NASA
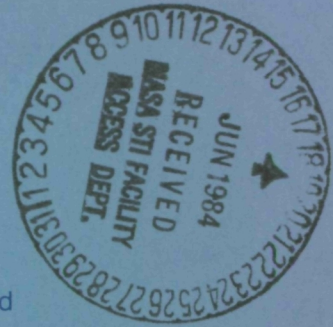
Aeronautical
Engineering
A Continuing
Bibliography
with Indexes

NASA SP-7037(174)
May 1984

National Aeronautics and
Space Administration

Aeronautical Engineering Aero
ering Aeronautical Enginee
ngineering Aeronautical Engine
cal Engineering Aeronautical E
nautical Engineering Aeronaut
Aeronautical Engineering Aero
ering Aeronautical Engineering
ngineering Aeronautical Engine
cal Engineering Aeronautical E
nautical Engineering Aeronaut
Aeronautical Engineering Aero
ering Aeronautical Engineering

ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series)   N84-16115 - N84-18152

IAA (A-10000 Series)   A84-19349 - A84-22956

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY
WITH INDEXES

(Supplement 174)

A selection of annotated references to unclassified
reports and journal articles that were introduced into
the NASA scientific and technical information
system and announced in April 1984 in

- *Scientific and Technical Aerospace Reports
  (STAR)*

- *International Aerospace Abstracts (IAA).*

INTRODUCTION

Under the terms of an interagency agreement with the Federal Aviation Administration this publication has been prepared by the National Aeronautics and Space Administration for the joint use of both agencies and the scientific and technical community concerned with the field of aeronautical engineering. The first issue of this bibliography was published in September 1970 and the first supplement in January 1971.

This supplement to *Aeronautical Engineering -- A Continuing Bibliography* (NASA SP-7037) lists 466 reports, journal articles, and other documents originally announced in April 1984 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*.

The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles.

Each entry in the bibliography consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by the first nine *STAR* specific categories and the remaining *STAR* major categories. This arrangement offers the user the most advantageous breakdown for individual objectives. The citations include the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Six indexes -- subject, personal author, corporate source, contract number, report number, and accession number -- are included.

An annual cumulative index will be published.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A84-10000 Series)

All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies of accessions are available at $8.50 per document. Microfiche[1] of documents announced in *IAA* are available at the rate of $4.00 per microfiche on demand. Standing order microfiche are available at the rate of $1.45 per microfiche for *IAA* source documents.

Minimum air-mail postage to foreign countries is $2.50 and all foreign orders are shipped on payment of pro-forma invoices.

All inquiries and requests should be addressed to AIAA Technical Information Service. Please refer to the accession number when requesting publications.

STAR ENTRIES (N84-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code preceded by the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page vii.

Documents on microfiche are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, Va. 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, as indicated above, for those documents identified by a # symbol.)

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Document Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

---

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26.1 reduction).

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: U.S. Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of 50 cents each, postage free.

Avail: ESDU. Pricing information on specific data items, computer programs, and details on ESDU topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on page vi.

Other availabilities: If the publication is available from a source other than the above, the publisher and his address will be displayed entirely on the availability line or in combination with the corporate author line.

GENERAL AVAILABILITY

All publications abstracted in this bibliography are available to the public through the sources as indicated in the category sections. It is suggested that the bibliography user contact his own library or other local libraries prior to ordering any publication inasmuch as many of the documents have been widely distributed by the issuing agencies, especially NASA. A listing of public collections of NASA documents is included on the inside back cover.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and
    Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and
    Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

ESDU International, Ltd.
1495 Chain Bridge Road
McLean, Virginia 22101

ESDU International, Ltd.
251-259 Regent Street
London, W1R 7AD, England

Fachinformationszentrum Energie, Physik,
    Mathematik GMBH
7514 Eggenstein Leopoldshafen
Federal Republic of Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information
    Facility
P.O. Box 8757
B.W.I. Airport, Maryland 21240

National Aeronautics and Space
    Administration
Scientific and Technical Information
    Branch (NIT-1)
Washington, D.C. 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library
    National Center – MS 950
12201 Sunrise Valley Drive
Reston, Virginia 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, Arizona 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS 914
Denver, Colorado 80225

NTIS PRICE SCHEDULES

Schedule A
STANDARD PAPER COPY PRICE SCHEDULE

(Effective January 1, 1983)

Price Code	Page Range	North American Price	Foreign Price
A01	Microfiche	$ 4.50	$ 9.00
A02	001-025	7.00	14.00
A03	026-050	8.50	17.00
A04	051-075	10.00	20.00
A05	076-100	11.50	23.00
A06	101-125	13.00	26.00
A07	126-150	14.5C	29.00
A08	151-175	16.00	32.00
A09	176-200	17.50	35.00
A10	201-225	19.00	38.00
A11	226-250	20.50	41.00
A12	251-275	22.00	44.00
A13	276-300	23.50	47.00
A14	301-325	25.00	50.00
A15	326-350	26.50	53.00
A16	351-375	28.00	56.00
A17	376-400	29.50	59.00
A18	401-425	31.00	62.00
A19	426-450	32.50	65.00
A20	451-475	34.00	68.00
A21	476-500	35.50	71.00
A22	501-525	37.00	74.00
A23	526-550	38.50	77.00
A24	551-575	40.00	80.00
A25	576-600	41.50	83.00
A99	601-up	-- 1	-- 2

1/   Add $1.50 for each additional 25 page increment or portion thereof for 601 pages up.

2/   Add $3.00 for each additional 25 page increment or portion thereof for 601 pages and more.

Schedule E
EXCEPTION PRICE SCHEDULE
Paper Copy & Microfiche

Price Code	North American Price	Foreign Price
E01	$ 6.50	$ 13.50
E02	7.50	15.50
E03	9.50	19.50
E04	11.50	23.50
E05	13.50	27.50
E06	15.50	31.50
E07	17.50	35.50
E08	19.50	39.50
E09	21.50	43.50
E10	23.50	47.50
E11	25.50	51.50
E12	28.50	57.50
E13	31.50	63.50
E14	34.50	69.50
E15	37.50	75.50
E16	40.50	81.50
E17	43.50	88.50
E18	46.50	93.50
E19	51.50	102.50
E20	61.50	123.50

E-99 - Write for quote

N01	35.00	45.00

TABLE OF CONTENTS

TYPICAL CITATION AND ABSTRACT FROM *STAR*

NASA SPONSORED DOCUMENT

NASA ACCESSION NUMBER

TITLE

AUTHORS

CONTRACT OR GRANT

REPORT NUMBER

AVAILABLE ON MICROFICHE

CORPORATE SOURCE

PUBLICATION DATE

AVAILABILITY SOURCE

COSATI CODE

→ N84-10017*# Kansas Univ., Lawrence. Flight Research Lab. ◄
→ A LIFTING SURFACE THEORY IN ROTATIONAL FLOW Topical Report, Jun. 1981 - Dec. 1982
→ M. J. SHIAU and C. E. LAN Oct. 1983 74 p refs
→ (Contract NAG1-75)
→ (NASA-CR-172233; NAS 1.26:172233; CRINC-FRL-467-2) Avail: ◄
NTIS HC A04/MF A01 CSCL 01A ◄

The partial differential equation for small disturbance steady rotational flow in three dimensions is solved through an integral equation approach. The solution is obtained by using the method of weighted residuals. Specific applications are directed to wings in nonuniform subsonic parallel streams with velocity varying in vertical and spanwise directions and to airfoils in nonuniform freestream. Comparison with limited known results indicates that the present method is reasonably accurate. Numerical results for the lifting pressure of airfoil, lift, induced drag, and pitching moments of airfoil, lift, induced drag, and pitching moments of elliptic, rectangular, and delta wings in a jet, wake, or monotonic sheared stream are presented. It is shown that, in addition to the effect of local dynamic pressures, a positive velocity gradient tends to enhance the lift.   Author

