a complete description of the technical approach, description of the aircraft, its instrumentation, the data reduction procedures, results and conclusion

N78-33117 General Dynamics/Fort Worth, Tex
AN INVESTIGATION OF WING BUFFETING RESPONSE AT SUBSONIC AND TRANSONIC SPEEDS: PHASE II: F-111A FLIGHT DATA ANALYSIS VOLUME 2: PLOTTED POWER SPECTRA
David B Benepe, Atlee M Cunningham, Jr., Sam Traylor, Jr., and W David Dunmyer 1978 724 p refs
(Contract NAS2-7091)
JOURNAL ARTICLES, BOOKS AND
CHAPERS OF BOOKS


A reduced-order version of the one-on-one aerial combat problem is studied as a pursuit-evasion differential game. The coplanar motion takes place at given speeds and given maximum available turn rates, and is described by three state equations which are equivalent to the range, bearing, and heading of one aircraft relative to the other. The purpose of the study is to determine those relative geometries from which either aircraft can be guaranteed a win, regardless of the maneuver strategies of the other. Termination is specified by the tail-chase geometry, at which time the roles of pursuer and evader are known. The roles are found in general, together with the associated optimal turn maneuvers, by solution of the differential game of kind. For the numerical parameters chosen, neither aircraft can win from the majority of possible initial conditions if the other turns optimally in certain critical geometries. (Author)


Objectives and functions of the Advanced Digital Avionics System (ADAS) for general aviation are outlined with particular reference to navigation, flight control, engine management, ATC surveillance, flight management, communications, and the pilot controls and displays. The resulting ADAS design comprises the selection of off-the-shelf avionics to be integrated with ADAS unique elements including new pilot displays and controls along with a microcomputer control complex (MCC). Reasons for which the ADAS achieves increased avionics capability are mentioned, including overall system integration through the MCC and pilot orientation from navigation map display. (D. S)

A78-14063 * Peripheral processors for high-speed simulation. W. J. Karplus (California, University, Los Angeles, Calif | Simulation, vol. 29, Nov. 1977, p 143-153. 7 refs NSF Grant No. ENG-76-07811, Contract No. NAS2-7806.

This paper describes some of the results of a study directed to the specification and procurement of a new cockpit simulator for an advanced class of helicopters. A part of the study was the definition of a challenging benchmark problem, and detailed analyses of it were made to assess the suitability of a variety of simulation techniques. The analyses showed that a particularly cost-effective approach to the attainment of adequate speed for this extremely demanding application is to employ a large microcomputer acting as host and controller for a special-purpose digital peripheral processor. Various realizations of such peripheral processors, all employing state-of-the-art electronic circuitry and a high degree of parallelism and pipelining, are available or under development. The types of peripheral processors - array processors, simulation-oriented processors, and arrays of processing elements are analyzed and compared. They are particularly promising approaches which should be suitable for high-speed simulations of all kinds, the cockpit simulator being a case in point. (Author)


A unique miniature pressure sensor system consisting of an array of fifty integrated sensor pressure transducers with integral electronic logic and switching is described. Solid state processing of the piezoresistive array is combined with hybrid microelectronics to produce a very small, dense (89 oz displacement), high reliability pressure measuring system. Application to high speed data acquisition, energy conservation in wind tunnels and flight test is discussed. Test data are presented typifying system performance. (Author)


Some new results concerning robustness and asymptotic properties of the error bounds of a linear quadratic feedback design are applied to an aircraft control problem. An autopilot for the flared control of the Augmentor Wing Jet STOL Research Aircraft (AWJSRA) is designed based on Linear Quadratic (LQ) theory and the results developed in this paper. The variation of the error bounds to changes
Aerospace Sciences Meeting, presented (Author) satisfactorily a reasonable error bound for variations in the system matrix and at simulations, and appropriate weighting matrices are chosen to obtain in the weighting matrices in the evaluate the basic accuracy and limitations associated with such transport wing designs. The purpose of these applications is to Paper 78-105 and flow conditions (Author) compared. Three-dimensional pressure distributions and aerodynamic cal results. Comparisons are made not only evaluations are completed. The paper summarizes a study of both the: small-disturbance and the full potential technique for computing three-dimensional transonic flows. Computed three-dimensional results are compared to both experimental measurements and theoretical results. Comparisons are made not only of pressure distributions but also of lift and drag forces. Transonic drag rise characteristics are compared. Three-dimensional pressure distributions and aerodynamic forces, computed from the full potential solution, compare reasonably well with experimental results for a wide range of configurations and flow conditions (Author)

A78-22586 * Transonic wing analysis using advanced computational methods P A Henne (Douglas Aircraft Co., Long Beach, Calif.) and R M Hicks (NASA, Ames Research Center, Moffett Field, Calif.) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 16th, Huntsville, Ala., Jan. 16-18, 1978, Paper 78-105 10 p. 9 refs This paper discusses the application of three-dimensional computational transonic flow methods to several different types of transport wing designs. The purpose of these applications is to evaluate the basic accuracy and limitations associated with such numerical methods. The use of such computational methods for practical engineering problems can only be justified after favorable evaluations are completed. The paper summarizes a study of both the small-disturbance and the full potential technique for computing three-dimensional transonic flows. Computed three-dimensional results are compared to both experimental measurements and theoretical results. Comparisons are made not only of pressure distributions but also of lift and drag forces. Transonic drag rise characteristics are compared. Three-dimensional pressure distributions and aerodynamic forces, computed from the full potential solution, compare reasonably well with experimental results for a wide range of configurations and flow conditions (Author)


The merger of two vortices was studied with a laser velocimeter designed to measure the two cross-stream components of velocity. Measurements were made at several downstream distances in the vortex wake shed by two semispan wings mounted on the wind tunnel walls. The velocity data provided well defined contours of cross-flow velocity, stream function and vorticity. Downstream of the merger point the vorticity was shown to be independent of the downstream distance for small radii, and at larger radii was dependent on the distance from the wing rather than from the merger point. Upstream of the merger point a multicell vorticity pattern was shown (Author)

A78-22594 * Measurements of unsteady vortex flow fields F K Owen (Owen International, Inc., Palo Alto, Calif.) and D A Johnson (NASA, Ames Research Center, Moffett Field, Calif.) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 16th, Huntsville, Ala., Jan. 16-18, 1978, Paper 78-18 10 p. USAF-supported research; Contract No. NASA-3168 A combined surface hot film and laser velocimeter measurement technique, used to obtain new information on the mean, constant phase-averaged and turbulent structure of time-dependent flow fields, is described. Data obtained in a cylinder wake are presented, and its structure in both the Eulerian and Lagrangian frames is discussed. Turbulence data obtained by conventional and conditional averaging of the velocity fluctuations are also presented. These data provide details of the small- and large-scale contributions to the total turbulent field (Author)

A78-22585 * Wake vortex measurements of bodies at high angle of attack P K Owen (Owen International Inc., Palo Alto, Calif.) and D A Johnson (NASA, Ames Research Center, Moffett Field, Calif.) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 16th, Huntsville, Ala., Jan. 16-18, 1978, Paper 78-23 10 p. 7 refs USAF-supported research; Contract No. NASA-8168 Three-dimensional laser velocimeter measurements have been made of the wake vortices of a slender tangent ogive body which had nose and body fineness rates of 3.5 and 12, respectively. Data were obtained for an angle of attack to spanwise angle ratio of 2.3 at a free stream Mach number of 0.6 and unit Reynolds number of 2 million/ft. Details of the mean flow field are presented and features of the turbulent and unsteady nature of the vortex flow fields are discussed. Problems associated with obtaining meaningful vortex measurements in high-speed flows are addressed (Author)


In support of the NASA wake vortex alleviation program, measurements were made of the influences of a ground plane on vortex trajectories and velocity profiles within lift-generated wakes. The wakes were generated by towing 0.61-m (2-ft) span models of two jumbo jets under water in a ship model basin. The models were configured with landing flaps and flight spoilers to investigate the wake characteristics of these aircraft in ground effect at simulated full-scale distances of 19 m (62 ft) to 116 m (380 ft) above the ground. The ground plane caused modifications in the vortex trajectories but did not alter vortex interactions and merging patterns in these multiple vortex wakes. Some distortions in the vortex vertical (tangential) velocity profiles were recorded as a result of vortex lateral motions and vortex interactions with the viscous boundary layer on the ground plane, however, maximum tangential velocities remained unchanged (Author)


The effects of flight on noise radiation from convecting quadrupoles in a jet flow are examined. The analysis shows that as flight velocity increases there is a steady increase of noise above the sound that is radiated into the forward arc and a reduction of the sound that is radiated into the rearward arc. The analysis also shows the same trend when there is a reduction in the exhaust velocity with, however, a further increase in amplification in the forward quadrant and a drop in attenuation in the aft quadrant. Finally, it is concluded that there is a transmission effect tending to enhance the sound radiation by a density ratio p/p0 which increases with increasing jet temperature. (Author)

A78-23883 * New frequency domain methods for system identification N K Gupta (Systems Control, Inc., Palo Alto, Calif.) In Joint Automatic Control Conference, San Francisco, Calif., June 22-24, 1977, Proceedings Volume 2 (A78-23851 08-63) New York, Institute of Electrical and Electronics Engineers, Inc., 1977, p. 804 908. 10 refs. Contracts No. N00014-76-C-0420; No. NASA-8799 This paper presents two new techniques for frequency domain identification of linear system parameters. The first technique uses the instrumental variables approach. The frequency domain formulation is shown to give a considerable insight into the selection of efficient and convergent instrumental variables. The new maximum likelihood formulation affords simpler numerical solution and provides a way to select parameter starting values in the gradient based optimization method. (Author)

The paper deals with the problem of expressing the robustness (stability) property of a linear quadratic state feedback (LQSF) design quantitatively in terms of bounds on the perturbations (modeling errors or parameter variations) in the system matrices so that the closed-loop system remains stable. Nonlinear time-varying and linear time-invariant perturbations are considered. The only computation required in obtaining a measure of the robustness of an LQSF design is to determine the eigenvalues of two symmetric matrices determined when solving the algebraic Riccati equation corresponding to the LQSF design problem. Results are applied to a complex dynamic system consisting of the flare control of a STOL aircraft. The design of the flare control is formulated as an LQSF tracking problem.

SD


This paper demonstrates a numerical technique for canard-wing shape optimization at two operating conditions. For purposes of simplicity, a mean surface wing paneling code is employed for the shape optimization at two operating conditions. For purposes of tracking problem.


A self-synchronizing schlieren flow visualization technique has been developed to study unsteady periodic flows which may result from aerodynamic effects. The technique allows the experimentalist to observe the flowfield as if the flow was stationary. The schlieren light source is driven by an electronically processed synchronizing signal that is derived from a periodic flow variable with a convenient sensor. Results for the visualization of the near-wake behind an oscillating airfoil at low speeds which show an ordered series of discrete vortices and a curvilinear short-wave-length wake disturbance are examined. Results are also presented for edge tone sound generation.


The uniqueness of the first-order lifting-line connection to the two-dimensional transonic small disturbance potential for the flow past a lifting, three-dimensional, large-aspect-ratio wing is proved. The uniqueness is the solution of a linear equation mixed type in the plane of the wing and along the positive x-axis. The boundary data consist of Neumann data, continuity restrictions, the Kutta condition, and the form of the asymptotic behavior at infinity. The zeroth-order flow is assumed to be shock-free, and hence the correction is shock-free.

P.R.H.


Flight simulation, both ground and in-flight, is experiencing major technological improvement and growth. The increased capabilities are providing new opportunities for support of the aircraft development process. The development of faster digital computers, improved visual displays, better motion systems, and computer-aided design interest in simulation fidelity has improved the ground simulator to the point where it accomplishes a major portion of the aircraft development before work on the flight article begins. The efficiency of the flight simulator as a forecaster for the flight testing phase is becoming well established. In-flight simulation is being properly used to bridge the gap between the ground simulator and the flight test article. Simulation provides the vital link between analysis, aerodynamic tests, and subsystem tests and the flight test article. This paper describes the latest advances in flight simulation and its increasing role in the aircraft development process.


A self-synchronizing schlieren flow visualization technique has been developed to study unsteady periodic flows which may result from aerodynamic effects. The technique allows the experimentalist to observe the flowfield as if the flow was stationary. The schlieren light source is driven by an electronically processed synchronizing signal that is derived from a periodic flow variable with a convenient sensor. Results for the visualization of the near-wake behind an oscillating airfoil at low speeds which show an ordered series of discrete vortices and a curvilinear short-wave-length wake disturbance are examined. Results are also presented for edge tone sound generation.


The paper describes the design and capabilities of a compact multichannel electrochemical unit devised to detect and automatically indicate detection time length of bacteria. By connecting this unit to a strip-chart recorder, a permanent record is obtained of the end points and growth curves for each of eight channels. The experimental setup utilizing the multichannel unit consists of a test tube (25 by 160 mm) containing a combination redox electrode plus 18 ml of lauryl tryptose broth and positioned in a 35°C water bath.

The fuel saving and economic potentials of the prop-fan high-speed propeller concept have been evaluated for subsonic commercial transport airplanes designed for 3333 km range, 150 passengers, and Mach 0.8 cruise. A fuel saving of 9.7% at the design range was estimated for a prop-fan aircraft having wing-mounted engines, while a 6.5% saving was estimated for a design having the engines mounted on the nacelle. The fuel savings and cost were found to be sensitive to the configuration of the aircraft and to aerodynamic drag effects due to wing/propeller interaction. Uncertainties in these effects could change the fuel savings as much as plus or minus 50%. A modest improvement in direct operating cost was estimated for the wing-mounted prop-fan at current fuel prices. (Author)


A performance analysis of gas-driven shock tubes shows that transonic airfoil flows with chord Reynolds numbers in the range of 100 million can be generated behind the primary shock in a large shock tube. A study of flow over simple airfoils has been carried out at low and intermediate Reynolds numbers to assess the testing technique. Results obtained from schlieren photos and airfoil pressure measurements show that steady transonic flows similar to those observed for the airfoils in wind-tunnel can be generated within the available testing time in a shock tube with either properly-contoured test section wall or a properly-designed slotted-wall test section. The study indicates that the shock tube is a useful facility for studying two-dimensional high Reynolds number transonic airfoil flows. (Author)


A buried wire gage for measuring wall shear stress in fluid flow was studied and further developed. Several methods of making this relatively new type of gage were examined to arrive at a successful technique that is well-suited for wind-tunnel testing. A series of measurements was made to demonstrate the adequacy of a two-point calibration procedure for these gages. The buried wire gage is also demonstrated to be ideally suited for quantitative measurement of wall shear stress in wind-tunnel testing. (Author)


A moving-type ground equipment, used for ground-effect simulation in STOL and VTOL tests, can be inconvenient and costly, especially in larger tunnels. In most cases such difficulties may be avoided by employing tangential blowing at the ground surface, from a single slot. The paper reviews several powered model tests using both moving ground and tangential blowing and describes the slot configuration, and the test techniques which were developed. Ground skin friction is monitored to set blowing levels and no model-dependent calculations are needed. It is also shown that application to center-tunnel testing can delay tunnel flow breakdown very considerably. (Author)


An advanced rotation-balancing apparatus has been developed for the Ames 12-ft pressure tunnel to study the effects of spin rate, angles of attack and sideslip, and, particularly, Reynolds number on the aerodynamics of fighter and general aviation aircraft in a steady spin. Angles of attack to 100 deg and sideslip to 30 deg are possible with spin rates to 42 rad/sec (400 rpm) and Reynolds numbers to 30 million on fighter models with wingspans that are typically 0.7 m. A complete description of the new rotation-balancing apparatus, its sting/behavior model assembly, and the operational capabilities is given. (Author)


Mach number scaling laws are derived for the rotational and the high-frequency broadband noise from helicopter rotors. The rotational scaling law is obtained directly from the theory of Lowson and Ollerhead (1969) by exploiting the properties of the nonlinear terms in the expression for the complex Fourier coefficients of sound radiation from a point source. The scaling law for the high-frequency broadband noise is obtained by assuming that the noise sources are acoustically compact and comparing the instantaneous pressure due to an element on an airfoil where vortices are shed, Experimental results on the correlation lengths for stationary airfoils are extended to rotating airfoils. On the assumption that the correlation length varies as the boundary layer displacement thickness, it is found that the Mach number scaling law contains a factor of Mach number raised to the exponent 5.8. Both scaling laws were verified by model tests F.T.H


An algorithm for computing transonic lifting line theory without shocks is presented, the numerical procedure relies on two-dimensional analyses developed to solve inviscid flow equations for slender airfoils. From a series of solutions to two-dimensional problems in which span effects appear parametrically, the three-dimensional potential field characterization is obtained. Numerical results are given for a lifting wing with an elliptic (spanwise) distribution of chord and a NACA-0012 cross section (a freestream Mach number of 0.83 and an angle of attack of 2 deg are assumed). J.M.B.

Throughout the aircraft development process flight simulators are used to evaluate design concepts, handling qualities, and operational procedures. A modern flight research simulator comprises a cockpit equipped with flight instruments and controls, subsystems to provide visual, motion, and other flight cues, and a digital computer. REPLAY is a computer program which enables a user to reproduce the multidimensional flight cues for an entire simulation 'run.' Attention is given to simulation fidelity improvement, simulation data recovery, simulation quality assurance, and aircraft systems research. It is pointed out that each of the applications discussed supports aircraft research by improving the realism, efficiency, or reliability of the simulation facility.


A dual-loop model of the human controller in single-axis compensatory tracking tasks is introduced. This model postulates an inner-loop closure that involves feeding back that portion of controlled element output rate that is due to control activity. A novel feature of the model is the explicit appearance of the human's internal representation of the manipulator-controlled element dynamics. It is demonstrated that the model can produce controller describing functions that closely approximate those measured in four laboratory tracking tasks in which the controlled element dynamics vary considerably in terms of ease of control. An empirically derived expression for the normalized error remnant spectrum is introduced.


We consider the numerical solution of a class of integral equations arising in the determination of the compressible flow about a thin airfoil in a ventilated wind tunnel. The integral equations are of the first kind with kernels having a Cauchy singularity. Using appropriately chosen Hilbert spaces, it is shown that the kernel gives rise to a mapping which is the sum of a unitary operator and a compact operator. Thus allows the problem to be studied in terms of an equivalent integral equation of the second kind. A convergent numerical algorithm for its solution is derived by using Galerkin's method. It is shown that this algorithm is numerically equivalent to Blund's collocation method, which is then used as the method of computation. Extensive numerical calculations are presented establishing the validity of the theory.


Inlet and nacelle static pressures were measured on a 0.55-scale model of the Quiet Short-Haul Research Airplane (OSRA) in the Ames Research Center's 40- by 80 Foot Wind Tunnel. This model is powered by four JT-15D engines located above the wing with closely spaced adjacent nacelles. A fifth JT-15D engine in the fuselage provides boundary-layer control air. Each inlet was instrumented with four to eight rows of axial pressure taps located between X/R approximately plus or minus 1. The tests simulated a broad range of aircraft flow conditions.


The application of the incompressible three-dimensional momentum integral equation to a finite wing is reviewed. The objective is to interpret the resulting equations in a way that suggests an alternate experimental method for determining the span-wise distribution of lift. It is shown that the vortex wake of the wing to provide the familiar relationship between lift and bound vortex. A novel technique is then presented for obtaining, from behind the wing, the spanwise lift distribution from velocity surveys that are made over only a short distance above and below the wing trailing edge. The necessary formalism is developed to use these measured values to obtain the net lifting force by using an equivalent single horseshoe vortex model to account for the unmeasured portion of the downward (or upward) momentum. The results of a numerical simulation are presented for a typical loading distribution. The technique is then verified experimentally using laser velocimeter data for the flow field around a model wing.


Hot-wire measurements have been made in the boundary layer, the separated region, and the near wake for flow past an NACA 4412 airfoil at maximum lift. The Reynolds number based on chord was about 1,500,000. Hot-wire, laser-velocimeter, hot-wire anemometer, and a trailing model of the airfoil at maximum lift were studied by means of a laser-velocimeter, hot-wire anemometer, and a trailing model incorporating a 6-component force balance. Velocity profiles and turbulence data from the laser-velocimeter and hot-wire anemometer are presented and shown to compare well with the Betz inverse circulation model. Lift and rolling moment measurements on the following model are compared with those predicted from the flow field measurements.
operating conditions, including engine-out, with lift coefficients from 0.9 to 10.0. Results indicate that the inlets perform well under most operating conditions with little interaction between inlets when the aircraft is moving. Potential problem areas identified are high side-slip angles around approach and an interaction effect between adjacent inlets with high mass flows in static conditions. (Author)


In the present paper, a new mathematical model of inlet turbulence is developed by application of basic fluid dynamics and statistical concepts. The model provides an understanding of the turbulent inlet flow as well as a means of describing the flow in quantitative terms. Specifically, the maximum instantaneous distortion produced by the inlet unsteady flow can be estimated by the simple measurement of rms data. Practical application of these techniques leads to a data/acquisition/reduction system that is at least one, and maybe two, orders of magnitude less expensive than conventional methods. Each data point can be reduced in terms of the mean strength of the turbulent vortices. By storing these two parameters (the removal of one of the inherent flow information), the maximal instantaneous distortion can be reconstructed for other distortion factors at any time subsequent to the test.

V.P.  


The viscous/potential flow past angle-element and multielement airfoils is studied theoretically and experimentally. A computerized analysis, based on iteratively coupled potential-flow and boundary-layer analysis, is used to predict the flow field of the airfoil. The method yields detailed characteristics of conventional laminar and turbulent boundary layers, turbulent wakes, and confluent boundary layers. The viscous flows are analyzed with a method that uses finite-difference solutions of the boundary-layer equations. Reynolds stress in the boundary layers and wakes is simulated with eddy viscosity models for the various flow zones. The viscous calculations are carried into the wake of the airfoil where the drag is found from the defect in the wake momentum. (Author)


It is noted that the stability properties of available galaxy models are not consistent with predictions based on observation and that axisymmetric disk systems with velocity dispersions like those of the Galaxy display major changes in form on a dynamical time scale. A report is given on a series of numerical experiments carried out as part of a systematic search for purely soft-constant disk galaxy models that might undergo little change over the time of several galactic rotations. The stability problem is reviewed, the method and calculations used are described, and initial conditions are outlined. The problem of estimating growth rates is discussed, and growth rates are evaluated for various disturbances. Experimental results are presented concerning growths of axisymmetric disturbances in 'cold' systems as well as disturbances with m = 1, 2, and 3. It is found that m = 2 disturbances are the most virulent and should dominate whereas m = 1, 2, and 3. It is found that m = 3 disturbances are the most virulent and should dominate whereas m = 1, 2, and 3. It is concluded that the most rapidly growing disturbances are inhibited when several m values are allowed.

F.G. M.


Lower stratospheric air trajectories entering the region over Alaska at the approximately 125 mb level during late May, 1978 indicate a substantial shift in the geographical source regions for the air masses present during that time. This shift coincides with an approximately 25% decrease in the observed halocarbon mixing ratios at the 125 mb level as determined from a daily sequence of halocarbon profiles. Since the halocarbon species measured are essentially chemically inactive at this level, the observed variation is linked to the changing meteorological pattern. (Author)


Even today, stall/spin accidents involving general aviation aircraft account for more fatal and serious injuries than any other kind of accident. The classic stall/spin accident is one in which the pilot stalls the aircraft at too low an altitude to affect recovery. The primary investigation in this investigation is given to aerodynamic considerations, although it is recognized that human factors and pilot training are also very important aspects of the total problem. A review of some 70 years of flight data indicates that consideration of the proper combination of aerodynamic parameters to provide good stall/spin avoidance has remained an elusive goal for designers of general aviation aircraft.

G.R.


Because fixed missile bases have become increasingly vulnerable to strategic nuclear attack, an air-mobile missile system is proposed, whereby ICBMs can be launched from the hold of large subsonic aircraft following a missile-assisted supersonic dash of the aircraft to a safe distance from their base (about 50-70 m). Three major categories of vehicle design are proposed: staged, which employs vertical take-off and a single solid rocket booster similar to that used on the Space Shuttle, unstaged, which employs vertical take-off and a four internally-carried reusable liquid rocket engines, and alternative concepts, some using horizontal take-off with duct-burning engines. Attention is given to the economics of maintaining 200 ICBMs airborne during an alert (about $600 million for each fleet alert, exclusive of acquisition costs). The chief advantage of the system is in its reduced vulnerability to surprise attack, because it can be launched on warning, and in the possibility for recall of the aircraft if the warning proves to be a false alarm. (Author)

D.M.W.


An airborne clear-air turbulence detector is being flight-tested on board NASA'S C-141 and Learjet aircraft. The device is an infrared (IR) sensor in the water vapor band and is designed to detect changes in vapor concentrations associated with turbulence in shear conditions. Warnings of about 5 min have been demonstrated at flight altitudes from 9.1 to 13.7 km (30,000 to 45,000 ft). Encounter predictions were obtained 80% of the time, and false
alarms were given about 6% of the time. Several simple algorithms were studied for use as signal output analyzers and for alert triggering (Author)

A78-47254 * On the stability of disklike galaxies in massive halos. R. H. Miller (NASA, Ames Research Center, Moffett Field, Calif.). Astrophysical Journal, Part 1, vol. 224, Aug. 15, 1978, p. 32-38. 16 refs. Results are reported for a series of disk-galaxy simulations carried out as part of a systematic search for disk-galaxy models that show little change over the time of several galactic rotations. Systems in a given fixed external field, such as might be provided by a massive halo, are considered. The analysis is performed in terms of two parameters: the fraction of the total mass that resides in the active disk and the velocity dispersion in the active disk. The amount of halo mass required to stabilize a disk with a given velocity dispersion is investigated along with the question of whether any amount of halo mass can stabilize a completely "cold" disk galaxy. The experimental results are quoted as growth rates estimated from plots of the amplitudes of Fourier analyses of the density in each of a set of narrow annuli, and systematic trends in the dependence of growth rates on the adjustable parameters are examined. It is shown that a massive and halo contributes to the stability of disk-galaxy models but some velocity dispersion is required.


The program described was initiated in 1975 to provide the critical information for the design of an advanced avionics system suitable for general aviation. Emphasis is on the use of data busing, distributed microsensors, shared electronic displays and pilot entry devices, innovative low-cost sensors, and improved functional characteristics. Design considerations include cost, reliability, maintainability, and modularity.

V.P.


The paper summarizes several studies to develop aerodynamic technology for high performance VSTOL aircraft anticipated after 1990. A contracted study jointly sponsored by NASA-Ames and David Taylor Naval Ship Research and Development Center is emphasized. Four contractors analyzed various methods and three horizontal-attitude takeoff and landing concepts with gross weights ranging from about 10 433 kg (32,000 lb) to 172 336 kg (35,000 lb). The aircraft have supersonic capability, high maneuver performance (sustained load factor 6.2 at Mach 0.6, 3048 m (10,000 ft) and a 4536 kg (10,000 lb) STO overload capability. The contractors have estimated the aerodynamics and identified aerodynamic uncertainties associated with their concept. Example uncertainties relate to propulsion-induced flows, canard-wing interactions, and top inlet/Wind-tunnel research programs were proposed to investigate these uncertainties.

F.G.M.


Lifting line theory is applied to describe the flow about a lifting wing at transonic speeds. The method extends that of Van Dyke (1975), in which lifting line theory is viewed as a singular perturbation treatment, to transonic flows. Inner and outer expansions are used. The inner wing rock oscillations, the energy balance between the pressure work input and the energy consumed by the model aerodynamic and mechanical damping was formulated and numerical data presented.


An approach to one-on-one air-combat analysis is described which employs discrete gaming of a parameterized model featuring choice between several closed-loop control policies. A preference-ordering formulation due to Falco's is applied to rational choice between outcomes: win, loss, mutual capture, purposeful engagement, draw. Approximate optimization between outcomes: win, loss, mutual capture, purposeful engagement, draw. Approximate optimization by using a 'backing up' process similar to that of Kopp. The approach is designed primarily for short duration duels between craft with large-envelope weaponry. Some illustrative computations are presented for an example modeled using constant-speed vehicles and very rough estimation of energy shifts.

G.R.


A wing leading-edge modification has been developed, applicable at present to single-engine, light aircraft, which produces stabilizing vortices at stall and beyond. These vortices have the effect of fixing the stall pattern of the wing such that the various portions of the wing upper surface stall nearly symmetrically. The lift coefficient produced is essentially constant to very high angles of attack above the stall angle of the unmodified wing. It is hypothesized that these characteristics will help prevent inadvertent spin entry after a stall. Results are presented from recent large-scale wind-tunnel tests of a complete light aircraft, both with and without the modification. (Author)


Ground-based flight simulation contributes greatly to the development of new aircraft and flight management systems and will be especially important in improving the performance, safety, and environmental characteristics of future civil and military V/STOL aircraft. This paper describes existing simulation facilities at Ames Research Center and discusses their capabilities and limitations for V/STOL aircraft investigations. Simulation requirements for NASA research and support of DOD programs are also discussed, including technology development for advanced rotorcraft and civil and military V/STOL aircraft. Current efforts and future plans are described for the upgrading of Ames simulation facilities to meet those requirements. Recent advances in equipment technology and operational methodology are shown to provide significantly improved simulation fidelity through better motion and visual cues and faster system response to pilot inputs. (Author)


A 100-W Boole free-piston Stirling engine was powered remotely by a CO2 laser for long periods of time. The engine ran on both continuous-wave and pulse laser input. The working fluid was helium doped with small quantities of sulfur hexafluoride, SF6. The CO2 radiation was absorbed by the vibrational modes of the sulfur hexafluoride, which in turn transferred the energy to the helium to drive the engine. Electrical energy was obtained from a linear alternator attached to the piston of the engine. Engine pressures, volumes, and temperatures were measured to determine engine performance. It was found that the pulse radiation mode was more efficient than the continuous-wave mode. An analysis of the engine heat consumption indicated that heat losses around the cylinder and the window used to transmit the beam into the engine accounted for nearly half the energy input. The overall efficiency, that is, electrical output to laser input, was approximately 0.76%. However, this experiment was not designed for high efficiency but only to demonstrate the concept of a laser-driven engine. Based on this experiment, the engine could be modified to achieve efficiencies of perhaps 25-30%. (Author)

ABSTRACTS FOR THE FLOW REGIMES

Author rate data correlations were developed for the laminar and turbulent in the laminar and transitional flow regimes. Empirical heating of the models.

result on aeolian processes and/or

BROADBAND ANTENNA TECHNIQUES SURVEY

This report is Part 2 of a three part series of reports investigating small antennas, their bandwidth and efficiency capabilities. Reviews and brief outlines of techniques published in the literature over the past 10-20 years, for broadening antennas are provided in this report. Experimental results from measurements of the Goubau antenna, a low-profile antenna (λ/20 closest operating frequency) are presented to show that this antenna possesses an octave bandwidth, regarding both impedance and radiation characteristics. Numerical results for some top-loaded structures are presented and matching network element variations are determined in order to estimate the bandwidth. It is shown that approximately 2 1 and approximately 4 1 increases in bandwidth are achieved when top-loading is applied to the stub and the loop antenna, respectively, and an L-network is used for tuning and matching.

The Planetary Geology Field Conference on Aeolian Processes was organized at the request of the Planetary Geology Program office of the National Aeronautics and Space Administration to bring together geologists working on aeolian problems on earth and planetologists concerned with similar problems on the planets. Abstracts of papers presented at the conference are arranged herein by alphabetical order of the senior author. Papers fall into three broad categories: (1) Viking Orbiter and Viking Lander results on aeolian processes and/or landforms on Mars, (2) laboratory results on studies of aeolian processes, and (3) photogeology and field studies of aeolian processes on Earth. Author

ABSTRACTS FOR THE PLANETARY GEOLOGY FIELD CONFERENCE ON AEOULAN PROCESSES

Ronald Greeley, ed (Arizona State Univ) and David Black, ed Jan 1978 63 p refs (NASA-TP-78455; A-7278) Avail NTIS HC A04/MF A01 CSCL 08G

The Planetary Geology Field Conference on Aeolian Processes was organized at the request of the Planetary Geology Program office of the National Aeronautics and Space Administration to bring together geologists working on aeolian problems on earth and planetologists concerned with similar problems on the planets. Abstracts of papers presented at the conference are arranged herein by alphabetical order of the senior author. Papers fall into three broad categories: (1) Viking Orbiter and Viking Lander results on aeolian processes and/or landforms on Mars, (2) laboratory results on studies of aeolian processes, and (3) photogeology and field studies of aeolian processes on Earth. Author


This report presents a consolidation of existing data on various devices used to suppress vortex-induced motions of cables and circular cylinders in the ocean. The types of devices discussed herein include 'fringe', hair, and ribbon flexible fairings and helical ridges. In general, the available data show that all of these methods do, in fact, suppress vortex-induced vibrations to a greater or lesser degree. However, because of the diverse ways in which suppression effectiveness has been measured, comparisons among different types of devices are difficult to make. Criteria for such comparisons are suggested. Relatively few measurements of the effects of strumming suppression devices on the drag of a cable or cylinder have been reported. The available data indicate that a large drag penalty may be incurred by use of such devices, depending on the configuration employed. Author (GRA)


Five environmental models were constructed to represent the solar wind and the upper middle, and lower ionosphere of Venus. The spacecraft structure was modeled with over 140 passive electrical elements representing structural elements of the spacecraft. Electron, ion, secondary electron, and photocurrents to the spacecraft from the plasma were calculated, ignoring sheath effects. In all but one case, potentials of interest were less than 1 volt. Potential differences between widely separated points on the equipment shelf were less than 1 mV. The one area of concern is the solar panel potential when the orbiter is passing through the bowshock region. Author

N78-13492# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. ASTRONAUTICS ABSTRACTS FOR THE FLOW REGIMES

Author rate data correlations were developed for the laminar and turbulent in the laminar and transitional flow regimes. Empirical heating of the models.

result on aeolian processes and/or

BROADBAND ANTENNA TECHNIQUES SURVEY

This report is Part 2 of a three part series of reports investigating small antennas, their bandwidth and efficiency capabilities. Reviews and brief outlines of techniques published in the literature over the past 10-20 years, for broadening antennas are provided in this report. Experimental results from measurements of the Goubau antenna, a low-profile antenna (λ/20 closest operating frequency) are presented to show that this antenna possesses an octave bandwidth, regarding both impedance and radiation characteristics. Numerical results for some top-loaded structures are presented and matching network element variations are determined in order to estimate the bandwidth. It is shown that approximately 2 1 and approximately 4 1 increases in bandwidth are achieved when top-loading is applied to the stub and the loop antenna, respectively, and an L-network is used for tuning and matching.

The Planetary Geology Field Conference on Aeolian Processes was organized at the request of the Planetary Geology Program office of the National Aeronautics and Space Administration to bring together geologists working on aeolian problems on earth and planetologists concerned with similar problems on the planets. Abstracts of papers presented at the conference are arranged herein by alphabetical order of the senior author. Papers fall into three broad categories: (1) Viking Orbiter and Viking Lander results on aeolian processes and/or landforms on Mars, (2) laboratory results on studies of aeolian processes, and (3) photogeology and field studies of aeolian processes on Earth. Author


The model bodies tested at Mach number 7.32 were hemispheres, blunt cones, and spherical segments. The mass addition consisted of air ejected through porous forward surfaces of the model. The experimental data consisted of heat transfer measurements from which boundary layer transitions were deduced. The data verified various applicable boundary layer codes in the laminar and transitional flow regimes. Empirical heating rate data correlations were developed for the laminar and turbulent flow regimes. Author

N78-18398# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif. STATUS AND FUTURE PROSPECTS OF USING NUMERICAL METHODS TO STUDY COMPLEX FLOWS AT HIGH REYNOLDS NUMBERS

Robert W McCormack In AGARD Three Dimensional and Unsteady Separation at High Reynolds Numbers Feb 1978 14 p refs (For availability see N78-18375 09-34) Avail NTIS HC A11/MF A01 CSCL 20D

The Navier-Stokes equations adequately describe aerodynamic flows at standard atmospheric temperatures and pressures. If these equations could be efficiently solved, there would be no need for experimental tests to design flight vehicles or other
aerodynamic devices Although much progress has been made toward the solutions, including complex unsteady two-dimensional and steady three-dimensional separated flows and have recently made some dramatic improvements in developing numerical methods, the calculation of flow fields past complete aircraft configurations at flight Reynolds numbers are far beyond numerical methods, the calculation of flow fields past complete aircraft configurations at flight Reynolds numbers are far beyond our reach, perhaps as long as a decade away. They await substantial progress in devising accurate and efficient numerical methods, in understanding and modeling the physics of turbulence, and in developing reliable and powerful computer hardware.

N78-15020** Hughes Aircraft Co. Culver City, Calif.

MAGNETOMETER DEPLOYMENT MECHANISM FOR PIÖLER VENUS


Avail NTIS HC A11/ MF A01 CSQL 14B

A three segment, 15-foot boom mechanism was devised, to deploy magnetometers from the Pioneer Venus orbiter spring shell. The storage mechanism is designed to contain the magnetometer during launch and to deploy these devices by centrifugal force upon pyrotechnic release. Unique gaps in epoxy boom segments are used for a lightweight design. A sufficient strength to withstand a 7.5 g pull is expected while extended. The extended boom length is described along with test methods developed for qualification in a one g field. Author

N78-19068** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.

THE ROLE OF TIME-HISTORY EFFECTS IN THE FORMULATION OF THE AERODYNAMICS OF AIRCRAFT DYNAMICS


The scope of any aerodynamic formulation proposing to embrace a range of possible maneuvers is shown to be determined principally by the extent to which the aerodynamic indicial response is allowed to depend on the past motion. Starting from the linearized formulation, in which the indicial response is independent of the past motion, two successively more comprehensive statements about the dependence on the past motion are assigned to the indicial response (1) dependence only on the recent past and (2) dependence additionally on a characteristic feature of the distant past. The first enables the rational introduction of nonlinear effects and accommodates a description of the rate dependent aerodynamic phenomena characteristic of airfoils in low speed dynamic stall; the second permits a description of the double valued aerodynamic behavior characteristic of certain kinds of aircraft stall. An aerodynamic formulation based on the second statement, automatically embracing the first, may be sufficiently comprehensive to include a large part of the aircraft's possible maneuvers. The results suggest a favorable conclusion regarding the role of dynamic stability experiments in flight dynamics studies. Author

N78-19778** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.

FUTURE COMPUTER REQUIREMENTS FOR COMPUTATIONAL AERODYNAMICS


Recent advances in computational aerodynamics are discussed as well as motivations for and potential benefits of a National Aerodynamics Simulation Facility. The author having the capability to calculate the fluid dynamics equations at speeds two to three orders of magnitude faster than presently possible with general computers. Two contracted efforts to define processor architectures for such a facility are summarized. For individual titles, see N78-19779 through N78-19819. Author

N78-19779** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.

COMPUTATIONAL AERODYNAMICS AND THE NUMERICAL AERODYNAMIC SIMULATION FACILITY

Victor L. Petersen In its Future Computer Requirements for Computational Aerodynamics Feb 1978 p 5-30 (For availability see N78-19778, 10-59)

Avail NTIS HC A22/MF A01 CSQL 09B

Technical and economic reasons for accelerating the maturation of the discipline of computational aerodynamics include the cost of conducting the experiments required to provide the empirical data base for new aeronautical vehicles and the limitations in test facilities (Reynolds number, wall and support interferences, aerelastic distortions, real-gas effects, etc.) for simulating the full-scale vehicle environment. General purpose computers do not have the necessary capability for the next stage of development. Solution of the three-dimensional Reynolds averaged Navier-Stokes equations in a short time to be practical for design purposes will require time the power of current supercomputers. However, it is feasible to construct a special purpose processor that will meet these requirements to enhance the nation's aerodynamic design capability in the 1980's Author

N78-19781** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.

THREE-DIMENSIONAL COMPUTATIONAL AERODYNAMICS IN THE 1980'S

C61 Harvard Lomax In its Future Computer Requirements for Computational Aerodynamics Feb 1978 p 33-38 (For availability see N78-19778, 10-59)

Avail NTIS HC A22/MF A01 CSQL 09B

The future requirements for constructing codes that can be used to compute the unsteady flows about aerodynamic shapes should be assessed in light of the constraints imposed by future computer architectures and the reality of usable algorithms that can provide practical three-dimensional simulations. On the hardware side, vector processing is inevitable in order to meet the CPU speeds required. To cope with three-dimensional geometries, massive data bases with fetch/store conflicts and transposition problems are inevitable. On the software side, codes must be prepared that (1) can be adapted to complex geometries, (2) can cut the very least guide the location of laminar and turbulent boundary layer separation, and (3) will converge rapidly to sufficiently accurate solutions. Author

N78-19782** Burroughs Corp, Paoli, Pa.

NUMERICAL AERODYNAMICS SIMULATION FACILITY PRELIMINARY STUDY, EXECUTIVE SUMMARY

Field Report In NASA Ames Res Center Future Computer Requirements for Computational Aerodynamics Feb. 1978 p 41-52 (For availability see N78-19778, 10-59)

(Contract NAS2-9456)

Avail NTIS HC A22/MF A01 CSQL 09B

The Burroughs Corporation solution to the problem of numerical aerodynamic simulation consists of a computing system designed to meet an effective throughput of one billion floating point operations per second for three-dimensional Navier-Stokes codes. In order to fully appreciate the design, its features, and subtleties, the methodology of the study which evolved this solution and the impact on the processor architecture evolution are described as well as details of the baseline design. Author

N78-19783** Control Data Corp, Minneapolis, Minn.

PRELIMINARY STUDY FOR A NUMERICAL AERODYNAMIC SIMULATION FACILITY Summary Report

C61 N R Lincoln In NASA Ames Res Center Future Computer Requirements for Computational Aerodynamics Feb 1978 p 63-78 (For availability see N78-19778, 10-59)

(Contract NAS2-9457)

Avail NTIS HC A22/MF A01 CSQL 09B

The state of the art of relevant technologies, of systems and processor architectures, and the measurable computational requirements of the two existing Navier-Stokes solution programs were assessed by Control Data Corporation to determine. Author
best approach for designing a system for aerodynamic simulation. Standard parts and components were used to identify the support processing system, which is composed of commercially available equipment and software. Technological achievements in large scale integration technology and system organization of subcomponents borrowed from the STAR-100C project were used in the design of the Navier-Stokes solver.

N78-1979# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.

MODELING OF THE REYNOLDS STRESSES c02
Morris W. Rubesin In Its Future Computer Requirements for Computational Aerodynamics Feb 1978 p 238-247 (For availability see N78-19778 10-59) Avail NTIS HC A22/MF A01 CSCL 01A

In their most general form, the Reynolds averaged conservation equations result from ensemble or time averages of the instantaneous Navier-Stokes equations or their compressible counterparts. For these averaging processes to be consistent, the averaging time period must exceed the periods identified with the largest time scales of the turbulence, and yet be shorter than the characteristic times of the flow field. With these equations, long period variations in the flow fields are deterministic, provided initial conditions are known. The average dependent variables are sufficiently smooth to be resolvable by finite difference techniques consistent with the size and speed of modern computers.