TYPICAL CITATION AND ABSTRACT FROM *IAA*

AIAA ACCESSION NUMBER

AUTHOR

TITLE OF PERIODICAL

AVAILABLE ON MICROFICHE

TITLE

AUTHOR'S AFFILIATION

PUBLICATION DATE

→ A84-10131#
EXPERIMENTAL INVESTIGATION OF CURVATURE EFFECTS ◄
ON VENTILATED WALL JETS
→ R. M. EL-TAHER (King Abdulaziz University, Jeddah, Saudi ◄
Arabia) AIAA Journal (ISSN 0001-1452), vol. 21, Nov. 1983, p. 1505-1511. refs

The results of an experimental study for a ventilated plane jet attaching to an offset plane surface or to an offset convex surface of circular cross section are presented. The results demonstrate the dependence of the rate of entrainment through the gap, the location of the attachment point, the growth of the length scale, and the decay of the maximum velocity on the wall curvature. Moreover, the effect of wall curvature on the mean velocity, the turbulence velocity components, and the Reynolds shear stress in the different zones of the jet are investigated.   Author

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 174)

01

AERONAUTICS (GENERAL)

A84-19574
MAINTENANCE CENTER FOR THE AIRCRAFT TYPE TU-134 [WARTUNGSZENTRUM FUER DEN FLUGZEUGTYP TU-134]
G. GEISSLER (INTERFLUG, Gesellschaft fuer internationalen Flugverkehr mbH, Berlin, East Germany) Technisch-Oekonomische Information der zivilen Luftfahrt (ISSN 0232-5012), no. 3, 1983, p. 95-99. In German.

Maintenance and service operations involving the Tu-134 and Tu-134A aircraft of the airline Interflug of the German Democratic Republic were mainly performed in a hangar. The same hangar was also employed for maintenance operations in the case of IL-62 and IL-18 aircraft. In connection with an increase in the number of aircraft of the types IL-62M and Tu-134A, it was found that the operational productivity achievable under the given conditions could not be further enhanced. An investigation was, therefore, conducted with the objective to determine suitable approaches for establishing a maintenance center for Tu-134 aircraft with improved possibilities for an optimization of the efficiency of the required maintenance operations. A description is given of the problems considered in this investigation and a plan developed for improving the efficiency of maintenance operations in three stages. G.R.

A84-19631#
HEALTH MONITORING OF HELICOPTER GEARBOXES
D. G. ASTRIDGE (Westland Helicopters, Ltd., Yeovil, Somerset, England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 14 p.

The various problems posed for gearbox health monitoring are discussed, and the solutions applied to the Westland 30 helicopter are described. These embrace the transition from traditional, well-known laboratory based techniques and subjective evaluations, to the on-line facilities of future aircraft such as the EH101, and growth versions of Westland 30. Author

A84-19741
THE POTENTIAL IMPACT OF TECHNOLOGY ON VTOL UTILIZATION (THE THIRD NIKOLSKY LECTURE)
R. H. MILLER (MIT, Cambridge, MA) American Helicopter Society, Journal (ISSN 0002-8711), vol. 29, Jan. 1984, p. 3-14. refs

Attention is given to the possibility that prospective advancements in VTOL aircraft technology will allow a short haul (intercity) passenger system to come into existence at the expense of existing automobile transportation. For the automobile market to be thus penetrated, VTOL systems must compete in terms of superior convenience, cost, and comfort. The present discussion of the cost factor, for the case of a tilt-rotor type VTOL configuration, emphasizes the importance of 'learning curve' effects when projecting costs, as the transportation system in question approaches maturity and full market penetration. Comfort criteria to be addressed by VTOL system designers prominently include noise and vibration. O.C.

A84-19858
ARMY AVIATION MANUFACTURING TECHNOLOGY CONFERENCE, 3RD, WILLIAMSBURG, VA, MARCH 7-11, 1983, REPORT
Conference sponsored by the U.S. Army and American Helicopter Society. St. Louis, MO, U.S. Army, Aviation Research and Development Command, 1983, 106 p.

The proceedings and results of a conference to reduce the costs of aviation systems through the selection of industry proposals are presented. The conference was composed of six panel areas: metal airframes, nonmetal airframes, drives, propulsion, rotors, and subsystems. Proposals submitted by industry were evaluated according to applicability to aircraft, probability of success, cost reduction, and implementation. The proposals were then prioritized as to importance to Army manufacturing technology. No individual items are abstracted in this volume C.D.

A84-19968* National Aeronautics and Space Administration, Washington, D. C.
CIVIL BENEFITS OF THE JVX
J. ZUK (NASA, Aeronautical Systems Branch, Washington, DC) Vertiflite (ISSN 0042-4455), vol. 30, Jan.-Feb. 1984, p. 20-23.

The inherently high productivity, VTOL capability, and low noise and vibration features of a civil version of the Joint Services Advanced Vertical Lift Aircraft, or 'JVX', are recommended for commercial exploitation. This tilt-rotor vehicle can provide ground and air traffic congestion relief through direct, city center-to-city center service, economically transporting 30 passengers for distances of up to 600 miles. Additional commercial opportunities emerge in the JVX's servicing of offshore, remote and infrastructureless areas. It is noted that Alaska, more than any other American state, would benefit from the JVX's VTOL access to natural resources and otherwise isolated settlements. The civilian development of the JVX could lead to the development of commercial tilt rotor aircraft for other size classes. O.C.

A84-20372
ROCKWELL COMPLETES FIRST B-1B FUSELAGE
B. A. SMITH Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 23, 1984, p. 78, 79, 81, 84.

Work related to plans for completing the initial production version of the B-1B bomber aircraft is discussed. Five fuselage sections of the first B-1B aircraft have been mated at the new assembly facility of an American aircraft manufacturer. Attention is given to the order of individual fuselage assembling operations, the installation of the vertical stabilizer on the B-1B aft fuselage section, the attachment of the rotary drive launcher mechanism and a weapons bay power drive unit to the bulkhead, the installation of the four engines and the main landing gear doors, a simulated fuel test, the application of paint, and fuel calibration and engine run. G.R.

A84-20991
WERE THE WRIGHTS RIGHT?
B. R. A. BURNS   Air International (ISSN 0306-5634), vol. 25, Dec. 1983, p. 285-292, 308, 309.

A development history is presented for the resurgence of experimentation with tandem wing and canard configurations from the late 1920s, to the present after such designs' virtually complete abandonment during WW I. The first such aircraft was the Focke-Wulf Flugzeugbau's F 19 'Ente', which was first flown in 1927. In addition to H. Focke and G. Wulf, other designers prominent in canard configuration research and development were R. Payen, M. Delanne, and G. Miles. The canard/pusher-prop configuration's freeing of the aircraft nose to serve as an unobstructed gun platform led to the construction, testing and limited production of several fighter aircraft of this type by both Axis and Allied manufacturers during WW II. Most recently, the configuration has become popular for both privately owned ultralights and high performance military aircraft, notably the XB-70 Mach-3 bomber prototype.   O.C.

A84-21228
THE FIFTEENTH SIR RICHARD FAIREY MEMORIAL LECTURE - THE QUIETER AIRPORT
N. J. PAYNE (British Airports Authority, Gatwick, Surrey, England) Journal of Sound and Vibration (ISSN 0022-460X), vol. 89, Aug. 22, 1983, p. 533-540.

Aircraft noise as a social problem arrived less than a quarter of a century ago with the jets and has been a significant factor in airport planning and the development of air transport ever since. This paper explains how the industry has responded, with the introduction of operating techniques, and how governments have introduced controls, both designed to mitigate the effects of aircraft noise, as far as possible, for people living near major airports. It shows that considerable success has been achieved and expresses the belief that as a result the worst is passed. The author also demonstrates that there are two sides to airport operations; noise nuisance, the main effects of which are confined to a relatively small area around the airport, is more than balanced by the economic benefits deriving from its operation. These are enjoyed within the immediate environs of the airport and spread widely to the region in which it is located and ultimately to the nation as a whole.   Author

A84-21721
THE NEXT 75 YEARS IN AEROSPACE
J. ALLEN   Flight International (ISSN 0015-3710), vol. 125, Jan. 21, 1984, p. 166-171.   refs

Aerospace innovations of the next 75 years are predicted. Technical thrusts are to include continued development in energy, efficient transport, and possible breakthroughs in optonics and laminar flow transport with L/D approaching 40. The airline market will become specialized though limited, and all transport systems can expect steadier progress. Population increase combined with a reversed trend in urbanization are to affect traffic demands and patterns. Energy substitutions such as nuclear power and hydrogen gas or liquid will also affect aviation, especially the latter's ability to reduce fuel weight. Landscape congestion is to provoke an increase in the number of man-made islands, and flying boats are to be developed for use in the Pacific area. New and continuing projects will include urban airport design, desert reclamation, space stations, comsats, and the Satellite Solar Power System.   C.M.

A84-21722
AD INEXPLORATA
R. P. HALLION (USAF, Flight Test Centre, Edwards AFB, CA) Flight International (ISSN 0015-3710), vol. 125, Jan. 21, 1984, p. 195-198.

A retrospective of Edwards Air Force Base is presented, with its role as a training base and a defense flight-test station traced from its inception in 1933 to the present. The Yeager supersonic test-flight in 1947 of the XS-1, the discovery that tricresyl phosphate would cause a series of aircraft explosions, the breakthrough of hypersonic flight, the research for NASA's Space Shuttle and the establishment of Dryden Flight Research Facility are considered. Current efforts involving the testing of night sensor systems and the improvement of range and weapons carriage are examined, and the role of the base as the spaceport for the Space Shuttle is discussed.   C.M.

A84-21723
SO WHAT'S NEW?
P. JARRETT   Flight International (ISSN 0015-3710), vol. 125, Jan. 21, 1984, p. 213-216.

A retrospective of American and European aircraft builders is presented while showing present-day reuse of their design ideas. Due to computerized control systems, inherent longitudinal instability (a feature of the Wright brothers' airplanes) is now being used in combat aircraft to improve maneuverability. The transport and testing of the Space Shuttle piggyback on a 747 stems from a 1916 British experiment, which concept was used by the Soviet Union to launch fighters from bombers in the 1930s. Asymmetric airplanes began with the first Wright Flyer and were also designed in Germany during the Second World War; they are now being tested by NASA. Variable geometry was effected in American jets in 1951, though the idea was first proposed in 1890 in France by Clement Ader. The history of jet propulsion, tandem-wings, canard aircraft, inverse taper wings, swept-forward wings and variable-incidence wings is also treated, and compared to old ideas.   C.M.

A84-21887
TOWARD THE TOTALLY INTEGRATED AIRPLANE
J. W. CANAN   Air Force Magazine (ISSN 0730-6784), vol. 67, Jan. 1984, p. 34-41.

The Wright Aeronautical Laboratories of the U.S. Air Force's Aeronautical Systems Division (ASD) have undertaken a wide-ranging series of technology development and integration programs in order to formulate the requirements for an Advanced Tactical Fighter (ATF) incorporating 'low observables' features and the interactive allocation of tasks between pilots and automated systems employing advanced computer hardware and software. Electronics deriving from the current Very High Speed Integrated Circuits program will be used, for example, as fire control processors receiving data from aircraft sensors showing multiple targets, rapidly generating the complex algorithms needed to deliver the aircraft's weapons to those targets with high discrimination and in a single pass of the ATF. Also important to the ASD effort are supersonic cruise engines, forward swept wings, and mission-adaptive wing controls.   O.C.

A84-21888
REPORT FROM THE BICYCLE SHOP
T. H. MCMULLEN (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH)   Air Force Magazine (ISSN 0730-6784), vol. 67, Jan. 1984, p. 42-48, 51.

Recent development programs undertaken by the U.S. Air Force's Aeronautical Systems Division (ASD), encompass not only the improvement of such existing aircraft as the B-1B, B-52, F-16, and KC-135, but also the design of avionics, sensors, propulsion systems and weapons applicable to the next generation of Air Force aircraft. Attention is given to the capabilities of such ASD-sponsored systems as the Air Launched Cruise Missile, the Advanced Medium Range Air-to-Air Missile, the Low Altitude Navigation and Targeting IR for Night sensor package, and the next-generation Advanced Tactical Fighter. One of the most promising of ASD's ongoing programs is that concerned with the development of Very High Speed Integrated Circuits, which will be capable of processing speeds 50-100 times greater than those of present integrated circuits.   O.C.

A84-22348#
AIRBORNE OBSERVATORIES - ASTRONOMY AT HIGH ALTITUDES [FLUGZEUGOBSERVATORIEN - ASTRONOMIE IN LUFTIGEN HOEHEN]
J. SCHMID-BURGK and C. THUM (Max-Planck-Institut fuer Radioastronomie, Bonn, West Germany)   Sterne und Weltraum (ISSN 0039-1263), vol. 23, Jan. 1984, p. 18-21. In German.

Practical aspects of airborne astronomy are discussed, and a typical observation flight is depicted. The research aircraft operated by NASA Ames (U2, Kuiper Airborne Observatory, and Learjet NASA 705) are characterized, and the equipment, layout, and flight parameters of the Learjet are examined in detail. The flight plan and procedures for far-IR observations at 13.5-km altitude of oxygen distribution in Galactic H II regions are described. Photographs of the aircraft and sample results are included.
T.K.

N84-16120#   Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).   Inst. fuer Flugmechanik.
LECTURES OF A FLIGHT MECHANICS CONFERENCE
Jul. 1983   128 p   refs   In GERMAN; ENGLISH summary
Conf. held at Brunswick, Dec. 1981 Report will also be announced as translation (ESA-TT-831)
(DFVLR-MITT-83-05) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 39,20

The development of flight mechanical research at the Technical University Braunschweig is surveyed. Activities of a US liaison office for research reports in Europe are reported. Flight mechanical problems of the pilot-aircraft system due to the introduction of new technologies are discussed. The influence of measuring section parameters on the results of a flight mechanical system identification is treated. Flight mechanical motion characteristics are estimated with Kalman filters. Gust producers for flight mechanical investigations in wind tunnels are considered.