N78-2016# Martin Marietta Aerospace, Denver, Colo.

FLUID INTERACTION WITH SPINNING TOROIDAL TANKS A A Feaster and J E. Anderson In ESA Attitude Control of Space Vehicles Technol and Dyn Prob! Assoc. with the Presence of Liquids Det 1977 p 77-86 refs (For availability see N78-20178 11-18) (Contract NAS2-7489) Avail NTIS HC A10/MF A01 CSCL 22B

An experimental study was conducted to evaluate propellant behavior in spinning toroidal tanks that could be used in a universal system of an advanced outer-planet Pioneer orbiter Information on propellant slosh and settling and on ullage orientation and stability was obtained. The effects of axial acceleration, spin rate, spin-rate change, and spacecraft wobble, both singly and in combination, were evaluated using a 180 scale transparent tank in one-g and low-g environments. Liquid loadings ranged from 5% to 66% full. The impact of a surface tension acquisition device was assessed by comparison with bare-tank results. The testing simulated the behavior of the fluorine/hydrazine and nitrogen tetroxide/monomethylhydrazine propellants. Results are presented that indicate that m a p r fluid behavior problems would be encountered with any of the four propellants in the toroidal tanks of a spin-stabilized orbiter spacecraft. (Author)

N78-2119# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


The state of contaminant molecules, the deposition rate on key surfaces, and the heat transfer rate were estimated by the use of a zeroth-order approximation. Optical surfaces of key surfaces, and the heat transfer rate were estimated. Optical surfaces of the purge gas method of contamination controls was discussed. This method attempts to drive condensible molecules from the telescope tube by impacts with a purge gas in the telescope tube. For this technique to be sufficiently effective, the pressure of the purge gas must be more than 2 x 100001 torr. The influence caused by interactions of the purged gas with the particulate contaminants was found to slightly increase the resident times of the particulate contaminants within the telescope field of view.

N78-2121# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


Fire resistivity studies were conducted on a wide range of candidate nonmetallic materials being considered for the construction of improved fire resistant aircraft passenger seats. These materials were evaluated on the basis of FAA airworthiness burn and smoke generation tests, colorfastness, limiting oxygen index, and animal toxicity tests. Physical, mechanical, and aesthetic properties were also assessed. Candidate seat materials that have significantly improved thermal response to various thermal loads corresponding to reasonable fire threats as they relate to in-flight fire situations, are identified. (Author)

N78-21215# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


Classical trajectory calculations are presented for the reaction CI + O yields CI + O2, a reaction which is an important step in the chlorine-catalyzed destruction of ozone which is thought to occur in the 220 and 1000 K. The calculated rate constant is 4.36 x 10 to the minus 11th power exp (-191/T) cu cm molecule (-1) and its value at 300 K is 2.3 plus or minus 10 to the 11th power cu cm molecule (-1) about a factor of 2 lower than recent experimental data. The empirical potential energy surface used in the calculations was constructed to fit experimental data for CI, O2 and CI0 molecules. Other important features of this potential surface, such as the barrier to reaction, were varied systematically and calculations were performed for a range of conditions to determine the best theoretical rate constants. Results demonstrate the utility of classical trajectory methods for determining activation energies and other kinetic data for important atmospheric reactions. (Author)

N78-21407# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


The period of the large coherent structure in a subsonic, compressible, turbulent boundary layer was determined using the autocorrelation of the velocity and pressure fluctuations for Reynolds numbers between 5,000 and 35,000. In low Reynolds number flows the overall correlation period scaled with the outer variables, namely, the free stream velocity and the boundary layer thickness. (Author)

N78-21409# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


By means of torsion tests performed on test specimens of the same material having a minimum of two different cross sections (flat sheet of different widths), the effective in-plane (G13) and out-of-plane (G23) shear moduli were determined for
two composite materials of uniaxial and angle ply fiber orientations. Test specimens were 16 plus (nominal 2 mm) thick, 100 mm in length, and in widths of 6.3 9.5, 12.5, and 15.8 mm. Torsion tests were run under controlled deflection (constant angle of twist) using an electrohydraulic servocontrolled test system. In-plane and out-of-plane shear moduli were calculated from an equation derived in the theory of elasticity which relates applied torque, the torsional angle of twist, the specimen width/thickness ratio, and the ratio of the two shear moduli G13/G23. Results demonstrate that torsional shear moduli, G23, as well as G13, can be determined by simple torsion test of flat specimens of rectangular cross section. Neither the uniaxial nor angle ply composite material were transversely isotropic. Author

**N78-22005** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

**DYNAMIC STALL OF AN OSCILLATING AIRFOIL**

Unmeel B Mehta (Stanford Univ., Calif) In AGARD Unsteady Aerodyr Feb 1978 32 p refs. Sponsored in part by ARMLD (For availability see N78-22033 13-02) (Contract NCA2-0746-002; Grant NSG-2253)

Avail NTIS HC A09/MF A01 CSCL 01A

Unsteady separated boundary layers and wakes were studied by investigating flow past an oscillating airfoil in part models the retreating blade stall on the helicopters. The Navier-Stokes equations in terms of the vorticity and stream function for linear flow were solved to determine the flow field around a modified NACA 0012 airfoil. After a fully developed flow was determined at zero incidence, the airfoil was oscillated in pitch through an angle of attack range from 0 deg to 20 deg. The computed streamlines during the pitch-up motion are in qualitative agreement with the trajectories of air bubbles observed in water tunnel experiments conducted with a NACA 0012 airfoil under the same conditions. During the pitch-down motion of the airfoil, the computed flow pattern cannot be compared with the experiments because the trajectories of air bubbles intersect...

**N78-24000** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

**A REVIEW OF NASA-SPONSORED TECHNOLOGY ASSESSMENT PROJECTS**


Recent technology assessment studies sponsored by NASA are reviewed and a summary of the technical results as well as a critique of the methodologies are presented. The reviews include Assessment of Lighter-Than-Air Technology, Technology Assessment of Portable Energy, RDT&P, Technology Assessment of Future Intercity Passenger Transportation Systems, and Technology Assessment of Space Disposal of Radioactive Nuclear Waste. The use of workshops has been introduced as a unique element of some of these assessments. Also included in this report is a brief synopsis of a method of quantifying opinions obtained through such group interactions. Representative of the current technology assessments these studies cover a broad range of socio-political factors and issues in greater depth than previously considered in NASA sponsored studies. In addition to the lessons learned through the conduct of these studies, a few suggestions for improving the effectiveness of future technology assessments are provided...

**N78-24860** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

**LAGRANGIAN COMPUTATION OF INVISCID COMPRESSIBLE FLOWS**


A Lagrangian method is developed to solve the Euler equations of gas dynamics. The solution of the equations is obtained by a numerical computation with the well-known Flux-Corrected-Transport (FCT) numerical method. This procedure is modified so that the boundary treatment is accurate and relatively simple. Shock waves and other flow discontinuities are captured monotonically without any type of fitting procedures. The Lagrangian method is employed so that the problem of mesh generation is completely avoided. The method is applicable to all Mach numbers except the low subsonic range where compressibility effects are small. The method is applied to a one-dimensional Riemann problem (shock tube) and to a two-dimensional supersonic channel flow with reflecting shock waves...

**N78-25017** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

**ENGINEERING TESTS OF THE KEPLER TELESCOPE**


Data on image quality, chopper performance, and the closed-loop operation of the 91 cm telescope of the Kepler Airborne Observatory which were obtained in September 1977 are presented...

**N78-26101** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

**CALCULATION OF SUPERSONIC VISCOUS FLOW OVER DELTA WINGS WITH SHARP SUBSONIC LEADING EDGES**


Two complementary procedures were developed to calculate the viscous supersonic flow over conical shapes at large angles of attack, with application to cones and delta wings. In the first approach the flow is assumed to be conical and the governing equations are solved at a given Reynolds number with a time-marching explicit finite-difference algorithm. In the second method the parabolized Navier-Stokes equations are solved with a space-marching implicit noniterative finite-difference algorithm. This latter approach is not restricted to conical shapes and provides a large improvement in computational efficiency over published methods. Results from the two procedures agree very well with each other and with available experimental data...

**N78-26100** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

**COMPUTATIONAL WING OPTIMIZATION AND COMPARISONS WITH EXPERIMENT FOR A SEMI-SPAN WING MODEL**


A computational wing optimization procedure was developed and verified by an experimental investigation of a semi-span variable camber wing model in the NASA Ames Research Center...
N78-28391*# National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif.
SOLUTION OF TRANSONIC FLOWS BY AN INTEGRAL-DIFFERENTIAL EQUATION METHOD

Solutions of steady transonic flow past a two-dimensional airfoil are obtained from a singular integro-differential-equation which involves a tangential derivative of the perturbation velocity potential. Subcritical flows are solved by taking central differences everywhere. For supercritical flows with shocks, central differences are taken in subsonic flow regions and backward differences in supersonic flow regions. The method is applied to a nonlifting parabolic-airfoil and to a lifting NASA 0012 airfoil. Results compare favorably with those of finite-difference schemes

Author

N78-28275*# National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif.
ON IMPROVING THE ITERATIVE CONVERGENCE PROPERTIES OF AN IMPLICIT APPROXIMATE-FACTORIZATION FINITE DIFFERENCE ALGORITHM

The iterative convergence properties of an approximate-factorization implicit finite-difference algorithm are analyzed both theoretically and numerically. Modifications to the basic algorithm were made to remove the inconsistence in the original implementation of artificial dissipation. In the present, the steady-state solution became dependent of the time-step, and much larger time-steps can be used steadily. To accelerate the iterative convergence, large time-steps and a cyclic sequence of time-steps were used. For a model transonic flow problem governed by the Euler equations, convergence was achieved with 10 times fewer time-steps using the modified differencing scheme. A particular form of instability due to variable coefficients is also analyzed.

Author

N78-28798*# National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif.
TECHNIQUES FOR CORRECTING APPROXIMATE FINITE DIFFERENCE SOLUTIONS

A method of correcting finite-difference solutions for the effect of truncation error or the use of an approximate basic equation is presented. Applications to transonic flow problems are described and examples are given.

Author

N78-28734*# National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif.
AN EXPERIMENTAL DOCUMENTATION OF PRESSURE GRADIENT AND REYNOLDS NUMBER EFFECTS ON COMPRESSIBLE TURBULENT BOUNDARY LAYERS

Attached supersonic turbulent boundary layers with a wide range of adverse pressure gradient strengths are investigated for Reynolds numbers from 11,7 x 1 million to 31,4 x 1 million. Surface pressure and surface shear measurements were obtained for six flow fields over the entire Reynolds number range. In addition two flow fields - one with a moderate pressure gradient and the other with a severe pressure gradient - are thoroughly documented at a single Reynolds number. This experimental documentation includes both mean and fluctuating profiles throughout the flow field, and is sufficient to define the complete flow field, including the upstream undisturbed flow region.
reacting systems was studied to understand some recent experimental measurements which imply the existence of negative activation energies. A collision theory model and classical trajectory calculations are used to demonstrate that the reaction probability can vary inversely with collision energy for bimolecular reactions occurring on attractive potential energy surfaces. However, this is not a sufficient condition to ensure that the rate constant has a negative temperature dependence. On the basis of these calculations, it seems unlikely that a true bimolecular reaction between neutral molecules will have a negative activation energy.

A R H

N78-29436# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

SYSTEM OPTIMIZATION OF GASDYNAMIC LASERS, COMPUTER PROGRAM USER'S MANUAL


The user's manual for a computer program that performs system optimization of gasdynamic lasers is provided. Detailed input/output formats are for CDC 7600/8600 computers. A dialect of FORTRAN Sample input/output data are provided to verify correct program operation along with a program listing.

A R H

N78-29451# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

TORQUING PRELOAD IN A LUBRICATED BOLT


The tension preload obtained by torquing a 7/8 in diam UNC high strength bolt was determined for lubricated and dry conditions. Consistent preload with a variation of 2% - 3% was observed when the bolt head area was lubricated prior to each torque application. Preload tensions nearly 70% greater than the values predicted with the commonly used formula occurred with the lubricated bolt. A reduction in 39% of the initial preload was observed during 50 torque applications without lubrication. Little evidence of wear was noted after 203 cycles of tightening.

Author

N78-30149# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

NASA/ESA CV-990 SPACELAB SIMULATION (ASSESS 2)


Cost effective techniques for addressing management and operational activities on Spacelab were identified and analyzed during a ten day NASA/ESA cooperative mission with payload and flight responsibilities handled by the organization assigned. for early Spacelabs. Topics discussed include (1) management concepts and interface relationships, (2) experiment selection, (3) hardware development, (4) payload integration and checkout, (5) selection and training of mission specialists and payload specialists, (6) mission control center payloads operations control center interactions with ground and flight problems, (7) real-time interaction during flight between principal investigators and the mission specialists/payload specialists flight crew, and (8) retrieval of scientific data and its analysis.

A R H

N78-30774# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

AN ASSESSMENT OF THE EFFECT OF SUPERSONIC AIRCRAFT OPERATIONS ON THE STRATOSPHERIC OZONE CONTENT

I G Popoff, R C Whitten, R P Tuve (R and D Associates, Manoa del Rey, Calif.) and L A Capone (San Jose State Univ Calif) 1 Aug 1978 60 p refs (NASA-R-1026. A-7399) Avail NTIS HC A04/MF A01 C5L 13B

- An assessment of the potential effect on stratospheric ozone of an advanced supersonic transport operation is presented.

This assessment, which was done in the light of NASA's desire for an up-to-date evaluation to guide programs for the development of supersonic technology and improved aircraft engine designs, uses the most recent chemical reaction rate data. From the results of the present assessment it would appear that realistic fleet sizes should not cause concern with regard to the depletion of the total ozone overburden. For example, the NOx emission of one type designed to cruise at 20 km altitude will cause the ozone overburden to increase by 0.03% to 0.12%, depending upon which vertical transport is used. These ozone changes can be compared with the predictions of a 1.7% ozone decrease (for 100 Large SSTs flying at 20 km) made in 1974 by the FAA's Climate Impact Assessment Program.

Author

N78-31030# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

PIONEER 10 OBSERVATION OF THE SOLAR WIND PROTON TEMPERATURE HELIOCENTRIC GRADIENT


Solar wind isotropic proton temperatures as measured out 12.2 AU heliocentric distance by the Ames plasma analyzer aboard Pioneer 10 are presented as consecutive averages over the Carrington solar rotation. The weighted least-squares fit of average temperature to heliocentric radial distance, R, yields the power law R sup 0.22. These average proton temperatures are not correlated as well with Pioneer 10's heliocentric radial distance (-0.5) as are the corresponding average Zurch sunspot numbers R sub z (-0.5). Consequently, it is difficult to isolate the spatial gradient in the Pioneer 10 solar wind proton temperatures using that data alone.

Author

N78-31608# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

HIGH ALTITUDE PERSPECTIVE

1978 33 p Original contains color illustrations (NASA-SP-4027) Avail NTIS MF A01; SC0 HC $1.60 C5L 14E

The capabilities of the NASA Ames Center U-2 aircraft for research or experimental programs are described for such areas as Earth resources inventories, remote sensing data interpretation, electronic sensor research and development, satellite investigative support, stratospheric gas studies, and astronomy and astrophysics. The availability of this aircraft on a cost-reimbursable basis for use in high-altitude investigations that cannot be performed by the private sector is discussed.

A R H

N78-32029# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif

CRUSTAL EVOLUTION INFERRED FROM APOLLO MAGNETIC MEASUREMENTS

Palmer Dyal, William D Daily, (Eisynk Res Lab) and Leonid L Vanyan (Acad of Sci Moscow) Sep 1978 31 p refs (Grant Nsg-2082) (NASA-TM-78524, A-7606B) Avail NTIS HC A03/MF A01 C5L 03B

Magnetic field and solar wind plasma density measurements were analyzed to determine the scale size characteristics of remnant fields at the Apollo 12, 15, and 16 landing sites. Theoretical model calculations of the field/plasma interaction, involving diffusion of the remnant field into the solar plasma, were compared to the data. The information provided by all these experiments shows that remnant fields over most of the lunar surface are characterized by spatial variations as small as a few kilometers. Large regions (50 to 100 km) of the lunar crust were probably uniformly magnetized during early crustal evolution. Bombardment and subsequent gardening of the upper layers of these magnetized regions left random or oriented, smaller scale (5 to 10 km) magnetic sources. These sources, in turn, will cause the larger scale size fields of magnitude approximately 0.1 gammas are measured by the orbiting subsatellite experiments and the small scale size remnant fields of magnitude approximately 100 gammas are measured by the surface experiments.

Author
Soids types for the silicate spheres show that nonvolatile elemental abundances are similar and relict grains are useful for determining the parent meteoroid and an Fe glass which is relatively low in Si. Bulk compositions of the Fe-rich spheres were produced during ablation of Fe and not experience any melting were analyzed. The spheres were bodies, or containing relict grains of parent old). Formed from particles that completely melted and subsequently recrystallized as they separated from their meteoroid (e.g., nickel-iron meteoroids produce spherules containing taenite, wuestite, pyrrhotite, pentlandite). The fragmentary debris may be either fine-grained aggregates of olivine, magnetite, pyroxene, or iron oxides (e.g., wuestite). The fragmentary debris may be either fine-grained aggregates of olivine, magnetite, pyroxene, or iron oxides (e.g., wuestite).


The natural and laboratory created fusion crusted and debris from artificial meteor samples were used to develop criteria for recognizing meteor ablation debris in a collection of 5 to 50 micron particles from the stratosphere. These laboratory studies indicate that meteor ablation debris from nickel-iron meteoroids produce spherules containing taenite, wuestite, magnetite, and hematite. These same studies also indicate that ablation debris from chondritic meteoroids produce spheres and fragmentary debris. The spheres may be either silicate rich, containing zoned olivine, magnetite, and glass, or sulfide rich, containing iron oxides (e.g., magnetite, wuestite) and iron sulfides (e.g., pyrrhotite pentlandite). The fragmentary debris may be either fine-grained aggregates of olivine, magnetite, pyroxene, and occasionally pyrrhotite (derived from the meteorite matrix) or individual olivine and pyroxene grains (derived from meteorite inclusions).

N78-384014#* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.

ARE THE STRATOSPHERIC DUST PARTICLES METEOR ABLATION DEBRIS OR INTERPLANETARY DUST?


A natural and laboratory created fusion crusted and debris from artificial meteor samples were used to develop criteria for recognizing meteor ablation debris in a collection of 5 to 50 micron particles from the stratosphere. These laboratory studies indicate that meteor ablation debris from nickel-iron meteoroids produce spherules containing taenite, wuestite, magnetite, and hematite. These same studies also indicate that ablation debris from chondritic meteoroids produce spheres and fragmentary debris. The spheres may be either silicate rich, containing zoned olivine, magnetite, and glass, or sulfide rich, containing iron oxides (e.g., magnetite, wuestite) and iron sulfides (e.g., pyrrhotite pentlandite). The fragmentary debris may be either fine-grained aggregates of olivine, magnetite, pyroxene, and occasionally pyrrhotite (derived from the meteorite matrix) or individual olivine and pyroxene grains (derived from meteorite inclusions).

N78-384021#* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.

METEOR ABLATION SPHERES FROM DEEP-SEA SEDIMENTS


Spheres from mid-Pacific abyssal plains (0 to 500,000 yrs old) formed from particles that completely melted and subsequently recrystallized as they separated from their meteoroid. Bodies, or containing relict grains of parent meteoroids that did not experience any melting were analyzed. The spheres were readily divided into three groups using their dominant mineralogy. The Fe-nich spheres were produced during ablation of Fe and metal-rich silicate meteoroids. The glassy spheres are considerably more Fe-rich than the silicate spheres. They consist of magnetite and an Fe glass which is relatively low in Si. Bulk compositions of the Fe-rich spheres were produced during ablation of Fe and metal-rich silicate meteoroids. The glassy spheres are considerably more Fe-rich than the silicate spheres. They consist of magnetite and an Fe glass which is relatively low in Si. Bulk compositions of the Fe-rich spheres were produced during ablation of Fe and metal-rich silicate meteoroids. The glassy spheres are considerably more Fe-rich than the silicate spheres. They consist of magnetite and an Fe glass which is relatively low in Si. Bulk compositions of the Fe-rich spheres were produced during ablation of Fe and metal-rich silicate meteoroids. The glassy spheres are considerably more Fe-rich than the silicate spheres. They consist of magnetite and an Fe glass which is relatively low in Si. Bulk compositions of the Fe-rich spheres were produced during ablation of Fe and metal-rich silicate meteoroids. The glassy spheres are considerably more Fe-rich than the silicate spheres. They consist of magnetite and an Fe glass which is relatively low in Si. Bulk compositions of the Fe-rich spheres were produced during ablation of Fe and metal-rich silicate meteoroids. The glassy spheres are considerably more Fe-rich than the silicate spheres. They consist of magnetite and an Fe glass which is relatively low in Si.
Functional requirements and preliminary design data were identified for use in the design of all system components and in the construction of a facility to perform aerodynamic simulation for a solar array design. A skeleton structure of specifications for the flow model processor and monitor, the operating system, and the language and its compiler is presented.


The objectives of the test were to assess fire containment and fire extinguishment in the cargo by reducing the ventilation through the cargo compartment. Parameters which were measured included ignition time, burnthrough time, and physical damage to the cargo liner, composition of selected combustible gases, temperature-time histories, heat flux, and detector response. The igniter load was made of a typical cargo consisting of folded cardboard cartons occupying 50% of the compartment volume.


The development of doped-germanium detectors which have optimized performance in the 30- to 120-micron wavelength range and are capable of achieving the objectives of the infrared astronomical satellite (IRAS) space mission is discussed. Topics covered include the growth and evaluation of Ge Ga and Ge Be crystals, procedures for the fabrication and testing of detectors, resistance measurements through MOSFET, test data are presented in graphs and charts.


To test the validity of the ARC approach to Spacelab several missions simulating aspects of Spacelab operations have been conducted as part of the ASSESS Program. Each mission was designed to evaluate potential Shuttle/Spacelab concepts in increasing detail. For this mission, emphasis was placed on development and exercise of management techniques planned for Spacelab using management participants from NASA and ESA who have responsibilities for Spacelab 1 which will be launched n. 1988.


Categories of cost and service measures that will appropriately define the characteristics of all intercity transportation systems were established. Previous methods of comparing transportation systems were reviewed. Specific comparison variables, applicable to all modes were defined, and the functional relationships by which these variables are interdependent were explored. A framework by which the set of variables may be employed for comparison of data from the individual systems was constructed.


Within the simulation limitations of on-orbit conditions it was demonstrated that a helium purge system could be an effective method for reducing the incoming flux of contaminant species. Although a generalized purge system was employed in conjunction with basic telescope components the simulation provided data that could be used for further modeling and design of a specific helium injection system. Experimental telescope pressures required for 90% attenuation appeared to be slightly higher (factor of 2 to 5). Cooling the helium purge gas and telescope components from 300 to 140 K had no measurable effect on stopping efficiency of a given mass flow of helium from the diffuser injectors.

N78-32991# National Aeronautics and Space Administration Ames Research Center, Moffett Field Calif ACCELERATION AND HEATING OF THE SOLAR WIND Aaron Barnes (JPL) A Close-up of the Sun 1 Sep 1978 344 p refs (For primary document see N78-32984 23-92) Avail: NTIS HC A25/MF A01 CSCL 03B

Some of the computing theories of solar wind acceleration and heating are reviewed, and the observations that are required to distinguish among them are discussed. In most cases what is required is measurement of plasma velocity and temperature and magnetic field, as near the sun as possible and certainly inside 20 solar radii, another critical aspect of this question is determining whether a turbulent envelope exists in this inner region, and if so, defining its properties. Plasma and magnetic observations from the proposed Solar Probe mission would thus yield a quantum jump in our understanding of the dynamics of the solar wind.


The adaptation of the Saturn-Uranus Atmospheric Entry Probe (SUAEP) to a Jupiter entry probe is summarized. This report is extracted from a comprehensive study of Jupiter missions, atmospheric model definitions and probe subsystem alternatives.

A high-capacity vapor-modulated heat pipe was designed and tested. In 1977, a program was undertaken to use the aforementioned heat pipe to study protection from freezing-point failure. The design, fabrication, and testing of a cryogenic rotatable heat pipe were undertaken. The performance of the rotatable heat pipes was evaluated. The results are discussed in the following sections:

1. **Occultation of Epsilon Geminorum by Mars**
   By J.Vevrka and R. Greeley, published on May 1979, p. 107-114. A high-capacity vapor-modulated heat pipe was designed and tested in 1977. The performance of the heat pipe was evaluated in a cryogenic environment. The results are discussed in the following sections:

2. **Some Martian volcanic features viewed from the Viking orbiters**
   By M. H. Carr (U.S. Geological Survey, Branch of Astrogeology, Menlo Park, Calif.), R. Greeley (NASA, Ames Research Center, Moffett Field, Calif.), K. R. Blaus (Planetary Science Institute, Pasadena, Calif.), J. E. Guest, and J. B. Murray (London University, Observatory, Mill Hill, Middlesex, England) published on May 1979, p. 115-121. A summary is presented of the results of these observations. Most of these observations are concerned with the Tharsis and Alba regions. The youth, size, and style of the volcanic features in these areas render them particularly susceptible to analysis. Excellent coverage was also acquired of Apollinaris Patera. A high-capacity vapor-modulated heat pipe was designed and tested in 1977. The performance of the heat pipe was evaluated in a cryogenic environment. The results are discussed in the following sections:

3. **Simultaneous determination of rotational and translational temperatures of OH/2 Pi in a gas discharge**
   By C. C. Wang (Ford Motor Co., Dearborn, Mich.) published on Sep 1976, p. 72-76. A high-capacity vapor-modulated heat pipe was designed and tested in 1977. The performance of the heat pipe was evaluated in a cryogenic environment. The results are discussed in the following sections:

4. **Cryogenic Rotating Heat Pipe: Development and Performance**
   By Rockwell International Corp., Downey, Calif. published on Sep 1978, p. 7-12. A high-capacity vapor-modulated heat pipe was designed and tested in 1977. The performance of the heat pipe was evaluated in a cryogenic environment. The results are discussed in the following sections:
A78-13762 *  

The observed bow shock encounters at Mercury, Venus and Mars are least square fit using the same technique so that their sizes and shapes can be intercompared. The shock front of Mercury most resembles the terrestrial shock in shape, and the shock stand off distance is consistent with the observed moment. The shape of the Venus and Mars shock fronts more resemble each other than the earth's and the stand off distances are consistent with direct interaction of the solar wind with the ionosphere on the dayside. The Venus shock is closer to the planet than the Mars shock suggesting more absorption of the solar wind at Venus. (Author)

A78-13845 *  

A simple closed loop control system has been developed to maintain the gas pressure in thin-window proportional counters during rocket flights. This system permits convenient external control of detector pressure and system flushing rate. The control system is activated at launch with the selection of a reference volume at the existing system pressure. In-flight control to plus or minus 2 torr at a working pressure of 760 torr has been achieved on six rocket flights. (Author)

A78-14622 *  

A theoretical study indicating that vortex rings at moderate Reynolds numbers are unstable to azimuthal bending waves is presented. Only the case of a thin vortex ring with a core of constant vorticity in an inviscid flow is examined. The disturbance flow and the mean flow of the vortex ring are derived as asymptotic solutions near the core, the stability analysis is developed completely for a certain class of bending waves that are unstable on a line filament in the presence of strain. The vortex ring is found to be always unstable for at least two wavenumbers for which waves on a line filament of the same vorticity distribution would not rotate. Published experimental results are cited to support these conclusions J.M.B

A78-14651 *  

Time ordered diagrammatic representations are shown to precisely define and to simplify calculations of radiative perturbations to the density matrix. Nonlinear optical susceptibilities, here exemplified by that of CARS, can be obtained by simple propagator rules. An interpretation of transient Raman scattering in terms of time ordered contributions is also discussed. (Author)

A78-14655 *  

The collisionless dissociation of SF6 has been studied using simultaneous irradiation by two frequencies from a CO2 laser which are both nearly resonant with the SF6(2) absorption band. It was found that the dissociation was enhanced, and occurred over a wider frequency range, than for single frequency dissociation. No threshold effect was observed for a weak resonant and a much higher energy field pumping slightly off-resonance. For such two frequency irradiation, the peak in the dissociation curve was found to be shifted to lower frequencies with respect to that for single frequency dissociation. (Author)

A78-15287 *  

The general problem of image data compression is discussed briefly with attention given to the use of Karhunen-Loeve transforms, suboptimal systems, and block quantization. A survey is then conducted encompassing the four categories of adaptive systems: (1) adaptive transform coding (adaptive sampling, adaptive quantization, etc), (2) adaptive predictive coding (adaptive delta modulation, adaptive DPCM encoding, etc), (3) adaptive cluster coding (blob algorithms and the multispectral cluster coding technique), and (4) adaptive entropy coding. B.J.

A78-16180 *  

An analytical study is carried out of the behavior of modern high-speed aircraft of inertially slender configurations in maneuvers involving large rates of roll. Inertial cross-coupling, as well as a linear variation of longitudinal static stability (C/m-alpha/s) with angle of attack, are considered. The steady-state solutions of the nonlinear equations of motion, based on principal inertia axes, are studied to obtain useful information on the response behavior of the state variables during roll maneuvers. It is shown that, in addition to the critical values of aileron deflection that have been previously found to limit a steady-state roll with constant longitudinal static stability, there can be two new critical values introduced by a linear decrease of the absolute value of longitudinal static stability with angle of attack. For aileron deflections near these critical values, the response of the aircraft exhibits violent oscillations and dangerous peak loads, due to the cross-coupled motion accompanying a roll maneuver. These critical values define a new range of aileron deflections in which no steady-state roll is possible. (Author)

A78-16454 *  

The problem of a 2-2 state atom colliding with a singlet sigma state diatom, which involves multiple potential surfaces, is investigated. Within a diabatic representation for the electronic degrees of
would be titanium because of its significantly higher strength. G. R.

Using either titanium showed that toroidal tanks can be fabricated with present technology during spacecraft operation. (Author)

Allied Weight Engineers, Annual Conference. A78-17881 OH

Modulation, promises a sensitivity of 374-376 Hz displacement surface and lift is discussed for the RAE wing flow. S D.

Results indicate that this technique, when combined with frequency modulation, promises a sensitivity of 100,000 molecules/cm for OH monitoring in the atmosphere. (Author)


Absorption of OH was measured using a CW tunable laser. Results indicate that this technique, when combined with frequency modulation, promises a sensitivity of 100,000 molecules/cm for OH monitoring in the atmosphere. (Author)


The reported study had been conducted to determine the feasibility of developing toroidal tanks for an auxiliary propulsion system that could be integrated into a Pioneer spin-stabilized spacecraft. The system evaluated consisted of two toroidal tanks equipped with surface tension devices. One tank is intended for nitrogen tetroxide, the other for monomethylhydrazine. The study included the design of a propellant storage system, the method that could satisfy the requirements of a spinning tank. It was found that an oxidizer tank spin rate of 76 rpm and a fuel tank spin rate of 110 rpm would be required to produce liquid loss from the acquisition system during spacecraft operation. An investigation showed that toroidal tanks can be fabricated with present technology using either titanium or aluminum alloys. The preferred material would be titanium because of its significantly higher strength. G. R.


Pioneer 11 flew by Jupiter in December 1974 and obtained several hundred images of the planet. It is presently targeted for encounter with Saturn in 1979. The imaging photomultiplier recorded scan-pan images with high photometric accuracy. It also recorded polarimetric and zodiacal-light data. Careful design of the instrument resulted in excellent performance in the Jovian radiation environment. Imaging data were displayed to maintain the proper shape of the planet. Color images were made by synthesizing green data from red and blue data. Pictures created from Pioneer 11 imaging data show complex detail within the Red Spot as well as indications of flow around it. Bright spots with trailing plumes are seen in the Equatorial Zone. The North Polar Region is devoid of debris, but numerous irregular cells are seen in red light. The Galilean satellites were imaged with a resolution of several hundred kilometers. (Author)


The numerical procedures previously developed for computing nonlinear and time-linearized small-perturbation unsteady transonic flows are briefly reviewed, and the effects of unsteady modes of motion on two-dimensional transonic flows are evaluated. The numerical procedure used comprises an alternating-direction implicit scheme and treiss shock waves as discontinuities in the flow. Comparison of the time-linearized results with fully nonlinear calculations delineates their range of applicability. The unsteady behavior due to harmonic pitching and flap oscillations of an NACA airfoil is also examined. S D.

On determining magnetospheric diffusion coefficients from the observed effects of Jupiter’s satellites Io, M. F. Thomsen, C. K. Goertz, and J. A. Van Allen (Iowa, University, Iowa City, Iowa) Journal of Geophysical Research, vol. 82, Dec 1, 1977, p. 5841-5850 14 refs. NSF Grant No. ATM-72-01282; Contract No. NASA-6553

A method is derived for determining the radial diffusion coefficient from observed satellite effects of the inner Jovian satellites on the energetic particle fluxes. The method is based on data from L values which are significantly removed from the actual sweeping region. With regard to the large-losses to the protons at Io’s L shell, it is suggested that in addition to satellite sweepup, the losses may be associated with an enhanced precipitation due to resonant interaction with ion cyclotron waves near Io’s orbit. It is noted that such additional loss mechanisms may also apply to electrons, and that such losses may significantly affect the estimated diffusion coefficient. S. C. S.


In connection with a need for more definitive information concerning the composition of Phobos in a study of its origin, an ultraviolet-visible-infrared reflectance spectrum of the Martian satellite was compiled from the Mariner 9 ultraviolet spectrometer, Viking lander imaging, and ground-based photometric data. The probable surface composition of Phobos was deduced by comparing the obtained spectrum with the spectra of asteroids of known composition. The considered data show that the reflectivity of Phobos is flat from 1100 to 400 nm but decreases sharply in the ultraviolet to about 1 percent at 212 nm. The reflectance spectrum is similar to the spectra of asteroids Ceres and Pallas which were found to have surface compositions similar to that of carbonaceous chondrites. It is concluded that the surface composition of Phobos is also similar to that of carbonaceous chondrites. The results of the investigation point to different modes of origin for Mars and Phobos. G. R.

Multicolor observations of Phobos with the Viking lander cameras - Evidence for a carbonaceous chondrite composition J. B. Pollack, D. Colburn (NASA, A. Research Center, Theoretical and Planetary Studies Branch, Moffett Field,
effects are optionally incorporated with a 'thin layer' approximation dimensional flow capable of handling arbitrary geometry through the Huntsville, Ala, Jan 16-18, 1978, Paper 78-20632

The reflective quality of Phobos has been determined in the spectral region from 0.4 to 1.1 micrometers from images taken with a Viking lander camera. The reflectivity curve is flat in this spectral interval and the geometric albedo equals 0.05 + or - 0.01. These results, together with Phobos's reflectivity spectrum in the ultraviolet, are compared with laboratory spectra of carbonaceous chondrites and basalt. The spectra of carbonaceous chondrites are consistent with the observations, whereas the basalt spectra are not. These findings raise the possibility that Phobos may be a captured object rather than a natural satellite of Mars. (Author)


Robertson's expression for the velocity-dependent effect of solar radiation on the motion of small particles is difficult because of its dependence on relativistic considerations, and it is also deficient in that it assumes perfectly absorbing particles. The present paper gives a heuristic derivation of the Poynting-Robertson effect. Robertson's expression for perfectly absorbing particles is obtained but on a much simpler physical basis, and an expression is also obtained for a particle that is seen by geocentric observers, transmits, and absorbs light. Some numerical results on the solar radiation forces felt by small particles of cosmochronologically important compositions are given.

The prediction of toxic atmospheres from decomposing polymers, A Buchler and C J Hilado (San Francisco University, San Francisco, Calif.), Journal of Fire and Flammability, vol 8, Oct 1977, p 478 493 6 refs Grants No NsG-2039; No NsG-2164

The generation of carbon monoxide from polymethyl methacrylate and polyethylene, and of hydrogen chloride from polyvinyl chloride, was calculated. Calculations were made for various amounts of acrylate and polyethylene, and of hydrogen chloride from polyvinyl decomp..ing polymers. A Buchler and C J Hilado (San Francisco University, San Francisco, Calif.), Journal of Fire and Flammability, vol 8, Oct 1977, p 478 493 6 refs Grants No NsG-2039; No NsG-2164


Approximate signal-to-noise ratios are calculated for 12 stellar occultations by the rings of Uranus during 1977-1980. Four of the stars are apparently bright enough to permit observation of the epsilon-ring occultations with a large telescope. For the rest of these events, occultations by rings alpha through delta should also be observable with a large telescope, and epsilon ring occultations should be detectable with smaller telescopes. Formulas for the signal-to-noise ratios are given to aid potential observers in evaluating the quality of the results they can expect to obtain with their own photometric equipment. (Author)


An implicit finite difference procedure for unsteady three-dimensional flow capable of handling arbitrary geometry through the use of general coordinate transformations is described. Viscous effects are optionally incorporated with a 'thin layer' approximation of the Navier-Stokes equations. An implicit approximate factorization technique is employed so that the small grid sizes required for spatial accuracy and viscous resolution do not impose stringent stability limitations. Results obtained from the program include transonic inviscid and laminar-turbulent solutions about simple body configurations. Comparisons with existing theories and experiments are made. Numerical accuracy and the effect of three dimensional coordinate singularities are also discussed. (Author)


The basic integral equations for a harmonically oscillating aerofoil in a transonic flow with shock waves are derived, the reduced frequency is assumed to be small. The problem associated with shock wave motion is treated using a strained coordinate system. The integral equation is linear and consists of both line integrals and surface integrals over the flow field which are evaluated by quadrature. This leads to a set of linear algebraic equations that can be solved directly. The shock motion is obtained explicitly by enforcing the condition that the flow is continuous except at a shock wave. Results obtained for both lifting and nonlifting oscillatory flows agree satisfactorily with other accurate results. (Author)


Solutions are presented for the stagnation-region shock-layer equations, including radiative transfer with spectral lines and silica ablation during Jovian entry. Results for variations of entry angle, surface-wave configuration, and atmospheric model are given. The effect of silica ablation on the radiative and convective surface heating is correlated with the ratio of the wall to free-stream mass flow. Correlations are also given for spectral distributions. The effect of newly obtained SiO radiation properties on the surface heating is examined. (Author)


A detailed investigation of attached supersonic turbulent boundary layers over an extensive range of Reynolds numbers (12 x 10 to the 6th to 314 x 10 to the 6th) is presented. Experimental measurements were obtained for adverse pressure gradients ranging in magnitude from those of previous investigations to those approaching separation. The measurements include mean values of surface pressure and skin-friction, mean-flow profiles, and profiles of the three turbulent velocity fluctuation components and turbulent shear stress. Numerical solutions employing three turbulence models of various degrees of complexity have been compared with the details of the measured flow fields. Generally, it was found that the more sophisticated turbulence models are superior to a simple length model for predicting the Reynolds number and pressure gradient effects. However, some details of the turbulent fluctuations as well as the exact Reynolds number trends indicated by the data were not accurately predicted with any of the turbulence models considered. (Author)
flow over an airfoil. Separation and reattachment points from numerical Navier-Stokes solutions agree with experiment within one boundary-layer thickness. Use of low-it-wall boundary conditions does not alter the predictions significantly. Applications of the model to other cases are contained in companion papers. (Author)


It is shown by quantum statistics that under certain stated conditions the entropy of coherent radiation is zero and it is still negligible for multimode laser operation. This makes possible gas lasers which, to a small extent, have already been observed or even utilized, but which can be greatly enhanced by an optimized choice of molecular structures and radiation conditions. Radiative cooling of gases is discussed in detail. The conditions for maximum heat withdrawal are derived, and it is proposed that the process of cooling and relaxation heating can be sufficiently separated in time to achieve certain effects and thermodynamic cycles. One of these is the complete conversion, possible in principle, of coherent radiation into work. This concept is based on a heat pump process followed by heat-to-work conversion, the heat rejected being just equal to that withdrawn by radiation. The conditions for complete conversion turn out to be the same as for maximum heat withdrawal. The feasibility of these processes depends on the degree to which practical conditions can be met, and on the validity of certain assumptions which have to await experimental verification. (Author)


A computational transonic wing design procedure has been developed and verified by a wind tunnel test of a variable camber semi-span wing model. The Baller-Ballhaus transonic potential flow analysis code linked to Vanderplaats's constrained minimization routine was used to optimize test configurations at 0.9 Mach number. Based on wind tunnel test results, computationally optimized designs were as efficient as the best configurations determined by previous parametric testing and performed better at off-design points. Wind tunnel test pressures agreed well with predictions from the improved Baller-Ballhaus code at moderate CL's. Computational optimization was shown to be an effective transonic wing design tool. (Author)


Experimental results for the response of ATJ graphite, Carbixite 100, and carbon phenolic to intense continuous-wave laser radiation are presented. Both penetration and mass-loss test techniques are used and compared. The results are also compared with a simple ablation theory applicable to laser irradiation. Reasons for the disparity between experiment and theory, and applicability of the results to other heating situations, such as planetary entry, are discussed. (Author)


A rapid numerical scheme is used to solve the complete mass-averaged Navier-Stokes equations for supersonic turbulent flow over a three-dimensional compression corner. A simple eddy viscosity model is developed, and the interaction of a swept shock wave and a three-dimensional turbulent boundary layer is studied. Good agreement is obtained between the present results and experimental measurements for the case of a wedge with an angle of 6 deg on a flat-plate sidewall. For the case of a 12-deg wedge angle, the computed results do not show the existence of a peak pressure found experimentally. However, the range of interaction, the peak pressure, and the peak heat transfer are closely predicted for all cases. The high heat transfer near the axial corner is due to the thinning of the boundary layer and inflow of fresh high-momentum fluid. The heat transfer is relieved through pressure reduction and boundary-layer thickening. (Author)


Data from two experiments on the development of the components of the Reynolds stress tensor after a sudden application of transverse strain are compared. Computations were based on four different turbulence models: a first-order mixing length model, a second-order two-equation eddy viscosity model, and two second-order Reynolds stress models. The second-order models do not produce dramatic improvements over the simple mixing length model. The Reynolds stress models still need development to represent the physics of shear-strained turbulence well. Finally, it is demonstrated that the assumption of a scalar eddyc viscosity, often used in engineering calculations of three-dimensional boundary layers, is quite reasonable.


Emission spectroscopy of shock-heated atomic silicon was performed in the spectral range 180 to 300 nm, in an environment simulating the ablation layer expected around a Jarvin entry probe with a silica heat shield. From the spectra obtained at temperatures from 6000 to 10,000 K and electron number densities from 1 quadrillion to 100 quadrillion per cm, the Lorentzian line-widths were determined. The results showed that silicon lines are broadened significantly by both electrons (Stark broadening) and hydrogen atoms (Van der Waals broadening), and the combined line-widths are much larger than previously assumed. From the data, the Stark and the Van der Waals line-widths were determined for 34 silicon lines. Radiative transport through a typical shock layer was computed using the new line-width data. The computations showed that silicon emission in the hot region is large, but it is mostly absorbed in the colder region adjacent to the wall. (Author)


Interferometric observations of key trace constituents of the stratosphere have been obtained. The NASA Lear Airborne Observatory with the Grumman airborne interferometer system was flown in the lower stratosphere at an altitude of 13.7 km to obtain transmission spectra in the 2800-6000 cm region at a resolution of 2.5 cm using the moon as a source. An atmospheric modeling program and the AFGL line parameter atlas are used to identify N2O, CH4, O2 and other trace constituents and to derive stratospheric column densities (molecules/cm). (Author)

A time-accurate finite-difference Naver-Stokes code has been used to calculate the viscous flow over a severely indented blunt body in a supersonic stream. An algebraic turbulence model is used and the results are compared with experimental data from wind-tunnel tests. Qualitative agreement is obtained for the surface pressure distribution and flow-field structure, including the separated bubble in the indented region. However, uncertainties still exist in the heating calculations, which are attributed to the turbulence model. For both laminar and turbulent calculations, the flow exhibits a fundamental unsteady character at a frequency of about 50 kHz.


A technique is described, by which a glass strip may be bent to match any curve of large radius of curvature, to a high degree of accuracy, so that it may be used as a glancing incidence X-ray or extreme ultraviolet optical element. The desired match is obtained by applying the optimum combination of end couples and by varying the cross-sectional moment of inertia along the length of the strip. A particular case, that of a parabola for use as a laboratory X-ray collimator, is considered in detail. The analysis predicts that a collimation of one or two arc seconds should be obtainable in practice, with simple and inexpensive apparatus. A prototype collimator is built for the testing of space payloads using geometric (McGrath) collimators is described and laboratory results presented.


It is proposed that the thermal velocity of a single atom could be measured in real time using a laser time-of-flight velocimeter (LTV) operating on the principle of laser resonance fluorescence. Theoretical data are presented for several atomic species that have resonances within the range of available dye laser systems. It is shown that measurements in the subsonic region are certainly feasible. The atoms could be either in vacuum or in a buffer gas, e.g., at atmospheric pressure. Measurements in the transonic and supersonic region also appear possible. One potential application is the measurement of flow speeds in wind tunnels, perhaps as high as Mach 45.


An occultation light curve can be analyzed to provide information about a planetary atmosphere: temperature, pressure, and number density profiles. The atmosphere of Mars is derived from a series of boundary layer equations, which invert equal increments of altitude (as opposed to time) in order to predict the noise quality of the occultation. Numerical results are given for a noisy isothermal light curve, with special attention to error analysis.


Asbestos reinforcing fibers in an automotive friction material was replaced by an experimental ingredient having better thermal stability, and the effects on wear and friction were studied. A friction materials test machine (SAE J691a) was used to determine friction and wear, under constant energy output conditions, as a function of temperature between 121 and 343.4°C (250 and 650°F). When potassium titrate fiber replaced one half of the asbestos in a standard commercial lining, with a 40% percent upward adjustment of phenolic resin content, wear above 294°C (400°F) was improved by 40% and friction by 30%. Tests on a full-scale inertial dynamometer supported the findings of the sample dynamometer tests. It was demonstrated that the potassium titrate fiber contributes directly to the improvement in wear and friction.


Exospheric neutral and electron temperatures have been estimated for the primitive upper atmosphere and ionosphere with various oxygen content in the scheme of our previous model (Shimizu and Shimagaki, 1976). The exospheric neutral temperature has been shown to be rather sensitive to the change of oxygen content, justifying our previous assumption for the temperature variation, while the exospheric electron temperature has been found to be quite sensitive to the compositional change, mainly owing to the strong dependence of electron density on the oxygen concentration.

A78-23576 * Quantum mechanical theory of collisional ionization in the presence of intense laser radiation. J. C. Bellum (Rochester University, Rochester, N.Y.) and T. F. George. Journal of Chemical Physics, vol. 68, Jan. 1978, p 134-144. 64 refs NSF Grant No. CHE-75-08779-A01; Contracts No. F44620-74-C-0073, No. F49620-78-C-0076.

The paper presents a quantum mechanical formalism for treating ionizing collisions occurring in the presence of an intense laser field. Both the intense laser radiation and the internal electronic continuum states associated with the emitted electrons are rigorously taken into account by combining discretization techniques with expansions in terms of electronic-field representations for the quasi-molecule-plus-photon system. The procedure leads to a coupled-channel description of the heavy-particle dynamics which involves effective electronic-field potential surfaces and continua. It is suggested that laser-influenced ionizing collisions can be studied to verify the effects of intense laser radiation on realistic collisional processes. Calculation procedures for electronic transition dipole matrix elements between discrete and continuum electronic states are outlined.


Measurements were made from a U-2 aircraft of profiles of CF2Cl2, CFCI3, C2F4 and NO2 in the lower stratosphere in a meridional survey at a longitude of 150 deg W during the period October 1 to November 14, 1976. The latitude distributions obtained show a marked decrease in mixing ratio with increasing
latitudes from about 7 deg N in the Intertropical Convergence Zone to about 79 deg N. The results suggest the importance of meridional transport and mixing in the stratosphere in accounting, at least in part, for the observed profile variation with latitude. The contaminants C2F4Cl2, C2FC3Cl, CHCCl3 and SF6 were also detected but their mixing ratios were small and no accurate standards were prepared for them.

B. J.


Consideration is given to the development of theories concerning the rings of Saturn. Particular attention is given to ring structure, noting its thinness, the separations between rings, and observed variations in brightness. Data gathered via infrared, radio and radar techniques are described in terms of ring particle composition and size. Hypotheses about ring origin and evolution are outlined, including the tidal disruption model; calculations of Saturn's gravitational contraction history, grazing, and meteoroid bombardment. Effects for future observations of Saturn's rings are reviewed, such as the variation in their radar reflectivity as a function of the tilt of the ring plane.

S.C.S.


A microparticle accelerator has been devised for micrometeoroid impact and cratering simulation; the device produces high-velocity (0.5-15 km/sec), micrometer-sized projectiles of any cohesive material. In the source, an electrodynamic levitator, single particles are charged by ion bombardment in high vacuum. The vertical accelerator has four drift tubes, each initially at a high negative voltage. After injection of the projectile, each tube is grounded in turn at a time determined by the voltage and charge/mass ratio to give four acceleration stages with a total voltage equivalent to about 1 MV. B. J.


The stars Alpha Aur (G5 III + C0 III), Alpha Boo (K2 IIip), Alpha Ori (M1-M2 Ia-IIa), Alpha Sco (M1.5 Iab), Mu Gem (M3 III), and Alpha Her (M5 Ib-II) have been observed using interference filters in five photometric bands between 1.25 and 3.25 microns during seven flights with NASA's Lear Jet Infrared Observatory. The filters were designed to measure molecular features, primarily from CO and CO2, and continuum fluxes. By calibrating the photometer in the laboratory against a stabilized blackbody source, relative flux curves have been derived. The energy distributions and the strength of molecular features are discussed. The most interesting result obtained is that the fluxes from Mu Gem and Alpha Her in the filter centered at 3.25 microns seem to be depressed by at least some tenth of a magnitude. Tentatively this depression is proposed to be due to the wings of the two vibration-rotation bands (about 2.7 microns) of hot water vapor. Since water vapor is an important opacity source and its abundance is a sensitive C/O indicator, the proposed interpretation makes renewed efforts to detect water bands in early M stars highly desirable.


The radar backscattering characteristics of compositional and structural models of Saturn's rings are calculated and compared with observations of the absolute value, wavelength dependence, and degree of depolarization of the rings' radar cross section (reflectivity). The doubling method is used to calculate reflectivities for systems that are many particles thick using optical depths derived from observations at visible wavelengths. If the rings are many particles thick, irregular centimeter-meter-sized particles composed primarily of water ice stay sufficiently high albedos and scattering efficiencies to explain the radar observations. In that case, the wavelength independence of radar reflectivity implies the existence of a broad particle size distribution; a narrower size distribution is also a possibility. Particles of primarily silicate composition are ruled out by the radar observations. Purely metallic particles may not be ruled out on the basis of existing radar observations. A monolayer of very large ice 'particles' that exhibit multiple internal scattering may not yet be ruled out.

A78-26070 * Dynamic MHD modeling of the solar wind disturbances during the August 1972 events M. Dryer, Z. K. Smith (NOAA, Space Environment Laboratory, Boulder, Colo.), R. S. Stenflo (Alabama, University, Huntsville, Ala.), E. J. Smith (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), J. H. Wolfe, J. D. Mihalov (NASA, Ames Research Center, Moffett Field, Calif.), P. Rosnaut (New York University, New York, N. Y.), and C. Costabal (JWPOF-76-2881)

A time-dependent one-dimensional MHD theoretical model is tested by using plasma and magnetic field observations of Pioneer 9 and Pioneer 10 during the August 1972 events on the sun and in the interplanetary medium. These spacecraft were nearly aligned along a common heliocentric radius during these events, considered now to be the most spectacular and best-documented events during solar cycle 20. The observations of Pioneer 9 at 0.78 AU were used as input for the theoretical model. The plasma and magnetic field forcing functions were superimposed upon a preexisting ambient solar wind at this inner boundary, and the response was simulated as far as 8 AU. The simulated output at 2.2 AU is compared directly with the Pioneer 10 observations at 2.2 AU. Qualitative comparison is good, although some limitations of the one-dimensional theory are noted.


Based on simultaneous measurements by Pioneer 11 of the 3-6 MeV Jovian electron flux, interplanetary magnetic field magnitude, and solar wind speed, the interplanetary transport of energetic particles is studied. It is found that corotating interaction regions (CIR's) greatly inhibit electron transport across the average field direction. Cross-field transport is also influenced by the degree of compression of the solar wind since CIR's are areas of compressed solar wind plasma. The propagation of Jovian electrons is studied by a model that includes the effects of CIR's. The model tests whether or not the three-dimensional connection-diffusion theory adequately describes the cross-field transport of electrons. The model is also valid for Jovian electron observations from earth-orbiting satellites. The model may be further applied to 1 AU from the sun where it is found that the cross-field diffusion of electrons explains why Jovian electrons are detected at the earth even during periods when the interplanetary magnetic field does not connect the earth directly to Jupiter.


Pioneer 11 has yielded data on approximately 100 energetic proton events at heliocentric distances between 1 and 2 AU. Measurements of absolute intensities, anisotropies, and crude energy...
spectra are studied in connection with interplanetary active regions (IAR's). It is found that in close vicinity to IAR's, the number of events observed per unit time interval is 10 times greater than in other areas of interplanetary space, and that the frequency of events has a maximum at plus or minus 5 hours of the time IAR edges are crossed. It is also noted that events in IAR vicinity have greater particle densities, softer energy spectra, and smaller time widths than other events. For many events associated with IAR's, particle anisotropies correspond to the net flow of particles along the interplanetary magnetic field toward the sun. This suggests that a mechanism in MHD shocks is responsible for local acceleration in the interplanetary medium.

A78-28350


The generalized Galerkin method (or the method of integral relations) is applied to the type of problem described by quasilinear parabolic equations. As an example the problem of nonlinear transient slab diffusion with a general reservoir boundary condition is worked out. The integral relations are given for an arbitrary number of strips, and solutions using up to seven strips have been obtained in order to investigate the convergence of the method.

A78-27744


Electronic-field representation is proposed as a technique for laser-assisted chemistry. Specifically, it is shown that several field-assisted chemical processes can be described in terms of mixed matter-field quantum states and their associated energies. The technique may be used to analyze the effects exerted by an intense laser on both bound and unbound molecular systems, and to investigate other field-induced effects including multiphoton processes, emission, and photodissociation.

A78-28936


A new metal-oxide-metal device (Ni-NiO-Ni, Edge MOM) which is stable, reproducibly fabricated, and with a 10 to the -10th cm tunneling area is presented. Performing detection experiments, the device's nonlinear I-V characteristic is shown to be invariant at audio frequencies, 10^(-6), 3.39, and 0.6328 microns. Similar devices with 10 to the -10th cm tunneling area perform as well as the Edge MOM's in the visible and the near-infrared range, but deteriorate in performance at the 10 microns range. A dominant competing effect is a thermal-induced signal, which increases with frequency and temperature. Coupling mechanisms at the various regimes are investigated. The device can serve as a broad-band detector and mixer, and might in the future be a basic element of broad-band amplifiers and oscillators.

Coupled time-dependent continuity-momentum and energy balance equations for the Venus ionosphere were simultaneously solved for CO2(+), O2(+), O(+), He(+), and H(+) densities and electron and ion temperatures for an altitude range of 120-500 km. Values of the solar zenith angle varied from 0 deg (subsolar point) to 90 deg (terminator). The calculations include the horizontal bulk transport of ions by neutral winds but not the horizontal diffusion. The two-stream photoelectron transport method was used to find the heating rates for the ambient electrons. Different boundary conditions were considered, and a nightside ionosphere was calculated. The results of these model calculations are in good agreement with measurements in the region of maximum electron density. Characteristics of topside and nightside densities and temperatures are discussed.

M. L.


An apparent solar-flare-generated shock wave detected by Pioneer-10 at 9.7 AU on April 9, 1978 is discussed. The shock wave may be correlated with a radio emission burst from Jupiter not associated with Io (March 30). The fact that solar flares observed on March 20 were at the central meridian with respect to Jupiter and Pioneer-10 and the fact that solar activity was very low before March 20 contribute to the argument that a shock wave had propagated to the region of the spacecraft.

J. M. B.


It is shown that correlation currents arising from the superposition of pairs of states on distinct sides of a potential barrier in metal-barrier-metal structures can result in inelastic tunneling through the emission of surface plasmons. Net gain of an externally excited plasmon field is possible.


Results are presented for an experimental study in which a 10-deg half-angle pointed cone model 57.9 cm long and made of magnesium (for lightness and minimization of material effects) is spun at several rates about an axis of symmetry. The model is spun in both directions, but most of the data presented are for the counter-clockwise rotation. The resulting side force is recorded on an oscillograph. It is shown that the side force observed occurs under the conditions of spin about the longitudinal axis, and that the general shape of the side-force curve with roll position does not depend strongly on spin rate. However, the peak-to-peak value of side force decreases substantially with spin rate, suggesting that the vortices producing the side force require a significant amount of time to change position and/or strength.

S. D.


A 33-GHz airborne radiometer system has been developed to map large angular scale variations in the temperature of the 3 K cosmic background radiation. A ferrite circulator switches a room-temperature mixer between two antennas pointing 60 deg apart in the sky. In 40 min of observing, the radiometer can measure the anisotropy of the microwave background with an accuracy of plus or minus 1 mK, or about 1 part in 3000 of 3 K. The apparatus is flown in a U-2 jet to 20 km altitude where 33-GHz thermal microwave emission from the atmosphere is at a low level. A second radiometer, tuned to 54 GHz near oxygen emission lines, monitors spurious signals from residual atmospheric radiation. The antennas, which have an extremely low side-lobe response of less than -65 dB past 80 deg, reject anisotropic radiation from the earth's surface. Periodic interchange of the antenna positions and reversal of the aircraft's flight direction cancel equipment-based imbalances. The system has been operated successfully in U-2 aircraft flown from NASA-Ames at Moffett Field, Calif.


Although the Navier-Stokes equations describe most flows of interest in aerodynamics, the inviscid conservation law equations may be used for small regions with viscous forces. Thus, Euler equations and several three-approximate finite difference procedures, explicit and implicit, are discussed. Although implicit techniques require more computational work, they permit larger time steps to be taken without instability. It is noted that the Jacobian matrices for Euler equations in conservation-law form have certain eigenvalue-eigenvector properties which may be used to construct conservative-coefficient matrices. This reduces the computation time of several implicit and semimplectic schemes. Extensions of the basic approach to other areas are suggested.

S. C. S.


A quantitative assessment is made of the long-term risk of earth reentrancy and reentry associated with aborted disposal of hazardous material in the space environment. Numerical results are presented for 10 candidate disposal options covering a broad spectrum of disposal destination and deployment propulsion systems. Based on representative models of system failure, the probability that a single payload will return and collide with earth within a period of 250,000 years is found to lie in the range 0002-006. Proportionately smaller risk attaches to shorter time intervals. Risk-critical factors related to trajectory geometry and system reliability are identified as possible mechanisms of hazard reduction.

A78-32467 * Bar-driven spiral waves in disk galaxies. J. M. Huntley (NASA, Ames Research Center, Moffett Field, Calif.; Virginia, University, Charlottesville, Va.), R. H. Sanders (Pittsburgh, University, Pittsburgh, Pa.), and W. W. Roberts, Jr. (Virginia, University, Charlottesville, Va.)
The response of rotating disks of gas to barlike perturbations in galactic gravitational fields is investigated. In particular, two-dimensional time-dependent numerical hydrodynamical calculations have been performed in order to determine the steady-state response of disks of gas to rotating barlike perturbations. Two types of barlike perturbations are considered: spiral waves. The local phase of the gas response is primarily a function of disks of gas to rotating barlike perturbations. Two types of barlike perturbations have been performed in order to determine the steady-state response of disks of gas to rotating barlike perturbations. The calculations reveal that the absence of gaseous self-gravity, a viscous differentially rotating disk of gas responds to a rotating barlike perturbation by forming a central gas bar with two trailing spiral waves. The local phase of the gas response is primarily a function of the principal resonance in the disk. This result may be understood in terms of particle orbit theory. The gas response to barlike perturbations also depends on the relative strength and the effective axial ratio of the bar. In these calculations strong narrow bars produce offset shocks in the central region molecules and CO(+) + CH4, N2(+), and N2(+) + CO2 collisions are reported, and a simple model of collisions is discussed. The cross sections were measured to within about 1 eV of their thresholds. Specific reaction channels were investigated by referring to mass spectrometric identification of the product ions scattered in the forward direction, and these product ion identifications were used to explain characteristic structures in the total charge production cross sections. The extent of the importance of dissociative ionization and 'simple' ionization in the studied collisions at low energy is considered, and charge transfer cross sections for (CO)+ + CO, (CO)+ + CH4, and N2(+) + CH4 are presented.

A78-34352 * A note on the diurnal averaging of anomalously models. R. P. Turco (R & D Associates, Marina del Rey, Calif.) and R. C. Whitten (NASA, Ames Research Center, Moffett Field, Calif.). Journal of Atmospheric and Terrestrial Physics, vol. 40, Jan. 1976, p. 13-20. 6 refs. An approximate technique for diurnally time-averaging atmospheric photochemical-dynamical models which eliminates the need for a detailed numerical resolution of sunrise and sunset transitions is developed. The scheme is equivalent to scaling certain chemical rate constants and photodissociation coefficients by appropriate atmospheric factors. To calculate the scaling factors, diurnal variations are parameterized with a step-function behavior, assuming that each species has a constant day-time and night-time concentration whose ratio can be determined by analyzing the chemical interactions occurring after sunset. The solution accounts for the effects of nighttime reactions on the 24 h average values of species abundances, and on the average daily rates of the catalytic processes consuming ozone in the stratosphere. The accuracy of the technique is demonstrated by comparing its predictions to those of a full diurnal simulation; typically, the precision is better than 10%. By contrast, it is shown that the use of some other well-known computational schemes can result in significantly larger predictive errors. (Author)


Iron and nickel-iron samples subjected to treatment by an arcoheated plasma of melted earth were used to model meteor ablation. The artificial ablation debris and fusion crusts were compared to the fusion crusts of three natural iron meteorites and to magnetic spherules from deep-sea manganese nodules. An outer discontinuous crust of magnetic and vesicular, followed by an unoxidized metallic zone, was observed in the artificially produced samples. Fractions of loss of volatile elements was also noted. (Author)


Cerenkov counters on the Pioneer 10 and 11 spacecraft, capable of detecting alpha particles and protons with energies up to 850 MeV, and nucleons and electrons with energies up to 6 MeV, have yielded data on cosmic ray anisotropies during periods of low solar activity. Observations from Pioneer 11 place east-west anisotropy at 0.41 plus or minus 0.11%, and the north-south anisotropy near zero. Pioneer 10 results show east-west anisotropies of approximately 0.59 plus or minus 0.18%, and the north-south component at 0.25 plus or minus 0.08%. It is noted that the Pioneer 10 observations were obtained at the 6 AU range, while those from Pioneer 11 originated closer to the sun (1.1 to 2.7 AU). Attention is given to the ratio of the perpendicular to parallel components of the diffusion coefficient, and to the large north-south anisotropy reported by Pioneer 10, an effect due possibly to gradient drift, and to an additional streaming independent of the magnetic field polarity.

A79-34062 * Semiempirical theory of unimolecular dissociation induced by a laser field. J.-M. Yuan (Rochester, University, Rochester, N.Y.) and T. F. George, Journal of Chemical Physics, vol. 68, Apr. 1, 1978, p. 3040-3052. 72 refs. NSF Grant No. CHE-75-0775-A01; Contracts No. F44620-74-C-0073; No. F49620-78-C-0005, Grant No. NSF-2189.

A semiclassical repertorium theory of direct photodissociation in a laser field is developed in which photon absorption and dissociation are treated in a unified fashion. This is achieved by visualizing nuclear dynamics as a representative particle moving on an electronic field. Methods are described for calculating dissociation rates and probabilities by Monte Carlo selection of initial conditions and integration of classical trajectories on these surfaces. This unified theory reduces to the golden rule expression in the weak-field and short-time limits, and predicts nonlinear behavior, i.e., breakdown of the golden rule expression in intense fields. Field strengths above which lowest-order perturbation theory fails to work have been estimated for some systems. Useful physical insights provided by the electronic-field representation have been illustrated. Intense field effects are discussed which are amenable to experimental observation. The semiclassical methods used here are also applicable to multiple-surface dynamics in field-free unimolecular and bimolecular reactions.


Nitric oxide and ozone concentrations in the lower stratosphere have been measured from a high-altitude research aircraft using in situ measuring techniques. Results of several geographical surveys are presented along with predictions of two two-dimensional stratospheric models. Meridional and zonal data were obtained in June
1974 and in June, July, and August 1975. At longitudes 172-150 deg W the meridional data taken between 5 and 80 deg N latitude show an increasing NO concentration with latitude, by a factor of 4 at 21 km altitude and a less marked increase at 18 km. The minimum NO concentration at 21 km is observed at 5 deg N latitude and is about 6 x 10^4 to the 8th power/cm^2. Zonal data at latitudes 22-38 deg N taken from 65 to 178 deg N longitude show little variation of the NO and O3 concentrations with longitude. (Author)

A78-35901 * # A method was developed for evaluation and prediction of effects of oxidation of the graphite substrate on structural properties of Reinforced Carbon-Carbon (RCC) thermal protection materials. Test specimens of RCC material were exposed to successive periods of convective heating in a plamalet facility to simulate the chemical reactions of Shuttle atmospheric entry. After each period of testing, the test specimen mass loss and performance in a nondestructive flexure test were determined. A computational model of the RCC specimen was developed for the NASA Structural Analysis (NASTRAN) program and validated by comparison of calculated and experimental results of flexure tests. The elastic modulus and ultimate loads in tension and compression were then computed for various levels of substrate oxidation. (Author)


A78-36040 * # A UV technique is presented for evaluating the adsorption-desorption properties of UHV vapor-deposited metal particles supported on insulating substrates. Desorption studies of CO from particulate and continuous Pd films supported on mica were performed. The desorption results indicate that the CO desorption energies from the deposited metals are much lower than those from bulk single crystals, two desorption states exist for the vapor-deposited films, and the energy desorption peak of the vapor-deposited films is coverage dependent. Possible reasons for the difference between previously reported CO desorption studies on bulk substrates and the present results are discussed. (Author)


providing continuous and slightly concentrated ablation, makes on the economic viability of solar farming is demonstrated New developments in solar sailing are incorporated to reduce mirror mass and transportation cost The system is compatible with incremental implementation and continual expansion to produce the world's power needs Key technology, environmental, and economic issues and payoffs are identified SOLARES appears to be economically superior to other advanced, and even conventional, energy systems and could be scaled to completely abate our fossil fuel usage for power generation. (Author)


Large-scale self-consistent-field plus configuration-interaction calculations have been performed for the 3Pi and d 3Pi g states of C2 The theoretical potential curves are in good agreement with those found by a Klein-Dunham analysis of measured molecular constants in terms of shape and excitation energy. The sum of the squares of the theoretical transition moments between the lowest excited states is 2,44 bohr a.u which agrees with the results of shock tube measurements The variation in the sum of the squares of the theoretical moments with internuclear separation agrees with the data of Danylewych and Nicholls (1974). Based on the data for C2 and other molecules in the same series of experiments, it is suggested that C1 calculations using Hartree-Fock or quality Slater basis sets produce highly reliable transition moments. - S.C.S.


The effect of initial probe heatshield shape on the total probe mass loss during jovian orbit is considered Modification of the aerothermal environment and probe entry trajectory due to changing probe heatshield shape is included in a computerized technique designed for rapid assessment of the effect of probe initial shape on heatshield mass loss Results obtained indicate the importance of trajectory and heating distribution coupling with probe shape and mass change. (Author)


The ablation of carbonaceous materials in a hydrogen-helium stream has been simulated using a charring materials ablator computer code These results are compared with the first ablation data to be obtained from the Ames-NASA Giant Planet Pilot Facility Test stream diagnostics and ablation effects on convective and radiative heat transfer are discussed since these parameters constitute important input data to the numerical simulation Graphite ablation was predicted to within 10 to 20%, and carbon-phenoIc somewhat less accurately. (Author)


The thermal control system developed for the Large Atmospheric Probe of the Pioneer Venus Multiprobe Mission is described The scope of the thermal control task requires maintaining the probe internal equipment shelf temperatures within a nonoperating range of -40 to 122 F and an operating range of -4 to 122 F during three different mission phases (1) prepassage, the transit phase of the mission when the probe is attached to the Multiprobe Spacecraft Bus (2) postseparation, the free-flight cruise phase of the mission following release from the Bus, and (3) descent, the phase of the mission from entry equipment turn-on to impact on the Venus surface Thermal control for these phases is achieved by a combination of passive thermal finishes on the probe exterior surfaces and heaters mounted on the equipment shelves. Verification of the adequacy of the total thermal design to meet all mission requirements has been completed. - B.J.


In a study of rigidity-independent coronal propagation processes, data on the azimuthal variation of the solar proton/alpa-particle ratio were obtained. Sources for the data included a statistical analysis of events observed by Heos-2, a comparative study of events recorded by both Heos-2 and Pioneer-10 and -11, and a multiday survey of individual events observed by Heos-2 and Pioneer-10. The statistical investigation of Heos-2 events reveals an increase of the lower value of the proton/alpha-particle ratio away from the well-connected region The data from one or two spacecraft connected at different heliopointitudes indicates no azimuthal dependence of the proton/alpha-particle ratio All the data appear to suggest rigidity-independent propagation or escape processes. J.M.B


Recent sensitive searches for H-alpha emission from ionized novae in globular clusters have set upper limits that conflict with theoretical predictions. It is suggested that nova outbursts heat the gas, producing winds that resolve this discrepancy. The incidence of novae in globular clusters, the conversion of kinetic energy of the nova shell to thermal energy of the intracluster gas, and the characteristics of the resultant winds are discussed Calculated emission from the novadriver models does not conflict with any observations to date Some suggestions are made concerning the most promising approaches for future detection of intracluster gas on the basis of these models. The possible relationship of nova-driven winds to globular cluster X-ray sources is also considered. (Author)


The indicial method for calculating flutter derivatives for two-dimensional airfoils at transonic speeds is discussed, with particular attention given to the effect of a moving shock on the flow variables in the indicial method An expression for the pressure coefficient is developed on the basis of an explicit treatment of the shock motion, the pressure distribution may then be calculated for general oscillations through use of the indicial method Explicit inclusion of the shock motion is not necessary if only the lift and pitching moment coefficients are desired. - J.M.B.

The most striking feature of the night sky in the tropics is the zodiacal light, which appears as a cone in the west after sunset and in the east before sunrise. It is caused by sunlight scattered or absorbed by particles in the interplanetary medium. The zodiacal light is the only source of information about the integrated properties of the whole ensemble of interplanetary dust. The brightness and polarization in different directions and at different colors can provide information on the optical properties and spatial distribution of the scattering particles. The zodiacal light arises from two independent physical processes related to the scattering of solar continuum radiation by interplanetary dust and to thermal emission which arises from solar radiation that is absorbed by interplanetary dust and reemitted mainly at infrared wavelengths. Attention is given to observational parameters of zodiacal light, the methods of observation, errors and absolute calibration, and the observed characteristics of zodiacal light.

G.R.


The 1 to 5.6-micron spectrum of the carbon star Y CVn is presented and discussed. The observations were made from the Kulper Airborne Observatory at an altitude of 12.5 km, thereby avoiding most of the absorption due to terrestrial water vapor. Comparison of Y CVn near 5 microns with laboratory spectra provides possible evidence for the presence of the linear acetylene molecule C3. For the first time in a carbon star the clearly formed band heads of the CN radial system between 1.2 and 2.3 microns are observed. Corroborative evidence for the presence of the molecules HCN, HCN, and C2H2 is presented, and the relative contributions of C3, HCN, and C2H2 to the 3-micron absorption band are discussed. Spectra of other carbon stars, TX Psc and S Cap, are presented for comparison.


The heat transfer to the stagnation point of an ablating carbonaceous heat shield, where both the gas-phase boundary layer and the heterogeneous surface reactions are not in chemical equilibrium, is examined. Specifically, the nonequilibrium changes in the mass fraction profiles of carbon species calculated for frozen flow are studied. A set of equations describing the steady-state, nonequilibrium laminar boundary layer in the axisymmetric stagnation region, over an ablating graphite surface, is solved, with allowance for the effects of finite rate of carbon vaporization.


A steady-state analysis of the current circuit between Io and the Jovian atmosphere is performed, assuming that the current is carried by electrons accelerated through potential double layers in the Io flux tube. The circuit analysis indicates that electrons may be accelerated up to energies of several hundred keV. Several phenomena associated with the formation of double layers are also discussed. The parallel potential drops decouple the flux tube from the satellite's orbital motion.


NO, HNO3, and O3 levels and air temperature were measured as a function of latitude in the 18 to 21 km region of the stratosphere, and the sum of odd nitrogen, equal to NO + NO2 + HNO3, was calculated and compared with model predictions (NO2 values were inferred from photochemical equilibrium characteristics). The data show that NO measurements generally exhibit good agreement with model predictions for low and midlatitudes but poor agreement at high latitudes. The experimental sum of odd nitrogen mixing ratios and model predictions agree within a factor of 2-1/2 or better at both 20 and 40 deg N, and show excellent agreement for latitudinal dependence.


Direct real-time gas chromatographic measurements of CF2Cl2, CFC13, CC14, and NO2 were made at latitudes from 74 deg N to 62 deg S aboard a NASA Convair 990 as part of the 1978 NASA CV-890 Latitude Survey Mission between Alaska and New Zealand. A difference was found in the average mixing ratios of CF2Cl2 and CFC13 between the Northern and Southern Hemispheres, but no differences were noted for CC14 and NO2. The results support some of the previous studies of interhemispheric tropospheric gradients and suggest the lack of any significant tropospheric sinks.


Relative toxicity data on the pyrolysis products of a variety of thermoplastic and thermoset polymers are presented. The data are presented in terms of time to incapacitation and time to death with a fixed sample weight of 10 g, and in terms of the apparent lethal concentration required to produce 50 percent mortality within a fixed exposure period of 30 min.


Some of the wide variations in the crater-size distributions in lunar photography and in the resulting statistics were interpreted as different degradation rates on different surfaces, different scaling laws in different targets, and a possible population of endogenic craters. These possibilities are reexamined for statistics of 26 different regions. In contrast to most other studies, crater diameters...
as small as 0.5 m were measured from enlarged Lunar Orbiter frames. According to the results of the reported analysis, the different crater distribution types appear to be most consistent with the hypotheses of differential degradation and a superposed crater population. Differential degradation can account for the low level of equilibrium in inhomogeneous materials such as ejecta deposits, mantle deposits, and deep regoliths where scaling law changes and catastrophic processes introduce contradictions with other observations.

G R


A78-41826  * An implicit algorithm for the conservative transonic full potential equation using an arbitrary mesh. T. L. Holst (NASA, Ames Research Center, Moffett Field, Calif.) American Institute of Aeronautics and Astronautics, Fluid and Plasma Dynamics Conference, 11th, Seattle, Wash., July 10-12, 1978, Paper 78-1113. 13 p. 10 refs. A new, implicit approximate factorization (AF) algorithm designed to solve the conservative full-potential equation for the transonic flow past arbitrary airfoils has been developed. The new algorithm uses an upwind bias of the density coefficient to provide stability in the transonic region. This allows the simple two- and three-band matrix form of the AF scheme to be retained over the entire flow field, even in regions of transonic flow. A numerical transformation is used to establish an arbitrary body-fitted finite-difference mesh. Aerodynamic pressure distributions have been computed and are in good agreement with independent results.


The primary objective of the reported investigation is the computational verification of the experimental results obtained by Satas and Daywitt (1978). Two existing computer codes were used to compute the supersonic flow field surrounding the external angular corner. For the inviscid and turbulent flow results, the unstable, three-dimensional implicit code of Pulliam and Steger (1978) was used. For the laminar flow results, the unsteady two-dimensional explicit procedure of Vigneron et al. (1977) was employed. Inviscid solutions for a symmetric configuration with a rounded corner resulted in either single or triple surface crossflow stagnation point flows, depending on the corner radius. Numerical results obtained for the same symmetric configuration tested experimentally show the crossflow in the vicinity of the corner to be away from the corner and thus in agreement with the experimental oil flow results.

G R


Two complementary procedures have been developed to calculate the viscous supersonic flow over conical shapes at large angles of attack, with application to cones and delta wings. In the first approach, the flow is assumed to be conical and the governing equations are solved at a given Reynolds number with a time-marching explicit finite-difference algorithm. In the second method, the parabolized Navier-Stokes equations are solved with a space-marching implicit Runge-Kutta algorithm. This latter approach is not restricted to conical shapes and provides a large improvement in computational efficiency over published methods. Results from the two procedures agree very well with each other and with available experimental data.

A78-41858  * An evaluation of several compressible turbulent-boundary-layer models. Effects of pressure gradient and Reynolds number. C. C. Horstman, M. I. Kustov, and M. J. Lanfranco. (NASA, Ames Research Center, Moffett Field, Calif.). American Institute of Aeronautics and Astronautics, Fluid and Plasma Dynamics Conference, 11th, Seattle, Wash., July 10-12, 1978. Paper 78-1160. 11 p. 12 refs. Comparisons, employing several turbulence models, are compared with a series of attached supersonic turbulent boundary-layer experiments over an extensive range of Reynolds numbers (11.7 x 10^6 to the 6th to 314 x 10^6 to the 6th). These experiments included measurements of surface pressure and skin friction for adverse pressure gradients ranging in magnitude from those of previous investigations to an order of magnitude greater. The turbulence models evaluated include algebraic and two-equation eddy-viscosity models and two full Reynolds stress models. In general, all the models tested performed well independently of the magnitude of the pressure gradient or Reynolds number and could predict the measured skin friction for most cases with sufficient accuracy for engineering purposes.

A78-41863  * Comparison of multiequation turbulence models for several shock-separated boundary-layer interaction flows. J. R. Vegas and C. C. Horstman (NASA, Ames Research Center, Moffett Field, Calif.). American Institute of Aeronautics and Astronautics, Fluid and Plasma Dynamics Conference, 11th, Seattle, Wash., July 10-12, 1978. Paper 78-1165. 21 p. 27 refs. Several multiequation eddy-viscosity models of turbulence are used with the Navier-Stokes equations to compute three classes of experimentally documented shock-separated turbulent boundary-layer flows. The types of flow studied are (1) a normal shock at transonic speeds in both a circular duct and a two-dimensional channel; (2) an incident oblique shock at supersonic speeds on a flat surface, and (3) a two-dimensional compression corner at supersonic speeds. Established zero-equation (algebraic), one-equation (kinetic energy), and two equation (kinetic energy plus length scale) turbulence models are each utilized to describe the Reynolds shear stress for the three classes of flows. These models are assessed by comparing the calculated values of skin friction, wall pressure distribution, velocity, Mach number, and turbulent kinetic energy profiles with experimental measurements. Of the models tested, the two-equation model results gave the best overall agreement with the data.


An experimental study has been carried out to detail the interaction of a compressible turbulent boundary layer with shock waves of varying strengths. The interaction was produced by two-dimensional compression corners of 8, 16, 20, and 24 deg angles. The incoming boundary layer had an edge Mach number of 2.05 and
a Reynolds number of 1.7 million based on overall thickness. Detailed mean-flow and surface measurements are presented for the four corner angles. The 8 deg corner flow was found to be fully attached, while the 16 deg case was near incipient separation. Both the 20 deg and 24 deg corners produced significant flow separation regions. In the discussion of these results, emphasis is placed on the development of flowfield properties from attached to separated conditions. Comparisons made with a computational solution of the Navier-Stokes-equations show good agreement when the corner flow is not separated (Author).


An experimental investigation of the effect of tangential air injection, when the injection slot is located inside of what would otherwise have been the dead air zone in a separated flow, in controlling shock-induced turbulent boundary layer separation is presented. The experiments were carried out at a free-stream Mach number of 2.5 in the separated flow induced by a compression corner with a 20 deg angle. The observations made were wall static pressures, pitot profiles, and schlieren visualizations of the flow. The results show that the present-location for injection is more effective in suppressing boundary-layer separation than the more conventional one, where the slot is located upstream of where separation would occur in the absence of injection (Author).


Aerodynamic properties of artillery shell such as normal force and pitching moment reach peak values in a narrow transonic Mach-number range. In order to compute these quantities, numerical techniques have been developed to obtain solutions to the three-dimensional transonic small disturbance equation about slender bodies at angle of attack. The computation is based on a planar relaxation technique involving Fourier transforms to partially decouple the three-dimensional difference equations. Particular care is taken to assure accurate solutions near corners found in shell designs. Computed surface pressures are compared to experimental measurements for a large sphere and cone cylinder bodies which have been selected as test cases. Computed pitching moments are compared to range measurements for a typical projectile shape (Author).


It is suggested that, if primitive Mars had a reducing-atmosphere composed mainly of methane, the atmosphere could be polymerized by solar ultraviolet radiation to produce higher hydrocarbons. These compounds, which would be low-viscosity liquids at present temperatures on Mars, could have contributed to the formation of channels. The Martian atmosphere model used in the analysis is similar to Stucken's (1977) but that assumption limited. Major receptors for this early Martian atmosphere are examined, and the number densities of the lighter alkanes in the lower atmosphere of Mars are determined. Since the photochemical mechanism investigated here would provide only a modest amount of fluid for a comparatively brief period of time (10-100 million years), liquid alkanes would not be the major factor in the formation of the channels, although their derivatives could contribute to the greenhouse effect or depress the freezing point of water (Author).


An exploratory study, dealing with the preparation of well-defined particulate metal deposits that can be used in model studies of catalytic reactions, was performed. Small metal particles of Fe and Pb were grown in situ in an electron microscope by vapor deposition onto different phase of electron transparent alumina substrates. The results show that characteristic properties of the deposits, such as particle density, size distribution, habit, and orientation, are strongly dependent on the cleanliness, phase, and crystallographic orientation of the alumina substrate; also, the deposition conditions can be chosen in such a way as to reproducibly manipulate the overall deposit structure (Author).


The present paper deals with the conditions of explosion or nuclear cratering required to simulate impact crater formation. Some planetary problems associated with three different aspects of crater formation are discussed, and solutions based on high-explosion data are proposed. Structures of impact craters and some selected explosion craters formed in layered media are examined and are related to the structure of lunar basins. The mode of ejection of material from impact craters is identified using explosion analogs. The ejection mode is shown to have important implications for the origin of material in crater and basin deposits. Equally important are the populations of secondary craters on lunar and planetary surfaces (Author).


An experimental study is conducted on 12.5-mm-thick SAE 1020 steel (plain carbon steel) plate to assess hydrogen attack at room temperature after specimen exposure at 525 C to hydrogen and a blend of hydrogen sulfide and hydrogen at a pressure of 3.5 MN/m² for exposure times up to 240 hr. The results are discussed in terms of test specimens, material behavior, and service scales. It is shown that hydrogen attack from a high-purity hydrogen environment is severe, with the formation of numerous manganese sulfide and sulfides along with a significant reduction in the room-temperature tensile...
yield and ultimate strengths. However, no hydrogen attack is observed in the hydrogen/hydrogen sulfide blend environment, i.e., no fissure or bubble formation occurred and the room-temperature tensile properties remained unchanged. It is suggested that the observed porous discontinuous scale of FeS acts as a barrier to hydrogen entry, thus reducing its effective equilibrium solubility in the iron lattice. Therefore, hydrogen attack should not occur in pressure-vessel steels used in many coal gasification processes. S.D.

A78-44773


The paper presents model calculations for the Cytherean nighttime and daytime ionosphere. It is shown how some of the proposed mechanisms can be tested with the aid of the Pioneer Venus observations scheduled for December 1978. Theoretical calculations of the energetics of the Cytherean ionosphere are performed, and it is concluded that the Project Venus measurements will find elevated ion and electron temperatures, resulting primarily from energy fluxes associated in some way with the solar wind. According to this model, the energy flux will act directly on the ion gas. Ultraviolet dayglow intensities were calculated, and it is anticipated that this model of CO2-related emission features will be observed. Nighthide ionosphere calculations were made assuming the precipitation of energetic electrons as an ionization source, and the intensities of some of the resulting emission features are calculated.

A78-44775


An error in Pioneer 11 data reduction software has, when present, caused a phase shift of 180 deg in the assignment of spacecraft roll angles. The corrected analysis of the pitch angle distributions of energetic particles in Jupiter's magnetosphere reveals significant proton anisotropies directed toward the planet in the southern hemisphere, contrary to the authors' (1975) original report. In the northern hemisphere, both proton and electron anisotropies are directed away from the planet, as reported previously. The revised data show that the claim of direct evidence for the hypothesis of recirculation of energetic particles in the Jovian magnetosphere is invalid. It is suggested that indirect evidence still supports the hypothesis, although the recirculation process must be weaker than originally envisioned and obscured by other processes.

A78-45128


Advances in computational fluid dynamics are paced by simulation methodology and computer resources. Examples of three-dimensional fluid dynamic simulations are presented to illustrate recent developments in equation modeling and numerical methods and to point out the need for increased computer power. Electronic technology dictates that to fill this need, computer scaling will be based on parallel processing principles. The identification of parallelism in three dimensions is illustrated by examining an implicit, approximate-factorization approach to the Navier-Stokes equations. Finally, two computer concepts aimed at satisfying the demands of the three-kilowatt Reynolds-averaged Navier-Stokes simulations are discussed.