N84-16128#   Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A Q-GERT ANALYSIS OF THE EFFECT OF IMPROVED AUTOMATIC TESTING ON F-16 AIRCRAFT AVAILABILITY M.S. Thesis
J. C. BENNER and P. M. ONEILL   Sep. 1983   190 p
(AD-A134280; AFIT-LSSR-2-83) Avail: NTIS HC A09/MF A01
CSCL 15E

Weapon systems and their associated maintenance task complexity have exceeded the limited technical capabilities of today's maintenance personnel. The present maintenance philosophy which relies heavily on Automatic Test Equipment (ATE) to narrow this complexity-capability gap has several shortcomings. Primarily, the false pull of properly functioning units and the false alarms of Built-in-Test equipment (BITE) result in increased maintenance actions, costs, and aircraft downtime. Implementing systems theory through the Systems Science Paradigm, the authors developed a Q-GERT model of the F-16 maintenance diagnostic process via a queueing scenario of the F-16 Low Power Radio Frequency (LPRF) repair cycle. F-16 Centralized Data System (CDS) data input to the model showed that a simulation model is representative of the actual repair process. Sensitivity analysis indicated that reduced diagnostic error rates significantly affect the time required to generate F-16 aircraft to an operationally ready state. Increased emphasis toward decreasing false alarms and false pulls was recommended.   Author (GRA)

N84-16129#   Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AIRCRAFT AVIONIC SYSTEM MAINTENANCE CANNOT DUPLICATE AND RETEST-OK ANALYTICAL SOURCE ANALYSIS M.S. Thesis
G. L. GEMAS   Sep. 1983   59 p
(AD-A134449; AFIT-LSSR-49-83) Avail: NTIS HC A04/MF A01
CSCL 15E

This study focuses on the aircraft avionic maintenance problems of cannot duplicate (CND) and retest-ok (RTOK) for three sampled

F-16 wings. Analytical and survey methods are used to evaluate four hypothesis in an attempt to determine causes of CND and RTOK occurrences and evaluate if they point to usable solutions to these problems. Hypothesis one evaluates the statistical differences in CND and RTOK rates between the sampled wings. Hypothesis two compares RTOK rates between avionic intermediate maintenance (AIS) test stations. Hypothesis three compiles the frequency of CND occurrences for each aircraft to determine if some aircraft experience higher CND rates than others. Hypothesis four evaluates the number of days between CND or RTOK corrective actions and the next maintenance repair action. The RTOK rates evaluated in hypothesis one were significantly different and require further study. Test stations RTOK rates for hypothesis two were significantly different between test stations, and between wings, and requires further study. Results for hypothesis three indicate some aircraft, given to chance, will experience higher CND and/or RTOK rates than others. The results of hypothesis four imply that 50 percent of all aircraft malfunctions cleared as CND or RTOK require maintenance repairs.
Author (GRA)

N84-16130#   Flughafen, Frankfurt am Main (West Germany).
THE AIR TRAFFIC PLANNING COORDINATOR OF THE FEDERAL REPUBLIC OF GERMANY [DER FLUGPLANKOORDINATOR DER BUNDESREPUBLIK DEUTSCHLAND. AUFGABEN UND VERFAHRENSWEISEN]
H. K. GERING and C. ULRICH   Jan. 1983   19 p   In GERMAN
(FACHTHEMEN-5) Avail: NTIS HC A02/MF A01

The tasks of the German coordinator of air traffic planning are described.   Author (ESA)

N84-17120#   Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
ESTIMATING THE COST OF COMPOSITE MATERIAL AIRFRAMES USING THE RAND CORPORATION DEVELOPMENT AND PROCUREMENT COSTS OF AIRCRAFT PARAMETRIC MODEL (DAPCA III) M.S. Thesis
G. D. KAGE, II   Sep. 1983   141 p
(AD-A134993; AFIT-LSSR-39-83) Avail: NTIS HC A07/MF A01
CSCL 05A

The increasing use of composite material in airframes is effecting the accuracy of the current methods of estimating aircraft costs. Aluminum and composite material parts are fabricated and assembled using different processes which have different costs. Parametric models such as DAPCA III rely on a data base of all-aluminum aircraft to estimate the cost aircraft that have large amounts of composite material in them. Adjusting the estimates to reflect the composite material in the aircraft requires a detailed analysis of the composite part cost then substituting that cost for the comparable amount of aluminum. The three-step process is time consuming and inaccurate. This thesis has developed a series of indices which reflect the differences in manufacturing cost for composite parts and aluminum parts that can be applied directly to the DAPCA III output. They were developed by comparing identical parts made from aluminum and then from composites. The ICAM Manufacturing Cost/Design Guide estimated the aluminum part cost and the FACET computer program estimated the composite material part cost. Indices are provided for nonrecurring tooling manhours, recurring manufacturing manhours, and material dollar costs.   Author (GRA)

N84-17121#   Industrial Coll. of the Armed Forces, Washington, D.C.
IDENTIFICATION OF BOTTLENECKS AND CAPACITY CONSTRAINTS IN F-14, F-15, F-16, AND F/A-18 AIRCRAFT PRODUCTION Research Report, 1982 - 1983
J. G. CABUK, JR., T. J. DUNCAN, I. L. HOFFMAN, and D. V. NOWLIN   Apr. 1983   146 p
(AD-A134629; NDU/ICAF-83/047; RR-41) Avail: NTIS HC A07/MF A01 CSCL 15C

This paper examines the aerospace industry capacity for surge production of tactical fighter aircraft in response to a national emergency. It provides a conceptual overview of the aerospace

industry, some general industrial production factors, and a discussion of the 1966 to 67 F-4 production surge. A vertical slice study of each of the four aircraft under consideration is then provided, followed by a horizontal slice study which addresses major critical production factors and ongoing corrective actions.

Author (GRA)

N84-17122# Army Inventory Research Office, Philadelphia, Pa.
SORTIE DURATION AND HELICOPTER COMPONENT FAILURES (AN EMPIRICAL STUDY)
E. GOTWALS   May 1983   250 p
(AD-A134745; USAIRO-TR-83/3)   Avail: NTIS HC A11/MF A01 CSCL 01C

This study investigates the effect that sorties, flying hours, and usage have on component failures for Army aircraft. The report documents the work done. It includes many graphs in the appendix depicting 20 years of 1352 flying hour data which may be useful in other research work. It shows no relationship between failures and flying hours, sorties, or utilization.   Author (GRA)

N84-17123#   Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Forschungsbereich Stroemungsmechanik.
THE PRANDTL HERGESELL PROJECT OF A NATIONAL RESEARCH ESTABLISHMENT FOR AERONAUTICS
J. C. ROTTA   Aug. 1983   67 p   refs   In GERMAN; ENGLISH summary   Report will also be announced as translation (ESA-TT-835)
(DFVLR-MITT-83-10; ESA-TT-835)   Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 18,50

A historical account on the project of a national research establishment for aeronautics in Germany is presented.

Author (ESA)

N84-17124#   Federal Aviation Administration, Washington, D.C. Office of Management Systems.
FAA (FEDERAL AVIATION ADMINISTRATION) STATISTICAL HANDBOOK OF AVIATION: CALENDER YEAR 1982 Annual Report
31 Dec. 1982   202 p
(PB84-127323)   Avail: NTIS HC A10/MF A01   CSCL 01B

This report presents statistical information pertaining to the Federal Aviation Administration, the National Airspace System, airports, airport activity, U.S. civil air carrier fleet, U.S. civil air carrier operating data, airmen, general aviation aircraft, aircraft accidents, aeronautical production and imports/exports, and a glossary of the terms used in this publication.   GRA

02

AERODYNAMICS

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

A84-19413#
COMPATIBILITY OF TRANSONIC FLOWS AT THICK TRAILING EDGE IN TURBINE BLADE ROW
M. INOUE (Kyushu University, Fukuoka, Japan), S. YAMAGUCHI (Fukuoka University, Fukuoka, Japan), T. IKUI (Toa University, Japan), and H. HAYASHI   JSME, Bulletin (ISSN 0021-3764), vol. 26, Nov. 1983, p. 1877-1883.   refs

In transonic turbine blades with thick trailing edge, the base pressure strongly influences the cascade performances. This paper presents two methods for predicting the base pressure, which are extensions of the analyses on the backward facing step by Korst (1956) (neglecting upstream boundary layer) and McDonald (1964) (taking account of upstream boundary layer). The compatibility is considered between separated flows (jets) from suction and pressure surfaces in each method. The validity of both methods

is discussed in comparison with the experiment of a two-dimensional turbine cascade with high stagger.   Author

A84-19553
TURBULENT FLOW NEAR THE TRAILING EDGE OF A PLATE AT ZERO ANGLE OF ATTACK [O TURBULENTNOM TECHENII ZHIDKOSTI V OKRESTNOSTI ZADNEI KROMKI PLASTINY, OBTEKAEMOI POD NULEVYM UGLOM ATAKI]
S. A. VELICHKO and IU. B. LIFSHITS   Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Nov.-Dec. 1983, p. 17-23. In Russian.   refs

The method of matched asymptotic expansions is used to investigate turbulent flow in the boundary layer and wake near the trailing edge of a flat plate. A system of linear elliptic equations with variable coefficients is obtained for averaged values of flow parameters in the main part of the boundary layer and wake, responsible for the variation of displacement thickness. This system is solved by the Fourier method in the case of a power law of velocity before the interaction region.   B.J.