A78-45127


A new method for the design of shock-free supersonic airfoils, wings, and three-dimensional configurations is described. Results illustrating this procedure in two and three dimensions are given. They include modifications to part of the upper surface of an NACA 64A410 airfoil that will maintain shock-free flow over a range of Mach numbers for a fixed lift coefficient, and the modifications are required on part of the upper surface of a swept wing with an NACA 64A410 root section to achieve shock-free flow. While the results are given for inviscid flow, the same procedures can be employed iteratively with a boundary layer calculation in order to achieve shock-free viscous designs. With a shock-free pressure field the boundary layer calculations will be reliable and not complicated by the difficulties of shock-wave boundary-layer interaction.

A78-45124


An implicit finite-difference method has been developed to compute two-dimensional turbulent, blunt body flows with an impinging shock wave. The full time-averaged Navier-Stokes equations are solved with algebraic eddy viscosity and turbulent Prandtl number models employed for shear stress and heat flux. The irregular-shaped bow shock is treated as a discontinuity across which characteristics of the flow field resulting from the motion and computes the asymmetric shock shape, crossflow and streamwise heat transfer, crossflow separation and vortex structures. The side force and moment are also computed. Reasonably good agreement is obtained with the side force measurements of Schiff and Tobok. Comparison is also made with the available numerical inviscid analysis. It is found that the asymmetric pressure loads due to oblique motion are much larger than all other viscous forces due to spin and coning, making viscous forces negligible in the combined motion.

A78-45168


A study is made of the amplitude and spectral extent of whistler mode noise in the inner magnetosphere of Jupiter. It is found that the 'hat-shaped' pitch angle distributions of energetic electrons (21 and 31 MeV at L=5) are consistent with those predicted in the presence of a band-limited spectrum of whistler mode noise. The equatorial maximum linear growth rate of parallel propagating whistlers is consistent with those necessary to limit the energetic electron intensities by the whistler mode instability. It is noted that...
the wave phase speeds before wave reflection can occur at high
latitudes and that wave growth is limited to a disk-like region
centered around the magnetic equator. The frequency extent of
the whistler mode noise spectrum may be estimated by the range of
frequencies maximally unstable to equatorial linear growth A value
is found for the spectral density of the broadband whistler mode
noise necessary to balance radial diffusion of energetic electrons
above the critical range, and an expression is derived for the energetic
electron system response to fluctuations about the limiting flux
value. S C S

A78-45475 * The relative free resistance of select thermo-
plastic materials D. A. Kourtides and J. A. Parlor (NASA, Ames
Research Center, Moffett Field, Calif.). Plastic Design and Processes,
Apr 1978 p 1 11 refs

The relative thermal stability, flammability, and related thermo-
chemical properties of some thermoplastic materials currently
used in aircraft interiors as well as of some candidate thermoplastics
were investigated. Currently used materials that were evaluated include
cyclonitrile butadiene styrene, bisphenol A polycarbonate, poly-
phenylene oxide, and polyvinyl fluoride Candidate thermoplastic
materials evaluated include: poly-4-hydroxyphenylenevifluorene
poly carbonate-poly(dimethylsiloxane) block polymer, chlorinated
polyvinylchloride homopolymer, phenolphthalein polycarbonate,
polyethersulfone, polyphenylene sulfide, polyarylsulfone, and poly-
vinyldiene fluoride M.L.

A78-45983 * Semirigorous bounds for the dipole moments
and transition moments of the LM molecule S. R. Langhoff and D
P Chong (NASA, Ames Research Center, Moffett Field, Calif.),
Journal of Chemical Physics, vol 69, July 1, 1978, p. 194-199 42
refs

Semirigorous error limits for the dipole moments and transition
moments of LM at R = 3.016 bohr are reported. Wrenholm's formu-
las for the upper and lower bounds to transition moments is extended
to include transitions between states of the same symmetry, and
Chong's (1978) semirigorous expression for the lower bound to the
overlap between the approximate and the true wavefunctions is
applied to the calculation. The semirigorous theory of Chong
was also generalized in the sense that the zero-order wavefunction
was allowed to contain many configuration state functions instead of just
the Hartree-Fock or first natural configuration state function M. L.

A78-46380 * The numerical solution of viscous flows at
high Reynolds number R W MacCormack (NASA, Ames Research
Center, Computational Fluid Dynamics Branch, Moffett Field, Calif.)
In Heat Transfer and Fluid Mechanics Institute, Meeting,
26th, Pullman, Wash., June 26-28, 1978, Proceedings (A78-
219-221, 16 refs.

A review is presented of implicit and hybrid methods applicable
to solving viscous flows at high Reynolds numbers Flows within
axysymmetric channels containing stationary shock waves, past
blunt-nosed lifting airfoils, past sharp-nosed symmetric airfoils with
buffet, past three-dimensional compression ramps with side walls,
and past ogive- and hemispheroids at angles of attack have been
examined with Reynolds numbers as high as 10 to the 9th power have
been used. S C S

A78-46557 * Entry dynamics performance predictions for
Pioneer Venus probes R D McClay (General Electric Co, Re-Entry
and Environmental Systems Div, Philadelphia, Pa.) In Atmospheric
Flight Mechanics Conference, Palo Alto, Calif., August 7-9, 1978,
Technical Papers (A78-46526 20 68) New York, American Institute
of Aeronautics and Astronautics, Inc., 1978, p. 286-293, 8 refs
Contract No. NAS-8300 (AIAA 78-1370)

The scientific experiments planned for the Pioneer Venus entry
probes require that the probes provide a stable platform at a
controlled roll rate throughout the atmospheric phase of the mission
The 45-degree half-cone forebody common to both the small and
large probe configurations provides a design which meets all stability
and attitude requirements. The uncertainty in the dynamic stability
parameter coupled with the possible variability of roll rate due to
ablation induced roll torques could, however, result in slight angle
of attack divergence in the transonic flight regime. Minimum roll rate
requirements on the small probe are passively achieved by a vane
mounted on the pressure-temperature sensing arm. The vane was
used to provide minimum dynamic disturbance. (Author)

S C S

A78-47272 * A short history of Pulkovo Observatory, K.
Krivzunov (NASA, Ames Research Center, Moffett Field, Calif.)

A78-48112 * The radii of Uranian rings alpha, beta, gamma,
delta, epsilon, etc, are 5, and 6 from their occultations of SAO
158887, J. L. Elliott, E. Durham (Cornell University, Ithaca, N Y),
L H Wasserman, R. L. Millis (Lowell Observatory, Flagstaff, Ariz),
and J. Juruns (South African Astronomical Observatory, observa-
1978, p. 880-892, 30 refs. NSF Grant No. AST-76-14932, Grants
No. NASA-2174, No NGR-03-003-001

All available timing data for the occultations of SAO 158887 on
March 10, 1977, by the outer rings of Uranus are analyzed
Least-squares fits to the data are performed using a model which
postulates that rings alpha, beta, gamma, and delta are circular and
co-planar. A solution obtained under the assumption that the ring
plane coincides with the plane of the satellite orbits is adopted which
yields radii of 44,844 km for ring alpha, 45,799 km for ring beta,
47,746 km for ring gamma, and 48,423 km for ring delta. The uncertain-
ties in these values are discussed along with the apparent shapes and
inclinations of these main rings. The mean radii estimated for the other
rings are 47,323 km for ring eta, 12,663 km for ring 4, 42,390 km for
ring 5, and 41,980 km for ring 6. F. G. M.

A78-48291 * The spiral field inhibition of thermal conduc-
tion in two-fluid solar wind models. S. Nerney and A. Barnes
(NASA, Ames Research Center, Space Sciences Div., Moffett Field, Calif.)
3729-3738, 28 refs.

The paper reports on two-field models which include the
inhibition of thermal conduction by the spiraling interplanetary field
to determine whether any of the major conclusions obtained by
Nerney and Barnes (1977) needs to be modified. Comparisons with
straight field line models reveal that for most basic conditions, the
primary effect of the inhibition of thermal conduction is the bottling-up of heat in the electrons as well as the quite different
temperature profiles at a large heliocentric radius The spiral field
solutions show that coronal hole boundary conditions do not
 correspond to states of high-speed streams as observed at 1 AU. The
two-fluid models suggest that the spiral field inhibition of thermal
conduction in the solar corona will generate higher gas pressures
in comparison with flows along the solar rotation axis (between 1
and 10 AU) in particular, massive outflows of stellar winds, such as
outflow from T Tauri stars, cannot be driven by thermal conduction
The conclusions of Nerney and Barnes remain essentially unchanged
S D

A78-49425 * Intensities, self-broadening, and broadening by
Ar and N2 for the 301/111 - 000 band of CO2 measured at different
temperatures. C B Suarez and F P. J Valero (NASA, Ames
Research Center, Moffett Field, Calif.) Journal of Molecular

A78-48835 * Experimental temperature distribution and
heat load characteristics of rotating heat pipes. T. C Daniels
(Swarase, University College, Swansea, Wales) and R J Williams
(NASA, Ames Research Center, Moffett Field, Calif.). International
refs.
Experimental results show conclusively that the presence of a small quantity of a noncondensable gas (NCG) mixed with the working fluid has a considerable effect on the condensation process in a rotating heat pipe. The temperature distribution in the condenser shows the blanketing effect of the NCG and the ratio of the molecular weight of the working fluid to that of the NCG has a very definite effect on the shape of this distribution. Some of the effects are quite similar to the well-established data on stationary heat pipes.

(Author)


Medium spectral resolution (20 kayser) infrared measurements of the Martian disk made between 2500 and 5500 kayser from the NASA Lunar Airborne Observatory have been successfully compared with predictions derived from a model of the Martian soil and atmosphere. Modeling of the Martian atmosphere permitted the extraction of Martian soil reflectance in the CO2 bands centered at 3.645 kayser. Three Martian soil analogs previously considered acceptable - limonite, montmorillonite, and basalts - were analyzed to determine the optical complex indices of refraction in the same range as the airborne observables, for mathematical modeling. A characteristic surface particle size approximately 1 to 3 microns in diameter is indicated. It is concluded that the Martian soil surface near-infrared optical properties are consistent with a soil composition similar to montmorillonite or limonite, mixed with a basalt.

(Author)


The evolution of a rotating massive cloud, starting at interstellar densities, continuing through a series of intermediate fragmentation stages, and ending with stellar multiple systems with components near the main sequence, is outlined. The scenario is based on results of two- and three-dimensional numerical hydrodynamical calculations of collapsing clouds. Transfer of spin angular momentum primarily into orbital motion is assumed to occur at each fragmentation stage. Expected initial conditions in the cloud lead to final fragments which have in many cases the masses and angular momenta of collapsing clouds. Transfer of spin angular momentum to components of two- and three-dimensional numerical hydrodynamical calculations is probable, and attention is given to warm and cool models. The thermal boundary layer is considered along with the role of thermal tides.

(Author)


Spectrophotometry of the classical Be star Gamma Cassiopeiae (1.4 microns with about 2% spectral resolution) is presented. These data, together with existing broad-band observations, are accurately described by simple isothermal LTE models for the IR excess which differ from previously published work in three ways: (1) hydrogenic bound-free emission is included, the attenuation of the star by the shell is included, and (3) no assumption is made that the shell contribution is negligible in some bandpass. The observations are consistent with the bulk of the IR excess consisting of hydrogenic bound-free and free-free emission from a shell of hot ionized hydrogen gas, although a small thermal component cannot be ruled out. The bound-free emission is strong, and the Balmer, Paschen, and Brackett discontinuities are correctly represented by the shell model with physical parameters that follow a shell temperature of approximately 18,000 K., an optical depth (at 1 micron) of about 0.5, an electron density of approximately 1 trillion per cm, and a size of about 2 trillion cm. The observed spectrum of the underlying star is discussed.

(Author)


The thermochemical and flammability characteristics of some typical thermoplastic materials currently in use and others being considered for use in aircraft interiors are described. The properties studied included (1) thermal mechanical properties such as glass transition and melt temperature, (2) changes in polymer enthalpy by differential scanning calorimetry, (3) thermogravimetric analysis in an anaerobic and oxidative environment, (4) oxygen index, (5) smoke evolution, (6) relative toxicity of the volatile products of pyrolysis, and (7) selected physical properties. The generic polymers which were evaluated included acrylonitrile-butadiene-styrene, bisphenol A polycarbonate, bisphenol fluoroenone carbonate-dimethylsloxane block polymer, phenolphthalein-bisphenol A polycarbonate, phenolphthalein polycarbonate, polystyrene sulfone, polycrystalline oxide, polycarbonate sulfide, polyvinyl fluoride, chlorinated polyvinyl chloride homopolymer, polyvinyl fluoride, and polyvinylidene fluoride. Processing parameters including molding characteristics of some of the advanced polymers are described. Test results and relative rankings of some of the flammability, smoke and toxicity properties are presented.

(Author)


A reference model is proposed for the structure of the Mars atmosphere up to 100-km altitude. Based on Viking data, the model incorporates the mean temperature structure, mean surface pressures, mean molecular weight and gas constant, and pressure and density profiles. Model profiles with Viking and Mars 6 data are compared, and attention is given to warm and cool models. The thermal boundary layer is considered along with the role of thermal tides.

A78-50488 * Absolute intensity measurements at different temperatures of the C12O/C16O bands 30 0 1-0 0 0 and 30 0 1-0 0 0 bands for CO2 0 P J Valero (NASA, Ames Research Center, Moffett Field, Calif.). Journal of Quantitative Spectroscopy and Radiative Transfer, vol. 19, June 1978, p. 569-578. 13 refs.

Measurement at different temperatures of the C12O/C16O bands 30 0 1-0 0 0 and 30 0 1-0 0 0 bands for CO2 at 6.448 cm. Values for the total band intensity, pure vibrational transition moment, and vibration-rotation interaction factors were deduced from the measurements.

P J Valero


An analytical solution is obtained for the problem of free and forced vibrations of a finite Euler-Bernoull beam with arbitrary (partially fixed) boundary conditions. The effects of linear viscous
damping, Winkler foundation, constant axial tension, a concentrated mass, and an arbitrary forcing function are included in the analysis. No restriction is placed on the values of the parameters involved, and the solution presented here contains all cited previous solutions as special cases. (Author)


Tests of the thermo-electronic laser energy converter (TELEC) concept are reported. This device has been devised as a means to convert high-average-power laser radiation into electrical energy, a crucial element in any space laser power transmission scheme using the available high-power/efficiency infrared lasers. Theoretical calculations, based upon inverse bremsstrahlung absorption in a cesium plasma, indicate internal conversion efficiency up to 50% with an overall system efficiency of 42%. The experiments reported were made with a test cell designed to confirm the theoretical model rather than demonstrate efficiency; 10.8-micron laser-beam absorption was limited to about 0.001 of the incident beam by the short absorption region. Nevertheless, confirmatory results were obtained, and the conversion of absorbed radiation to electric power is estimated to be near 10%.


The nonequilibrium chemical processes of nitric oxide formation are computed for the wake of the Tunguska meteor of 1908. The wake characteristics are derived by carrying out an optically-thick radiation field analysis for ablating the meteoroid. The wake flow field is approximated by a one-dimensional, well-stirred reactor model. Known characteristics of the Tunguska event are imposed as constraints, and these controlling parameters - chemical composition, density, and velocity - are varied over a range around the values derived by Korobelkov et al., (1978) and Petrov and Stulov (1975). The calculation shows that at least 10 million tons of nitric oxide is produced between the altitudes of 10 and 50 km. The anomalous atmospheric phenomena following the event are attributed to the reactions involving nitric oxide thus produced and atmospheric ozone. It is speculated that the nitric oxide produced by the event fertilized the area near the fall, causing the observed rapid plant growth.


This paper describes fire resistivity studies of a wide range of candidate nonmetallic materials for the construction of improved fire resistant aircraft passenger seats. These materials were evaluated on the basis of FAA airworthiness burn and smoke generation tests, colorfastness, and animal toxicity tests. Physical, mechanical, and aesthetic properties were also included in the evaluations. Candidate seat materials that have significantly improved thermal response to various thermal loads corresponding to reasonable fire threats, as they relate to in-flight fire situations, are identified.


The work described was carried out to study the thermal rearrangements of two unsaturated diene polymers - 1,2-poly cis-1,4-hexadiene (CHD) and 1,2-poly(1,4-hexadiene) (THD). It is shown that both CHD and THD have a predominately 1,8 diene structure and seem to cyclize mainly by the (2 + 2) thermal cycloaddition of double bonds, and to a small extent also by sigmatropic rearrangement with hydrogen shift. V.P.


A planetary boundary layer model is described and used to simulate PBL phenomena including cloud formation and pollution transport in the San Francisco Bay Area. The effect of events in the PBL on air pollution is considered, and governing equations for the average momentum, potential temperature, water vapor mixing ratio, and air contaminants are presented. These equations are derived by integrating the basic equations vertically through the mixed layer. Characteristics of the day used for simulation are reported, and the results suggest that the diurnally cyclic features of the mesoscale motion, including clouds and air pollution, can be simulated in a readily interpretable way with the model.


Emission signals from Europa with wavelength below 800 A, detected by the Pioneer 10 ultraviolet photometer. In the present paper, improved procedures for data reduction are used to determine the spatial region as well as the intensity of the suggested emission sources. The observations indicate a cloud with a radius of about 1.5 Jupiter radii and an apparent brightness of approximately 10 rayleighs for a wavelength of 500 A. It is argued that neutral oxygen atoms, along with neutral hydrogen, are produced through dissociation of water ice on the surface of Europa by particle impact. Impact electron ionization excitation of oxygen atoms in the resulting cloud then gives rise to the observed emission. The present source brightness and cloud radius results are used to estimate an oxygen column density of the order of 10 trillion per sq cm, while the density of atomic hydrogen is at most 100 billion per sq cm and 1 trillion per sq cm for molecular hydrogen.


Pioneer 10 vector helium magnetometer data acquired in 1972-1973 during Bartels solar rotations 1896-1918 are used to investigate the radial dependences of the distant interplanetary magnetic field (IMF) between 1 and 5 AU. Least-square fits were determined for the radial dependences of the averages of the magnitudes of IMF components and total field and plane proctor, and radial fits were prepared for the standard deviations of these variables over the solar rotation, one day, and three-hour intervals. The variation of the weighted averages of the radial component of the field with respect to the heliocentric distance, the variation of
The tangential component of the field, and the characteristics of a sub-component corresponding to a relatively low average solar wind velocity are reported.

M.L.


The preliminary projects to test an MHD one-dimensional time-dependent model of corotating solar wind streams during the period from Sept. 30 to Nov. 25, 1973 is described. During this period, five or six corotating interaction regions streamed past the two spacecraft, and, as a result of multiple-spacecraft radial alignment and temporarily varying conditions at the solar wind source, the pattern predicted by the Steinolfson et al. (1975) model could be compared with observations. The results, in general, support the validity of the model, although the neglect of thermal energy exchange leads to incorrect values for the proton temperature. A detailed analysis of a stream is discussed.

M.L.


The indeterminacy inherent to the formal extension of Arrhenius' law to reactions in turbulent flow is shown to be surmountable in the case of a binary exchange reaction with a sufficiently high activation energy. A preliminary calculation predicts that the turbulent reaction rate is invariant in the Arrhenius form except for an equivalently lowered activation energy. This is a reflection of turbulence-augmented molecular vigor, and causes an appreciable increase in the reaction rate. A similarity to the tunnel effect in quantum mechanics is indicated. The anomaly associated with the wild ignition of oxy-hydrogen mixtures is discussed in this light.

M.L.


Photoelectric, ionization, and gas sensors were used to detect the signatures from the radiant heat or flame of various aircraft materials. It was found that both ionization and photoelectric detectors are about equally capable of detecting products of pyrolysis and combustion of synthetic polyesters, especially those containing fire-retardant additives. Ionization detectors alone appeared to be sensitive to combustion products of simple cellulose materials. A gas sensor detector appeared to be insensitive to pyrolysis or combustion products of many of the materials.

P. T. H.

PATENTS

N78-22152 * National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.


The 1,1,1-triaryl 2,2,2-trifluoro ethanes, in which the aryl radicals carry one or more substituents, were prepared by condensing trifluoroacetophenones with substituted aromatic compounds in the presence of catalytic quantities of trifluoro methyl sulfonic acid. The reaction can be carried out under reflux in toulene or, for strikingly better results in certain cases, reactants are simply stirred at room temperature for about 24 to 48 hours.

N78-22164 * National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.


The 1,1,1-triaryl 2,2,2-trifluoro ethanes, in which the aryl radicals carry one or more substituents, were prepared by condensing trifluoroacetophenones with substituted aromatic compounds in the presence of catalytic quantities of trifluoro methyl sulfonic acid. The reaction can be carried out under reflux in toulene or, for strikingly better results in certain cases, reactants are simply stirred at room temperature for about 24 to 48 hours.

N78-22166 * National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.


This invention relates to the use of metal salts of caprylic (octanoic) acid for catalyzing the formation of imide linkages by the reaction of aromatic tetracarboxylic acid dihydrides with aromatic polysocyanates. The preferred catalysts are stannous, ferric, and aluminum octoates. The reaction can be carried out in one operation, i.e., by placing all the ingredients in a mold and heating at a suitable temperature to obtain a foamed product. Alternatively and preferably, a prepolymer is allowed to form between the reactants, with loss of carbon monoxide equal to about half the theoretical quantity that can be liberated by complete reaction of the ingredients. This prepolymer is then placed in a mold and heated to form the final polyimide foam product. The product has outstanding thermal and fire performance, as shown by burn-through time and flame spread characteristics.

N78-27190 * National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.


An intumescent-ablator coating composition which contains the ammonium salt of 1,4-nitroanilino-2-sulfonic acid or 4,4-dimetyl sulfone, a polymeric binder system and about 5 to 30% weight of an endothermic filler is reported. The filler has a decomposition temperature about or within the exothermic region of the intumescent agent. Official Gazette of the U.S. Patent Office 49
SANSILICIDES.

Application to the panel or other article and cure the prepolymer to form the agent, and then heating the prepolymer to aromatic dicarboxylic acid anhydride in the presence of a blowing compound consisting of polyamide paper and bismaleimide-glass fabric which is filled with carbon microballoons. The carbon microballoons are prepared by pyrolyzing phenolic micro-balloons in the presence of nitrogen. A slurry of the carbon microballoons is prepared to fill the porous core structure. The porous core structure and face sheet are bonded to provide panel structures exhibiting increased mechanical capacities and lower oxygen limit values and smoke density values.


A process is described for constructing a composite laminate structure which exhibits a high resistance to heat and flame provided it has a core of anode compartment. Composite laminate structures are prepared by the bismaleimide resin prepregmentation of a fibreglass cloth in the presence of an aromatic dicarboxylic acid anhydride in the presence of a blowing compound. The bismaleimide resin is applied to a porous core structure selected from the group consisting of polyamide paper and bismaleimide-glass fabric which is filled with carbon microballoons. The carbon microballoons are produced by pyrolyzing phenolic micro-balloons in the presence of nitrogen. A slurry of the carbon microballoons is prepared to fill the porous core structure. The porous core structure and face sheet are bonded to provide panel structures exhibiting increased mechanical capacities and lower oxygen limit values and smoke density values.


Wood paneling or other molded wood compositions are prepared from lignocellulosic particles such as finely divided wood chips, flour, or strands, by bonding such particles with 10 to 33% by weight of a modified novolac resin. The resin prepolymer and a hardening agent such as hexamethylene tetramine are sprayed onto the particles and the mix is hot pressed to form the wood paneling or other wood compositions. The preferred fillers are ammonium polyphosphate or a mixture of ammonium polyphosphate and boric oxide, based on the total weight. The wood structure is formed from an ammonia ether or halide, e.g., 1,4-dimethoxy-methylbenzene, and a phenol. By using the modified resins, panels are formed that have a burn-through time of about 450 seconds as opposed to about 280 seconds when tested under the same conditions. The incorporation of inorganic fillers into the prepolymer will decrease the oxygen limit values.


The invention relates to reaction cured glass and glass coatings prepared by reacting a compound selected from the group consisting of silicon tetraoxide, silicon hexafluoride, other boron siloxides, boron and mixtures with a reactive glass frit composed of a porous high silica borosilicate glass and boron oxide. The glassy composites of the present invention are useful as coatings on low density fibrous porous silica insulations used as heat shields and for articles such as reaction vessels that are subjected to high temperatures with rapid heating and cooling and that require resistance to temperature and repeated thermal shock at temperatures up to about 1482°C (2700°F).


A spray coating apparatus is described for rotating a workpiece relative to a spray station to obtain a uniform coating of the workpiece. The apparatus for rotating the workpiece includes a base support with a rotatable stage for rotation in the horizontal plane and a rotatable stage for rotation in a second plane inclined at an angle to the horizontal plane. The workpiece is rotatable in both of the two planes of rotation. The workpiece support is detachable from the first rotatable stage and the workpiece is readily detachable from the workpiece support to facilitate off loading of the spray coated workpiece. The workpiece holder includes a spray guard extending around the periphery of the workpiece to shield that portion of the workpiece where no coating is desired. The two degrees of freedom permit the various shapes of the workpiece to be sequentially rotated into an orthogonal relationship to the spray station for uniform coating.


A high temperature insulating material suitable for reusable reentry heat shielding was prepared from silica fibers and aluminosilicate fibers in a weight ratio ranging from 1:19 to 19:1, and about 0.5% to 30% boron oxide, based on the total fiber-weight. Aluminoborosilicate fibers and additional free boron oxide, up to the 30% limit, may be substituted for the aluminosilicate fiber and boron oxide requirements. Small quantities of refractory oxides, such as silicon carbide, may be added. The composites are characterized by the absence of nonfibrous matrix.
LIFE SCIENCES

FORMAL REPORTS

N78-19446** National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

A COMPUTER PROGRAM FOR CALCULATING LAMINAR AND TURBULENT BOUNDARY LAYERS FOR TWO-DIMENSIONAL TIME-DEPENDENT FLOWS
Tuncer Cebeci (Calif State Univ, Long Beach) and Lawrence W Carr Mar 1978 62 p refs
(NASA-TM-78470, A-7340) Avail NTIS HC A04/MF A01 CSCL 20D A computer program is described which provides solutions of two dimensional equations appropriate to laminar and turbulent boundary layers for boundary conditions with an external flow which fluctuates in magnitude The program is based on the numerical solution of the governing boundary layer equations by an efficient two point finite difference method An eddy viscosity formulation was used to model the Reynolds shear stress term The main features of the method are briefly described and instructions for the computer program with a listing are provided Sample calculations to demonstrate its usage and capabilities are also presented

Author

N78-21019* National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

A BIBLIOGRAPHY ON THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE
Eugene F Mallove (Analytic Sci Corp, Reading, Mass), Mary M Conners, Robert L Forward (Hughes Res Labs, Malibu, Calif), and Zbigniew Paprotny (Orzeszkowaj, Poland) Mar 1978 135 p refs
(NASA-RP-1021) Avail NTIS HC A07/MF A01 CSCL 06E

This report presents a uniform compilation of works dealing with the search for extraterrestrial intelligence Entries are by first author with cross-reference by topic index and by periodical index This bibliography updates earlier bibliographies on this general topic while concentrating on research related to listening for signals from extraterrestrial intelligence

Author

N78-25071* National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

NASA AVIATION SAFETY REPORTING SYSTEM Quarterly Report 1 Apr. - 30 Jun. 1977
Apr 1978 62 p Prepared in cooperation with Battelle Columbus Labs Mountain View Calif

(NASA-TM-78478, A-7373 OR-5) Avail NTIS HC A04/MF A01 CSCL 02A Reports describing various types of communication problems are presented along with summaries dealing with judgment and decision making Concerns relating to the ground proximity warning system are summarized and several examples of true terrain proximity warnings are provided An analytic study of reports relating to profile descents was performed Problems were found to be associated with charting and graphic presentation of the descents with lack of uniformity of the descent procedures among facilities using them and with the flight crew workload engendered by profile descents frequently when additional requirements are imposed by air traffic control during the execution of the profiles A selection of alert bulletins and responses to them were reviewed

Author

N78-26740* National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

SPACE ECOSYNTHESIS: AN APPROACH TO THE DESIGN OF CLOSED ECOSYSTEMS FOR USE IN SPACE
R D MacEwan and M M Avener (California Univ, at Berkeley) Jun 1978 41 p refs
(NASA-TM-78491) Avail NTIS HC A03/MF A01 CSCL 06K

The use of closed ecological systems for the regeneration of wastes, air and water is discussed It is concluded that such systems, if they are to be used for the support of humans in space, will require extensive mechanical and physico-chemical support The reason for this is that the buffering capacity available in small systems is inadequate, and that natural biological and physical regulatory mechanisms rapidly become inoperative In such systems, the governing boundary layer equations will require extensive mechanical and physico-chemical support

Author

N78-28972* National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

CRITICAL REVIEW OF AMES LIFE SCIENCE PARTICIPATION IN SPACELAB MISSION DEVELOPMENT TEST 1: THE SMD 3 MANAGEMENT STUDY
Robert Helmsrech (Texas Univ, Austin), John Wilhelm (Texas Univ, Austin), Tieve A Tanner, Joan E Sieber (Calif State Univ, Hayward), and Susan Buerenbach Jun 1978 84 p refs
(NASA-TM-78494, A-7471) Avail NTIS HC A04/MF A01 CSCL 06A

A management study was conducted to specify activities and problems encountered during the development of procedures for documentation and crew training on experiments, as well as during the design, integration and delivery of a life sciences experiment payload to Johnson Space Center for a 7 day simulation of a Spacelab mission. Conclusions and recommendations to project management for current and future Ames life sciences projects are included. Broader issues relevant to the conduct of future scientific missions under the constraints imposed by the environment of space are also addressed

Author

N78-27736* National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

CV 990 INTERFACE TEST AND PROCEDURE ANALYSIS OF THE MONKEY RESTRAINT, SUPPORT EQUIPMENT, AND TELEMETRY ELECTRONICS PROPOSED FOR SPACELAB
Bernard D Newsom Jun 1978 85 p refs
(NASA-TM-78434, A-7417) Avail NTIS HC A05/MF A01 CSCL 06C

A biological system proposed to restrain a monkey in the Spacelab was tested under operational conditions using typical metabolic and telemetered cardiovascular instrumentation. Instrumentation, interfaced with other electronics, and data gathering during a very active operational mission were analyzed for adequacy of procedure and success of data handling by the onboard computer

Author
An analytical study of reports relating to cockpit altitude alert systems was performed. A recent change in the Federal Air Regulation permits the system to be modified so that the alerting signal approaching altitude has only a visual component. The auditory signal would continue to be heard if a deviation from an assigned altitude occurred. Failure to observe altitude alert signals and failure to reset the system were the commonest cause of altitude violations related to this system. Cockpit crew distraction was the most frequent reason for these failures. It was noted by numerous reporters that the presence of altitude alerting signal approaching altitude has only a visual component. An alert system made them less aware of altitude; this lack of altitude awareness is discussed. Failures of crew coordination were also noted. It is suggested that although modification of the altitude alert system may be highly desirable in short-haul aircraft, it may not be desirable for long-haul aircraft in which cockpit workloads are much lower for long periods of time. In these cockpits, the aural alert approaches altitudes is perceived as useful and helpful. If the systems are to be modified, it appears that additional emphasis on altitude awareness during recurrent training will be necessary. It is also possible that flight crew operating procedures during climb and descent may need to be modified. The project plan for joint FAA/NASA head-up display system development for aero-space vehicles. The overall objectives of the present program are to: (1) improve the performance of the electrochemical CO2 removal technique by increasing CO2 removal efficiencies at pCO2 levels below 400 Pa, increasing cell power output and broadening the tolerance of electrochemical cells for operation over wide ranges of cabin relative humidity, (2) design, fabricate, and assemble development hardware to continue the evolution of the electrochemical concentrating technique from the existing level to an advanced level able to efficiently meet the CO2 removal needs of a spacecraft air revitalization system (ARS), (3) develop and incorporate into the EDC the components and concepts that allow for the efficient integration of the electrochemical technique with other subsystems to form a spacecraft ARS, (4) combine ARS functions to enable the elimination of subsystem components and interfaces, and (5) demonstrate the integration concepts through actual operation of a functionally integrated ARS.
nitrogen generation concept used liquid hydrazine as the stored form of nitrogen. This reduced tankage and expandables weight associated with high pressure gaseous and cryogenic liquid nitrogen storage. The hydrazine was catalytically dissociated to yield a mixture of nitrogen and hydrogen. The latter was separated and stored. The hydrazine was catalytically dissociated to yield a mixture of nitrogen and hydrogen. The latter was separated and stored.

A proposal to study the function of the adrenal gland as the rat during stress is presented. In the proposed project, three different phases of experimentation will be undertaken. The first phase includes establishment of the ocular rhythm of both brain amines and glucocorticoids, under normal conditions and under chronic and acute stressful conditions. The second phase includes the study of the pharmacodynamics of glucocorticoids binding under normal and stress conditions. The third phase includes adrenal uptake and binding under different experimental conditions. In the outlined experiments adrenal biogenic amines will be evaluated. Adrenal functions will be measured and stress effect on those parameters will be studied. It is hoped that this investigation can explain some of the complex relationships between the brain neurotransmitter and adrenal function.

Author

N78-30808# Florida Agricultural and Mechanical Univ., Tallahassee School of Pharmacy
REGULATION OF THE ADRENAL CORTEX FUNCTION DURING STRESS Final Report
Karim F A Soliman 1 Sep 1978 53 p refs
(Grant No.7-2183)
NASA-CR-157397 Avail NTIS HC A04/MA A01 CSCL 858

A proposal to study the function of the adrenal gland as the rat during stress is presented. In the proposed project, three different phases of experimentation will be undertaken. The first phase includes establishment of the ocular rhythm of both brain amines and glucocorticoids, under normal conditions and under chronic and acute stressful conditions. The second phase includes the study of the pharmacodynamics of glucocorticoids binding under normal and stress conditions. The third phase includes brain uptake and binding under different experimental conditions. In the outlined experiments adrenal biogenic amines will be evaluated. Adrenal functions will be measured and stress effect on those parameters will be studied. It is hoped that this investigation can explain some of the complex relationships between the brain neurotransmitter and adrenal function.

Author

N78-32106# Systems Technology, Inc., Mountain View, Calif
COMPUTED RESPONSES OF SEVERAL AIRCRAFT TO ATMOSPHERIC TURBULENCE AND DISCRETE WIND SHEARS Final Report
(Contract NAS2-8899)
NASA-CR-152216; STI-TR-1063-2 Avail NTIS HC A05/MA A01 CSCL 01C

The computed RMS and peak responses due to atmospheric turbulence and discrete wind shears, respectively, are presented for several aircraft in different flight conditions. The responses are presented with and without the effects of a typical second order washout filter. A complete set of dimensional stability derivatives for each aircraft/flight condition combination evaluated is also presented.

Author

JOURNAL ARTICLES, BOOKS AND CHAPTERS OF BOOKS


An earth-based evaluation of the Viking Lander 1 life detection experiments was conducted using a radio frequency glow discharge in a simulated Martian atmosphere. The Gas Exchange Experiment conducted in the humid mode released substantial amounts of CO2, O2, N2, Ar, and CO into the atmosphere, indicating that these substances were adsorbed onto the Martian soil. An adsorption potential plot is given, graphing quantity of gas against time (t): For a model surface area of 17 square meters per gram of measured substance, oxygen adsorption was found to be relatively high, a result which tends to confirm the hypothesis that Martian oxygen exists largely in chemisorbed states or in active oxygen compounds, e.g., peroxide, superoxide, and hydroperoxide.

B W M.

A76-27124 * Effects of exercise and excitement on mesenteric and renal dynamics in conscious, unrestrained baboons. S. F. Vatner (Harvard University, Peter Bent Brigham Hospital; Children’s Hospital Medical Center, Boston, New England Regional Primate Research Center, Southborough, Mass.). American Journal of Physiology, vol 234, Feb 1978, p H210-H214, 24 refs. Research supported by the American Heart Association, Grants No. PHS-HL-15416; No. NIG-7-236

Radio telemetry was used to measure arterial pressure and mesenteric and renal blood flows from nine unrestrained, conscious baboons.
L.

situations Computer aiding substantially lessens the diagnosis task W B Rouse (Illinois, University, Urbana, Starling mechanism in this case.

the task mistaken diagnoses...brute force strategies, as compared to those adopted in self-paced increases. Forced-pacing appears to cause the human to adopt fairly problem solving in such situations is considered, and the results of be

problems to assume the role of troubleshooter or problem solver and that the 1978, p 258-271 52


It is proposed that humans in automated systems will be asked to assume the role of troubleshooter or problem solver and that the problems which they will be asked to solve in such systems will not be amenable to rote solution. The design of visual displays for problem solving in such situations is considered, and the results of two experimental investigations of human problem solving performance in the diagnosis of faults in graphically displayed network problems are discussed. The effects of problem size, forced-pacing, computer aiding, and training are considered. Results indicate that human performance deviates from optimality as problem size increases. Forced-pacing appears to cause the human to adopt fairly brute force strategies, as compared to those adopted in self-paced situations. Computer aiding substantially lessens the number of mistaken diagnoses by performing the bookkeeping portions of the task (Author)

A78-33522 * Extent of utilization of the Frank-Starling mechanism in conscious dogs D H Boettcher (Harvard University, Harvard Medical School, Boston, Mass.), S F. Vatner (Peter Bent Brigham Hospital, Boston, Mass.), G R. Heyndrickx (Children's Hospital Medical Center, Boston, Mass.), and E. Braunwald (New England Regional Primate Research Center, Southborough, Mass.) American Journal of Physiology, vol 234, Apr 1978, p H328-H345 36 refs Research supported by the American Heart Association, Grants No. PHS-HL-15416, No PHS-HL-17459; No PHS-HL-17665, No NFG-2136

The left ventricular end-diastolic pressure-volume relationships in conscious dogs were studied, the ventricle was stressed to its limit in terms of myocardial preload in order to assess the extent of use of the Frank-Starling mechanism under these conditions. The preload was increased through volume loading with saline infusions, the provocation of global myocardial ischemia by constriction of the left main coronary artery, and infusion of methoxamine. While left ventricular end-diastolic pressure increased substantially in the reclining conscious animals, the left ventricular end-diastolic diameter did not increase, suggesting a minimum role for the Frank-Starling mechanism in this case. (JMB)


Analytical techniques of improved sensitivity have revealed details of the concentrations and isotopic compositions of light elements for a comprehensive suite of samples from the Apollo 12 regolith. These samples show a wide spread in maturity, although maximum contents observed for solar wind elements are less than observed at other sites, possibly reflecting relative recency of craters at the Apollo 12 site. Isotopic composition of nitrogen is consistent with the idea that N-15/N-14 in the solar wind has increased with time, at least a major part of this increase having occurred in the past 3.1 Gyr. Sulphur isotope systematics support a model in which sulphur is both added to the regolith by meteoric influx, and lost, by an isotopically selective process. Most soils from this site are heavily contaminated with terrestrial carbon. (Author)


Experiments were conducted on six trained distance runners (21-23 yr) subjected to an eight-day dietary control at sea level, followed by an eight-day stay in an altitude chamber (2297 m altitude) and a four-day recovery at sea level. Fluid and electrolyte shifts during exercise at altitude were evaluated to gain insight into the mechanism of reduction in working capacity. The results are discussed in terms of resting fluid volumes and blood constituents, maximal exercise variables, and maximal exercise fluid-electrolyte shifts. Since there are no significant changes in fluid balance or resting plasma volume (PV) at altitude, it is concluded that neither these nor the excessive PV shifts with exercise contribute to the reduction in maximal oxygen uptake at altitude. During altitude exposure the percent loss in PV is found to follow the percent reduction in maximal oxygen uptake, however, on the first day of recovery the percent change in PV remains depressed while maximal oxygen uptake returns to control levels (S D).

A78-37055 * Stratigraphic measurements of CF2Cl2 and N2O. B. J. Tyson, J. F. Vedder, J. C Arvesen (NASA, Ames Research Center, Moffett Field, Calif.), and R. B. Brewer Geo­physical Research Letters, vol 5, May 1978, p 369-372 21 refs Concentrated samples of stratospheric air were obtained at pressure altitudes of 18.3 km and 21.3 km aboard U-2 aircraft, and at 28.3 km and 36.9 km aboard a balloon platform. The mooring ratios of CF2Cl2 and N2O are reported for locations in California, Oregon, Texas, and Quebec, Canada. The observed mixing ratios compare within a factor of 2 to those reported by other investigators and show a more rapid decrease with altitude than predicted by a two-dimensional model. (Author)


Utilizing elementary concepts from the theory of fuzzy sets as well as several nonfuzzy heuristics, a model is presented of human decisionmaking in the task of troubleshooting graphically displayed networks. The performance of the model is compared to the results of two previously reported experimental studies. The ability of the model to represent human decisionmaking as a function of network size, forced-pacing, and computer aiding is considered. (Author)

The three biological experiments on board the Viking Mars landers are discussed. The gas exchange experiment provided periodic measurement of the composition and quantity of gases from Martian surface material, either in a humid or a wet nutrient sampling mode. The labeled release experiment demonstrated that adding an aqueous solution of dilute radioactive compounds to Martian material caused a rapid release of labeled gas. The results of the pyrolytic release experiment remain difficult to interpret. Data from the two first experiments suggest that oxidants (including H2O2) and iron oxide rather than biota may account for all of the observed reactions.


As a possible predictive test for screening Space Shuttle passengers, the secretion of the pituitary-adenal system and the adrenal medulla have been studied in conjunction with exposure to gravitational acceleration three times the normal level. Twelve female subjects in the test were divided into ambulatory and bedrest groups. Before bedrest, a high tolerance to centrifugation appeared to be constant. However, the relationship did not hold after bedrest. The correlation between tolerance to centrifugation and 24-hour urinary epinephrine-to-norepinephrine ratio was not significant.


Physiological criteria determining the design of the habitat for a space colony with 10000 people are discussed. Centrifugally generated earth-normal gravity, maximum ionizing radiation dose standards less than or equal to 0.05 rem/year (obtained with passive shielding), and an atmosphere with reduced nitrogen partial pressures were established as design requirements for the habitat. However, further research is needed to determine whether humans experience complete adaptation to weightlessness and whether there are long-term effects of breathing various atmosphere mixtures and pressures.


Both new and published data (rats, mice, and human beings) on three parameters - fat mass, fat-free body mass (FFBM), and total body mass in some cases - are evaluated. Steady state values of the parameters are analyzed for changes in response to specific perturbing agents and their frequency distributions. Temporal sequences of values on individuals are examined for evidence of regulatory response. The results lead to the hypothesis that the FFBM is regulated, but probably not as a unit, and that mass of fat is regulated with a high priority near the range extremes but with a much lower priority in the mid-range. Properties and advantages of such a mechanism are discussed. (Author)


The preparation of a polymer for the Pioneer-Venus large probe gas chromatograph and another polymer for gas-chromatographic analysis of the Jovian atmosphere is described. Technical-grade dibenzene is used as in a simulated extraterrestrial sample for 20 monomer for the preparation of polymer beads. The discussion covers monomeric preparation, polymerization apparatus, first-stage polymer beads, second-stage polymer beads, amino-polymer, column and gas-chromatographic testing instrumentation used. The polymer for the Pioneer-Venus gas chromatograph is suitable for ammonia but not for amine analysis. However, the polymer for the analysis of the Jovian atmosphere is a chemically derivatized aromatic polymer that is suitable for amine analysis. The two-stage polymerization produces a highly efficient polymer packing clearly superior to others prepared by adjusted dilution of the aqueous-organic suspension system.


The preparation of a polymer for the Pioneer-Venus large probe gas chromatograph and another polymer for gas-chromatographic analysis of the Jovian atmosphere is described. Technical-grade dibenzene is used as in a simulated extraterrestrial sample for 20 monomer for the preparation of polymer beads. The discussion covers monomeric preparation, polymerization apparatus, first-stage polymer beads, second-stage polymer beads, amino-polymer, column and gas-chromatographic testing instrumentation used. The polymer for the Pioneer-Venus gas chromatograph is suitable for ammonia but not for amine analysis. However, the polymer for the analysis of the Jovian atmosphere is a chemically derivatized aromatic polymer that is suitable for amine analysis. The two-stage polymerization produces a highly efficient polymer packing clearly superior to others prepared by adjusted dilution of the aqueous-organic suspension system.
**A78-488581**


**A78-488671**

Gravity as a biochemical determinant. S. M. Segal (Hawaii University, Honolulu, Hawaii) COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978. Paper. 20 p. 67 refs Grant No NGR-12-001-063; Contracts No NAS2-6624, No NAS2-8687.

Hyogravity effects on the biochemistry of living organisms are studied. While plant ethylene and peroxidase both increase under orbital, clinostat, or flotation conditions, F3PGA-dehydrogenase increases under orbital but not clinostat conditions and cytochrome C reduction and malate dehydrogenase are affected by clinostat but not actual free fall conditions. Reasons for these discrepancies are considered.

**A78-490177**


The carbon suboxide thermal polymer or its irradiated product is affected by water vapor. The polymerized carbon suboxide simulates the Martian wave of darkening on the inner wall of a glass tube when humidified by passage of water vapor through the tube. With increasing polymer thickness and/or water vapor concentration the wave of darkening similarly intensifies simulating the dark fringe on the Martian circumpolar areas. Surfaces are lightened constantly being renewed by particulate material settling from the atmosphere. It is hypothesized that light and dark areas have polymer coatings, but light areas have small particles which scatter white light more effectively and appear brighter on the surface of Mars.

**A78-490179**

Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission. N. Pace, D. F. Rahimian, R. C. Mann, A. M. Kordina (California, University, Berkeley, Calif.), and E. P. McCutcheon (NASA, Ames Research Center, Biomedical Research Div, Moffett Field, Calif.). COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978. Paper. 8 p. 6 refs Grant No NsG-7262

An adult male pig-tailed monkey (Macaca nemestrina) with surgically implanted bloodpressure unit was inserted into a fiberglass pod system which was installed in a Spacelab mock-up to simulate a 6-day mission during which extensive physiological measurements were obtained. The purpose of the pod was to make possible the study of respiratory gas exchange. Body temperature and selected cardiovascular parameters were recorded continuously for 2.6 days prior to "launch", 6.3 days during "flight", and 1.8 days after "landing". The results are surveyed, and it is concluded that it is feasible to perform sound physiological experiments on nonhuman primates in the Spacelab environment.

**A78-490780**


Differences between space industrialization and space colonization are outlined along with the physiological, psychological, and esthetic needs of the inhabitants of a space habitat. The detrimental effects of zero gravity on human physiology are reviewed, and the necessity of providing artificial gravity, an acceptable atmosphere, and comfortable relative humidity and temperature in a space habitat is discussed. Consideration is also given to social organization and governance, supply of food and water, and design criteria for space colonies.

**A78-511225**


Parameters of bone formation and resorption were measured in rats orbited for 19.5 days aboard the Soviet Cosmos 762 biological satellite. The most striking effects were on bone formation. During flight, rats formed significantly less periosteal bone than did control rats on the ground. An arrest line at both the periosteum and the endosteum of flight animals suggests that a complete cessation of bone growth occurred during a 20-day postflight period, the defect in bone formation was corrected. No significant changes in bone resorption were observed.

**A78-51346**


Sensitivity and roundoff errors can seriously limit the application of recursive digital filters in practice, particularly when the filters have poles near z = -1. A filter structure, based on digital incremental computers is proposed, which has low sensitivity, good error characteristics, and simple hardware implementation. A design procedure is suggested to implement the new filter structure given the transfer function. Simulation results are presented.

**A78-51896**


**A78-53400**


This paper describes a computer model that was designed to investigate the conformation of molecules, macromolecules and subsequent complexes. Utilizing an advanced 3-D dynamic computer display system, model is sufficiently versatile to accommodate a large variety of molecular input and generate data for multiple purposes such as visual representation of conformational changes, and calculation of conformation and interaction energy. Molecules can be built on the basis of several levels of information. These include the specification of atomic coordinates and connectivities.

The effect of soil sterilization by dry heat (0.08% relative humidity), gamma radiation, or both on soil phosphatase, urease, and dehydrogenase activity was studied. Soil sterilized by a long exposure to dry heat at relatively low temperatures (eight weeks at 102.5 C) retained higher activities than did soil exposed to a higher temperature (two weeks at 124.5 C), while all activity was destroyed by four days at 148 C. Sterilization with 7.5 Ms destroyed less activity than did heat sterilization. The effect of several individually nonsterilizing doses of wet radiation is described by M. L.


PATENTS

N78-14104* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


An apparatus for performing electrophoresis and a multiple-sample applicator is described. Electrophoresis is a physical process in which electrically charged molecules and colloidal particles, upon the application of a dc current, migrate along a gel or a membrane that is wetted with an electrolyte. A multiple-sample applicator is provided, which coacts with a novel button, thus causing multiple samples to be deposited on the gel or on the membrane simultaneously, or to depress one or more sample applicators separately by means of a separate button for each applicator. Official Gazette of the US Patent Office

N78-18763* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


A space suit is presented having a waist joint, shoulder joints, elbow joints, hip joints, and ankle joints. Each of the joints includes at least one pair of annuli supported for pivotal displacement about paralleling axes and a flexible, substantially impermeable diaphragm of a tubular configuration spanning the distance between the annuli and connected thereto in a hermetically sealed relationship. The diaphragm includes at least one rolling convoluted section having a crown disposed in a fixed relation with an axis about which one of the annuli pivots. The knee joint is constructed slightly different from the other joints. A curved tubular shell is disposed between two circular bellows. Cables are secured to the rings, shell, and bellows. The cables limit the motion of the bellows when the suit is pressurized.

N78-22720* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


A sweat collection capsule permitting quantitative collection of sweat is described. The capsule was comprised of a frame held immobile on the skin, a closure secured to the frame and absorbent material located next to the skin in a cavity formed by the frame and the closure. The absorbent materials were removed from the device by removing the closure from the frame while the frame was held immobile on the skin.

N78-22725* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


New polymeric materials were developed to serve as the stationary phase in chromatographic columns. These materials consist of a crosslinked polymer matrix, e.g., a divinylbenzene polymer, into which was embedded an organic complexed on or chelate, e.g., Colacaco, which is N,N-ethylene-bis(oxyacetyliminomethyloctyl) (2) Organic nitrogenous bases, such as pyridine, may be incorporated into the chelate-polymer complexes to increase their chromatographic utility. Critical factors in obtaining satisfactory chromatographic performance from the polymer-chelate complexes are identified as (1) the nature and concentration of the nonpolar diluent, n-heptane and ethylbenzene being preferred, (2) completeness of crosslinking of the matrix, (3) the chelate content of the complex, and (4) the nature and concentration of the coordinating organic base employed.

N78-27334* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.


A device for exercising animals such as primate is described, which includes a cylindrical housing mounted for rotation about a horizontal axis of revolution and has a cylindrical treadway portion on which the animal treads while the drum is rotated by means of a motorized drive. The treadway portion of the drum includes an electrode structure with sectors being independently energizable by means of a commutator and source of potential so that an electrical shock station is created behind a running-in-place station on the moving treadway. In this manner if the animal should fall behind its running-in-place station, it may be shocked by treading on the energized electrode structure. One end of the tread drum comprises a transparent wall for unobstructed viewing of the animal being exercised.

N78-31233* National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif.

BORON TRIFLUORIDE COATINGS FOR THERMOPLASTIC MATERIALS AND METHOD OF APPLYING SAME IN GLOW DISCHARGE Patent Ronald Michael Kubacki, inventor (to NASA) (Bell and Howell.
Plastic surfaces can be improved physically and optically by treating them with a plasma of boron trifluoride. The trifluoride can be the sole reactant or be part of a mixture also containing an organic monomeric substance such as perfluorobutene-2 or an organosilane. The boron trifluoride-containing coating can also serve as an intermediate-coating between the plastic surface and a plasma deposited organic polymer.
RESEARCH SUPPORT

FORMAL REPORTS

N78-1980883 National Aeronautics and Space Administration Ames Research Center Moffett Field Calif A SINGLE USER EFFICIENCY MEASURE FOR EVALUATION OF PARALLEL OR PIPELINE COMPUTER ARCHITECTURES W P Jones In its Future Computer Requirements for Computational Aerodynamics Feb 1978 p 383-371 (For availability see N78-19778 10-59) Avail NTIS HC A23/MF A01 CSCL 09B A precise statement of the relationship between sequential computation at one rate, parallel or pipeline computation at a much higher rate, the data movement rate between levels of memory, the fraction of inherently sequential operations or data that must be processed sequentially the fraction of data to be moved that cannot be overlapped with computation, and the relative computational complexity of the algorithms for the two processes, scalar and vector, was developed. The relationship should be applied to the multirate processes that obtain in the employment of various new or proposed computer architectures for computational aerodynamics. The relationship, an efficiency measure that the single user of the computer system perceives, argues strongly in favor of separating scalar and vector processes, sometimes referred to as loosely coupled processes, to achieve optimum use of hardware. Author

N78-199017 California Univ Los Angeles Dept of Physics NON-LINEAR PARAMETRIC GENERATION OF SOUND BY RESONANT MODE CONVERSION Interim Report Steven Lurie Garrett Dec 1977 201 p refs (Contract N00014-75-C-0246) (AO-A049157, TR-39) Avail NTIS HC A10/MF A01 CSCL 20/1 When non-linear terms are included in the two fluid hydrodynamic description of superfluid helium-4, first sound and second sound are coupled. The interaction of two second sound waves to produce a propagating first sound wave is shown to occur at a specific angle which makes the point of intersection of the second sound waves travel at the speed of first sound. An experiment to observe this mode conversion process in a waveguide of rectangular cross-section is described. Measurements show that the resonant conversion occurs at a theoretically predicted frequency. The amplitude of the mode converted first sound is found to exhibit a quadratic dependence on the amplitude of the primary wave which is characteristic of a second order effect. A new application of the reciprocity technique allowed an absolute calibration of the pressure microphones in situ. Absolute measurements of the coupling of first sound to second sound agree with theory. This agreement is a direct confirmation of the importance of the additional, intrinsically non-linear, Galilean invariant variable, in the thermo-hydrodynamics of superfluid helium. The theoretical formalism is applied to the parametric amplification of second sound by high intensity first sound and the results are in disagreement with a previous calculation by Khoklov and Pushkina Author (GRA)

N78-237067 National Aeronautics and Space Administration Ames Research Center Moffett Field Calif AN INDUCTIVELY POWERED TELEMETRY SYSTEM FOR TEMPERATURE, EKG, AND ACTIVITY MONITORING Thomas B Fryer Gordon F Lund (San Jose State Univ Calif) and Bill A. Williams (San Jose State Univ Calif) May 1978 43 p refs (Grant N00014-72-C-0197) (NASA-TM 76486, A-7423) Avail NTIS HC A03/MF A01 CSCL 06B An implant telemetry system for the simultaneous monitoring of temperature activity, and EKG from small animals, such as rats, was designed with the feature that instead of a battery the system is energized by an inductive field. A 250 kHz resonant coil surrounds the cage (30 x 30 x 20 cm) and provides the approximately 100 micros of power required to operate the implant transmitter while allowing the animal unrestrained movement in the cage. The implant can also be battery operated if desired. RF transmission is in the 8-10 MHz band which allows the use of a simple, essentially single IC chip, receiver. Author

N78-2435409 California Univ Berkeley Dept of Chemical Engineering STRESS-STRAIN BEHAVIOR OF SOME ACRYLIC GRADIENT POLYMERS C F Jasso, S D Hong, and M. Shen 10 Feb 1978 17 p refs (Contract N00014-75-C-0955) (AO-A052617, TR-17) Avail NTIS HC A02/MF A01 CSCL 11/6 Multicomponent polymers whose structure or composition varies as a function of position in the sample are called gradient polymers. One way to prepare gradient polymers is to permit a guest monomer to diffuse into a host polymer network. The resulting profile of the diffusion gradient is fixed by polymerizing the monomer in situ. In this work we used 2-chloroethyl acrylate as the monomer and poly(methyl methacrylate) as the polymer matrix. Both gradient polymers and interpenetrating networks were prepared. It was found that the stress-strain behavior of gradient polymers is quite different from that of the interpenetrating networks of comparable composition. The former shows a yield point, and considerably enhanced fracture strain. The latter is essentially rubber in character. Possible mechanisms for the unique properties of gradient polymers are discussed. Author (GRA)

N78-30862 National Aeronautics and Space Administration Ames Research Center Moffett Field Calif A DECODING PROCEDURE FOR THE REED-SOLOMON CODES Raymond S Lim Aug 1978 25 p refs (NASA-TP-1286: A-7372) Avail NTIS HC A02/MF A01 CSCL 09B A decoding procedure is described for the (n,k) 1-error correcting Reed-Solomon (RS) code, and an implementation of the (31,15) RS code for the 14-TENEX central system. This code can be used for error correction in large archival memory systems. The principal features of the decoder are a Galois field arithmetic unit implemented by microprogramming a microprocessor, and syndrome calculation by using the g(x) encoding shift register. Complete decoding of the (31,15) code is expected to take less than 500 microseconds. The syndrome calculation is performed by hardware using the encoding shift register and a modified Chuang search. The error location polynomial is computed by using Lin’s table, which is an interpretation of Berlekamp’s iterative algorithm. The error location numbers are calculated by using the Chien search. Finally, the error values are computed by using Forney’s method.

LS
NASA CONTRACTOR REPORTS

X10: A FORTRAN DIRECT ACCESS DATA MANAGEMENT SYSTEM
David P. Roland In NASA Langley Res. Center Eng and Sci.
Data Management 1978 p 155-182 (For primary document see N78-33778 24-61)
(Contract NAS2-6914) Avail: NTIS HC A12/MF A01 CSCL 09B

The X10 system is a set of subroutines that provide generalized data management capability for FORTRAN programs using a direct access file. Arrays of integer, real, double precision, and character data may be stored, each logical group of data identified by a unique matrix number. A matrix may be organized and stored as batches to reduce core requirements. Batches may be accessed randomly or sequentially. The file may be checkpointed and retained, allowing for restarts with stored values. The X10 subroutines operate on either IBM 360-370/OS/VS or DEC PDP-11/RSX computing systems.

N78-33717* National Aeronautics and Space Administration
AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
MICRO-FLUID EXCHANGE COUPLING APPARATUS Patent Application
John E. Johnson (San Francisco Univ., Calif) and Paul F. Swartz, inventor (to NASA) Filed 16 Oct. 1978 13 p
NASA Case ARC 1114-4, US Patent Appl SN 851422 Avail: NTIS HC A02/MF A01 CSCL 09B

In a microfluid exchange apparatus for exchanging fluid with an organ, such as the trachea or a blood vessel of a small animal, a syringe needle is provided for penetrating the fluid conduit of the animal. The syringe needle is coupled to a plenum chamber having an inlet and outlet port. The plenum chamber is equipped with an a-c bridge with the bridge potentiometer being an equal number of digital-controlled switches for removing resistors from the networks. The plenum chamber is provided with a pedal for adjusting the height and angle of inclination of the needle relative to a reference base support. The needle is positioned adjacent to the incised trachea or a blood vessel of a small animal and the micrometer drive head is operated for penetrating the fluid conduit of the animal.

PATENTS

N78-27425* National Aeronautics and Space Administration
AMES RESEARCH CENTER, MÓFFETT FIELD, CALIF.
ROTARY LEVELING BASE PLATFORM Patent
Robert W. Delaplane and Daniel L. Mossolani, inventors (to NASA) Issued 9 May 1978 5 p Filed 2 Nov. 1976 Supersedes N77-10498 (15.01; p 0089)

A leveling apparatus for the precise adjustment of a scientific instrument is reported. A base member is provided having a hollow cylindrical shape. A table for supporting the instrument rests on the base and has a shaft portion extending below the table. The upper portion of the shaft fits tightly into the hollow portion of the base member whereas the lower portion of the shaft is machined to fit loosely. The lower portion of the shaft is provided with a groove. Adjusting screws are threaded through the hollow cylindrical portion and are adapted to enter the groove. The adjusting screws are coupled to a micrometer drive head. The micrometer drive head is slidably and pivotally coupled to a pedestal adjusting the height and angle of inclination of the needle relative to reference base support. The needle is positioned adjacent to the incised trachea or a blood vessel of a small animal and the micrometer drive head is operated for penetrating the fluid conduit of the animal.
The flight simulator for advanced aircraft at Ames Research Center was used to evaluate the flying qualities of a small jet transport and those of a derivative model of that airplane. Technical criteria that piloted simulations must meet to enable their increased use for demonstrating compliance with transport category aircraft airworthiness requirements were defined. Flying-qualities data were obtained for numerous test configurations and conditions using conventional certification flight test procedures. These data correlated well with the basic airplane data from the manufacturer's certification test report. Analysis of the simulator data showed valid results in critical test cases, such as the demonstration of static longitudinal stability and minimum control speed, with confidence that all influencing and limiting factors were identified.

An important aspect was the accurate simulation of the control force-feel qualities of the reversible flight control system. The simulator was judged to have duplicated actual flight results with a high degree of confidence.
U.S. ARMY RESEARCH AND TECHNOLOGY LABORATORIES
AND AEROMECHANICS LABORATORY

FORMAL REPORTS

N78-17000* National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, Calif

DYNAMIC STALL EXPERIMENTS ON THE NACA 0012 AIRFOIL
Kenneth W. MoAlister, Lawrence W. Carr, and William J
McCroskey Jan. 1978 168 p refs
(NASA-TP-1100; A-7098) Avail NTIS HC A08/MF A01 CSCL 01A

The flow over a NACA 0012 airfoil undergoing large
oscillations in pitch was experimentally studied at a Reynolds
number of 2.6 million and over a range of frequencies and ampli-
tudes. Hot-wire probes and surface-pressure transducers were
used to clarify the role of the laminar separation bubble, to deline-
ate the growth and shedding of the stall vortex, and to quantify the
resultant aerodynamic loads. In addition to the pressure
distributions and normal force and pitching moment data that
have often been obtained in previous investigations, estimates of
the unsteady drag force during dynamic stall have been derived
from the surface pressure measurements. Special characteristics
of the pressure response, which are symptomatic of the occurrence
and relative severity of moment stall, have also been examined.

Author

N78-18043* National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, Calif

AEROMECHANICAL STABILITY OF HELICOPTERS WITH
A BEARINGLESS MAIN ROTOR. PART 1: EQUATIONS
OF MOTION
Dawsey H Hodges Feb. 1978 102 p refs Prepared in cooperation
with Army Aviation Res and Develop Command, Moffett Field,
Calif
(NASA-TM-7846; A-7301-Pt-1) Avail NTIS HC A06/MF A01 CSCL 01C

Equations of motion for a coupled rotor-body system were
designed for the purpose of studying air and ground resonance
characteristics of helicopters that have bearingless main rotors.
For the fuselage, only four rigid degrees of freedom are consid-
ered: longitudinal and lateral translations, pitch, and roll.
Calculating the flow around an airfoil undergoing dynamic
stall is a task which has not yet been accomplished at high
Reynolds numbers, although several approximate analytical
methods have been proposed. The most promising of those
methods seems to be either a combination of the discrete potential
vortex and thin boundary layer approaches, or a significantly
improved version of the strong viscous-inviscid interaction
approach. The former may prove to be superior for low speed,
high amplitude flows, but the latter seems likely to be more
suitable for airfoils that operate under supercritical transonic flow
conditions and for cases that do not penetrate deeply into stall.
At the present time, the engineer who is faced with the need
to predict the aerodynamic forces and moments on oscillating
airfoils would be better advised to turn to one of the empirical
correlation techniques, or perhaps to utilize more than one
method and average the results in any event, these methods permit
the essential features of dynamic stall to be described, even
though further improvements are highly desirable. Future efforts
will probably see more use made of the two-dimensional
theoretical analyses, while experiments can be expected to play
the major role in assessing the importance of the three-dimensional
effects that are likely to be encountered in practice.

Author

N78-18383* National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, Calif

SOME UNSTEADY SEPARATION PROBLEMS FOR SLEN-
DER BODIES
W. J. McCroskey In AGARD Three Dimensional and Unsteady
Separation at High Reynolds Numbers Feb. 1978 11 p refs
(For availability see N78-18375 09-34) Avail NTIS HC A11/MF A01 CSCL 20D

The development of reliable prediction techniques for engi-
neering purposes requires a fundamental and detailed
understanding of the unsteady flow fields on wings and rotating
blades. Some of the peculiar features of unsteady separated
flows that are not simple analogs or extensions of quasi-steady
flows are discussed. These include the unsteady Kutta-
Joukowski condition, dynamic stall on oscillating airfoils (with
applications to helicopter rotor blades) and unsteady shock
wave-boundary layer interaction

Author
WATER-TUNNEL EXPERIMENTS ON AN OSCILLATING AIRFOIL AT RE EQUALS 21,000

Kenneth W. McAlester and Lawrence W. Carr Mar 1978 84 p refs
(NASA-TM-78446. A-7232) Avail. NTIS HC A05/MF A01
CSCL 01A

Flow visualization experiments were performed in a water tunnel on a modified NACA 0012 airfoil undergoing large amplitude harmonic oscillations in pitch. Hydrogen bubbles were used to (1) create a conveniently sized and well preserved set of inviscid flow markers, and (2) to expose the succession of events occurring within the viscous domain during the onset of dynamic stall. Unsteady effects were shown to have an important influence on the progression of flow reversal along the airfoil surface prior to stall. A region of reversed flow underlying a free shear layer was found to momentarily exist over the entire upper surface without any appreciable disturbance of the viscous-inviscid boundary. A flow protuberance was observed to develop near the leading edge, while minor vortices evolve from an expanding instability of the free shear layer over the rear portion of the airfoil. The complete breakdown of this shear layer culminates in the successive formation of two dominant vortices.

Author

N78-28403§ National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
INTRODUCTION TO UNSTEADY ASPECTS OF SEPARATION IN SUBSONIC AND TRANSONIC FLOW
W J McCroskey In AGARD Three Dimensional and Unsteady Separation at High Reynolds No Feb 1978 8 p refs (For primary document see N78-28397 19-34)
Avail NTIS HC A11/MF A01 CSCL 20D

Unsteady flow phenomena are reviewed with emphasis on separated flow in the subsonic and transonic regimes. Specific topics discussed include external flows past bluff bodies, unsteady separation on slender bodies, and internal flows.

Author

N78-28405§ National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
SOME UNSTEADY SEPARATION PROBLEMS FOR SLENDER BODIES
W J McCroskey In AGARD Three Dimensional and Unsteady Separation at High Reynolds No Feb 1978 11 p refs (For primary document see N78-28297 19-34)
Avail NTIS HC A11/MF A01 CSCL 20D

The unsteady Kutta-Joukowski condition, dynamic stall, oscillating airfoils, and unsteady shock wave-boundary layer interaction are discussed. Emphasis is placed on developing reliable prediction techniques and suppression of unsteady separation on oscillating control surfaces, wings, and rotating blades.

Author

N78-28409§ National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
PREDICTION OF UNSTEADY SEPARATED FLOWS ON OSCILLATING AIRFOILS
W J McCroskey In AGARD Three Dimensional and Unsteady Separation at High Reynolds No. Feb 1978 8 p refs (For primary document see N78-28397 19-34)
Avail NTIS HC A11/MF A01 CSCL 20D

Techniques for calculating high Reynolds number flow around an airfoil undergoing dynamic stall are reviewed. Emphasis is placed on predicting the values of lift, drag, and pitching moments. Methods discussed include the discrete potential vortex method, thin boundary layer method, strong interaction between inviscid and viscous flows, and solutions to the Navier-Stokes equations. Empirical methods for estimating unsteady airfoils on oscillating airfoils are also described. These methods correlate force and moment data from wind tunnel tests to indicate the effects of various parameters, such as airfoil shape, Mach number, amplitude, and frequency of sinusoidal oscillations, mean angle, and type of motion.

Author

N78-29044§ National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
HOVERING IMPULSIVE NOISE: SOME MEASURE AND CALCULATED RESULTS
Avail NTIS HC A17/MF A01 CSCL 20A

In-plane impulsive noise radiating from a hovering model rotor was measured in an anechoic chamber. The hover acoustic signature was compared with existing theoretical prediction models with previous forward flight experiments using the same model rotor. These hover tests showed good experimental consistency with forward flight measurements, both in pressure level, and waveform character, over the range of Mach numbers tested (0.8 to 1.0). Generally poor correlation, however, was confirmed with current linear theory prediction efforts. Failure to predict both the peak pressure levels and the shape was reported, especially with increasing tip Mach number.

Author

N78-32831§ National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
AN APPROXIMATE SOLUTION FOR THE FREE VIBRATIONS OF ROTATING UNIFORM CANTILEVER BEAMS

Approximate solutions are obtained for the uncoupled frequencies and modes of rotating uniform cantilever beams. The frequency approximations for flapping, bending, and torsion, and torsion are simple expressions having errors of less than a few percent over the entire frequency range. These expressions provide a simple way of determining the relations between mass and stiffness parameters and the resultant frequencies and modes of rotating uniform beams.

Author

N78-10117§ Systems Technology, Inc. Mountain View, Calif
THE DETERMINATION OF SOME REQUIREMENTS FOR A HELICOPTER FLIGHT SIMULATION FACILITY
J B Snicas Sep 1977 59 p refs (Contract NAS2-9421)
(NASA-CR-152068; TR-1097-1) Avail NTIS HC A04/MF A01 CSCL 14B

Important requirements were defined for a flight simulation facility to support Army helicopter development. These requirements are associated with the visual and motion subsystems.

Author

NASA CONTRACTOR REPORTS
of the planned simulator were studied. The method used in the
motion requirements study is presented together with the
underlying assumptions and a description of the supporting data.
Results are given in a form suitable for use in a preliminary
design. Visual requirements associated with a television camera/
model concept are related. The important parameters are described
together with substantiating data and assumptions. Research
recommendations are given.

N78-19155# Cincinnati Univ., Ohio Dept. of Aerospace
Engineering and Applied Mechanics
THEORETICAL AND EXPERIMENTAL STUDY OF AERODY-
NAMICS, HEAT TRANSFER AND PERFORMANCE OF A
Army Air Mobility Res and Develop Lab
(Contract NAS2-7850)
(NASA-CR-152105) Avail. NTIS HC A04/MF A01 CSCL
21E

A two-dimensional finite difference numerical technique is
presented to determine the temperature distribution in a solid
blade of a radial turbine guide vane. A computer program is
written in FORTRAN 4 for the IBM 370/165 computer. The
computer results obtained from these programs have a similar
behavior and trend as those obtained by experimental results.

N78-33065# Kaman Aerospace Corp., Bloomfield, Conn
THEORETICAL STUDY OF MULTICYCIC CONTROL OF A
CONTROLLABLE TWIST ROTOR
(Contract NAS2-7738)
(NASA-CR-151959; R-1393) Avail. NTIS HC A04/MF A01
CSCL 01C

Analytical studies were performed to ascertain the feasibility
of reducing helicopter rotor induced 4/rev vibratory forces by
means of multicyclic flap control input on a dual control, four-
bladed rotor system. The dual control consisted of a primary
inboard pitch horn blade control and a secondary outboard flap
control. Flap control was put in at frequencies greater than the
turbine rotational speed.

JOURNAL ARTICLES, BOOKS AND
CHAPTERS OF BOOKS

A78-22570 # Stress analysis study in cooled radial inflow
turbine. A. Hamed, Y. Sheorin, and W. Tabakoff (Cincinnati,
University, Cincinnati, Ohio). American Institute of Aeronautics and
Astronautics, Aerospace Sciences Meeting, 16th, Huntsville, Ala.,
NAS2-7850.

With increased turbine inlet temperatures, numerical methods
of thermal and stress analysis are becoming more valuable in the design
of air-cooled turbines. This paper presents a study of the stresses
associated with different cooling patterns in a radial inflow turbine
rotor. The finite element method is used in the stress calculations
taking into consideration centrifugal, thermal and aerodynamic
loading. The effects of temperature distribution and the presence
of internal cooling passages are discussed. (Author)

A78-47930 # Application of advanced high speed turboprop
technology to future civil short-haul transport aircraft design. J. A
Conlon (U.S. Army, Research and Technology Laboratories, Moffett
Field, Calif.) and J. V. Bowles (NASA, Ames Research Center,
Moffett Field, Calif.). American Institute of Aeronautics and
Astronautics, Aircraft Systems and Technology Conference, Los
SECTION II
INDEXES
### SUBJECT INDEX

**Typical Subject Index Listing**

<table>
<thead>
<tr>
<th>SUBJECT HEADING</th>
<th>TITLE</th>
<th>REPORT NUMBER</th>
<th>PAGE NUMBER</th>
<th>NASA ACCESS NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERIAL PHOTOGRAPHY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABLATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABRASION RESISTANCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABSORPTION SPECTRA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABSTRACTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document contents, a title extension is added. Accession numbers are arranged in sequence with the NASA accession numbers appearing first.

**ACCELERATION (PHYSICS)**
- Acceleration and heating of the solar wind [p0029] NT 78-32991

**ACCELERATION TOLERANCE**
- Hormonal indices of tolerance to +Gz acceleration in female subjects -- personal selection in Shuttle program [p0055] NT 78-41162

**ACCUMULATORS**
- Fire detector response in aircraft applications [p0049] NT 78-53674

**ACOUSTICS**
- Use of coherence and phase data between two receivers in evaluation of noise environments [p0016] NT 78-26495

**ACROGENESIS**
- Chemical evolution and the origin of life -- Bibliography supplement 1976 [p0057] NT 78-53875

**ABLATION**
- The response of heat-shield materials to intense laser radiation [p0034] NT 78-22583

**ABLATIVE MATERIALS**
- Carbon vaporization into a nonequilibrium stagnation-point boundary layer [p0039] NT 78-43506

**ABLATIVE ROSE CONES**
- Jupiter probe heatshield configuration optimization [p0041] NT 78-27270

**ABORTED MISSIONS**
- Earth reencounter probabilities for aborted space disposal of hazardous nuclear waste [p0038] NT 78-31921

**ABSORPTION SPECTRA**
- Simultaneous determination of rotational and translational temperatures of O2/3 Pj in a gas discharge [p0030] NT 78-10405

**ABSTRACTS**
- Abstracts for the Planetary Geology Field Conference on Aeolian Processes [p0022] NT 78-13402
CARBON

Carbon vaporization into a nonequilibrium, stagnation-point boundary layer... p0042 A78-40036


CARBON COMPOUNDS

A theoretical study of the electronic transition moment for the Cl Swan band system p0041 A78-36776

CARBON DIOXIDE

Intensities, self-broadening, and broadening by Ar and N2 for the 301/1/ - 000 band of CO2 measured at different temperatures. p0046 A78-48425

Absolute intensity measurements at different temperatures of the C(12)/0-16/2 bands 30 0 1 T-00 0 0 and 30 0 1 IV-00 0 0 p0047 A78-50498

Measurement at different temperatures of absolute intensities, line half-widths, and broadening by Ar for the 30 0 1 II-00 0 0 band of CO2 p0047 A78-50498

Comments on the note by Arie et al. on the transition moment of the CO2 band near 7700 kaysers p0048 A78-52388

Advanced solid electrolyte cell for CO2 and N2 electrolysis --- for extended duration spaceflights. [NASA-CN-12009] p0052 W78-21235

An investigation of the reduction of carbon dioxide in a silent electric discharge [NASA-CN-15245] p0053 W78-25767

CARBON DIOXIDE CONCENTRATION

Technology advancement of the electrochemical CO2 concentrating process [NASA-CN-15209B] p0057 W78-22723

CARBON DIOXIDE LASERS

Collisionless dissociation of SF6 using two resonant frequency CO2 laser fields p0031 A78-16655

CO2 laser-driven Stirling engine --- space power applications p0021 A78-49984

CARBON FIBER REINFORCED PLASTICS


CARBON MONOXIDES

Low energy ionizing collisions between N2 and CO blend molecules and CO, N2, NO, CN, and CO2 target molecules p0039 A78-38137

Chemisorption of CO on Fe particles supported on silica p0040 A78-36940

CARBON STEELS

C3 and infrared spectrophotometry of Y Canum Venaticorum p0042 A78-39440

CARBON STEELS

Hydrogen attack - Influence of hydrogen sulfide --- on carbon steel p0046 A78-48108

CARBON SUBOXIDES

Carbon suboxide polymer, an explanation for the wave of dimming on Mars p0056 A78-43177

CARBON-CARBON COMPOSITES

The response of heat-shield materials to intense laser radiation [AIAA PAPER 78-139] p0036 A78-22563


Jupiter probe heatshield configuration optimization [AIAA PAPER 78-847] p0641 A78-37270

CARBONACEOUS CHONDRITES

The composition of Phobos - Evidence for a carbonaceous chondrite surface from spectral analysis p0032 A78-18374

MULTICOLOR OBSERVATIONS OF PHOBOS WITH THE VIKING LANDER CAMERAS - EVIDENCE FOR A CARBONACEOUS CHONDRITE COMPOSITION p0032 A78-18875

CARDIAC VENTRICLES

Extent of utilization of the Frank-Starling mechanism in conscious dogs --- preload effects on myocardial regulation p0054 A78-33522

CAROTID

A study of characteristics of intercity transportation systems. Phase I: Definition of transportation comparison methodology [NASA-CN-152153-2] p0001 W78-29996

CARGO

Aircraft cargo compartment fire test simulation program [NASA-CN-151951] p0029 W78-21223

CARTILAGE

Responses of articular and epiphyseal cartilage to zones of developing avian radii to estrone treatment and a 2-6 environment p0056 A78-29562

CASCADE CONTROLS

Application of special-purpose digital computers to rotorcraft real-time simulation [NASA-TD-1027] p0007 W78-27113

CASCADES (PLASMA DYNAMICS)

Catalysts for iside formation from aromatic isocyanates and aromatic dianhydrides [NASA-CN-ARC-11107-1] p0049 W78-22156

CELESTIAL BODIES

C Eyre Nebulae Galaxies p003 W78-36914

C B Stars p003 W78-36914

C Carbon Stars p003 W78-36914

C Carbonaceous Chondrites p003 W78-36914

C Dwarf Stars p003 W78-36914

C Dwarf Carbon Stars p003 W78-36914

C Earth (Planet) p003 W78-36914

C Euphoria p003 W78-36914

C Globular Clusters p003 W78-36914

C Io p003 W78-36914

C Iron Meteorites p003 W78-36914

C Jupiter (Planet) p003 W78-36914

C Late Stars p003 W78-36914

C Mars (Planet) p003 W78-36914

C Mercury (Planet) p003 W78-36914

C Meteorites p003 W78-36914

C Micrometeoroids p003 W78-36914

C Meteoroids p003 W78-36914

C Phobos p003 W78-36914

C Saturn Rings p003 W78-36914

C Solar System p003 W78-36914

C Terrestrial Planets p003 W78-36914

C Titan Gasoporphorite p003 W78-36914

C Uranus (Planet) p003 W78-36914

Cells (Biooject) p003 W78-36914

C Neurons p003 W78-36914

CERAMIC PROTECTIVE COATINGS

C Protective Coatings p003 W78-36914

CERAMIC COATINGS

Spray coating apparatus having a rotatable workplace holder [NASA-CN-ARC-11110-1] p0050 W78-32430

CERTIFICATION

Certification study of a derivative model of a small jet transport airplane using a piloted research simulator [AIAA-A9664] p0061 W78-14033

CESIUM FLASHER

A cesium plasma TESEC device for conversion of laser radiation to electric power p0048 A78-51067

CESSNA MILITARY AIRCRAFT

C Military Aircraft p003 W78-36914

CFRP

C Carbon Fiber Reinforced Plastics p003 W78-36914

74
The prediction of toxic atmospheres from decomposing polymers
FIRE RESISTIVITY AND TOXICITY STUDIES OF CANDIDATE AIRCRAFT PASSENGER SEAT MATERIALS

TRAJECTORY MODULE OF THE NASA AMES RESEARCH CENTER AIRCRAFT SYNTHESIS PROGRAM AC5T87
Theoretical and experimental study of the drag of multielement airfoils [AIAA PAPER 78-1223]
A computer program for calculating laminar and turbulent boundary layer flows for two-dimensional time-dependent flows [NASA-TR-78-707]
Trajectory module of the NASA Ames Research Center computer simulation program AACSMT [NASA-PAN-78497]
System optimization of gasdynamic lasers, computer program user's manual [NASA-PAN-73193]

SUBJECT INDEX

COMPUTERIZED SIMULATION

COMPUTER STORAGE DEVICES

U BUFFER STORAGE

The ILLIAC IV memory system: Current status and future possibilities [NASA-CR-152177]

COMPUTER SYSTEMS DESIGN

Peripheral processors for high-speed simulation: helicopter cockpit simulator [NASA-CP-2032]

COMPUTATIONAL AERODYNAMICS

Preliminary study for a numerical aerodynamic simulation facility. Phase I: Extension [NASA-CR-152108]
Future Computer Requirements for Computational Aerodynamics [NASA-CR-2032]
Computational aerodynamics and the numerical aerodynamic simulation facility [NASA-CR-78-1977]
Future requirements and roles of computers in aerodynamics [NASA-CR-78-19806]
The ILLIAC IV memory system: Current status and future possibilities [NASA-CR-152177]

COMPUTER SYSTEMS PROGRAMS

U OPERATING SYSTEMS (COMPUTERS)

COMPUTER TECHNIQUES

A view toward future fluid dynamics computing [AIAA PAPER 78-1112]
Project plan for joint FAR/NASA head-up display concept evaluation [NASA-TR-78512]
Pegfer: An automatic boresight peaking routine for the C-74F telescope [NASA-TR-78516]

COMPURIZED CONTROL

U NUMERICAL CONTROL

Robustness in linear quadratic feedback design with application to an aircraft control problem [AIAA PAPER 78-102]
Computation wing optimization and wind tunnel test of semi-span model [AIAA PAPER 78-102]
A study of computer airplane design optimization [NASA-CR-152170]

COMPURIZED SIMULATION

U DIGITAL SIMULATION

Behavior of a turbulent boundary layer subjected to sudden transverse strain [AIAA PAPER 78-201]
Carbonaceous materials subjected to extreme heating: A comparison of numerical simulation and experiments: Jovian entry conditions [AIAA PAPER 78-866]
Simulation replay - Implementation and flight simulation applications [NASA-CR-78-28773]
A view toward future fluid dynamics computing [AIAA PAPER 78-1112]

V/STOL aircraft simulation - Requirements and capabilities at Ames Research Center [AIAA PAPER 78-1515]
Digital aerodynamic simulation facility [NASA-CR-152106]
Preliminary study for a numerical aerodynamic simulation facility. Phase I: Extension [NASA-CR-152108]
Computational aerodynamics and the numerical aerodynamic simulation facility [NASA-CR-78-19779]
Computing viscous flows [NASA-CR-78-1979]
Infrastructure dynamics: A selected bibliography [AIAA PAPER 152162]
Application of special-purpose digital computers to rotorcraft real-time simulation [NASA-TR-1267]

CONSUMERS

U AIRBORNE/SPACEBORNE COMPUTERS

U DIGITAL COMPUTERS

U ILLIAC COMPUTERS

U CARBON DIOXIDE CONCENTRATION

CONDUCTORS

U RESISTANCE

CONDUCTIVE HEAT TRANSFER

The spiral field inhibition of thermal conduction in two-fluid solar wind models [NASA-TR-78-48921]

CONDUCTORS

U PHOTOCONDUCTORS

COSES

U ABALISTIC NOSE CONES

U CIRCULAR CONES

U CONICAL BODIES

U NOSE CONES

Computational supersonic laminar viscous flow past a pointed cone at angle of attack in spinning and coning motion [AIAA PAPER 78-1217]

CONFERENCE

Abstracts for the Planetary Geology Field Conference on Aeolian Processes [NASA-TR-78455]
Future Computer Requirements for Computational Aerodynamics [NASA-CR-2032]
Calculation of supersonic viscous flow over delta wings with sharp subsonic leading edges [NASA-TR-78455]

CONICAL BODIES

Calculation of supersonic viscous flow over delta wings with sharp subsonic leading edges [NASA-TR-78455]

CONICAL FLUID

U CONES

CONICAL FLOW

Calculation of supersonic viscous flow over delta wings with sharp subsonic leading edges [AIAA PAPER 78-1121]

CONNECTIONS

U JOINTS (JUNCTIONS)

CONNECTIONS - TISSUE

U TISSUE

CONNECTIONS - BONE

U BONE

CONSERVATION

U ENERGY CONSERVATION

CONSERVATION EQUATIONS

Coercive criteria for implicit finite difference solution of the inviscid fluid conservation law equations [NASA-TR-78-48921]

CONSTANTS

Calculated rate constants for the reaction CI + O yields Cl + O2 between 220 and 1000 deg K --- molecular trajectories and stratospheric ozone [NASA-TR-78455]

CONSTRAINTS

U PHYSIOLOGICAL PARAMETERS

CONSTRUCTION MATERIALS

U AIRCRAFT CONSTRUCTION MATERIALS

CONSUMPTION

U FUEL CONSUMPTION

FAB (PROGRAMMING LANGUAGE) N PORTTRAN

FABRICATION
Continued development of doped-germanium photoconductors for astronomical observations at wavelengths from 30 to 120 micrometers [NASA-CR-152125] p0029 N78-22000

FAILURE ANALYSIS
A model of human decision-making in a fault diagnosis task p0054 A78-32673

FAILURE MODES
Earth reencounter probabilities for aborted space disposal of hazardous nuclear waste p0038 A78-31921