A84-19555
GEOMETRIC CHARACTERISTICS OF THE SEPARATION OF A TURBULENT BOUNDARY LAYER DURING THE INTERACTION WITH A NORMAL SHOCK IN CONICAL FLOWS [GEOMETRICHESKIE KHARAKTERISTIKI OTRYVA TURBULENTNOGO POGRANICHNOGO SLOIA PRI VZAIMODEISTVII S PRIAMYM SKACHKOM UPLOTNENIIA V KONICHESKIKH TECHENIIAKH]
M. A. ZUBIN and N. A. OSTAPENKO (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR)   Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Nov.-Dec. 1983, p. 43-51. In Russian.   refs

A large body of experimental data is used to analyze the effect of the determining parameters on the dimensions of the separation region resulting from the incidence of a normal shock on a turbulent boundary layer in conical flow. Empirical relationships are derived for the geometric characteristics of the separation region arising during the incidence of a plane shock wave on a turbulent boundary layer in a corner, and it is noted that these relationships can be used to determine the dimensions and location of the separation region with respect to the incident shock or the direction of the unperturbed flow.   B.J.

A84-19556
THE EFFECT OF TURBULENCE ON HEAT TRANSFER NEAR A STAGNATION POINT [VLIIANIE TURBULENTNOSTI NA TEPLOOBMEN V OKRESTNOSTI KRITICHESKOI TOCHKI]
S. S. CHENTSOV   Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Nov.-Dec. 1983, p. 52-59. In Russian.   refs

A method is developed for calculating the enhancement of heat transfer near the stagnation point (or line) of a body in turbulent (uniform or jet) flow. Conditions for the commencement of heat-transfer enhancement are established, and a universal criterion determining the heat-transfer gain is obtained. Calculation results are found to agree with available experimental data for various classes of flows.   B.J.

A84-19562
HYPERSONIC NONEQUILIBRIUM GAS FLOW PAST A LOW-ASPECT-RATIO WING [O GIPERZVUKOVOM OBTEKANII KRYLA MALOGO UDLINENIIA NERAVNOVESNYM POTOKOM GAZA]
A. I. GOLUBINSKII and V. N. GOLUBKIN   Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Nov.-Dec. 1983, p. 125-128. In Russian.   refs

The thin-shock-layer method is used to analyze the hypersonic nonequilibrium gas flow past a low-aspect-ratio wing at angle of attack. The conservation of the flow component of vorticity along the streamlines is shown, and this property is used to obtain an analytical solution to the equations of a three-dimensional nonequilibrium shock layer. The effect of nonequilibrium on shock-layer thickness and pressure distribution is assessed.   B.J.

A84-19571
THE DENSITY DISTRIBUTION OF A SUPERSONIC JET ISSUING INTO A VACUUM FROM A NOZZLE WITH A BEVELED EXIT SECTION [RASPREDELENIE PLOTNOSTI V SVERKHZVUKOVOI STRUE, ISTEKAIUSHCHEI V VAKUUM IZ SOPLA S KOSYM SREZOM]
A. V. RODIONOV   Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza (ISSN 0568-5281), Nov.-Dec. 1983, p. 179, 180. In Russian.   refs
In those cases where the nozzle exit section is not perpendicular to the nozzle axis, flow in the jet becomes three-dimensional. The effect of a beveled nozzle exit section can be sometimes allowed for through a correction in the density distribution. An expression for such a correction is obtained here on the basis of calculations made in an earlier study (Rodionov, 1982).   V.L.

A84-19592
VISUALIZATION OF ACCELERATING FLOW AROUND AN AIRFOIL AT HIGH ANGLES OF ATTACK
P. FREYMUTH, W. BANK, and M. PALMER (Colorado, University, Boulder, CO)   Zeitschrift fuer Flugwissenschaften und Weltraumforschung (ISSN 0342-068X), vol. 7, Nov.-Dec. 1983, p. 392-400.   refs
(Contract AF-AFOSR-81-0037)
The acceleration of flow around an airfoil was studied, using smoke visualization. The flow was started from rest and allowed to accelerate at a constant rate for several seconds. Movies were taken to document the initiation and development of separated vortex structures at high angles of attack. The evolving vortex patterns are interpreted as the elaborate initiation characteristics of an unsteady turbulent vortex street.   Author

A84-19593
THE TRANSONIC INTERACTION OF A NORMAL SHOCK WITH A MILDLY SEPARATED TURBULENT BOUNDARY LAYER
A. G. PANARAS (Patras, University, Patras, Greece)   Zeitschrift fuer Flugwissenschaften und Weltraumforschung (ISSN 0342-068X), vol. 7, Nov.-Dec. 1983, p. 400-406.   refs
A method of calculation of the transonic interaction field is described. Both the pressure field and the development of the boundary layer can be estimated by this method. The triple deck model of Inger, which is based on the principles laid down by Lighthill, is used for the estimation of the pressure disturbance field. The simplified integral method of the present author, in which the shear term is neglected in the x-momentum equation, is extended to mildly separated boundary layers. Thus interactions containing a thin separation bubble downstream of the shock can be handled. The method is characterized by its accuracy and the small computation time (four minutes CPU time in a PRIME 550 Computer) and it is very suitable for the study of new airfoils and blades. The splitting of the normal shock into a triple shock formation is the limit of application of the method.   Author

A84-19623#
PRESSURE FIELD INDUCED ON AN AIRFOIL BY AN UNSTEADY FLOW
H. ARBEY and M. ROGER (Lyon, Ecole Centrale, Ecully, Rhone, France)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper, 10 p.
The coherence of the pressure fields induced on two 2-D NACA 0012 airfoils by a turbulent flow with mean velocity of 20 m/s was measured, and then compared with theoretical predictions using various unsteady aerodynamic transfer functions. The characteristics of the pressure field induced by the upstream turbulence are well predicted by the Filotas theory (1969). The magnitude of fluctuations in the convective pressure field increased exponentially downstream. This field, apparently induced by the transitional boundary layer, was seen to have a higher convection velocity and weaker chordwise and spanwise coherences when compared with a field induced by a turbulent boundary layer.
J.N.