FAIRCHILD MILITARY AIRCRAFT

FALLBACK CONTROL

FASTENERS
MT BOLTS

FEASIBILITY ANALYSIS
Toroidal tank evaluation --- propellant tanks for spin-stabilized Pioneer spacecraft p0032 A78-17801
Comments on 'Feasibility study of a hybrid airship operating in ground effect' p0016 A78-24367

FEEDBACK CONTROL

MT CASCADE CONTROL
Demand-type gas supply system for rocket borne thin-window proportional counters p0031 A78-13095
Robustness in linear quadratic feedback design with application to an aircraft control problem p0014 A78-18059
Robustness of linear quadratic state feedback designs in the presence of system uncertainty --- application to Augmentor Wing Jet STOL Research aircraft flare control autopilot design p0016 A78-23917
A preference-ordered discrete-gaming approach to air-combat analysis p0020 A78-69255

FERRONS
MT SOLAR PROTONS

FERROMAGNETISM
Square Ising ferromagnetic and antiferromagnetic lattices in a magnetic field --- a new perturbation approach p0036 A78-51886

FIBER COMPOSITES
MT CARBON FIBER REINFORCED PLASTICS
Fibrous refractory composite insulation --- shielding reusable spacecraft [NASA-CASE-ARC-11169-1] p0050 N78-32109

FIBERS
MT REINFORCING-FIBERS
FIELD THEORY (PHYSICS)
A new concept in laser-assisted chemistry - The electronic-field representation p0037 A78-27763
Semiclassical theory of unimolecular dissociation induced by a laser field [AD-A056671] p0029 A78-36682

FIGHTER AIRCRAFT

MT P-5 AIRCRAFT
MT P-15 AIRCRAFT
MT V-11 AIRCRAFT
MT HARRIER AIRCRAFT

Coaxial tail-chase aerial combat as a differential game p0034 A78-10455
Studies of aerodynamic technology for VSTOL . . . fighter/attack aircraft [AIAA PAPER 78-1113] p0020 A78-47996

FILE MAINTENANCE (COMPUTERS)
X10: A PORTTRAN direct access data management system
FLIGHT CONDITIONS
Computed responses of several aircraft to atmospheric turbulence and discrete wind shear s [NASA-CR-152165] p0053 78-2120
FLIGHT CONTROL
V/STOL aircraft simulation - Requirements and capabilities at Ames Research Center [NASA PAPER 78-1515] p0021 78-20790
Optimal horizontal guidance techniques for aircraft [NASA T-2016] p0006 78-22016
FLIGHT HAZARDS
Simulation and analysis of wind shear hazard --- for aircraft landing and takeoff [NASA-CR-157470] p0053 78-29699
FLIGHT INSTRUMENTS
FLIGHT SAFETY
V/STOL aircraft simulation - Requirements and capabilities at Ames Research Center [NASA PAPER 78-1515] p0021 78-20790
The determination of some requirements for a helicopter flight research simulation facility [NASA-CR-152666] p0063 78-10117
Multi-recalculation rate simulations [NASA-CR-153265] p0009 78-13755
A pilot evaluation of two g-seat ejection schemes [NASA-T-1255] p0004 78-31759
FLIGHT SIMULATORS
V/STOL aircraft simulation - Requirements and capabilities at Ames Research Center [NASA PAPER 78-1515] p0021 78-20790
Certification study of a derivative model of a small jet transport airplane using a piloted research simulator [NASA-CR-152868] p0061 78-14033
FLIGHT TESTS
Flight tests of a simple airborne device for predicting air traffic turbulence encounters [NASA-CR-78-76975] p0019 78-96650
Engineering tests of the C-141 telescope [NASA-CR-78-84547] p0025 78-25017
Development and flight tests of a Kalman filter for navigation during terminal area and landing operations [NASA-CR-3015] p0012 78-27105
FLOW DISTRIBUTION
Estimating maximum instantaneous distortion from inlet total pressure measurements [AIAA PAPER 78-1100] p0019 78-43525
FLOW MEASUREMENT
Measurements of unsteady vortex flow fields [AIAA PAPER 78-18] p0015 78-22554
Wake vortex measurements of bodies at high angle of attack [AIAA PAPER 78-1109] p0015 78-22555
An implicit algorithm for the conservation of transonic full potential equation using an arbitrary mesh [AIAA PAPER 78-1137] p0043 78-41826
Calculation of supersonic viscous flow over delta wings with sharp subsonic leading edges [NASA PAPER 78-1137] p0063 78-41821
Computation of transonic flow past projectiles at angle of attack [AIAA PAPER 78-1137] p0041 78-41825
The spanwise lift distribution on a wing from flow-field velocity surveys [AIAA PAPER 78-1195] p0018 78-41896
Computation of supersonic laminar viscous flow past a pointed cone at angle of attack in subsonic and sonic conditions [AIAA PAPER 78-1211] p0045 78-45139
States and future prospects of using numerical methods to study complex flows at high Reynolds numbers [NASA-TM-78476] p0051 78-28410
FLOW FIELDS
U FLOW DISTRIBUTION
FLW GEOMETRY
Propagation of sound through a sheared flow [NASA-CR-152996] p0014 78-33876
FLOW MEASUREMENT
Measurements of unsteady vortex flow fields [AIAA PAPER 78-18] p0015 78-22554
Wake vortex measurements of bodies at high angle of attack [AIAA PAPER 78-23] p0015 78-22555
FLOW PATTERNS
FLOW DISTRIBUTIONS
FLOW RESISTANCE
FLOW RESISTANCE
FLOW SEPARATION
FLOW SEPARATION
U BOUNDARY LAYER SEPARATION
U SEPARATED FLOW
FLOW STABILITY
The instability of the thin vortex ring of constant vorticity [AIAA PAPER 78-502] p0016 78-29804
FLOW THEORY
FLOW VELOCITY
H SOLAR WIND VELOCITY
FLOW VISUALIZATION
FLOW VISUALIZATION
Visualisation of quasi-periodic unsteady flows [AIAA PAPER 78-502] p0016 78-29804
FLOW MACHINES
H HOT-WIRE FLOWMETERS
FLUID DYNAMICS
H AERODYNAMICS
H ASTROAERODYNAMICS
H GAS DYNAMICS
H HYDRODYNAMICS
H MAGNETOHYDRODYNAMICS
H MOVING AERODYNAMICS
H ROSES AERODYNAMICS
A view toward future fluid dynamics computing [AIAA PAPER 78-1112] p0045 78-45125
FLUID FLOW
H AIR FLOW
H AXISYMMETRIC FLOW
H BLIND FLOW
H BOUNDARY LAYER FLOW
H BOUNDARY LAYER SEPARATION
H CHANNEL FLOW
H CIRCULAR FLOW
H CORNER FLOW
H CROSS FLOW
H DELTA FLOW
H INLET FLOW
H ROUND FLOW
H SPIRAL FLOW
H TURBULENT FLOW
H WIND TUNNEL FLOW
H WIND TUNNEL FLOW
H WIND TUNNEL FLOW
H WIND TUNNEL FLOW
H WIND TUNNEL FLOW
H WIND TUNNEL FLOW
SUBJECT INDEX

G

G FORCE
U ACCELERATION (PHYSICS)
GALACTIC NUCLEI
Irre and the dwarf content of the inner nuclear regions of M31 --- Intrinsic Strength Anomalies p0042 A78-38569
GALACTIC RADIATION
Quiet time interplanetary cosmic ray anisotropies observed from Pioneer 10 and 11 p0039 A78-34567
GALACTIC ROTATION
Evolution of rotating interstellar clouds. III - On the formation of multiple star systems p0047 A78-29917
GALACTIC STRUCTURE
Bar-driven spiral waves in disk galaxies p0038 A78-32667
Numerical experiments on the stability of disklike galaxies p0019 A78-45539
On the stability of disklike galaxies in massive halos p0620 A78-97385
GALILEI SATELLITES
MT EUROPA
MT IO
GALVANIC CELLS
U ELECTROLYTIC CELLS
GAMES THEORY
Co-planar tail-chase aerial combat as a differential game p0014 A78-10455
A preference-ordered discrete-gaming approach to air-combat analysis p0020 A78-92255
GAMMA RADIATION
U GAMMA RAYS
GAMMA RAYS
Degradation of biochemical activity in soil sterilized by dry heat and gamma radiation p0057 A78-53874
GANGEZI
MT NEPHELIUM
GAREKES
GAS ANALYSIS
GAS CHROMATOGRAPHY
Interhemispheric gradients of CF2Cl2, CFC13, CCl4, and N2O p0042 A78-41124
Synthesis of porous polymeric column packings for GC analysis of extraterrestrial atmospheres p0055 A78-48577
Chelate-modified polymers for atmospheric gas chromatography [NASA-CASE-ARC-11154-1] p0057 78-27275
GAS COMPOSITION
MT CARBON DIOXIDE CONCENTRATION
GAS DETECTIONS
Fire detector response in aircraft applications p0049 A78-53674
GAS DISCHARGES
Simultaneous determination of rotational and translational temperatures of 08/2 Pi/ in a gas discharge p0030 A78-10405
GAS DISASSOCIATION
Collisions of dissociative 376 using two resonant frequency CO2 laser fields p0031 A78-14655
GAS DYNAMICS
MT AERODYNAMICS
MT AEROTHERMODYNAMICS
MT ROCKET AERODYNAMICS
Thermodynamic processes induced by coherent radiation p0034 A78-21624
Lagrangian computation of inviscid compressible flows [NASA-TR-78356] p0025 78-24860
GAS EVOLUTION
Nitric oxide production by Tuaysaka seeter p0048 A78-31811
GAS EXCHANGE
The Viking biological experiments on Mars p0055 A78-39746
GAS FLOW
UT AIR FLOW
GAS GIANT PLANETS
MT JUPITER (PLANET)
MT URANUS (PLANET)
GAS HEATING
Nova-driven winds in globular clusters p0041 A78-37649
GAS IGNITION
Low energy ionizing collisions between N2 and CO beam molecules and CO, N2, NO, CH4, and CO2 target molecules p0039 A78-34137
GAS LASERS
MT CARBON DIOXIDE LASERS
Computational study of a molecular collision process in the presence of an intense radiation field - Enhanced quenching of SO by Xe in the 248-nm light of the KrF laser [AD-A056078] p0046 A78-42818
System optimization of gasdynamic lasers, computer program user's manual [NASA-TR-78-3932] p0027 78-29436
GAS LIQUIDIFICATION
U CONDENSING
GAS MIXTURES
MT DETONABLE GAS MIXTURES
GAS PRESSURE
Demand-type gas supply system for rocket borne thin-window proportional counters p0031 A78-13895
GAS TURBINES
GAS-GAS INTERACTIONS
Low energy ionizing collisions between N2 and CO beam molecules and CO, N2, NO, CH4, and CO2 target molecules p0039 A78-34137
GAS-METAL INTERACTIONS
The co-absorption of copper and oxygen on a tungsten 100 plate-type surface p0037 78-29489
Hydrogen attack - Influence of hydrogen sulfide --- on carbon steel p0044 78-44108
GAS-SOLID INTERACTIONS
MT GAS-NUCLEAR INTERACTIONS
GASES
MT CARBON DIOXIDE
MT CARBON MONOXIDE
MT CARBON SULFIDES
MT DETONABLE GAS MIXTURES
MT HYDROGEN
MT INTERSTELLAR GAS
MT MOLECULAR GASES
MT NITROGEN
MT NITROGEN IONS
MT NONCONDUCTING GASES
MT OXYGEN
MT OXYGEN IONS
MT OZONE
HEAT TRANSFER

- Conduction Heat Transfer
- Convective Heat Transfer
- Laminar Heat Transfer
- Radiative Heat Transfer

Experimental temperature distribution and heat load characteristics of rotating beat pipes

Investigation of a cryogenic thermal diode

A re-entrant groove hydrogen heat pipe

Jet pump assisted arterial heat pipe

Experimental temperature distribution and heat load characteristics of rotating beat pipes

Heat Regulation
- Temperature Control
- Heat Resistance
- Thermal Resistance

Heat Shielding

Head-up Displays

Project plan for joint FAA/NASA head-up display concept evaluation

Heart

- Cardiac Ventricles
- Myocardium

Extent of utilization of the Frank-Starling mechanism in conscious dogs --- preload effects on myocardial regulation

Heat Pipes

Investigation of a cryogenic thermal diode

A re-entrant groove hydrogen heat pipe

Jet pump assisted arterial heat pipe

Experimental temperature distribution and heat load characteristics of rotating beat pipes

Heat Transfer

- Conductive Heat Transfer
- Convective Heat Transfer
- Radiative Heat Transfer

A note on multicyclic control by swashplate oscillation

Aerothermodynamic environment for Jovian entry simulation for Jupiter probes

Shock-tube studies of atomic silicon emission in the spectral range 180 to 300 nm --- environment simulation for Jupiter probes

Jet pump -- heatshield configuration optimization

Carbonaceous materials subjected to extreme heating - A comparison of numerical simulation and experiments --- Jovian entry conditions

Carbon vaporization into a nonequilibrium, stagnation-point boundary layer

Theoretical and experimental study of aerodynamics, heat transfer and performance of a radial turbine
### INTERPLANETARY MAGNETIC FIELDS

- Small spherical particles - in interplanetary space
- Radial light as an indicator of interplanetary dust

### INTERPLANETARY DUST
- NT INTERPLANETARY DUST
  - Energetic protons associated with interplanetary active regions 1-5 AU from the sun

### INTERPLANETARY SPACE
- Acceleration of nucleons in the interplanetary space and the modulation of Jupiter electrons in the interval from 1 to 10 AU by corotating regions of solar origin
- Quiet time interplanetary cosmic ray anisotropies observed from Pioneer 10 and 11

### INTERPLANETARY SPACECRAFT
- MT JUPITER PROBES
- NT PIONEER SPACE PROBES
- NT PIONEER VENUS SPACECRAFT
- NT PIONEER 10 SPACE PROBE
- NT VENUS PROBES
- NT VIKING LANDER SPACECRAFT
- NT VIKING LANDER 1
- NT VIKING ORBITER SPACECRAFT

### INTERSTELLAR GAS
- Nova-driven winds in globular clusters

### INTERSTELLAR MATTER
- Evolution of rotating interstellar clouds. III - On the formation of multiple star systems

### INVESTMENTS
- A technology assessment of transportation system investments - Markovian decision theory

### INVISCID FLOW
- Lagrangian computation of inviscid compressible flows

### JETS
- On determining magnetospheric diffusion coefficients from the observed effects of Jupiter's satellite Io

### IONIZATION
- Acceleration of charged particles

### IONIZATION RADIATION
- MT ALPHAN PARTICLES
- MT COSMIC RAYS
- MT GAMMA RAYS
- MT SOLAR X-RAYS

### IONOSPHERIC COMPOSITION
- A comprehensive model of the Venus ionosphere

### IONOSPHERIC ELECTRON DENSITY
- Thermal structure of the primitive ionosphere

### IONOSPHERIC NOISE
- MT WHISTLERS
- MT THUNDERSTORMS

### IONOSPHERIC TEMPERATURE
- Thermal structure of the primitive ionosphere

### IONS
- MT NITROGEN IONS
- MT OXYGEN IONS

### IRON
- Controlled vapor growth of small particles of Fe and Fe on thin Al2O3 substrates

### IRON ALLOYS
- MT STAINLESS STEELS

### ITERATIVE SOLUTION
- On improving the iterative convergence properties of an implicit approximate-factorization finite difference algorithm — considering transonic flow

### JEEPS
- MT CERTIFICATION

### JET AIRCRAFT
- MT CV-990 AIRCRAFT
- MT P-5 AIRCRAFT
- MT P-15 AIRCRAFT
- MT P-111 AIRCRAFT
- MT SUBORPORP AIRCRAFT
- MT U-2 AIRCRAFT

### JOINT PROJECTS
- Certification study of a derivative model of a small jet transport airplane using a piloted research simulator

### JET FLOW
- Analysis of flight effects on noise radiation from jet flow using a convecting quadrupole model

### JET PLASMA
- MT Cesium plasma

### JET STABLES
- MT SOLAR WIND
- MT STELLAR WINDS

### JET TURBINES
- MT ALPHA REACTORS

### JET WING LEADS
- MT AUGMENTED WING LEADS

### JET WING PROFILES
- MT JET PLATOON
- MT JET PLANE

### JET PLANE
- MT JET PLANE

### JET PLANE
- MT JET PLANE

### JET PLANE
- MT JET PLANE

### JET PLANE
- MT JET PLANE

### JET PLANE
- MT JET PLANE
JET FLOW
Analysis of flight effects on noise radiation from jet flow using a convective quadruple model
[AIAA PAPER 78-192] p0015 A78-22594

JET NOISE
U JET AIRCRAFT NOISE
JET PUMPS
Jet pump assisted arterial heat pipe
[AIAA 78-443] p0040 A78-35622

JETAVATORS
U GUIDE VAMS

JITTER
U VIBRATION
JOINTS (ANATOMY)
Spacesuit mobility knee joints

JOINTS (JUNCTIONS)
Spacesuit mobility joints
[NASA-CASE-ARC-11056-1] p0058 N78-31735

JUNCTION DIODES
Characteristics of integrated MOS junctions at d.c. and at optical frequencies
[AN-A056165] p0037 A78-28526

JUPITER (PLANET)
The Pioneer 11 imaging experiment of Jupiter
On the apparent source depth of planetary magnetic fields
Acceleration of nucleons in the interplanetary space and the modulation of Jupiter electrons in the interval from 1 to 10 A.U. by coronating regions of solar origin
On determining magnetospheric diffusion coefficients from the observed effects of Jupiter's satellite Io
Aeroacoustodynamic environment for Jovian entry with silica heat shield
On the modulation of the Jovian decanetric radiation by Io. 1 - Acceleration of charged particles
Correction to 'Recirculation of energetic particles in Jupiter's magnetosphere'
Whistler mode noise in Jupiter's inner magnetosphere
Pioneer Jupiter orbiter probe mission 1980, probe description

JUPITER ATMOSPHERE
On determining magnetospheric diffusion coefficients from the observed effects of Jupiter's satellite Io
Aeroacoustodynamic environment for Jovian entry with silica heat shield
On the modulation of the Jovian decanetric radiation by Io. 1 - Acceleration of charged particles
Correction to 'Recirculation of energetic particles in Jupiter's magnetosphere'
Whistler mode noise in Jupiter's inner magnetosphere
Pioneer Jupiter orbiter probe mission 1980, probe description

JUPITER PROBES
Shock-tube studies of atomic silicon emission in the spectral range 160 to 300 m --- environment simulation for Jupiter probes
Jupiter probe heatfield configuration optimization
Pioneer Jupiter orbiter probe mission 1980, probe description

K
KALMAN FILTERS
Development and flight tests of a Kalman filter for navigation during terminal area and landing operations
[AIAA-CR-3015] p0012 N78-27105

KINETIC THEORY
Thermodynamic processes induced by coherent radiation
[AN-A097346] p0034 A78-21629

Arhenius' law in turbulent media and an equivalent tunnel effect --- in binary exchange chemical reactions

KINETICS
U REACTION KINETICS
KIRCHHOFF-BUTENKERS PRINCIPLE
U WAVES PROPAGATION

L
LABORATORY EQUIPMENT
Automatic multiple-sample applicator and electrophoresis apparatus
[NASA-CASE-ARC-10517-1] p0057 N78-14104

LAMBERT
Further investigation of the spontaneous and evoked activity of the primary neurons of statoacoustic (and other receptors) of the labyrinth of the bullfrog before, during and after an extended period of weightlessness, including alternate intervals of artificial gravity
[NASA-CHR-158507] p0052 N78-10668

LAGRANGIAN STATIONARY HYPOTHESIS
Lagrangian computation of inviscid compressible flows
[AIAA 78-79456] p0025 N78-24060

LAMINAR BOUNDARY LAYER
Carbon vaporization into a nonequilibrium, stagnation-point boundary layer
A computer program for calculating laminar and turbulent boundary layers for two-dimensional time-dependent flows
[NASA-TM-78470] p0051 N78-19444

LAMINAR BOUNDARY LAYER SEPARATION
U LAMINAR BOUNDARY LAYER

LAMINAR PLATES
U LAMINAR FLOW

LAMINAR FLOW
Navier-Stokes calculations for laminar and turbulent hypersonic flow over indented monostrips
[AIAA PAPER 78-260] p0035 A78-22608

Computation of the viscous supersonic flow over symmetrical and asymmetrical external axial cones
[AIAA PAPER 78-1135] p0043 A78-41839

Computation of supersonic laminar viscous flow past a pointed cone at angle of attack in spinning and coning motion
[AIAA PAPER 78-1211] p0045 A78-45139

LAMINAR FLOW CONTROL
U BOUNDARY LAYER CONTROL
U LAMINAR PLATES

LAMINAR HEAT TRANSFER
Effects of mass addition on blunt-body boundary-layer transition and heat transfer
[NASA-TF-1119] p0022 N78-16326

LAMINAR JETS
U JET FLOW
U LAMINAR FLOW

LAMINATED MATERIALS
U LAMINATES

LAMINATES
Simple torsion test for shear moduli determination of orthotropic composites
[NASA-TF-78485] p0029 N78-33127

LAMINATIONS
U LAMINATES

LANDING
U AIRCRAFT LANDING

LANGUAGES
U FORTRAN

LASER APPLICATIONS
A new concept in laser-assisted chemistry - The electronic-field representation
CO2 laser-driven Stirling engine --- space power applications
Study, optimization, and design of a laser heat engine
[LASER-78-107] p0015 A78-20687

Measuring the velocity of individual stars in real time
Hot-wire, laser anemometer and force balance measurements of cross-sectional planes of single and interacting trailing vortices
[AIAA PAPER 78-1194] p0020 A78-41805

Laser velocimeter surveys of merging vortices in a wind tunnel: Complete data and analysis
LIFE SUPPORT SYSTEMS

LIFT
Transonic lifting line theory - Numerical

LEVEL (QUANTITY)

LEVEL (HORIZONTAL)
Rotary leveling base platform

LASER OUTPUTS

LASERS

LIFT DEVICES

Effect of high lift flap systems on the conceptual design of a 1985 short-haul commercial STOL tilt rotor transport

LIFT DISTRIBUTION

U LIFT

LIFT DRAG RATIO

Three-dimensional canard-wing shape optimization in aircraft cruise and maneuver environments

LIFT FORCES

U LIFT

LIFTING BODIES
Lifting line theory for transonic flow

LIFTING SURFACES

U LIFT DEVICES
U LIFTING BODIES

LIGHT (PHOTON RADIATION)

LIGHT AIRCRAFT

A method for localizing wing flow separation at stall to alleviate spin entry tendencies

LIGHT DEVICES

A method for localizing wing flow separation at stall to alleviate spin entry tendencies

LIGHT SCIENTIFIC INSTRUMENTS

Light element geochemistry of the Apollo 12 site

LIGHT TRANSMISSION

U HALO

Light element geochonomy of the Apollo 12 site

LIFE SUPPORT SYSTEMS

Critical review of Ames Life Science participation in Spacelab Mission Development Test 3: The 889 3 management study

LIFE SUPPORT SYSTEMS

Technology advancement of the electrochemical CO2 concentrating process

LIFTS

A method for localizing wing flow separation at stall to alleviate spin entry tendencies

LIFE SCIENTIFIC INSTRUMENTS

Light element geochonomy of the Apollo 12 site

LIFE SCIENCES

New frequency domain methods for system identification

LIFE SCIENCES

Robustness of linear quadratic state feedback designs in the presence of system uncertainty --- application to Augmentor Wing Jet STOL

LIFE SCIENCES

Applications of algebraic geometry to systems theory - The McMillan degree and Froehnerer indices of transfer functions as topological and holomorphic system invariants

LIFE SCIENCES

Applications of algebraic geometry to systems theory - The McMillan degree and Froehnerer indices of transfer functions as topological and holomorphic system invariants

LIFTS

Transonic lifting line theory - Numerical

procedure for shock-free flows
MAGNETIC FIELD CONFIGURATIONS
On the apparent source depth of planetary magnetic fields
The spiral field inhibition of thermal conduction
in two-fluid solar wind models

MAGNETIC FIELDS
NT GEOMAGNETISM
NT INTERPLANETARY MAGNETIC FIELDS
NT PLANETARY MAGNETIC FIELDS
NT SOLAR MAGNETIC FIELD

MAGNETIC MEASUREMENTS
Crystal evolution inferred from Apollo magnetic measurements

MAGNETIC RESONANCE
U MAGNETIC STORAGE
MAGNETIC PROPERTIES
NT ANTIFERROMAGNETISM
NT FERROMAGNETISM
NT GEOMAGNETISM
NT MAGNETIC EFFECTS
NT SPIN-LATTICE RELAXATION
MAGNETIC RELAXATION
NT SPIN-LATTICE RELAXATION
MAGNETIC STORAGE
A decoding procedure for the Reed-Solomon codes

MAGNETOHYDRODYNAMICS
U MAGNETOHYDROMAGNETISM
MAGNETOHYDRODYNAMICS
Acceleration of nucleons in the interplanetary space and the modulation of Jupiter electrons in the interval from 1 to 10 A.U. by corotating regions of solar origin

MAGNETOHYDROMAGNETISM
Dynamic MHD modeling of solar wind corotating stream interaction regions observed by Pioneer 10 and 11

MAGNETOHYDRODYNAMICS
Dynamic MHD modeling of the solar wind disturbances during the August 1972 events

MAGNETOBIOLOGY
U MAGNETIC MEASUREMENT
MAGNETOPLASMA DYNAMICS
MAGNETOSPHERIC INSTABILITY
Correction to ‘Recirculation of energetic particles in Jupiter’s magnetosphere’

MACHINE MAINTENANCE (COMPUTERS)
U MACHINE SYSTEMS
NT MEMS

MANNUSCRIPT INDEX

MACHINE STORAGE
U COMPUTER STORAGE DEVICES
MAGNETIC EFFECTS
Square Tsing ferromagnetic and antiferromagnetic lattices in a magnetic field — A new perturbation approach

LOGISTICS
NT LOGISTICS
NT LOADER
LUNAR 
LUNAR CRATES
Interpreting statistics of small lunar craters

LUNAR CRUST
Crustal evolution inferred from Apollo magnetic measurements

LUNAR CINEMATOGRAPHY
U LUNAR PHOTOGRAPHY
LUNAR CRATES
Interpreting statistics of small lunar craters

LUNAR SOIL
Light element geochemistry of the Apollo 12 site

LUNAR SPACECRAFT
NT APOLLO SPACECRAFT

LIPIDS
NT LIPOPROTEINS
Physiologic regulation of body energy storage

LOW DENSITY MATERIALS
Lipids — Bimaleimide-carbon microballoon composites -— aircraft and submarine compartment safety

LOW VELOCITY WINGS
LOW VELOCITY WIND TUNNELS
Low speed test of a high-bypass-ratio propulsion system with an asymmetric inlet designed for a tilt-nacelle V/STOL airplane

LOW-SPEED WING-TUNNEL TESTS
Low speed aerodynamic characteristics of an 0.075-scale F-15 airplane model at high angles of attack and sideslip

LOW-SPEED WING-TUNNEL TESTS
Low-speed aerodynamic characteristics of a 0.08-scale Y-17 airplane model at high angles of attack and sideslip

MAINTENANCE
NT FILE MAINTENANCE (COMPUTERS)
MAMMALS
NT MICE
NT RATS

MACHINE SYSTEMS
Flight simulation — A vital and expanding technology in aircraft development

MANAGEMENT
NT DATA MANAGEMENT
NT PROCUREMENT MANAGEMENT
NT PROJECT MANAGEMENT
NT RESEARCH MANAGEMENT
MANAGEMENT METHODS
Critical review of Ames life Science participation in Spacelab mission development Test 3: The SME 3 management study
The Viking biological experiments on Mars

Carbon suboxide polymer, an explanation for the formation of channels on Mars

Mars Probes

Mars Orbiter Spacecraft

Mars Surface SAMPLES

The Viking biological experiments on Mars

Effects of mass addition on blunt-body boundary-layer transition and heat transfer

Material Balance

NASA/Cr-152122

Manning

NASA/TN-78-49231

Mars probe

Mars Orbiter Spacecraft

Mars Surface

Multiextensive study of the Martian upper atmosphere

Chemical interpretation of Viking Lander 1 life detection experiment

An analytic study of impact ejecta trajectories in the atmospheres of Venus, Mars, and Earth

Primitive atmosphere and implications for the formation of channels on Mars

Post-Viking models for the structure of the summer atmosphere of Mars

Mars Environment

Mars Probes

Mars Lander

Mars Orbiter Spacecraft

Some volcanic features on Mars as viewed from the Viking orbiters

Primitive atmosphere and implications for the formation of channels on Mars

Carbon suboxide polymer, an explanation for the wave of darkening on Mars

Comparison between infrared Martian disk spectra and optical properties of terrestrial analogs

Mars Surface Samples

The Viking biological experiments on Mars

Mass Transfer

Effects of mass addition on blunt-body boundary-layer transition and heat transfer

Material Balance

NASA/TP-1139
SIMULATORS

SKY RADIATION

SLENDER BODIES

SKIN FRICTION

SIMULATION

NT SILICON DIoxide

SILICON

SILICON DIoxide

SILICON DIoxide

SILICON DIOXIDE

SILICON OXYde

NT SILICON DIoxide

SILTS

NT SEDIMENTS

SIMILARITY THEOREM

NT LAGRANGE SIMILARITY HYPOTHESIS

SIMULATED ALTITUDE

NT ALTITUDE SIMULATION

NT COMPUTERIZED SIMULATION

NT CONTROL SIMULATION

NT DIGITAL SIMULATION

NT FLIGHT SIMULATION

NT SPACE ENVIRONMENT SIMULATION

NT THERMAL SIMULATION

Aircraft cargo compartment fire test simulation program

[SOLAR-COM-PAPER 15191]

p0029 N78-21223

SIMULATORS

NT COCKPIT SIMULATORS

NT CONTROL SIMULATION

NT FLIGHT SIMULATORS

NT MOTION SIMULATORS

NT SPACE SIMULATORS

SKIN FRICTION

NT AERODYNAMIC DRAG

NT SUPERSONIC DRAG

SKY WAVES

NT WHISTLERS

SLENDER BODIES

Wake vortex measurements of bodies at high angle of attack

[AIAA PAPER 78-23]

p0015 A78-22555

Computation of transonic flow past projectiles at angle of attack

[AIAA PAPER 78-1182]

p0044 A78-41075

Some unsteady separation problems for slender bodies

p0063 A78-28405

SLENDER WINGS

Transonic lifting line theory - Numerical procedure for shock-free flows

p0017 A78-37472

SMALL PARTICULATION FLOW

Displacement thickness distributions in transonic flows about 3-D wings

p0032 A78-17612

A uniqueness proof for a transonic flow problem

p0016 A78-25599

Lifting line theory for transonic flow

p0020 A78-45991

SMOKE

Fire detector response in aircraft applications

p0049 A78-51674

SOCIAL FACTORS

A review of NASA-sponsored technology assessment

p0038 A78-30691

SOLAR ACTIVITY

NT SOLAR FLARES

SOLAR ACTIVITY EFFECTS

Dynamic MHD modeling of the solar wind

disturbances during the August 1972 events

p0036 A78-26079

SOLAR COLLECTORS

NT SOLAR REFLECTORS

SOLAR CORONA

The quiet corona x-ray spectrum of highly ionized oxygen and nitrogen

p0086 A78-31108

Rigidity-independent coronal propagation and escape of solar protons and alpha particles

p0041 A78-37354

SOLAR CORPUSCULAR RADIATION

NT SOLAR PROTONs

SOLAR FLARES

Dynamic MHD modeling of the solar wind

disturbances during the August 1972 events

p0036 A78-26079

ON the observation of a flare-generated shock wave

at 9.7 AU by Pioneer 10

[AD-A053721]

p0038 A78-39078

Rigidity-independent coronal propagation and escape of solar protons and alpha particles

p0041 A78-37354

SOLAR INSTRUMENTS

NT SPEKTROROLOGIES

SOLAR MAGNETIC FIELD

Dynamic MHD modeling of the solar wind

disturbances during the August 1972 events

p0036 A78-26079

SOLAR RADIATION

NT SOLAR CORONA

SOLAR RADIATION (RADIATION)

NT SOLAR WIND

SOLAR PROTONS

Pioneer 10 observation of the solar wind proton temperature heliocentric gradient

[SOLAR-WH-78815]

p0027 N78-31030

SOLAR PROTONs

Energetic protons associated with interplanetary active region 1-5 AU from the sun

p0036 A78-26081

Rigidity-independent coronal propagation and escape of solar protons and alpha particles

p0041 A78-37354

Pioneer 10 observation of the solar wind proton temperature heliocentric gradient

[SOLAR-WH-78815]

p0027 N78-31030

SOLAR RADIATION

NT SOLAR PROTONS

NT SOLAR WIND

NT SOLAR X-RAYS

Radiation pressure and Poynting-Robertson drag for small spherical particles

--- in interplanetary space

p0033 A78-19748

SOLAR REFLECTORS

Satellite mirror systems for providing terrestrial power - System concept

[AAS 77-240]

p0040 A78-36717

SOLAR ROTATION

Dynamic MHD modeling of solar wind corotating streams interaction regions observed by Pioneer 10 and 11

p0049 A78-52522

SOLAR SYSTEM

Radiometer system to map the cosmic background radiation

p0038 A78-30691
**SPACE COLONIES**

**SPACE WIND**

**SPACE WIND**

On the relative locations of the bow shocks of the terrestrial planets

Dynamic MHD modeling of the solar wind disturbances during the August 1972 events

Acceleration of nucleons in the interplanetary space and the modulation of Jupiter electrons in the interval from 1 to 10 A.U. by corotating regions of solar origin

The spiral field inhibition of thermal conduction in two-fluid solar wind models

Dynamic MHD modeling of solar wind corotating stream interaction regions observed by Pioneer 10 and 11

Pioneer 10 observation of the solar wind proton tangenture heliocentric gradient

Acceleration and heating of the solar wind

**SOLAR WIND VELOCITY**

The interplanetary modulation and transport of Jordanian electrons

**SOLAR X-RAYS**

The quiet coronal X-ray spectra of highly ionized oxygen and nitrogen

**SOLIDIFICATION**

U ROTATING BODIES

SOLID STATE DEVICES

U TRANSPORT DEVICES

SOLID SURFACES

Study of a high performance evaporative heat transfer surface

**SOLUTIONS**

U DETECTABLE GAS MIXTURES

**SONIC FLOW**

U DETERMINABLE GAS MIXTURES

**SOUND GENERATORS**

Non-linear parametric generation of sound by resonant mode conversion

**SOUND MEASUREMENTS**

U ACOUSTIC MEASUREMENTS

**SOUND PROPAGATION**

Acoustical effects of blade tip shape changes on a full scale helicopter rotor in a wind tunnel

Propagation of sound through a sheared flow

**SOUND WAVES**

U AERODYNAMIC NOISE

U AIRCRAFT NOISE

U ENSIGE NOISE

U JET AIRCRAFT NOISE

**SPACE BASICS**

**SPACE CROSS***

SPACE COLUMNS

**SPACE BIOLOGY**

U BIODIVERSITY

Space habitats --- prognosis for space colonization

**SPACE ENVIRONMENT**

U AEROSPACE ENVIRONMENTS

**SPACE ENVIRONMENT SIMULATION**

Shock-tube studies of atomic silicon emission in the spectral range 160 to 300 nm --- environment simulation for Jupiter probes

**SPACE FLIGHT**

U APOLLO 12 FLIGHT

U HYPERSONIC RESEARCH

U SPACECRAFT REPERTORY

**SPACE INDUSTRIALIZATION**

Space industrialization --- education --- via communication satellites

Space habitats --- prognosis for space colonization

**SPACE MISSIONS**

Earth reencounter probabilities for aborted space disposal of hazardous nuclear waste

**SPACE PHOTOGRAPHY**

U SPACEBORNE PHOTOGRAPHY

**SPACE PROBES**

U JUPITER PROBES

U PIONEER SPACE PROBES

U PIONEER 10 SPACE PROBE

U PIONEER 11 SPACE PROBE

U SOLAR PROBES

U VENUS PROBES

**SPACE SHUTTLE ORBITERS**

Static and dynamic stability analysis of the space shuttle vehicle-orbiter

**SPACE SHUTTLE PAYLOADS**

**SPACE SYSTEMS**

Hormonal indices of tolerance to Gz acceleration in female subjects --- personnel selection in Shuttle program

**SPACE SIMULATORS**

Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission

**SPACE SUITS**

Spacesuit mobility knee joints

Spacesuit mobility joints

Spacesuit torso closure

**SPACE TRANSPORTATION SYSTEM**

U SPACE SHUTTLE ORBITERS

**SPACE VEHICLES**

U SPACECRAFT

**SPACECRAFT PHOTOGRAPHY**

Some Martian volcanic features as viewed from the Viking orbiters

**SPACECRAFT PROPULSION**

Study, optimization, and design of a laser heat engine

**SPACELAB**

**SPACE SUITS**

**SPACE TRACKS**

**SPACE TROPOSPHERES**

**SPACE VEHICLES**

**SPACEBORNE PHOTOGRAPHY**

Some Martian volcanic features as viewed from the Viking orbiters

**SPACE LOGISTICS**

**SPACE SHUTTLE ORBITERS**

**SPACE视觉 INDUSTRIALIZATION**

**SPACE MISSIONS**

Earth reencounter probabilities for aborted space disposal of hazardous nuclear waste

**SPACE PHOTOGRAPHY**

U SPACEBORNE PHOTOGRAPHY

**SPACE PROBES**

U JUPITER PROBES

U PIONEER SPACE PROBES

U PIONEER 10 SPACE PROBE

U PIONEER 11 SPACE PROBE

U SOLAR PROBES

U VENUS PROBES

**SPACE SHUTTLE ORBITERS**

Static and dynamic stability analysis of the space shuttle vehicle-orbiter

**SPACE SHUTTLE PAYLOADS**

**SPACE SYSTEMS**

Hormonal indices of tolerance to Gz acceleration in female subjects --- personnel selection in Shuttle program

**SPACE SIMULATORS**

Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission

**SPACE SUITS**

Spacesuit mobility knee joints

Spacesuit mobility joints

Spacesuit torso closure

**SPACE TRANSPORTATION SYSTEM**

U SPACE SHUTTLE ORBITERS

**SPACE VEHICLES**

U SPACECRAFT

**SPACECRAFT PHOTOGRAPHY**

Some Martian volcanic features as viewed from the Viking orbiters

**SPACECRAFT PROPULSION**

Study, optimization, and design of a laser heat engine
SYMMETRICAL SYNTHESIS
SWIRLING SWEPTBACK SWEAT SWAN SUPPRESSORS
Cable strumming suppression SUPPORT SYSTEMS
NT NT DELTA U NT DELTA U NT AUTOMOBILES NT CLOSED ECOLOGICAL SYSTEMS NT LIFE SUPPORT SYSTEMS
SUPPRESSIONS
Cable strumming suppression [AD-A047996] p0022 N78-18366
Application of second-order turbulent modeling to the prediction of radiated aerodynamic sound [NASA-CR-2994] p0012 N78-25359
SURFACE PROPERTIES
NT SPECIAL REFLECTANCE Stimulated emission of surface plasmons by electron tunneling in metal-barrier-metal structures p0030 A78-30667
SURFACE TO SURFACE MISSILES
NT INTERCONTINENTAL BALLISTIC MISSILES
SURFACE VEHICLES
NT AUTOMOBILES SWAN BANDS
A theoretical study of the electronic transition moment for the C2 Swan band system p0041 A78-36776
SWASH
U SPLASHING SWASH
SWEET WINGS NT DELTA WINGS
Computational wing optimization and comparisons with experiment for a semi-span wing model [NASA-TH-78480] p0025 N78-26106
Phenomenological aspects of quasi-stationary controlled and uncontrolled three-dimensional flow separations --- in relation to aircraft design considerations and sweet wings p0007 N78-29402
SWEETBACK WINGS
NT DELTA WINGS
SWIRLING WAKES NT TURBULENCE WAKES
STEAMERIAL BODIES
NT ASYMMETRICAL BODIES NT BODIES OF REVOLUTION NT CONICAL BODIES NT ROTATING CYLINDERS
SYNTHESIS
TRANSPORT COEFFICIENTS

[ NASA-TM-78470 ] p0005 A78-21094
Short-haul CTOL aircraft research --- on reduced energy for commercial air transportation [ NASA-CR-152151 ] p0013 A78-29060
Requirements for regional short-haul air service and the definition of a flight program to determine neighborhood reactions to small transport aircraft [ NASA-CR-152151 ] p0013 A78-36070
U, TRANSPORT PROPERTIES
TRANSPORT PROPERTIES
NT DIFFUSION NT VISCOSITY NT THERMAL CONDUCTIVITY
calcium transport in halobacterium halobium
vesicles - noncompetitive, asymmetric inhibition by L-cystine
Transport of contaminants in the planetary boundary layer

TRANSPORTATION
NT AIR TRANSPORTATION NT ORDAN TRANSPORTATION
A study of characteristics of intercity transportation systems. Phase 1: Definition of transportation comparison methodology [ NASA-CR-152152-VOL-1 ] p0061 A78-29069

TRANSMILLS
Tread mill for animals --- having an electrical shock station [ NASA-CASE-RC-10917-1 ] p0057 A78-27333

TRIANGULAR WINGS
U DELTA WINGS
U TRIANGLE BALANCE
U AERODYNAMIC BALANCE
U HYDROPLANE BALANCE
U LIQUID ROCKET PROPELLANTS

TROTHMS
NT AEROFOILS

TUBES
Interhemispheric gradients of CF2Cl2, CF2Cl3, CC14, and N2O p0042 A78-41124

TUBULAR BEAMS
Digital filter structures having low errors and simple hardware implementation p0056 A78-51394

TURBINES
Advanced solid electrolyte cell for CO2 and H2O electrolysis --- for extended duration manned spaceflights [ NASA-CR-152093 ] p0026 A78-2696

TURBINE
U ETYPS (ETERO)
U TURBINE
The co-adsorption of copper and oxygen on a tungsten 100 phase-type surface p0037 A78-29849

TURBOGAME ENGINS
Nitric oxide production by Tunguska meteor p0042 A78-51811

TUNNEL RESISTORS
U ELECTRON TUNNELING

TURBULENCE
Interhemispheric gradients to American meteor tunguska
Stress analysis study in cooled radial inflow turbine [ AIAA PAPER 78-94 ] p0064 A78-22570

TURBULENCE
NT AEROFOILS
NT TURBULENCE
NT AERODYNAMIC BALANCE
NT HYDROFOILS (HYDROFOIL)
NT ROTOR BLADES (TURBOPROP)

TURBULENCE
NT ATMOSPHERIC TURBULENCE
NT CLEAR AIR TURBULENCE
NT TURBULENCE BOUNDARY-LAYER
Reynolds number and pressure gradient effects on compressible turbulent boundary layers [ AIAA PAPER 78-1135 ] p0043 A78-41863
Numerical solution of a three-dimensional shock wave and turbulent boundary-layer interaction [ NASA-PAPER 78-161 ] p0034 A78-22591
Behavior of a turbulent boundary layer subjected to sudden transverse strain [ AIAA PAPER 78-271 ] p0034 A78-22595
An evaluation of several compressible turbulent boundary-layer models Effects of pressure gradient and Reynolds number on crossflow [ AIAA PAPER 78-1160 ] p0063 A78-41589
Comparison of subequation turbulence models for several shock-separated boundary-layer interaction flows [ AIAA PAPER 78-1165 ] p0043 A78-41863
A detailed study of attached and separated compression corner flowfields in high Reynolds number supersonic flow [ AIAA PAPER 78-1165 ] p0043 A78-41865
Injection slot location for boundary-layer control in shock-induced separation [ NASA-PAPER 78-170 ] p0044 A78-41866
A computer program for calculating laminar and turbulent boundary layers for two-dimensional time-dependent flows [ NASA-TE-78470 ] p0051 A78-19444
An experimental documentation of pressure gradient and Reynolds number effects on compressible turbulent boundary layers [ NASA-TE-78480 ] p0026 A78-27364

TURBULENT FLOW
Thin-layer approximation and algebraic model for separated turbulent flows [ AIAA PAPER 78-257 ] p0033 A78-29776
Measurements of unsteady vortex flow fields [ AIAA PAPER 78-18 ] p0015 A78-22554
Navier-Stokes calculations for laminar and turbulent hypersonic flow over indented nosetips [ AIAA PAPER 78-260 ] p0035 A78-22608
Computations of the viscous supersonic flow over symmetrical and asymmetrical external axial cowlings [ AIAA PAPER 78-1135 ] p0063 A78-41839
Estimating maximum instantaneous distortion from inlet total pressure rms measurements [ AIAA PAPER 78-070 ] p0019 A78-43525
Numerical solution of two-dimensional turbulent blunt body flows with an impinging shock [ AIAA PAPER 78-1208 ] p0045 A78-45144
Arrhenius' law in turbulent media and an equivalent tunnel effect --- in binary exchange chemical reactions p009 A78-52597
Application of second-order turbulent modeling to the prediction of radiated aeroacoustic sound [ NASA-CR-152105 ] p0064 A78-19155
<table>
<thead>
<tr>
<th>SUBJECT INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TURBULENT WAVES</strong></td>
</tr>
<tr>
<td>Wake vortex measurements of bodies at high angle of attack (AIAA Paper 78-23) p0015 178-22555</td>
</tr>
<tr>
<td>Measured wake-vortex characteristics of aircraft in ground effect (AIAA Paper 79-199) p0015 178-22570</td>
</tr>
<tr>
<td>TVC (CONTROL)</td>
</tr>
<tr>
<td>TWO DIMENSIONAL BODIES</td>
</tr>
<tr>
<td>Notes on the transonic initial method –– for two-dimensional airfoil flutter derivative calculation p0041 178-37732</td>
</tr>
<tr>
<td>TWO DIMENSIONAL BOUNDARY LAYER</td>
</tr>
<tr>
<td>Behavior of a turbulent boundary layer subjected to sudden traverse strain (AIAA Paper 78-201) p0034 178-22595</td>
</tr>
<tr>
<td>Flying-hot-wire study of two-dimensional mean flow past an H211121 airplane at maximum lift (AIAA Paper 78-1196) p0010 178-41867</td>
</tr>
<tr>
<td>TWO DIMENSIONAL FLOW</td>
</tr>
<tr>
<td>Unsteady transonic flow computations p0032 178-18274</td>
</tr>
<tr>
<td>Numerical solution of a class of integral equations arising in two-dimensional aerodynamics p0010 178-49324</td>
</tr>
<tr>
<td>Numerical solution of two-dimensional turbulent blast body flows with an impinging shock (AIAA Paper 78-1209) p0035 178-45144</td>
</tr>
<tr>
<td>A computer program for calculating laminar and turbulent boundary layers for two-dimensional time-dependent flows (NASA-TM-781701) p0051 178-19444</td>
</tr>
<tr>
<td>TWO-WAVELENGTH LASERS</td>
</tr>
<tr>
<td>Collisionless dissociation of SP6 using two resonant frequency CO2 laser fields p0031 178-14655</td>
</tr>
<tr>
<td>U</td>
</tr>
<tr>
<td>U-2 AIRCRAFT</td>
</tr>
<tr>
<td>High altitude perspective –– cost-reimbursable services using NASA U-2 aircraft (NASA-SP-427) p0027 178-31508</td>
</tr>
<tr>
<td>ULTRAVIOLET ABSORPTION</td>
</tr>
<tr>
<td>Absorption measurements of OH using a CW tunable laser p0032 178-17837</td>
</tr>
<tr>
<td>ULTRAVIOLET ASTRONOMY</td>
</tr>
<tr>
<td>Europe – ultraviolet emissions and the possibility of atomic oxygen and hydrogen clouds p0046 178-52662</td>
</tr>
<tr>
<td>UNDERWATER VEHICLES</td>
</tr>
<tr>
<td>MT SUBMARINES</td>
</tr>
<tr>
<td>UNDERWATER TECHNOLOGY</td>
</tr>
<tr>
<td>A uniqueness proof for a transonic flow problem p0016 178-26599</td>
</tr>
<tr>
<td>UNITED STATES OF AMERICA</td>
</tr>
<tr>
<td>UN CALIFORNIA</td>
</tr>
<tr>
<td>UNMANNED SPACECRAFT</td>
</tr>
<tr>
<td>NT JUPITER PROBES</td>
</tr>
<tr>
<td>NT STORKER SPACE PROBES</td>
</tr>
<tr>
<td>NT PIONEER VENUS SPACECRAFT</td>
</tr>
<tr>
<td>NT PIONEER 10 SPACE PROBE</td>
</tr>
<tr>
<td>NT STORKER 11 SPACE PROBE</td>
</tr>
<tr>
<td>NT SOLAR PROBES</td>
</tr>
<tr>
<td>NT VENUS PROBES</td>
</tr>
<tr>
<td>UNSCERTED FLOW</td>
</tr>
<tr>
<td>Unsteady transonic flow computations p0032 178-18274</td>
</tr>
<tr>
<td>On implicit finite-difference simulations of three-dimensional flow (AIAA Paper 78-193) p0033 178-20630</td>
</tr>
<tr>
<td>Calculation of unsteady transonic flows using the integral equation method (AIAA Paper 78-191) p0033 178-20632</td>
</tr>
<tr>
<td>Measurements of unsteady vortex flow fields (AIAA Paper 78-118) p0015 178-22550</td>
</tr>
<tr>
<td>Advanced panel-type influence coefficient methods applied to unsteady three-dimensional potential flows (AIAA Paper 78-229) p0021 178-52630</td>
</tr>
<tr>
<td>Dynamic stall of an oscillating airfoil p0025 178-22655</td>
</tr>
<tr>
<td>VAPOR DEPOSITION</td>
</tr>
<tr>
<td>Introduction to unsteady aspects of separation in subsonic and transonic flow p0063 178-28403</td>
</tr>
<tr>
<td>Some unsteady separation problems for slender bodies p0063 178-28405</td>
</tr>
<tr>
<td>UNSTEADY WINGS</td>
</tr>
<tr>
<td>Transonic lifting line theory –– Numerical procedure for shock-free flows p0017 178-37742</td>
</tr>
<tr>
<td>UPPER AIR</td>
</tr>
<tr>
<td>UPPER ATMOSPHERE</td>
</tr>
<tr>
<td>UPPER AZORES</td>
</tr>
<tr>
<td>U RAIN</td>
</tr>
<tr>
<td>Occultation of Epsilon Geminorum by Mars. II –– The structure and extinction of the Martian upper atmosphere p0039 178-10597</td>
</tr>
<tr>
<td>URANUS (PLANET)</td>
</tr>
<tr>
<td>Transonic lifting line theory –– Numerical procedure for shock-free flows p0017 178-37742</td>
</tr>
<tr>
<td>URANUS RINGS</td>
</tr>
<tr>
<td>Signal-to-noise ratios for stellars occultations by the rings of Uranus, 1977-1996 p0033 178-20223</td>
</tr>
<tr>
<td>URANUS RINGS</td>
</tr>
<tr>
<td>The radii of Uranian rings alpha, beta, gamma, delta, epsilon, etc. 4, 5, and 6 from their occultations of SAO 158687 p0046 178-84112</td>
</tr>
<tr>
<td>URBAN AREAS</td>
</tr>
<tr>
<td>U CITIES</td>
</tr>
<tr>
<td>URBAN TRANSPORTATION</td>
</tr>
<tr>
<td>Planning for airport access: Analysis of the San Francisco Bay area p0001 178-26152</td>
</tr>
<tr>
<td>A study of characteristics of intercity transportation systems. Phase 1: Definition of transportation corridor methodology (NASA-CR-121512-2) p0001 178-29996</td>
</tr>
<tr>
<td>USER MANUALS (COMPUTER PROGRAMS)</td>
</tr>
<tr>
<td>System optimization of gasdynamic lasers, computer program user’s manual (NASA-CP-2044) p0027 178-29436</td>
</tr>
<tr>
<td>USER REQUIREMENTS</td>
</tr>
<tr>
<td>Future requirements and roles of computers in aerodynamics p0004 178-19786</td>
</tr>
<tr>
<td>UTILITY AIRCRAFT</td>
</tr>
<tr>
<td>UT-2 AIRCRAFT</td>
</tr>
<tr>
<td>UTILIZATION</td>
</tr>
<tr>
<td>UT LASER APPLICATIONS</td>
</tr>
<tr>
<td>V</td>
</tr>
<tr>
<td>V/STOL AIRCRAFT</td>
</tr>
<tr>
<td>NT HELICOPTERS</td>
</tr>
<tr>
<td>NT MILITARY HELICOPTERS</td>
</tr>
<tr>
<td>NT ROTARY WING AIRCRAFT</td>
</tr>
<tr>
<td>NT SHORT TAKE-OFF AIRCRAFT</td>
</tr>
<tr>
<td>NT VERTICAL TAKE-OFF AIRCRAFT</td>
</tr>
<tr>
<td>NT XV-15 AIRCRAFT</td>
</tr>
<tr>
<td>Simulator evaluation of three situation and guidance displays for V/STOL aircraft zero-zero landing approaches p0055 178-44131</td>
</tr>
<tr>
<td>Studies of aerodynamic technology for V/STOL fighter/attack aircraft (NASA CR-152072) p0020 178-47946</td>
</tr>
<tr>
<td>V/STOL aircraft simulation –– Requirements and capabilities at Ames Research Center (NASA CR-152093) p0021 178-49790</td>
</tr>
<tr>
<td>Low speed test of a high-bypass-ratio propulsion system with an asymmetric inlet designed for a tilt-macelle V/STOL airplane (NASA CR-152087) p0009 178-17062</td>
</tr>
<tr>
<td>Conceptual design study of a Barrier V/STOL research aircraft (NASA CR-152086) p0009 178-19096</td>
</tr>
<tr>
<td>Static tests of a large scale swivel nozzle thrust deflector (NASA CR-152091) p0011 178-22100</td>
</tr>
<tr>
<td>VACUUM DEPOSITION</td>
</tr>
<tr>
<td>Controlled vapor growth of small particles of Pd and Fe on thin Al2O3 substrates p0048 178-43384</td>
</tr>
<tr>
<td>VAPORS</td>
</tr>
<tr>
<td>NT GUIDED VAPORS</td>
</tr>
<tr>
<td>VAPOR DEPOSITION</td>
</tr>
<tr>
<td>NT VACUUM DEPOSITION</td>
</tr>
</tbody>
</table>
The Viking biological experiments on Mars

The Viking landingers 1

Venndor models for the structure of the summer atmosphere of Mars

Viking Landers 1

Chemical interpretation of Viking Lander 1 life detection experiment

Viking Orbiter Spacecraft

Some Martian volcanic features as viewed from the Viking orbiters

Venus Probes

Thermal design and development of a planetary probe - Pioneer Venus large probe

The solar wind and plasma of Venus - Prospects for Pioneer Venus

Venus Probes

Thermal design and development of a planetary probe - Pioneer Venus large probe

Venera

NT Nice

NT image

VRCETICAL DISTRIBUTION

Thermal design and development of a planetary probe - Pioneer Venus large probe

Vertical Takeoff Aircraft

Evaluation of the tilt rotor concept: The XV-15's role

Vibration

NT free vibration

NT structural vibration

NT transonic flutter

Vibrational Relaxation

U molecular relaxation

Vibrational Spectra

Absolute intensity measurements at different temperatures of the C-12/0-16/2 bands 30 0 1
1-00 0 0 and 30 0 1 1-00 0 0

Comets on the note by Ares et al. on the transition moment of the CO2 band near 7740

Lasers

Video Communication

Survey of adaptive image coding techniques

Viking Landers Spacecraft

NT Viking Lander 1

Adaptive image coding techniques

Post-Viking models for the structure of the summer atmosphere of Mars

Venus Probes

Thermal design and development of a planetary probe - Pioneer Venus large probe

Theoretical solution of viscous flows at high Reynolds number

Computing viscous flows

Visualization Devices

Display devices

Visual tracking

Volcanology

Visual display

Some Martian volcanic features as viewed from the Viking orbiters

Voltaic-channel characteristics

Characterization of integrated CMOS junctions at DC and at optical frequencies

Vortex Colors

U Vortices

Vortex Disturbances

U Vortices

Vortex Flow

Vortex Ring

The instability of the thin vortex ring of constant vorticity

Vortex Shires

Measured wake-vortex characteristics of aircraft in ground effect

Vortex Tubs

U Vortices

Vortices

Laser-velocimeter surveys of merging vortices in a wind tunnel

Measurements of unsteady vortex flow fields

Wake vortex measurements of bodies at high angle of attack

SUBJECT INDEX
<table>
<thead>
<tr>
<th>SUBJECT INDEX</th>
<th>WIND TUNNEL TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot-wire, laser anemometer and force balance measurements of cross-sectional planes of single and interacting trailing vortices (AIAA Paper 78-1196)</td>
<td>p0018 N78-31885</td>
</tr>
<tr>
<td>on the period of the coherent structure in boundary layers at large Reynolds numbers (NASA-TM-79847)</td>
<td>p0024 N78-21407</td>
</tr>
<tr>
<td>The evolution of vortex structure on helicopter noise due to blade/vortex interaction (NASA-CR-152150)</td>
<td>p0012 N78-25832</td>
</tr>
<tr>
<td>Laser-velocimeter surveys of merging vortices in a wind tunnel: Complete data and analysis (NASA-TM-78449)</td>
<td>p0008 N78-33403</td>
</tr>
<tr>
<td>VORTEX TURBULENCE</td>
<td></td>
</tr>
<tr>
<td>The instability of the thin vortex ring of constant vorticity</td>
<td>p0031 N78-15622</td>
</tr>
<tr>
<td>VTOL AIRCRAFT</td>
<td></td>
</tr>
<tr>
<td>U VERTICAL TAKEOFF AIRCRAFT</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
</tr>
<tr>
<td>WAKES</td>
<td></td>
</tr>
<tr>
<td>WAKE ATOM MUSIC WAKES</td>
<td></td>
</tr>
<tr>
<td>WAKE TURBULENT WAVES</td>
<td></td>
</tr>
<tr>
<td>WALL FLOW</td>
<td></td>
</tr>
<tr>
<td>Buried wire gage for wall shear stress measurements (AIAA 76-758)</td>
<td>p0017 A78-32353</td>
</tr>
<tr>
<td>A study of test section configuration for shock tube testing of transonic airfoils (NASA-CR-152701)</td>
<td>p0012 N78-26153</td>
</tr>
<tr>
<td>WARNING</td>
<td></td>
</tr>
<tr>
<td>WARNING DEVICES</td>
<td></td>
</tr>
<tr>
<td>U WARNING SYSTEMS</td>
<td></td>
</tr>
<tr>
<td>WARNING SENSORS</td>
<td></td>
</tr>
<tr>
<td>U WARNING SYSTEMS</td>
<td></td>
</tr>
<tr>
<td>WARNING SYSTEMS</td>
<td></td>
</tr>
<tr>
<td>Flight tests of a simple airborne device for predicting clear air turbulence encounters (AIAA 76-1375)</td>
<td>p0019 N78-6566</td>
</tr>
<tr>
<td>NASA aviation safety reporting system (NASA-TM-78511)</td>
<td>p0052 N78-32075</td>
</tr>
<tr>
<td>WASH DISPOSAL</td>
<td></td>
</tr>
<tr>
<td>Earth reencounter probabilities for aborted space disposal of hazardous nuclear waste</td>
<td>p0038 N78-31921</td>
</tr>
<tr>
<td>Space ecosystems: An approach to the design of closed ecosystems for use in space (NASA-TM-784917)</td>
<td>p0051 N78-26740</td>
</tr>
<tr>
<td>WAVES</td>
<td></td>
</tr>
<tr>
<td>WAKE ATOM MUSIC WAVES</td>
<td></td>
</tr>
<tr>
<td>WAKE TURBULENT WAVES</td>
<td></td>
</tr>
<tr>
<td>WAVE</td>
<td></td>
</tr>
<tr>
<td>WAVE ELECTROLYTE</td>
<td></td>
</tr>
<tr>
<td>Advanced solid electrolyte cell for automotive and aerospace applications (NASA-CR-152093)</td>
<td>p0052 N78-21235</td>
</tr>
<tr>
<td>WAVE BALANCE</td>
<td></td>
</tr>
<tr>
<td>Fluid-electrolyte shifts and axial oxygen uptake in man at simulated altitude /2,237 m/ (NASA-TM-786917)</td>
<td>p0054 A78-36602</td>
</tr>
<tr>
<td>WATER TUNNELS</td>
<td></td>
</tr>
<tr>
<td>U HYDRAULIC TEST TUNNELS</td>
<td></td>
</tr>
<tr>
<td>WATER VEHICLES</td>
<td></td>
</tr>
<tr>
<td>WAVE INTERACTIONS</td>
<td></td>
</tr>
<tr>
<td>WAVE SHOCK WAVE INTERACTION</td>
<td></td>
</tr>
<tr>
<td>The instability of the thin vortex ring of constant vorticity</td>
<td>p0031 N78-15622</td>
</tr>
<tr>
<td>WAVE PROPAGATION</td>
<td></td>
</tr>
<tr>
<td>WAVE DYNAMICS</td>
<td></td>
</tr>
<tr>
<td>WAVE ELECTROLYTE</td>
<td></td>
</tr>
<tr>
<td>Advanced solid electrolyte cell for automotive and aerospace applications (NASA-CR-152093)</td>
<td>p0052 N78-21235</td>
</tr>
<tr>
<td>WAVE ELECTROLYTE</td>
<td></td>
</tr>
<tr>
<td>Electrolytic cell for automotive and aerospace applications (NASA-CR-152093)</td>
<td>p0052 N78-21235</td>
</tr>
<tr>
<td>WAVE ELECTROLYTE</td>
<td></td>
</tr>
<tr>
<td>Electrolytic cell for automotive and aerospace applications (NASA-CR-152093)</td>
<td>p0052 N78-21235</td>
</tr>
<tr>
<td>WATER TUNNELS</td>
<td></td>
</tr>
<tr>
<td>U HYDRAULIC TEST TUNNELS</td>
<td></td>
</tr>
<tr>
<td>WATER VEHICLES</td>
<td></td>
</tr>
<tr>
<td>WAVE INTERACTIONS</td>
<td></td>
</tr>
<tr>
<td>WAVE SHOCK WAVE INTERACTION</td>
<td></td>
</tr>
<tr>
<td>The instability of the thin vortex ring of constant vorticity</td>
<td>p0031 N78-15622</td>
</tr>
<tr>
<td>WEAR PLATES</td>
<td></td>
</tr>
<tr>
<td>Effects of potassium titaate fiber on the wear of automotive brake linings</td>
<td>p0035 N78-23450</td>
</tr>
<tr>
<td>WINGS (MEMBRANES)</td>
<td></td>
</tr>
<tr>
<td>U MEMBRANES</td>
<td></td>
</tr>
<tr>
<td>WEIGHT (MASS)</td>
<td></td>
</tr>
<tr>
<td>BODY WEIGHT</td>
<td></td>
</tr>
<tr>
<td>WEIGHTLESSNESS</td>
<td></td>
</tr>
<tr>
<td>Space colonization - Some physiological perspectives</td>
<td>p0055 N78-41160</td>
</tr>
<tr>
<td>Further investigation of the spontaneous and evoked activity of the primary neurons of the labyrinth of the bullfrog before, during and after an extended period of weightlessness, including alternative intervals of artificial gravity (NASA-CR-154507)</td>
<td>p0052 N78-16064</td>
</tr>
<tr>
<td>WHEEL INSTABILITY</td>
<td></td>
</tr>
<tr>
<td>U ROTARY INSTABILITY</td>
<td></td>
</tr>
<tr>
<td>WHISTLERS</td>
<td></td>
</tr>
<tr>
<td>Whistler mode noise in Jupiter's inner magnetosphere</td>
<td>p0045 N78-45180</td>
</tr>
<tr>
<td>WIND</td>
<td></td>
</tr>
<tr>
<td>WIND SENTRY</td>
<td></td>
</tr>
<tr>
<td>WIND SENTRY</td>
<td></td>
</tr>
<tr>
<td>Wind tunnel tests of semi-span model (NASA-TM-78180)</td>
<td>p0025 N78-26106</td>
</tr>
<tr>
<td>WIND TUNNEL APPARATUS</td>
<td></td>
</tr>
<tr>
<td>Laser-velocimeter surveys of merging vortices in a wind tunnel (AIAA Paper 78-107)</td>
<td>p0015 N78-20687</td>
</tr>
<tr>
<td>Use of coherence and phase data between two receivers in evaluation of noise environments (NASA-TM-784917)</td>
<td>p0017 N78-33686</td>
</tr>
<tr>
<td>WIND TUNNEL BALANCING</td>
<td></td>
</tr>
<tr>
<td>U WIND TUNNEL APPARATUS</td>
<td></td>
</tr>
<tr>
<td>WIND TUNNEL MODELS</td>
<td></td>
</tr>
<tr>
<td>Computational wing optimization and comparisons with experiment for a semi-span wing model (NASA-TM-78480)</td>
<td>p0025 N78-26106</td>
</tr>
<tr>
<td>WIND TUNNEL TESTS</td>
<td></td>
</tr>
<tr>
<td>Laser-velocimeter surveys of merging vortices in a wind tunnel (AIAA Paper 78-107)</td>
<td>p0015 N78-20687</td>
</tr>
<tr>
<td>Computational wing optimization and wind tunnel test of semi-span model (AIAA Paper 78-102)</td>
<td>p0034 N78-22575</td>
</tr>
<tr>
<td>Buried wire gage for wall shear stress measurements (AIAA 78-798)</td>
<td>p0017 N78-32353</td>
</tr>
<tr>
<td>Moving ground simulation by tangential blowing (AIAA 78-798)</td>
<td>p0017 N78-32353</td>
</tr>
<tr>
<td>WIND TUNNEL TESTS</td>
<td></td>
</tr>
<tr>
<td>Hot-wire, laser anemometer and force balance measurements of cross-sectional planes of single and interacting trailing vortices</td>
<td>p0015 N78-41685</td>
</tr>
<tr>
<td>Effects of inlet airframe integration on the inlet of a supersonic transportation system (NASA-CR-152125)</td>
<td>p0029 N78-22090</td>
</tr>
<tr>
<td>EFFECTS OF INLET AIRFRAME INTEGRATION ON THE INLET</td>
<td></td>
</tr>
<tr>
<td>Effects of inlet airframe integration on the inlet of a supersonic transportation system (NASA-CR-152125)</td>
<td>p0029 N78-22090</td>
</tr>
</tbody>
</table>

WOODEN STRUCTURES
Structural wood panels with improved fire resistance — using propylene and hexamethyleneurethane [NASA-CASE-ARC-11174] p0050 N78-28178

WORLD
U EARTH (PLANET)
U-2 AIRCRAFT
U U-2 AIRCRAFT

X

X RAY ASTRONOMY
Generation of a parallel X-ray beam and its use for testing collimators [NASA-CASE-ARC-11174] p0050 N78-28178

X RAYS
U SPF SOLAR X-RAYS
XV-15 AIRCRAFT
Development of automatic and manual flight director landing systems for the XV-15 tilt rotor aircraft in helicopter mode [NASA-CASE-ARC-11174] p0050 N78-28178
Computational wing optimization and comparisons rotor aircraft in helicopter mode with experiment for a semi-span wing model [NASA-CE-152140] p0011 N78-22071

Z

ZERO GRAVITY
U WEIGHTLESSNESS
ZODIACAL LIGHT
Zodiacal light as an indicator of interplanetary dust [NASA-CASE-ARC-11174] p0050 N78-28178

WIND TUNNELS
Wind tunnel investigation of computational optimized variable camber wing configurations [NASA-AM-78847] p0026 N78-29057

SUBJECT INDEX
## PERSONAL AUTHOR INDEX

### Typical Personal Author Index Listing

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>TITLE</th>
<th>REPORT NUMBER</th>
<th>PAGE NUMBER</th>
<th>ACCESSION NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARR, L. W.</td>
<td>Water-tunnel experiments on an oscillating airfoil at Re equal to 21,000</td>
<td>p0062</td>
<td>N78-19058</td>
<td></td>
</tr>
<tr>
<td>AGARWAL, B.</td>
<td>Computation of supersonic laminar viscous flow past a pointed cone at angle of attack in spinning and coning motion</td>
<td>p0027</td>
<td>N78-23763</td>
<td></td>
</tr>
<tr>
<td>ALYEA, H. H.</td>
<td>Reynolds number and pressure gradient effects on compressible turbulent boundary layers</td>
<td>p0065</td>
<td>A78-51346</td>
<td></td>
</tr>
<tr>
<td>ARMAWDER, W.</td>
<td>An experimental documentation of pressure gradient and Reynolds number effects on compressible turbulent boundary layers</td>
<td>p0026</td>
<td>N78-23763</td>
<td></td>
</tr>
<tr>
<td>ALBUR, A. I.</td>
<td>Reynolds number and pressure gradient effects on compressible turbulent boundary layers</td>
<td>p0065</td>
<td>A78-51346</td>
<td></td>
</tr>
<tr>
<td>AKHTER, W.</td>
<td>Reynolds number and pressure gradient effects on compressible turbulent boundary layers</td>
<td>p0065</td>
<td>A78-51346</td>
<td></td>
</tr>
<tr>
<td>ACTOR, W. A.</td>
<td>Demand-type gas supply system for rocket borne thin-window proportional counters</td>
<td>p0031</td>
<td>A78-13945</td>
<td></td>
</tr>
<tr>
<td>ADUEL-HAIJA, S. B.</td>
<td>Multicolor observations of Phobos using lander cameras - Evidence for a carbonaceous chondritic surface from spectral analysis</td>
<td>p0032</td>
<td>A78-18875</td>
<td></td>
</tr>
<tr>
<td>DUBOIS, M. C.</td>
<td>Fluid-electrolyte shifts and maximal oxygen uptake in man at simulated altitude /2,287 m/</td>
<td>p0054</td>
<td>A78-36602</td>
<td></td>
</tr>
<tr>
<td>ACHARYA, A.</td>
<td>Cosmogonic and supernova viscous flow past a pointed cone at angle of attack in spinning and coning motion</td>
<td>p0045</td>
<td>A78-45129</td>
<td></td>
</tr>
<tr>
<td>ACABAL, T.</td>
<td>The composition of Phobos - Evidence for a carbonaceous chondritic surface from spectral analysis</td>
<td>p0032</td>
<td>A78-18875</td>
<td></td>
</tr>
<tr>
<td>AXFOED, A.</td>
<td>Multi-color observations of Phobos with the Viking lander cameras - Evidence for a carbonaceous chondritic composition</td>
<td>p0032</td>
<td>A78-18875</td>
<td></td>
</tr>
<tr>
<td>AXFOED, A.</td>
<td>Multi-color observations of Phobos with the Viking lander cameras - Evidence for a carbonaceous chondritic composition</td>
<td>p0032</td>
<td>A78-18875</td>
<td></td>
</tr>
<tr>
<td>AXFOED, A.</td>
<td>Multi-color observations of Phobos with the Viking lander cameras - Evidence for a carbonaceous chondritic composition</td>
<td>p0032</td>
<td>A78-18875</td>
<td></td>
</tr>
<tr>
<td>ADAMS, W.</td>
<td>Flame-diffuse shifts and maximal oxygen uptake in man at simulated altitude /2,287 m/</td>
<td>p0054</td>
<td>A78-36602</td>
<td></td>
</tr>
</tbody>
</table>

### Accession Numbers

Accession numbers appearing first.
DAILY, W. J.
Crustal evolution inferred from Apollo magnetic measurements
[AIAA PAPER 78-137591] p0029 N78-36327

DAMAD, S. S.
Assessing the future of air freight
[AIAA PAPER 78-137611] p0069 N78-19816

Infrastructure dynamics: A selected bibliography
[AIAA PAPER 78-137611] p0012 N78-25929

Planning for airport access: An analysis of the San Francisco Bay area
[AIAA PAPER 78-137618] p0001 N78-26152

DALLMAN, F. P.
Horizontal indices of tolerance to oz acceleration in female subjects
p0055 A78-41162

DANIELS, T. C.
Experimental temperature distribution and heat load characteristics of rotating heat pipes
p0046 A78-40835

DASH, R.
Analysis of flight effects on noise radiation from jet flow using a convecting quadrupole model
[AIAA PAPER 78-192] p0015 A78-22590

DAVAIL, R.
Effect of a nonconstant C/a-alpha/ on the stability of rolling aircraft
p0031 A78-16180

DAVENDORE, F. J.
Proximal potential of Mach 0.8 twin engine prop-fan transports
p0017 A78-31306

DAVIS, A. S.
Analysis of ablation debris from natural and artificial iron meteorites
p0039 A78-34506

DAVIES, R. E.
The co-adsortption of copper and oxygen on a tungsten 100 plane-type surface
p0037 A78-29489

DAVIES, R.
Two-dimensional transonic testing with splitter plates
[AIAA TP-1153] p0008 N78-17999

DAVIS, J. S.
Visualization of quasi-periodic unsteady flows
[AIAA TP-1153] p0016 A78-29800

DAVIS, R. C.
Carbonaceous materials subjected to extreme heating - A comparison of numerical simulation and experiments
[AIAA PAPER 78-866] p0041 A78-37273

DREPI, R.
Jet-prop assisted arterial blood pump
[AIAA PAPER 78-137611] p0040 A78-26679

DREPI, R.
Low profile antenna performance study. Part 2: Broadband antenna techniques survey
[AD-A0577892] p0022 N78-18274

DREPI, J. A.
On improving the iterative convergence properties of an implicit approximate-factorization finite difference algorithm
[AIAA PAPER 78-137616] p0026 N78-26795

DREPI, J. A.
Light element geochemistry of the Apollo 12 site
p0054 A78-34503

DEVASTA, R. J.
An integral solution to a nonlinear diffusion problem
p0037 A78-26350

DEVITIETI, R.
Generation of a monodispersed aerosol
[AIAA PAPER 78-137516] p0011 N78-21645

DEVITIETI, R.
Quantum mechanical theory of a structured atom-diaton collision system - A + B/C/Sigma/
[AIAA PAPER 78-137516] p0031 A78-1645a

A new concept in laser-assisted chemistry - The electronic-field representation
p0037 A78-27743

Computational study of a molecular collision process in the presence of an intense radiation field - Enhanced quenching of T by T in the 248-nm light of the KrF laser
[AD-A0540786] p0044 A78-42818

DICKER, R. M.
The response of heat-shield materials to intense laser radiation
[AIAA PAPER 78-137516] p0036 A78-22583

Carbonaceous materials subjected to extreme heating - A comparison of numerical simulation and experiments
[AIAA PAPER 78-866] p0041 A78-37273

DICKISON, J. T.
Chemisorption of CO on Pd particles supported on silica
p0040 A78-36040

DIEHL, J. J.
Application of a cost/performance measurement system on a research aircraft project
[AIAA PAPER 78-192] p0007 N78-27043

DUNHAM, E.
Dynamic MHD modeling of the solar wind disturbances during the August 1972 events
p0036 A78-26079

On the observation of a flare-generated shock wave at 0.7 AU by Pioneer 10
[AD-M037271] p0026 A78-30097

Dynamic MHD modeling of solar wind containing stream interaction regions observed by Pioneer 10 and 11
p0049 A78-52522

DURAR, A. S.
Jet prop assisted arterial blood pump
[AIAA PAPER 78-137516] p0040 A78-35622

DUNHAM, R. P.
Prop-fan data support study
[AIAA PAPER 78-137516] p0013 N78-27129

DUNHAM, R.
Oscillation of Epsilon Geminorum by Kasa. II. The structure and extinction of the Martian upper atmosphere
p0030 A78-10587

The radii of Uranian rings alpha, beta, gamma, delta, epsilon, eta, 4, 5, and 6 from their occultations of Saturn
p0046 A78-6112
HARRIS, R. A.
Applications of algebraic geometry to systems theory - The Molinari degree and Frobenius indices of transfer functions as topological and holographic system invariants
[NASA-CB-152098]
p0052 N78-22723

HARRIS, R. A.
Dual-loop model of the hassan controller
[NASA-CR-152171]
p0021 A79-51860

HICKS, B. R.
Transonic wing analysis using advanced computational methods
[AIAA PAPER 78-105]
p0015 A73-20686

HICKS, R. M.
Evaluating the Frank-Starling mechanism in conscious dogs
[NASA-TM-78456]
p0007 N73-28053

HICKS, R. M.
Behavior of a turbulent boundary layer subjected to sudden transverse strain
[AIAA PAPER 78-291]
p0034 A79-22955

HILK, C. J.
The prediction of toxic atmospheres from decomposing polymers
[AIAA PAPER 78-252]
p0030 A78-22506

HILLEN, T.
An experimental documentation of pressure gradient and Reynolds number effects on compressible turbulent boundary layers
[AIAA PAPER 78-1165]
p0003 k78-41859

HILLIS, J. W.
Study to design and develop remote manipulator systems
[NASA-CR-152092]
p0052 N78-16620

HINGMAN, T.
Airborne infrared interferometric observations and analysis of stratospheric trace constituents
[AIAA PAPER 78-285]
p0028 N78-34021

HOLBROOK, L. G.
Development of automatic and manual flight director landing systems for the YV-15 tilt rotor aircraft in helicopter mode
[NASA-CR-152169]
p0011 N78-222071

HOBBS, P. W.
Meteor ablation spheres from deep-sea sediments
[NASA-TM-78516]
p0026 N78-34062

HODGINS, D. L.
An automechanical stability of helicopters with a bearingless main rotor. Part 1: Equations of motion
[NASA-TM-78459]
p0062 N78-18043

HODGINS, D. L.
Development of automatic and manual flight director landing systems for the YV-15 tilt rotor aircraft in helicopter mode
[NASA-CR-152169]
p0011 N78-222071

HOLBROOK, P. W.
Advanced digital avionics system for general aviation
[AIAA 77-1498]
p0014 A78-12243

HONDA, Y.
Development of automatic and manual flight director landing systems for the YV-15 tilt rotor aircraft in helicopter mode
[NASA-CR-152169]
p0011 N78-222071

BOLZAN, A. E.
Pioneer Venus spacecraft charging model
[NASA-TM-78516]
p0022 N78-10146

BOLST, T. L.
An implicit algorithm for the conservative transonic full potential equation using an arbitrary mesh
[AIAA PAPER 78-1113]
p0042 A79-91266

HONG, S. D.
Strain-strain behavior of some acrylic polymers
[AD-A052617]
p0059 N78-24364

HORSTMAN, C. C.
Reynolds number and pressure gradient effects on compressible turbulent boundary layers
[AIAA PAPER 78-1194]
p0033 A78-20741

HORSTMAN, C. C.
An evaluation of novel compressible turbulent boundary-layer models. Effects of pressure gradient and Reynolds number
[AIAA PAPER 78-1165]
p0043 A78-41859

HOMAN, R.
Comparison of multigeneration turbulence models for several shock-saturated boundary-layer interaction flows
[AIAA PAPER 78-1165]
p0003 A78-41863

HUBBLE, W. M.
An experimental documentation of pressure gradient and Reynolds number effects on compressible turbulent boundary layers
[NASA-TM-784481]
p0026 N78-27364

HUBBLE, W. M.
Tread dm's for animals
[NASA-CXSR-ARC-10917-1]
p0057 N78-27733

HUBBARD, R.
A method for the analysis of the benefits and costs for aeronautical research and technology development
[AD-A050974]
p006 A78-22754

HUBBELL, F. A.
An integral solution to a nonlinear diffusion problem
[AIAA PAPER 78-1194]
p0020 A78-47907

HUCHEL, W. M.
Lower stratosphere measurements of variation with latitude of CFC12, CFC13, CC14, and N2O profiles in the northern hemisphere
[AD-A052617]
p0059 A78-24364

HUXLEY, B. C.
Quiet time interplanetary cosmic ray anisotropies observed from Pioneer 10 and 11
[NASA-TM-78049]
p0008 A78-33043

HYDE, P. A.
Laser velocimeter surveys of merging vortices in a wind tunnel
[AIAA PAPER 78-107]
p0015 A78-20687

HYDE, J. D.
Laser velocimeter surveys of merging vortices in a wind tunnel
[AIAA PAPER 78-107]
p0015 A78-20687

HYDE, J. D.
Laser velocimeter surveys of merging vortices in a wind tunnel
[AIAA PAPER 78-107]
p0015 A78-20687

HYDE, J. D.
Laser velocimeter surveys of merging vortices in a wind tunnel
[AIAA PAPER 78-107]
p0015 A78-20687
The relative fire resistance of select thermoplastic materials
Assessment of relative flammability and thermomechanical properties of some thermoplastic materials
Low density bismaleimide-carbon microballoon composites
Syntactic composite structures with low density bismaleimide-carbon microballoon composites

Kaspar, K. H.
Synthesis of multifunction triaryltrifluoroethanes

Kutler, J. R.
Evaluation of several compressible turbulent boundary-layer models Effects of pressure gradient and Reynolds number

Kudacki, L. J.
Boron trifluoride coatings for thermoplastic materials and method of applying same in glow discharge

Kudacki, L. J.
Process for producing a well-adhered durable optical coating on an optical plastic substrate

Kuh, P. L.
Flight tests of a simple airborne device for predicting clear air turbulence encounters

Ku, C. C.
Influence of spin rate on side force of an axisymmetric body

Kubacky, R. N.
Boron trifluoride coatings for thermoplastic materials and method of applying same in glow discharge

Kusson, H. L.
Reynolds number and pressure gradient effects on compressible turbulent boundary layers

Kutler, L. J.
Computation of the viscous supersonic flow over symmetrical and asymmetrical external axial corners

Lee, J. E.
Are the stratospheric dust particles meteor ablation debris or interplanetary dust?