A84-19654#
AERODYNAMICS OF THE HELICOPTER REAR FUSELAGE UPSWEEP
J. SEDDON (Bristol, University, Bristol, England)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 16 p.   refs
It is established that two very different types of flow can exist around the bluff upswept rear fuselage typical of some helicopters, and that the change from one type (eddy flow) to the other (vortex flow) can, depending on the circumstances, be accompanied by a large increase in drag and a reduction in fin effectiveness. Angle of incidence of the fuselage (alpha) is an important parameter, as are lateral taper and to a lesser extent edge radii. Results are presented for two series of rear-fuselage shapes, each covering a range of upsweep angles (phi). The nature of the vortex-type flow is discussed. An alpha/phi diagram provides a useful way of assessing a given type of configuration from a design aspect. In a final section, the two types of flow are put into a broader context by means of an extended alpha/phi diagram.   , Author

A84-19655#
A LIFTING LINE THEORY FOR CURVED HELICOPTER BLADES IN HOVERING AND AXIAL FLIGHT
O. RAND and A. ROSEN (Technion - Israel Institute of Technology, Haifa, Israel)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 17 p.   refs
A lifting line model to calculate the aerodynamic loads along a curved helicopter blade, in hovering and axial flight, is derived. In the derivation a 'semi-rigid' wake model, which depends on the induced velocity distribution along the blade, is used. The influence of both, trailing and bound vortices, are taken into account. The derivation yields an efficient numerical scheme of calculations. Results for two different curved blades are presented and compared with similar straight blades. It is shown that curvature influences the distribution of the aerodynamic properties along the blades. Good agreement between the results of the present lifting line theory and a 'momentum-blade element' theory for curved blades is also presented.   Author

A84-19657#
ADVANCED ROTOR ANALYSIS METHODS FOR THE AERODYNAMICS OF VORTEX/BLADE INTERACTIONS IN HOVER
J. M. SUMMA (Analytical Methods, Inc., Bellevue, WA)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 18 p.   refs
(Contract DAAK51-81-C-0006; DAAG29-81-C-0032)
The work discussed in this report has shown that the complete hovering rotor wake geometry, including the inner sheet, can be predicted without the constraints or empiricisms of a prescribed wake. Moreover, the calculated wakes for some modern rotors violate the usual hypothesis in prescribed wake methods of a weak linear inner sheet and a single rolled-up tip vortex. When coupled with a lifting-surface method, this relaxed wake procedure allows for the accurate analysis of rotor performance at proper collective settings. Finally, the application of a surface singularity method developed for rotors has demonstrated the capability of accurately computing blade surface pressures very near the rotor tip edge.   Author

A84-19658#
APPLICATION OF FAST FREE WAKE ANALYSIS TECHNIQUES TO ROTORS
R. H. MILLER (MIT, Cambridge, MA)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 6 p. refs
The fast free wake analysis technique has been applied using various models for the near and far wake, including two-dimensional and three-dimensional configurations, and lifting surface and lifting

line treatments of the blade. The technique has also been applied to the case of a wind turbine, operating in the turbulent wake/vortex ring state. Author

A84-19659#
PRACTICAL COMPUTATION OF UNSTEADY LIFT
T. S. BEDDOES (Westland Helicopters, Ltd., Yeovil, Somerset, England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 20 p. Research supported by the Ministry of Defence (Procurement Executive). refs

It is pointed out that rotor airload calculations require a versatile method for evaluating the unsteady lift response to angle of attack forcing which may vary in a discontinuous or almost arbitrary manner. The present investigation is concerned with the unsteady lift calculation in the case of attached (potential) flow, taking into account a structure for the evaluation of critical conditions for the onset of separated flow and the subsequent required modifications to implement the consequences. Attention is given to the derivation of the indicial lift functions, the lift transfer function, the frequency response to pitching oscillations, the frequency response to plunge oscillation, the response to an idealized ramp, the response to a real ramp, the application of explicit solutions, numerical methods, and a comparison with the Navier Stokes equation. G.R.

A84-19660#
DESIGN OF AIRFOILS FOR A SPECIFIED MOMENT COEFFICIENT
S. DE PONTE and L. MANFRIANI (Milano, Politecnico, Milan, Italy) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p. refs

Airfoil lift and moment coefficients are expressed in the form of boundary layer parameters, through the use of simple, closed form relationships for a simplified representation of boundary layer properties. This allows the identification of maximum lift penalties due to either a moment constraint or an increase in airfoil thickness. Attention is given to compressibility effects, and the approximations developed are compared to both exact data and experimental results. O.C.

A84-19665#
APPLICATION OF AN ANALYTIC STALL MODEL TO DYNAMIC ANALYSIS OF ROTOR BLADES
J. P. ROGERS (U.S. Army, Aviation Research and Development Command, St. Louis, MO) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 26 p. refs
(Contract DAAG29-80-C-0092)

A dynamic analysis of a rotor blade is performed, including an analytic model for blade stall. The normal lift force on the blade element is determined throughout the linear and non-linear regimes of angle of attack from a simplified version of the stall model of Tran and Petot. Blade-element theory is used to investigate the forced and transient response of a single rotor-blade element, hinged in the flapping degree of freedom. The analysis shows that this dynamic stall model may be easily incorporated into conventional, blade-element theory; and this results in a more realistic estimate of blade response than can be predicted by classical linearized theory. Author

A84-19743
APPLICATIONS OF AN ANALYTIC STALL MODEL TO TIME-HISTORY AND EIGENVALUE ANALYSIS OF ROTOR BLADES
J. P. ROGERS (U.S. Army, Directorate for Advanced Systems, St. Louis, MO) American Helicopter Society, Journal (ISSN 0002-8711), vol. 29, Jan. 1984, p. 25-33. refs
(Contract DAAG29-80-C-0092)

A dynamic analysis of a single-section model of helicopter blade is performed including an analytic model of dynamic stall. This stall model, a simplified version of the model introduced by Tran

and Petot, characterizes the lift force on the blade section throughout both the linear and nonlinear regimes of angle of attack. The resultant, nonlinear blade equations are solved by numerical integration for the periodic, forced response. Perturbation equations, written for small disturbances about this equilibrium, provide eigenvalue and stability information by means of Floquet theory. Author

A84-19889*# Rockwell International Corp., Canoga Park, Calif.
ON THE METHOD OF PSEUDO COMPRESSIBILITY FOR NUMERICALLY SOLVING INCOMPRESSIBLE FLOWS
J. L. C. CHANG (Rockwell International Corp., Rocketdyne Div., Canoga Park, CA) and D. KWAK (NASA, Ames Research Center, Moffett Field, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 10 p. refs
(Contract NAS8-27980)
(AIAA PAPER 84-0252)

Pseudo compressibility is used for numerically solving incompressible flows to achieve computational efficiency. The use of pseudo compressibility results in a system of hyperbolic-type equations of motion that introduce waves of finite speed. The interactions of the wave propagation and the vorticity spreading are analyzed. A criterion governing the dependence of the pseudo compressiblity on the Reynolds number and the characteristic length of the flow geometry is obtained that allows for a proper convergence. It is demonstrated that the solution does tend to the incompressible limit. External and internal viscous flow test problems are presented to verify the theory. Author

A84-19903*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMPACT OF COMPUTERS ON AERODYNAMICS RESEARCH AND DEVELOPMENT
V. L. PETERSON (NASA, Ames Research Center, Moffett Field, CA) IEEE, Proceedings (ISSN 0018-9219), vol. 72, Jan. 1984, p. 68-79. refs

Factors motivating the development of computational aerodynamics as a discipline are traced back to the limitations of the tools available to the aerodynamicist before the development of digital computers. Governing equations in exact and approximate forms are discussed together with approaches to their numerical solution. Example results obtained from the successively refined forms of the equations are presented and discussed, both in the context of levels of computer power required and the degree of the effect that their solution has on aerodynamic research and development. Factors pacing advances in computational aerodynamics are identified, including the amount of computational power required to take the next major step in the discipline. Finally, the Numerical Aerodynamic Simulation (NAS) Program - with its 1987 target of achieving a sustained computational rate of 1 billion floating-point operations per second operating on a memory of 240 million words - is briefly discussed in terms of its projected effect on the future of computational aerodynamics. Author

A84-19952
TRAILING VORTICES IN HOMOGENEOUS AND DENSITY-STRATIFIED MEDIA
T. SARPKAYA (U.S. Naval Postgraduate School, Monterey, CA) Journal of Fluid Mechanics (ISSN 0022-1120), vol. 136, Nov. 1983, p. 85-109. refs

Experiments were conducted with three delta wings and two rectangular wings to investigate the evolution of trailing vortices in stratified and unstratified water. The vortex trajectories were determined as a function of the normalized time Vot/bo, stratification parameter Nbo/Vo and an effective vortex-core size re/bo. The results have shown that the vortices rise only to a finite height as they decay gradually at first and rapidly thereafter under the influence of turbulence, sinusoidal instability, and core bursting. The effect of stratification is to reduce the lifespan of vortices and the maximum height attained by them. Author

A84-19987#

THE EVOLUTION OF COMPUTATIONAL METHODS IN AERODYNAMICS

A. JAMESON (Princeton University, Princeton, NJ) ASME, Transactions, Journal of Applied Mechanics (ISSN 0021-8936), vol. 50, no. 4b, Dec. 1983, p. 1052-1070. refs

This paper surveys the evolution of computational methods in aerodynamics. Improvements in high-speed electronic computers have made it feasible to attempt numerical calculations of progressively more complex mathematical models of aerodynamic flows. Numerical approximation methods for a hierarchy of models are examined in ascending order of complexity, ranging from the linearized potential flow equation to the Reynolds averaged Navier Stokes equations, with the inclusion of some previously unpublished material on implicit and multigrid methods for the Euler equations. It is concluded that the solution to the Euler equations for inviscid flow past a complete aircraft is a presently attainable objective, while the solution to the Reyolds averaged Navier-Stokes equations is a possibility clearly visible on the horizon. Author

A84-20178

SEPARATED FLOW PAST BODIES WITH FIXED SEPARATION SITES [OTRYVNOE OBTEKANIE TEL S FIKSIROVANNYMY MESTAMI OTRYVA]

O. M. BELOTSERKOVSKII, S. M. BELOTSERKOVSKII, IU. M. DAVYDOV, and M. I. NISHT (Akademiia Nauk SSSR, Vychislitel'nyi Tsentri; Voenno-Vozdushnaia Inzhenernaia Akademiia, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 273, no. 4, 1983, p. 821-825. In Russian. refs

The discrete-vortex method is used to solve nonlinear steady and unsteady problems concerning flow past bodies in an incompressible medium, and the large-particle method is used to analyze a number of significant phenomena arising in separated flow past bodies at subsonic and supersonic velocities. It is shown that the main features and macroscopic effects arising in separated flow past bodies at high Reynolds numbers in the case of fixed separation sites (e.g., fixed on the sharp edges of thin lifting surfaces) do not depend on viscosity but are determined by inertial interaction described by the unsteady equations of an ideal fluid. The velocity field near a helicopter rotor and vortex structures near swept wings are examined as examples. B.J.

A84-20215

INVARIANCE GROUPS AND REDUCTION OF THE UNSTEADY TRANSONIC SMALL DISTURBANCE EQUATION

W. STRAMPP (Kassel, Gesamthochschule, Kassel, West Germany) International Journal of Non-Linear Mechanics (ISSN 0020-7462), vol. 18, no. 6, 1983, p. 431-439. refs

A geometric approach is undertaken toward the solution of the unsteady transonic small disturbance equation describing the low frequency flow field about a thin airfoil. From group properties given in Anderson and Ibragimov (1979), three invariance groups for the equation are derived. Based on these groups a reduction of the equation is performed. The reduction leads to a steady equation and to an ordinary differential equation from which group-invariant solutions of the unsteady transonic small disturbance equation can be obtained. Author

A84-20839#

CALCULATION OF TRANSONIC INLET FLOWS [BERECHNUNG SCHALLNAHER EINLAUFSTROEMUNGEN]

U. GIESE Rheinisch-Westfaelische Technische Hochschule, Aerodynamisches Institut, Abhandlungen, no. 26, 1983, p. 13-19. In German. refs

At the inlet of pipes and containers, sharp edges are often found in connection with manufacturing considerations. A resulting flow contraction in the case of a safety valve inlet can lead to an unsteady flow. Such flow conditions can be avoided by rounding off the edges of the inlet. The present investigation is concerned with questions regarding a contour for an inlet which will ensure an adherence of the flow. The compressible flow in planar inlets is studied on the basis of difference solutions of the fundamental equation of gas dynamics. The transonic flow characteristics are determined by solving the full potential equation and the boundary layer equations. The influence of the wall curvature and the mass flow rate on the detachment behavior of flows at rounded inlets is considered. G.R.

A84-20840#

THE CALCULATION OF THE LAMINAR BOUNDARY LAYER ON A WING-LIKE ELLIPSOID WITH INCIDENCE [BERECHNUNG DER LAMINAREN GRENZSCHICHT AN EINEM FLUEGELAEHNLICHEN ELLIPSOID MIT ANSTELLUNG]

D. SCHWAMBORN (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer theoretische Stroemungsmechanik, Goettingen, West Germany) Rheinisch-Westfaelische Technische Hochschule, Aerodynamisches Institut, Abhandlungen, no. 26, 1983, p. 20-27. In German. refs

The present investigation is concerned with the calculation of the boundary layer on a wing-like ellipsoid with the aid of a difference procedure. In the case of an asymmetric three-dimensional flow, a consideration of quasi-two-dimensional flows is generally not feasible, and initial data near the leading edge are usually computed by means of approximate methods. In certain cases, however, such an approach can lead to incorrect solutions. For these reasons, in the current study a method for the exact calculation of the three-dimensional boundary layer is developed. Attention is given to the selected coordinate system, the equations of motion for the three-dimensional boundary layer, the numerical solution procedure, questions of stability and convergence, and the computation of the boundary layer. G.R.

A84-20841#

DISTURBANCE OF A PLANAR TURBULENT WAKE BY A COMPRESSION SHOCK [STOERUNG EINES EBENEN TURBULENTEN NACHLAUFES DURCH EINEN VERDICHTUNGSSTOSS]

G. MARENBACH Rheinisch-Westfaelische Technische Hochschule, Aerodynamisches Institut, Abhandlungen, no. 26, 1983, p. 42-47. In German. refs

Steady and unsteady compression shocks disturb the shear layers which are found, for instance, behind the cascades of transonic or supersonic compressors or in the wake of transonic or supersonic flow around individual profiles. The effects of a compression shock on turbulent fluctuations and their correlations are not yet known. The present investigation is concerned with the measurement of shock-produced changes in the fluctuation correlations of the Reynolds stresses. The measurements are conducted with the aid of an optical procedure. The model flow considered is a steady planar supersonic wake behind a plate. The wake is disturbed by a steady compression shock. The obtained density and velocity relations at the boundary of the disturbed wake are shown in a graph. G.R.

A84-20842#

PERIODIC VORTEX SHEDDING IN THE SUPERSONIC WAKE OF A PLANAR PLATE [PERIODISCHE WIRBELABLOESUNG IM UEBERSCHALLNACHLAUF EINER EBENEN PLATTE]

W. F. XING and G. MARENBACH Rheinisch-Westfaelische Technische Hochschule, Aerodynamisches Institut, Abhandlungen, no. 26, 1983, p. 48-52. In German. refs

Vortex streets in the wake have been mainly studied in incompressible flows and in the transonic region. Heinemann et al. (1976) have shown that for the subsonic region the Strouhal number is nearly independent of the Mach number. Motallebi and Norbury (1981) have observed an increase in the Strouhal number in transonic supersonic flow at Mach numbers up to 1.25. The present investigation is concerned with an extension of the studies of vortex shedding to higher supersonic Mach numbers, taking into account questions regarding the possibility of a generation of stable von Karman vortex paths in the considered Mach number range. It is found that the vortex street observed in a supersonic wake behind a rough plate is only stable and reproducible in cases involving a certain surface roughness and certain aspects of trailing edge geometry. G.R.