Lee, J. N.
A new concept in laser-assisted chemistry - The electronic-field representation

Lee, J. N.
Semirigorous bounds for the dipole moments and envelope vesicles

Lee, J. W.
Effect of a nonconstant C/\alpha on the stability of rolling aircraft

Lee, K. S.
Semiclassical approach to collision-induced emission in the presence of intense laser radiation - An aspect in the study of cooperative chemical and optical pumping

Lee, P. I.
Radiation pressure and Poynting-Robertson drag for small spherical particles

Lee, R. L.
The composition of Phobos - Evidence for carbonaceous chondritic surface from spectral analysis

Lefkovitz, E. A.
Conceptual design study of a Harrier V/STOL research aircraft

Lefkovitz, E. A.
A theoretical study of the electronic transition moment for the C2 Swan band system

Lefkovitz, E. A.
Semirigorous approach to collision-induced emission in the presence of intense laser radiation - An aspect in the study of cooperative chemical and optical pumping

Lefkovitz, E. A.
Effect of a nonconstant C/\alpha on the stability of rolling aircraft
The numerical solution of viscous flows at high Reynolds number

Status and future prospects of using numerical methods to study complex flows at high Reynolds numbers

Macleod, R. D.
Computer display and manipulation of biological molecules

Space ecosynthesis: An approach to the design of closed ecosystems for use in space

Mace, B. E.
Chemical interpretation of Viking Lander 1 life detection experiment

Mackey, B. B.
Application of special-purpose digital computers to rotorcraft real-time simulation

Mackus, M. A.
An improved higher order panel method for linearized supersonic flow

Mailia, R. S.
Computational study of a molecular collision process in the presence of an intense radiation field - Enhanced quenching of \( \lambda \) by \( \lambda \) in the 200-nm light of the KrF laser

Mains, B. R.
Continued metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission

McCool, G. N.
New rotation-balance apparatus for measuring airplane spin aerodynamics in the wind tunnel

Mallon, J. R.
A five-channel electrically scanned pressure module

Mallove, E. P.
A bibliography on the search for extraterrestrial intelligence

Mandel, J. A.
Effects of potassium titanate fiber on the wear of automotive brake linings

Mark, H.
J. R.
Exchange and relaxation effects in low-energy radiationless transitions

Marr, R. D.
Evaluation of a spacecraft nitrogen generator

Martin, C.
Applications of algebraic geometry to systems theory - The McMillan degree and Kronecker index of transfer functions as topological and holomorphic system invariants

Mars, J. G.
On the period of the coherent structure in boundary layers at large Reynolds numbers

Mascy, M. A.
A review of NASA-sponsored technology assessment projects

Matthews, T.
Peaker: An automatic boresight peaking routine for the C-141 telescope

May, L. A.
Chelate-modified polymers for atmospheric gas chromatography

Meier, R. G.
Scrap-tan data support study

McKee, R. W.
Dynamic stall experiments on the NASA 0972 airfoil

McKee, R. W.
Water-tunnel experiments on an oscillating airfoil at \( Re \) equals 21,000
Introduction to unsteady aspects of separation in dynamic stall experiments on the A
Cable strumming suppression
The quiet coronal X-ray spectrum of
Generation of a monodispersed aerosol
Pioneer 10
Dynamic BHD modeling of solar wind corotating
stream interaction regions observed by Pioneer
Dynamic MHD modeling of the solar wind
disturbances during the August
Application of special-purpose digital computers
to rotorcraft real-time simulation
Prop-fan data support study
On the observation of a flare-generated shock wave
at 9.7 AU by Pioneer 10
Dynaic MHD modeling of solar wind corotating
stream interaction regions observed by Pioneer
10 and 11
Pioneer 10 observation of the solar wind proton
temperature heliocentric gradient
Generation of a monodispersed aerosol
A study of characteristics of intercity transportation systems. Phase I: Definition of transportation comparison methodology

4. L.
Airborne infrared interferometric observations and analysis of stratospheric trace constituents
[AIAA PAPER 78-252] p0034 78-22606

A comparison between infrared and optical properties of terrestrial analogs
[SMITH] p0047 78-49231

5. N.
Fibrous refractory composite insulation
[NASA-CASE-ARC-11169-1] p0050 78-32189

Spray coating apparatus having a rotatable workpiece holder
[NASA-CASE-ARC-11110-1] p0050 78-32434

6. R.
On the modulation of the Jovian decametric radiation by Io. I - Acceleration of charged particles
[SMITH] p0062 78-41074

7. R.
Closed-form equations for the lift, drag, and pitching moment coefficients of airfoil sections in subsonic flow
[NASA-TM-76992] p0066 78-29068

8. E.
Dynamic MHD modeling of the solar wind disturbances during the August 1972 events
[SMITH] p0036 78-26079

9. B.
Dynamic MHD modeling of solar wind corotating stream interaction regions observed by Pioneer 10 and 11
[SMITH] p0049 78-52522

G. F.
Radioisotopes to map the cosmic background radiation
[SMITH] p0038 78-30691

R. K.
Advanced Digital Avionics System for general aviation
[AIAA 77-1694] p0014 78-12283

A new method for designing shock-free transonic configurations
[AIAA PAPER 78-1114] p0045 78-45127

R.
Regulation of the adrenal cortex function during stress
[NASA-CR-157397] p0053 78-30808

J. A.
Development and flight tests of a Kalman filter for navigation during terminal area and landing operations
[NASA-CR-3015] p0012 78-27105

S.
Radiation pressure and Poynting-Robertson drag for small spherical particles
[SOTHE] p0033 78-19768

K. A.
Degradation of biochemical activity in soil sterilized by dry heat and gamma radiation
[SPEAR] p0057 78-53749

J. G.
Zodiacal light as an indicator of interplanetary dust
[p0042 78-38228]

F. A.
Factors affecting the retirement of commercial transport jet aircraft

H.
Fire resistivity and toxicity studies of candidate aircraft passenger seat materials
[NASA-TM-78495] p0042 78-26630

R.
Fire resistivity and toxicity studies of candidate aircraft passenger seat materials
[SMITH] p0048 78-51838

E. L.
Robustness in linear quadratic feedback design with application to an aircraft control problem
[STEGER] p0016 78-16059

Linear quadratic state feedback designs in the presence of system uncertainty
[SMITH] p0016 78-23917

L.
Computed responses of several aircraft to atmospheric turbulence and discrete wind shears
[NASA-CR-152185] p0053 78-32106

L. L.
The ILLIAC IV memory system: Current status and future possibilities
[NASA-CASE-ARC-11169-I] p0001 78-14432

H.
Coherent finite difference solution of the incompressible flow equations
[SMITH] p0038 78-30693

On improving the iterative convergence properties of an implicit approximate-factorization finite difference algorithm
[NASA-TH-78495] p0026 78-26795

L.
Dynamic MHD modeling of the solar wind disturbances during the August 1972 events
[SMITH] p0049 78-52522

Dynamic MHD modeling of solar wind corotating stream interaction regions observed by Pioneer 10 and 11
[SMITH] p0050 78-26079

E.
The ionosphere and airflow of Venus - Prospects for Pioneer Venus
[STEVENSON] p0045 78-45773

C.
Quasi-optimal control of a moving-base simulator
[STEVENSON] p0006 78-23021

Optimal guidance and control for investigating aircraft noise-impact reduction
[NASA-TF-1237] p0006 78-23100

W.
C3 and infrared spectrophotometry of Y Canum Venaticorum
[STEVENSON] p0042 78-39448

Infrared excesses in early-type stars - Gama Cassiopeiae
[STEVENSON] p0047 78-49475

Engineering tests of the C-141 telescope
[NASA-TM-78467] p0025 78-25017

S.
Illumination-dependent changes in the intrinsic fluorescence of bacteriophorphins
[STEVENSON] p0055 78-48578

R.
Computation of transonic flow past projectiles at angle of attack
[AIAA PAPER 78-1112] p0044 78-41675

H.
Intensities, self-broadening, and broadening by Ar and H2 for the 301/3II/ - 00 band of CO2 measured at different temperatures
[SMITH] p0046 78-48925

Absolute intensity measurements at different temperatures of the C-12/0-14/2 bands 30 0 1
[SMITH] p0046 78-48925

Measurement of different temperatures of absolute intensities, line half-widths, and broadening by
AR and NE for the 30 0 1 IX-0 0 0 band of CO2

SUBRAMANIAN, S.
Synthesis of N-substituted bisitaconimide monomers for use as thermosetting polyiside resins

SULLIVAN, E. L.
Application of advanced technologies to small, short-haul aircraft

SUTTON, C. E.
Low-speed aerodynamic characteristics of a 0.96-scale Yr-17 airplane model at high angles of attack and sideslip

SWAN, F. E.
A flight investigation of the stability, control, and handling qualities of an augmented jet flap 750B airplane

SWAN, F. E.
Transport of contaminants in the planetary boundary layer

SWANSON, G. A.
Factors affecting the retirement of commercial transport jet aircraft

SWART, P. F.
Micro-fluid exchange coupling apparatus

SWIMMEL, W.
The Pioneer 11 imaging experiment of Jupiter

STEERNS, W.
Low speed test of a high-bypass-ratio propulsion system with an asymmetric inlet designed for a tilt-massele Y750B airplane

TADAMOFF, W.
Stress analysis study in cooled radial inflow turbine

TANHER, R. A.
A simple method for estimating minimum autorotative descent rate of single rotor helicopters

TANWHEEL, J. C.
Navier-Stokes calculations for laminar and turbulent hypersonic flow over indented nosetips

TANNER, R. A.
A critical overview of Ames Life Science participation in Spacelab Mission Development Test 3: The SMD 3 management study

TAYLOR, J. P.
Diagrammatic evaluation of the density operator for nonlinear optical calculations

TERR, R. F.
An analytic study of impact ejecta trajectories in the atmosphere of Venus, Mars, and earth

TODA, M.
The Pioneer 11 imaging experiment of Jupiter

TSIII, C.
The instability of the thin vortex ring of constant vorticity

TUGS, S.
Analysis of the diurnal averaging of aerodynamical models

TURCO, R. F.
An assessment of the effect of supersonic aircraft operations on the stratospheric ozone content
VEDDEE, V. L.
Radioactivity system to map the cosmic background radiation
p0336 A78-30691

UNDREDWOOD, J. H.
Generation of a parallel X-ray beam and its use for testing collimators
p0335 A78-23083

UTTREDBACK, R. G.
Low energy ionizing collisions between N2 and CO
p0339 A78-34217

VALDEZ, R. F. J.
Intensities, self-broadening, and broadening by Ar and N2 for the 301/2II - 600 band of CO2 measured at different temperatures
p0396 A78-48425

VAN ALLEN, J. A.
On determining magnetospheric diffusion coefficients from the observed effects of Jupiter's satellite Io
p0392 A78-18732

VAN ZYL, R.
Low energy ionizing collisions between N2 and CO
p0339 A78-34217

VANTAYA, L. L.
Crustal evolution inferred from Apollo magnetic measurements [NASA-TH-78524]
p0277 A78-32629

VARDEN, R. E.
Thermal design and development of a planetary probe - Pioneer Venus large probe
[AITTA PAPER 78-916]
p0401 A78-37275

VATTER, S. F.
Effects of exercise and excitement on mesenteric and renal dynamics in conscious, unrestrained rabbits
p0523 A78-27124

VEDDER, J. P.
Lower stratospheric measurements of variation with latitude of CF2Cl2, CFCl3, CCl4, and N2O profiles in the northern hemisphere
p0335 A78-23610

VEXNER, T.
Breadth of tolerance to 02 acceleration in female subjects
p0055 A78-37655

YARYAN, L. I.
The composition of Phobos - evidence for carbonaceous chondrite surface from spectral analysis
p0303 A78-18784

YEE, C.
Multicolor observations of Phobos with the Viking lander cameras - evidence for a carbonaceous chondritic composition
p0303 A78-18785

YEXXORO-MARRULLIS, J.
Hormonal indices of tolerance to 02 acceleration in female subjects
p0055 A78-41162

YEVNEVA, E.
Occultation of Aquilae Geminae by Mars, XI - the structure and extinction of the Martian upper atmosphere
p0030 A78-10597

YONAL, J. M.
Stratospheric measurements of CF2Cl2 and N2O
p0054 A78-37655

ZAK, S.
Correlation of energetic (NASA-CASE-ARC-11058-1) proton data with the Viking lander probe - Pioneer Venus large probe Computational wing optimization and comparisons
[AITTA PAPER 78-1165]
p0043 A78-41863

ZIEGEL, J. C.
Comparison of multifluid turbulence models for several shock-separated boundary-layer interaction flows
[AITTA PAPER 78-1165]
p0043 A78-41863

ZVEGERS, J. B.
Injection slot location for boundary-layer control in shock-induced separation
[AITTA PAPER 78-1166]
p0044 A78-41866

ZWISWATER, P. H.
The co-adsorption of copper and oxygen on a tungsten 100 plane-type surface
p0037 A78-29689

ZOBASZ, E. F.
A flight investigation of the stability, control, and handling qualities of an augmented jet flap STOL airplane
[NASA-TP-1254]
p0006 A78-26151

ZVEDEL, R. C.
Spacecraft mobility knee joints
[NASA-CASE-ARC-11058-2]
p0057 A78-18763

Spacecraft mobility joints
[NASA-CASE-ARC-11058-1]
p0058 A78-31735

Spacecraft torso closure
[NASA-CASE-ARC-11058-1]
p0058 A78-31736

WACCO, A. J.
Flying-hot-wire study of two-dimensional mean flow past a SLV 412 airfoil at maximum lift
[AITTA PAPER 78-1196]
p0010 A78-41867

WAGGNER, R. H.
Computational wing optimization and wind tunnel test of semi-span model
[AITTA PAPER 78-102]
p0034 A78-22575

Waggoner, B.
Computational wing optimization and comparisons with experiment for a semi-span wing model
[NASA-TP-70480]
p0025 A78-26191

WANG, E. C.
Wind tunnel investigation of computationally optimized variable camber wing configurations
[NASA-TP-70480]
p0026 A78-29067

WANDERER, P. M.
A method for determining structural properties of RCC thermal protection material
[AITTA PAPER 78-869]
p0040 A78-35997

WALKER, J. R.
Prop-fan data support study
[NASA-97-152147]
p0013 A78-27129

WANG, C. C.
Simultaneous determination of rotational and translational temperatures of 02/2 E4 in a gas discharge

<table>
<thead>
<tr>
<th>Personal Author Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Y</strong></td>
</tr>
<tr>
<td><strong>TANG, P. Y.</strong></td>
</tr>
<tr>
<td>Advanced instrumentation concepts for environmental control subsystems</td>
</tr>
<tr>
<td>[NASA-CR-152100]</td>
</tr>
<tr>
<td>p0053 A78-28807</td>
</tr>
<tr>
<td>IBARRA, A. H.</td>
</tr>
<tr>
<td>Estimating maximum instantaneous distortion from inlet total pressure measurements</td>
</tr>
<tr>
<td>[AIAA PAPER 78-970]</td>
</tr>
<tr>
<td>p0019 A78-43525</td>
</tr>
<tr>
<td>YEE, S. Y.</td>
</tr>
<tr>
<td>Diagrammatic evaluation of the density operator for nonlinear optical calculations</td>
</tr>
<tr>
<td>[ONERA, TP NO. 1977-165]</td>
</tr>
<tr>
<td>p0031 A78-14651</td>
</tr>
<tr>
<td>YOUNG, R. H.</td>
</tr>
<tr>
<td>The quiet coronal X-ray spectrum of highly ionized oxygen and nitrogen</td>
</tr>
<tr>
<td>p0038 A78-31108</td>
</tr>
<tr>
<td>YOUNG, R. N.</td>
</tr>
<tr>
<td>Multichannel electrochemical microbial detection unit</td>
</tr>
<tr>
<td>p0016 A78-31300</td>
</tr>
<tr>
<td>YU, K. J.</td>
</tr>
<tr>
<td>Unsteady transonic flow computations</td>
</tr>
<tr>
<td>[AIAA PAPER 78-1114]</td>
</tr>
<tr>
<td>p004 5 A78-45127</td>
</tr>
<tr>
<td>YUAN, J.-M.</td>
</tr>
<tr>
<td>An investigation of short haul air transportation in the southeastern United States</td>
</tr>
<tr>
<td>[NASA-CR-152166]</td>
</tr>
<tr>
<td>p0012 A78-27094</td>
</tr>
<tr>
<td>YUNG, Y. L.</td>
</tr>
<tr>
<td>The quiet coronal X-ray spectrum of highly ionized oxygen and nitrogen</td>
</tr>
<tr>
<td>p0044 A78-42460</td>
</tr>
<tr>
<td>ZIMMERMAN, I. H.</td>
</tr>
<tr>
<td>A new concept in laser-assisted chemistry - The electronic-field representation</td>
</tr>
<tr>
<td>p0037 A78-27743</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Z</strong></td>
</tr>
<tr>
<td><strong>ZIMMERMAN, I. H.</strong></td>
</tr>
<tr>
<td>A new concept in laser-assisted chemistry - The electronic-field representation</td>
</tr>
<tr>
<td>p0037 A78-27743</td>
</tr>
<tr>
<td>A new concept in laser-assisted chemistry - The electronic-field representation</td>
</tr>
<tr>
<td>[AIAA PAPER 78-1114]</td>
</tr>
<tr>
<td>p0045 A78-45127</td>
</tr>
<tr>
<td>TITLE</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Aerothermodynamic environment for Jovian entry with silica heat shield</td>
</tr>
<tr>
<td>Application of second-order turbulent modeling to the prediction of</td>
</tr>
<tr>
<td>radiated aerodynamic sound</td>
</tr>
<tr>
<td>Requirements for regional short-haul air service and the definition</td>
</tr>
<tr>
<td>of a flight program to determine neighborhood reactions to small</td>
</tr>
<tr>
<td>transport aircraft</td>
</tr>
<tr>
<td>Zodiak light as an indicator of interplanetary dust</td>
</tr>
<tr>
<td>Coplanar tail-chase aerial combat as a differential gas</td>
</tr>
<tr>
<td>The quiet coronal X-ray spectrum of highly ionized oxygen and nitrogen</td>
</tr>
<tr>
<td>On the observation of a flare-generated shock wave at 5.7 AU by</td>
</tr>
<tr>
<td>Pioneer 10</td>
</tr>
<tr>
<td>Dynamic MHD modeling of the solar wind disturbances during the</td>
</tr>
<tr>
<td>August 1972 events</td>
</tr>
<tr>
<td>Dynamic MHD modeling of solar wind coronating great interaction</td>
</tr>
<tr>
<td>regions observed by Pioneer 10 and 11</td>
</tr>
<tr>
<td>The co-adsorption of copper and oxygen on a tungsten 100-plate type</td>
</tr>
<tr>
<td>surface</td>
</tr>
<tr>
<td>Preference-ordered discrete-gaming approach to air-combat analysis</td>
</tr>
<tr>
<td>Development and flight tests of a Kalman filter for navigation during</td>
</tr>
<tr>
<td>terminal area and landing operations</td>
</tr>
<tr>
<td>The Pioneer 11 imaging experiment of Jupiter</td>
</tr>
<tr>
<td>Unsteady transonic flow computations</td>
</tr>
<tr>
<td>A new method for designing shock-free transonic configurations</td>
</tr>
<tr>
<td>Wind tunnel investigation of computationally optimized variable</td>
</tr>
<tr>
<td>camber wing configurations</td>
</tr>
<tr>
<td>Theoretical and experimental study of the drag of multielement</td>
</tr>
<tr>
<td>airfoils</td>
</tr>
<tr>
<td>Closed-form equations for the lift, drag, and pitching-moment</td>
</tr>
<tr>
<td>coefficients of airfoil sections in subsonic flow</td>
</tr>
<tr>
<td>The quiet coronal X-ray spectrum of highly ionized oxygen and</td>
</tr>
<tr>
<td>nitrogene</td>
</tr>
<tr>
<td>Low profile antenna performance study. Part 2: Broadband antenna</td>
</tr>
<tr>
<td>techniques survey</td>
</tr>
<tr>
<td>Application of advanced high speed turboprop technology to future</td>
</tr>
<tr>
<td>civil short-haul transport aircraft design</td>
</tr>
<tr>
<td>Application of advanced high speed turboprop technology to future</td>
</tr>
<tr>
<td>civil short-haul transport aircraft design</td>
</tr>
<tr>
<td>Latest shield hardware analysis</td>
</tr>
<tr>
<td>Application of advanced high speed turboprop technology to future</td>
</tr>
<tr>
<td>civil short-haul transport aircraft design</td>
</tr>
<tr>
<td>Latest shield hardware analysis</td>
</tr>
<tr>
<td>High performance dash-on-warning air mobile missile system</td>
</tr>
<tr>
<td>NASA aviation safety reporting system</td>
</tr>
</tbody>
</table>
Acoustical effects of blade tip shape changes on a full scale helicopter rotor in a wind tunnel [NASA-CH-152082]

BELL AND NOVELL Co., CHICAGO, ILL.

Boron trifluoride coatings for thermoplastic materials and method of applying same in glow discharge [NASA-CASI-ARC-11057-1]


Effects of potassium nitrate fiber on the wear of automotive brake linings [p0035 A78-23160]

Borg Warner Co., Cleveland, Ohio

Advanced panel-type influence coefficient methods applied to unsteady three dimensional potential flows [AIAA Paper 78-229]

An improved higher order panel method for linearized supersonic flow [AIAA Paper 78-153]

Application of advanced technologies to small, short-haul aircraft [NASA-CH-152089]

A Mach line panel method for computing the linearized supersonic flow over planar wings [NASA-CH-152072]


Flow saving potential of Mach 0.8 twin engine prop-fan transports [p0017 A78-31306]

Boeing Co., Seattle, Wash.

Advanced panel-type influence coefficient methods applied to unsteady three dimensional potential flows [AIAA Paper 78-229]

Boeing Co., Blaine, Wash.

Low speed test of a high-bypass-ratio propulsion system with an asymmetric inlet designed for a tilt-symmetric V/STOL airplane [NASA-CH-152072]

Boeing Co., Seattle, Wash.

Numerical Aerodynamics Simulation Facility preliminary study, executive summary [NASA-CR-152166]

Boeing Co., Seattle, Wash.

An improved higher order panel method for linearized supersonic flow [AIAA Paper 78-153]

Application of advanced technologies to small, short-haul aircraft [NASA-CH-152089]

A Mach line panel method for computing the linearized supersonic flow over planar wings [NASA-CH-152072]

Bolt, Beranek and Newman, Inc., Canoga Park, Calif.

Use of coherence and phase data between two receivers in evaluation of noise environments [p0016 A78-26495]


Numerical aerodynamic simulation facility. Preliminary study extension [NASA-CH-152070]

Numerical aerodynamic simulation facility. Preliminary study, executive summary [p0023 A78-19782]

California Inst. of Tech., Pasadena.

Flying-hot-wire study of two-dimensional mean flow past an NACA 4412 airfoil at maximum lift [AIAA Paper 78-1987]

Primitive atmosphere and implications for the formation of channels on Mars [p0046 A78-42460]

California Inst. of Tech., Pasadena.

Diagrammatic evaluation of the density operator for nonlinear optical calculations [Oberl, TP No. 78-1766] [p0031 A78-14651]

Collisionless dissociation of SF6 using two resonant frequency CO2 laser fields [p0031 A78-14655]

Effect of a nonconstant C/alpha/ on the stability of rolling aircraft [p0031 A78-16180]

Characteristics of integrated MNM junctions at dc and at optical frequencies [AD-A056165]

Stabilized emission of surface plasmons by electron tunneling in metal-barrier-metal structures [p0037 A78-26926]

Radiator system to tap the cosmic background radiation [p0038 A78-30647]

Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission [p0056 A78-48715]

California Inst. of Tech., Pasadena.

Stress analysis study in aeroelastic structure [AIAA Paper 78-1404] [p0066 A78-25570]

Theoretical and experimental study of aerodynamics, heat transfer and performance of a radial turbine [NASA-CR-152105] [p0064 A78-19155]
CORPORATE SOURCE INDEX

COLORADO STATE UNIV., FORT COLLINS.
Measuring the velocity of individual atoms in real time

COLORADO UNIV., BOULDER.
Visualization of quasi-periodic unsteady flows

[AAIA PAPER 78-1052] p0065 A78-23124

On the observation of a flare-generated shock wave at 0.7 AU by Pioneer 10

[AA-A052726] p0038 A78-30004

COSMOS Corp.

DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.
Aircraft cargo compartment fire test simulation program

[AAIA PAPER 78-1052] p0029 A78-21223

DOUGLAS AIRCRAFT CO., INC., SANTA MONICA, CALIF.
A solution to the surface intersection problem

[AAIA PAPER 78-1052] p0010 A79-19569

DYNAMICS TECHNOLOGY, INC., TORRANCE, CALIF.
Behavior of a turbulent boundary layer subjected to sudden transverse strain

[AAIA PAPER 78-1052] p0034 A78-22595

E

ECOFER HY INC., LOS ANGELES, CALIF.
A study of characteristics of intercity transportation systems. Phase I: Definition of transportation comparison methodology

[AAIA PAPER 78-1052] p0036 A78-29996

EUROPEAN SPACE AGENCY, WROCLAV (POLAND).
Rigidity-independent coronal preacceleration and escape of solar protons and alpha particles

[AAIA PAPER 78-1052] p0041 A78-37535

EUROPEAN SPACE AGENCY, PARIS (FRANCE).
NASA/ESA CT-990 spacelab simulation (ASS2S 2)

[AAIA PAPER 78-1052] p0027 A78-30149

F

FEDERAL AVIATION ADMINISTRATION, BOISET FIEL, CALIF.
Certification study of a derivative model of a small jet transport airplane using a piloted research simulator

[AAIA PAPER 78-1052] p0061 A78-10033

FLORIDA AGRICULTURAL AND MECHANICAL UNIV., TALLAHASSEE.
Regulation of the adrenal cortex function during stress

[AAIA PAPER 78-1052] p0053 A78-30086

FORD MOTOR CO., DEARBORN, MICH.
Simultaneous determination of rotational and translational temperatures of OH/2 P/4 in a gas discharge

[AAIA PAPER 78-1052] p0030 A78-10495

Absorption measurements of OH using a CW tunable laser

[AAIA PAPER 78-1052] p0032 A78-17837

G

GENERAL DYNAMICS/FORT WORTH, TEX.
An investigation of wing buffeting response at subsonic and transonic speeds. Phase 2: F-111A flight data analysis. Volume 3: Plotted power spectra

[AAIA PAPER 78-1052] p0034 A78-33117

An investigation of wing buffeting response at subsonic and transonic speeds. Phase 3: aerodynamics data. Volume 3: Tabulated power spectra

[AAIA PAPER 78-1052] p0034 A78-33118

GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Entry dynamics performance predictions for Pioneer Venus probes

[AAIA PAPER 78-1052] p0006 A78-46557

GEODECICAL SURVEY, HENLO PARK, CALIF.
Some Martian volcanic features as viewed from the Viking orbiters

[AAIA PAPER 78-1052] p0030 A78-11403

GIBB ASSOCIATES, THOUSAND OAKS, CALIF.
Study to determine operational and performance criteria for STOL aircraft operating in low visibility conditions

[AAIA PAPER 78-1052] p0013 A78-28083

GRUMMAN AEROSPACE CORP., HARRISBURG, MICH.
Airborne infrared interferometric observations and analysis of stratospheric trace constituents

[AAIA PAPER 78-1052] p0936 A78-22806

A re-entrant groove hydrogen heat pipe

[AAIA PAPER 78-1052] p0060 A78-35603

Comparison between infrared Martian disk spectra and optical properties of terrestrial analogs

[AAIA PAPER 78-1052] p0047 A78-49231

H

HAMILTON STANDARD, WINDSOR LOCKS, CONN.
Prop-fan data support study

[AAIA PAPER 78-1052] p0013 A78-27128

HARVARD MEDICAL SCHOOL, BOSTON, MASS.
Extent of utilization of the Frank-Starling mechanism in conscious dogs

[AAIA PAPER 78-1052] p0056 A78-33522
Advanced instrumentation concepts for environmental control subsystems  
[NASA-CP-292100]  
LOCKHEED—CALIFORNIA, CORP., BURBANK,
Rotorcraft linear simulation model. Volume 1: Engineering documentation  
[NASA-CR-152074-VOL-1]  
Rotorcraft linear simulation model. Volume 2: Computer implementation  
[NASA-CR-152075-VOL-2]  
Fuel conservation merits of advanced turboprop transport aircraft  
[NASA-CR-152096]

LOCKHEED—GEORGIA CO., MARIETTA,
Moving ground simulation by tangential blowing  
[AILA 78-864]  
LOCKHEED MISSILIES AND SPACE CO., PALO ALTO, CALIF.
Demand-type gas supply system for rocket borne thin-window proportional counter  
[88017 A78-32260]

LOCKHEED MISSILIES AND SPACE CO., SUNNYVALE, CALIF.
An investigation of the reduction of carbon dioxide in a silent electric discharge  
[NASA-CR-292166]  

LONDON UNIV., OBSERVATORY (ENGLAND)
Some Galactic volcanic features as viewed from the Viking orbiters  
[0030 A78-11403]

LOWELL OBSERVATORY, FLAGSTAFF, ARIZ.
The radial of Uranian rings alpha, beta, gamma, delta, epsilon, etc., 4, 5, and 6 from their occultations of 158687  
[0064 A78-48112]

LUNAR AND PLANETARY INST., HOUSTON, TEX.
Interpreting statistics of small lunar craters  
[0042 A78-41753]

M

MARTIN MARIETTA
Toroidal tank evaluation  
[0032 A78-178681]

Fluid interaction with spinning toroidal tanks  
[0024 A78-202086]

Experimental investigation of contamination prevention techniques to cryogenic surfaces on board orbiting spacecraft  
[NASA-CR-152171]

MAHER CORP., SAN ANTONIO, CALIF.
NAPA/MSA CV-990 Spacelab simulation (ASSESS 2)  
[NASA-CR-152122]  

MASSACHUSETTS INST. OF TECH., CAMBRIDGE
The instability of the thin vortex ring of constant vorticity  
[0029 A78-29146]

A simplified Mach number scaling law for helicopter rotor noise  
[0031 A78-14622]

Meteorological control of lower stratospheric minor species variations - An observational example  
[0017 A78-35371]

Generalization of Buffon coding to minimize the probability of buffer overflow  
[AD-A050974]  
[0006 A78-22754]

The effect of tip vortex structure on helicopter noise due to blade/vortex interaction  
[NASA-CR-152105]  
[0012 A78-25032]

MATHEMATICAL SCIENCES CORPORATION, INC., BELLSURF, WA.
Study, optimization, and design of a laser beam engine  
[NASA-CR-152104]  
[0009 A78-19461]

MAX—PLANCK INSTITUTE FUR AERONOMIE,
KAYLINGENH—LINDAU (WEST GERMANY)
Quiet time interplanetary cosmic ray anisotropies observed from Pioneer 10 and 11  
[0039 A78-34567]

MCDOUGALL—DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.
Pioneer Jupiter orbit probe mission 1980, probe description  
[NASA-CP-273521]  
[0025 A78-33127]

MCDOUGALL—DOUGLAS CORP., ST. LOUIS, MO.
Conceptual design study of a Harrier V/STOL research aircraft  
[NASA-CR-152065]  
[0009 A78-19594]

MICHIGAN UNIV., ANN ARBOR
Simultaneous determination of rotational and translational temperatures of OH/2 Pi/ in a gas discharge  
[0030 A78-10405]

The ionosphere and airglow of Venus - Prospects for Pioneer Venus  
[0045 A78-47733]

A method for localizing wing flow separation at a delta to alleviate spin entry tendencies  
[AILA PAPER 78-14767]

MILCO INTERNATIONAL, INC., HUNTINGTON BEACH, CALIF.
Advanced digital avionics System for general aviation  
[AILA 77-1494]

MONASH UNIV., CLAYTON (AUSTRALIA)
Quiet time interplanetary cosmic ray anisotropies observed from Pioneer 10 and 11  
[0035 A78-34567]

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
Primitve atmosphere and implications for the formation of channels on Mars  
[0041 A78-42460]

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
LINDON E. JOHNSON SPACE CENTER, HOUSTON, TEX.
Molecular indices of tolerance to 250g acceleration in female subjects  
[0055 A78-41162]

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
LANGLY RESEARCH CENTER, HAMPTON, VA.
Multichannel electronical microbal detection unit  

NATIONAL INST. ON AGING, BALTIMORE, MD.
Spectrophotofluorometric and electron microscopic study of lipofuscin accumulation in the testis of aging mice  
[0056 A78-48581]

NATIONAL COSMIC AND ATMOSPHERIC ADMINISTRATION,
ANN ARBOR, MICH.
A comprehensive model of the Venus ionosphere  
[0036 A78-30071]

NATIONAL COSMIC AND ATMOSPHERIC ADMINISTRATION,
BOULDER, COLORADO.
Dynamic N/2 modeling of the solar wind disturbances during the August 1972 events  
[0036 A78-26079]

On the observation of a face-generated shock wave at 9.7 Ao by Pioneer 10  
[AD-A053721]  
[0038 A78-10078]

Flight tests of a simple airborne device for predicting clear air turbulence encounters  
[AILA 78-1375]  
[0019 A78-46560]

Dynamic N/2 modeling of solar wind corotating stream interaction regions observed by Pioneer 10 and 11  

NATIONAL CIVIL ENGINEERING LAB., SOUTHBOROUGH, MA.
Cable streaming suppression  
[0022 A78-18366]

NEVADA UNIV., LAS VEGAS
Numerical solution of a class of integral equations arising in two-dimensional aerodynamics  

NEW ENGLAND REGIONAL PRIME RESEARCH CENTER,
SOUTHBRIDGE, MASS.
Effects of exercise and excitement on mesenteric and renal dynamics in conscious, unrestrained baboons  
[0053 A78-27124]

EXTENT OF UTILIZATION OF THE FRANK—STARRING MECHANISM IN CONSCIOUS DOGS  
[0054 A78-33522]

NEW YORK UNIV., N. Y.
Dynamic N/2 modeling of the solar wind disturbances during the August 1972 events  
[0036 A78-26079]

NIELSEN ENGINEERING AND RESEARCH, INC., NICHOLLIN
VIEW, CALIF.
Atishe's law in turbulent media and an equivalent tunnel effect  
[0046 A78-52597]

High angle canard missile test in the Ames 11-foot transonic wind tunnel  
[NASA-CP-2993]  
[0011 A78-25657]

151
Propagation of sound through a sheared flow
[NASA-CR-152196] p0019 A78-33676
NORTHROP CORP., HAWTHORN, CALIF.

Some observations on the mechanism of aircraft wing rock
[AILA PAPER 78-1456] p0020 A78-47907
NORTHROP INC., HAMPTON, VA.

"multichannel" electrochemical microbial detection unit
[NASA-CR-152115] p0016 A78-31300
NORTHEASTERN UNIV., EVANSTON, ILL.

Factors affecting the retirement of commercial transport jet aircraft

OBSERVATOIRES DE PARIS-Bures (FRANCE).

On the nodulation of the Jovian decametric radiation by No. I - Acceleration of charged particles
OCCAM NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).

Diagrammatic evaluation of the density operator
[UPENDA, 7E NO. 1977-166] p0031 A78-14651
OHIO STATE UNIV., COLUMBUS.

Responses of articular and epiphyseal cartilage zones of developing avian calci to estrogen treatment and a 2-D environment
[AILA PAPER 78-18] p0015 A78-22555
PEPPERDINE UNIV., LOS ANGELES, CALIF.
Who should conduct aerostatic R and D for the Federal Government?
[AILA-CR-152021] p0001 A78-10946
PEYER BRIGHT HOSPITAL, BOSTON, MASS.

Effects of exercise and excitement on neostereic and renal dynamics in conscious, unrestrained baboons
[AILA PAPER 78-18] p0023 A78-27123
PEPPERDINE UNIV., LOS ANGELES, CALIF.

Extent of utilization of the Frank-Starling mechanism in conscious dogs
[AILA PAPER 78-18] p0054 A78-33522
PITTSBURGH UNIV., PA.

Bar-driven spiral waves in disk galaxies
[AILA PAPER 78-1167] p0034 A78-41865
PITTSBURGH UNIV., PA.

Further investigation of the spontaneous and evoked activity of the primary neurons of the statocorp of the labyrinth of the bullfrog before, during and after an extended period of weightlessness, including alternative intervals of artificial gravity
[AILA-CR-152021] p0015 A78-10946
PLANETARY SCIENCE INST., PASADENA, CALIF.

Some Martian volcanic features as viewed from the Viking orbiters
[AILA-CR-152135] p0030 A78-11403
PRIVATEY M. J.

A detailed study of attached and separated compression corner flowfields in high Reynolds number supersonic flow
[AILA PAPER 78-1167] p0023 A78-41865
PRIVATEY M. J.

Optimal control theory (OCTM) applied to a helicopter in the hover and approach phase
[AILA-CR-152135] p0010 A78-21161
PRIVATEY M. J.
The co-adsorption of copper and oxygen on a tungsten 100 plane-type surface poly-n-arylenebenzimidazoles

Computed responses of several aircraft to executive summary: Benefit-cost evaluation of advanced digital avionics system for general aviation

Synthesis of multifunction triaryltrifluoroethanes

Study of a high performance evaporative heat transfer surface

Digital filter structures having low errors and simple hardware implementation

Multi-calculation rate simulations

Chemisorption of CO on N2 particles supported on mica

Digital filter structures having low errors and simple hardware implementation

Tungsten 100 plane-type surface poly-n-arylenebenzimidazoles

Shock-tube studies of atomic silicon emission in target molecules

Reaction cured glass and glass coatings

Fibrous refractory composite insulation

Sodialic light as an indicator of interplanetary dust

Airborne photometric observations between 1.25 and 3.25 microns of late-type stars

Airborne photometric observations between 1.25 and 3.25 microns of late-type stars

New frequency domain methods for system identification

Advanced digital avionics system for general aviation

Development of automatic and manual flight director landing systems for the XV-15 tilt rotor aircraft in helicopter mode

Fibrous refractory composite insulation

Thermal structure of the primitive ionosphere

Solvent probing probabilities for abscorbed space disposal of hazardous nuclear waste

A study of coherent thermodynamic processes induced by coherent

Study of coherent thermodynamic processes induced by coherent

Synthesizing multifunction triaryltrifluoroethanes

Synthesizing multifunction triaryltrifluoroethanes

Earth probe backscatter for abscorbed space disposal of hazardous nuclear waste

Procurement of digital filter structures having low errors and simple hardware implementation

Procurement of digital filter structures having low errors and simple hardware implementation

Assessment of multi-calculation rate simulations

Internal structure dynamics: A selected bibliography

Earth probe backscatter for abscorbed space disposal of hazardous nuclear waste

Jupiter probe backscatter for abscorbed space disposal of hazardous nuclear waste

Estimating maximum instantaneous distortion from test of semi-span model

Survey of adaptive image coding techniques

Low energy ionizing collisions between N2 and CO2 target molecules

Extended development of variable conductance heat pipes

0.9 to 300 nm

0.9 to 300 nm
## Typical Contract Number Index Listing

<table>
<thead>
<tr>
<th>CONTRACT NUMBER</th>
<th>PAGE NUMBER</th>
<th>ACCESSION NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS2-6553</td>
<td>p0032</td>
<td>A78-18732</td>
</tr>
</tbody>
</table>

Listings in this index are arranged alphabetically 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 accession numbers appearing in list. Preceding the accession number is the page number in the abstract section in which the citation may be found.
REPORT/ACCESSION NUMBER INDEX

Typical Report/Accession Number Index Listing

| A-7508 | p0026 W70-28173# |
| A-7524 | p0028 W70-34021# |
| A-7537 | p0026 W70-29169# |
| A-7559 | p0028 W70-30755# |
| A-7562 | p0052 W70-29575# |
| A-7579 | p0027 W70-31030# |
| A-7584 | p0028 W70-32556# |
| A-7508 | p0027 W70-32029# |
| A-7638 | p0008 W70-32046# |
| A-7639 | p0008 W70-23045# |

AAS 77-320 | p0040 A70-35717# |
AAS 77-258 | p0001 A70-35722# |

AD-A00642# | p0001 W70-19033# |
AD-A007932 | p0022 W70-17274# |
AD-A97966# | p0015 W70-16355# |
AD-A09157# | p0059 W70-19001# |
AD-A00597# | p0006 W70-22375# |
AD-A00561# | p0005 W70-16450# |
AD-A002635 | p0053 W70-29699# |
AD-A002647 | p0009 W70-23064# |
AD-A005911 | p0035 W70-24061# |
AD-A003592 | p0007 W70-24278# |
AD-A0035721 | p0038 A70-30788# |
AD-A0054078 | p0004 A70-7278# |
AD-A0056165 | p0037 A70-24926# |
AD-A0056671 | p0039 A70-34682# |

AGS 78-78-0097 | p0038 A70-30780# |

AFOST-78-0009# | p0031 A70-16585# |
AFOST-78-0006# | p0034 A70-42809# |
AFOST-78-1042# | p0037 A70-28526# |
AFOST-78-1042# | p0039 A70-34682# |

A LLC PAPER 77-10 | p0033 A70-20360# |
A LLC PAPER 77-13 | p0033 A70-29632# |
A LLC PAPER 77-18 | p0031 A70-22244# |
A LLC PAPER 77-130 | p0015 A70-22554# |
A LLC PAPER 77-23 | p0015 A70-22555# |
A LLC PAPER 77-98 | p0034 A70-22557# |
A LLC PAPER 77-95 | p0015 A70-22558# |
A LLC PAPER 77-107 | p0016 A70-2267# |
A LLC PAPER 77-109 | p0016 A70-22678# |
A LLC PAPER 77-130 | p0032 A70-22679# |
A LLC PAPER 77-161 | p0034 A70-22685# |
A LLC PAPER 77-186 | p0015 A70-22697# |
A LLC PAPER 77-192 | p0014 A70-22698# |
A LLC PAPER 77-199 | p0013 A70-22730# |
A LLC PAPER 77-201 | p0013 A70-22741# |
A LLC PAPER 77-229 | p0012 A70-22243# |
A LLC PAPER 77-234 | p0011 A70-22244# |
A LLC PAPER 77-234 | p0010 A70-22245# |
A LLC PAPER 77-257 | p0009 A70-22246# |
A LLC PAPER 77-256 | p0008 A70-22247# |
A LLC PAPER 77-256 | p0007 A70-22248# |
A LLC PAPER 77-260 | p0006 A70-22249# |
A LLC PAPER 77-333 | p0005 A70-22250# |
A LLC PAPER 77-333 | p0004 A70-22251# |
A LLC PAPER 77-333 | p0003 A70-22252# |
A LLC PAPER 77-337 | p0002 A70-22253# |
A LLC PAPER 77-943 | p0001 A70-22254# |
A LLC PAPER 77-964 | p0000 A70-22255# |
A LLC PAPER 77-866 | p0041 A70-31273# |
A LLC PAPER 77-869 | p0040 A70-35599# |
A LLC PAPER 77-916 | p0040 A70-35597# |
A LLC PAPER 77-959 | p0039 A70-43521# |
A LLC PAPER 77-970 | p0039 A70-43522# |
A LLC PAPER 77-1112 | p0019 A70-43523# |
A LLC PAPER 77-1113 | p0018 A70-43524# |
A LLC PAPER 77-1114 | p0017 A70-43525# |
A LLC PAPER 77-1115 | p0016 A70-43526# |
A LLC PAPER 77-1116 | p0015 A70-43527# |
A LLC PAPER 77-1117 | p0014 A70-43528# |
A LLC PAPER 77-1118 | p0013 A70-43529# |
A LLC PAPER 77-1119 | p0012 A70-43530# |
A LLC PAPER 77-1120 | p0011 A70-43531# |
A LLC PAPER 77-1121 | p0010 A70-43532# |
A LLC PAPER 77-1122 | p0009 A70-43533# |
A LLC PAPER 77-1123 | p0008 A70-43534# |
A LLC PAPER 77-1124 | p0007 A70-43535# |
A LLC PAPER 77-1125 | p0006 A70-43536# |
A LLC PAPER 77-1126 | p0005 A70-43537# |
A LLC PAPER 77-1127 | p0004 A70-43538# |
A LLC PAPER 77-1128 | p0003 A70-43539# |
A LLC PAPER 77-1129 | p0002 A70-43540# |
A LLC PAPER 77-1130 | p0001 A70-43541# |
A LLC PAPER 77-1131 | p0000 A70-43542# |

Typically, a report number is located in the abstract section of the page with the same number. The accession number denotes the number of the accession in which it is listed. The symbol (1) indicates that the report is available on microfilm.
<table>
<thead>
<tr>
<th>Patent Class</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>428-331</td>
<td>p0050 N78-32260*</td>
</tr>
<tr>
<td>428-332</td>
<td>p0049 N78-27180*</td>
</tr>
<tr>
<td>428-341</td>
<td>p0050 N78-32260*</td>
</tr>
<tr>
<td>428-346</td>
<td>p0050 N78-32260*</td>
</tr>
<tr>
<td>428-411</td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td>428-412</td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td>428-422</td>
<td>p0058 N78-32260*</td>
</tr>
<tr>
<td>428-428</td>
<td>p0050 N78-32260*</td>
</tr>
<tr>
<td>428-446</td>
<td>p0050 N78-32260*</td>
</tr>
<tr>
<td>428-447</td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td>428-515</td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td>428-523</td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td>428-538</td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td></td>
<td>p0050 N78-32260*</td>
</tr>
<tr>
<td></td>
<td>p0049 N78-27180*</td>
</tr>
<tr>
<td></td>
<td>p0057 N78-14104*</td>
</tr>
<tr>
<td></td>
<td>p0057 N78-27180*</td>
</tr>
<tr>
<td></td>
<td>p0050 N78-27180*</td>
</tr>
<tr>
<td></td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td></td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td></td>
<td>p0057 N78-31233*</td>
</tr>
<tr>
<td></td>
<td>p0058 N78-31735*</td>
</tr>
<tr>
<td></td>
<td>p0058 N78-31736*</td>
</tr>
<tr>
<td></td>
<td>p0050 N78-31232*</td>
</tr>
<tr>
<td></td>
<td>p0050 N78-32260*</td>
</tr>
<tr>
<td></td>
<td>p0060 N78-32395*</td>
</tr>
<tr>
<td></td>
<td>p0058 N78-32854*</td>
</tr>
</tbody>
</table>

---

**Note:** This appears to be a table listing patent numbers and accession numbers in a specific format, possibly for a database or reference collection.
This bibliography lists formal NASA publications, journal articles, books, chapters of books, patents and contractor reports issued by Ames Research Center which were indexed by Scientific and Technical Aerospace Abstracts, Limited Scientific and Technical Aerospace Abstracts, and International Aerospace Abstracts in 1978. Citations are arranged by directorate, type of publication and NASA accession numbers. Subject, Personal Author, Corporate Source, Contract Number, and Report/Accession Number Indexes are provided.