A84-20843#
INTERACTION BETWEEN A TURBULENT PLANAR PLATE BOUNDARY LAYER AND A PLANAR CYLINDER WAKE [WECHSELWIRKUNG ZWISCHEN EINER TURBULENTEN EBENEN PLATTENGRENZSCHICHT UND EINEM EBENEN ZYLINDERNACHLAUF]
E. P. TSIOLAKIS   Rheinisch-Westfaelische Technische Hochschule, Aerodynamisches Institut, Abhandlungen, no. 26, 1983, p. 53-61. In German. refs

The present investigation is concerned with an experiment which was conducted to study the interaction of an incompressible, two-dimensional turbulent plate boundary layer with a planar cylinder wake, taking into account also the subsequent relaxation of the boundary layer flow. The interaction effects were experimentally determined by measuring with the aid of hot-wire anemometry the mean velocities and the four Reynolds stresses. Attention is given to experimental details, the evaluation of hot wire signals, the determination of wall shear stresses with the aid of a Preston tube, and the measured data.   G.R.

A84-21117
EXCITATION OF TOLLMEIN-SCHLICHTING WAVES IN THE BOUNDARY LAYER ON THE VIBRATING SURFACE OF A SWEPT WING OF INFINITE SPAN [VOZBUZHDENIE VOLN TOLLMINA-SHLIKHTINGA V POGRANICHNOM SLOE NA VIBRIRUIUSHCHEI POVERKHNOSTI STRELOVIDNOGO KRYLA BESKONECHNOGO RAZMAKHA]
A. M. TUMIN PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), Sept.-Oct. 1983, p. 70-74. In Russian. refs

The excitation of instability waves in a three-dimensional boundary layer of a compressible gas on the vibrating surface of a swept wing of infinite span is analyzed. The linearized Navier-Stokes equations, accounting for the equation of state after a time Fourier transform, are given. The solution of these equations for the case of a weakly nonuniform flow in the x-direction is presented in the form of a biorthogonal system of vectors. Attention is given to the resonance case, when the frequency and wave number characterizing the vibrating surface coincide with corresponding parameters for unstable excitation at the point of stability loss. The present analysis is applied to a symmetric NACA 0012 foil section at zero angle of attack and a sweep angle of 30 deg.   J.N.

A84-21120
THEORY OF HYPERSONIC THREE-DIMENSIONAL FLOW AROUND A SLENDER WING OF ARBITRARY ASPECT RATIO BY AN UNSTEADY STREAM OF RELAXING GAS [K TEORII GIPERZVUKOVOGO PROSTRANSTVENNOGO OBTEKANIIA TONKOGO KRYLA PROIZVOL'NOGO UDLINENIIA NESTATSIONARNYM POTOKOM RELAKSIRUIUSHCHEGO GAZA]
M. M. KUZNETSOV   PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), Sept.-Oct. 1983, p. 88-93. In Russian. refs

The three-dimensional uniform hypersonic flow over the windward side of a slender wing with a time-dependent surface configuration and at a constant angle of attack is examined. The present approach considers that the flow in the shock layer is accompanied by physico-chemical changes and is of a relaxing character. The thickness of the shock layer is taken to be proportional to the small parameter epsilon, which is equal to the characteristic value of the density ratio at the head shock wave front. The thin shock layer method is applied to a wing of arbitrary aspect ratio to obtain exact particular solutions for the direct and inverse problems of unsteady nonuniform gas flow around a wing. The direct problem is formulated for a numerical-integration solution.   J.N.

A84-21121
AN EXACT SOLUTION FOR THE PROBLEM OF THE INTERACTION OF A WEDGE MOVING AT SUPERSONIC VELOCITY WITH THE INTERFACE OF TWO GASES [TOCHNOE RESHENIE ZADACHI VZAIMODEISTVIIA DVIZHUSHCHEGOSIA SO SVERKHZVUKOVOI SKOROST'IU KLINA S GRANITSEI RAZDELA DVUKH GAZOV]
R. IA. TUGAZAKOV   PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), Sept.-Oct. 1983, p. 94-98. In Russian. refs

A class of self-similar exact solutions describing the interaction of a wedge moving at supersonic velocity in an ideal gas with the interface of two gases is presented. For the case of a shock wave reflected from the interface, the velocity discontinuity on that surface is investigated. To fully describe the flow around the wedge, general equations describing the shock wave refraction on the contact discontinuity are closed by secondary conditions. A numerical analysis of the behavior of gasdynamic flow characteristics depending on the specific-heat ratio of the two gases, wedge thickness, and wedge velocity is carried out.   J.N.

A84-21129
A STUDY OF THE GAS DYNAMICS OF A MODEL WITH COMBUSTION IN A PULSED WIND TUNNEL [ISSLEDOVANIE GAZODINAMIKI MODELI S GORENIEM V IMPUL'SNOI AERODINAMICHESKOI TRUBE]
V. K. BAEV, V. V. SHUMSKII, and M. I. IAROSLAVTSEV PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), Nov.-Dec. 1983, p. 58-66. In Russian. refs

Gasdynamic models with hydrogen combustion were tested in a pulsed wind tunnel at stagnation pressures and temperatures of 70-7 MPa and 2250-1000 C, respectively, static pressures and temperatures of 110-20 GPa and 220-90 K, and Mach 7.33. The working process of the model is analyzed on the basis of weight and drain measurements. The effect of the internal passage characteristics on the operation of the air intake is discussed. Test results are presented in graphical form.   V.L.

A84-21131
THREE-DIMENSIONAL HYPERSONIC FLOW OF A RADIATING GAS PAST A WING [GIPERZVUKOVOE PROSTRANSTVENNOE OBTEKANIE KRYLA POTOKOM IZLUCHAIUSHCHEGO GAZA]
A. I. GOLUBINSKII and V. N. GOLUBKIN   PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), Nov.-Dec. 1983, p. 71-78. In Russian. refs

An analysis is made of the unsteady three-dimensional hypersonic flow of a radiating gas in the shock layer at the windward surface of a low-aspect-ratio wing in which the shape of the surface varies with time. By using the thin-shock-layer method, a general solution to the gasdynamic equations is obtained where all flow parameters are expressed in terms of the shape of the head shock wave. A class of exact solutions is obtained to the problem of determining the shape of the head shock wave. The effect of radiation on the shock layer thickness, density, temperature, and pressure distribution is discussed, and the distribution of the radiative heat flux over the wing is calculated.   V.L.

A84-21133
HYPERSONIC FLOW OF A VISCOUS GAS AT THE SURFACE OF A BLUNT CONE WITH STRONG INJECTION NEAR THE BLUNT SECTION [GIPERZVUKOVOE TECHENIE VIAZKOGO GAZA NA POVERKHNOSTI ZATUPLENNOGO KONUSA PRI SIL'NOM VDUVE V OKRESTNOSTI ZATUPLENIIA]
IU. N. ERMAK   PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), Nov.-Dec. 1983, p. 94-101. In Russian. refs

For the case of laminar hypersonic flow of a viscous gas past a blunt cone with gas injection near the blunt section, an analysis is made of the absorption of the injected gas by the boundary layer at the side surface of the cone. The gas is injected in such a way that the boundary layer is forced away from the surface and becomes a mixing layer whose thickness is much less than that of the injection layer. The thickness of the injection layer is,

in turn, much less than that of the shock layer, and flow in the injection layer is described by equations of the nonviscous boundary layer. The injection layer remains nonviscous over a certain distance downstream and at the side surface of the cone where injection is discontinued. This gas layer is then absorbed by the boundary layer at the cone surface and by the mixing layer at the hot gas boundary behind the shock wave.   V.L.

A84-21189
AN ACTUATOR DISC ANALYSIS OF UNSTEADY SUPERSONIC CASCADE FLOW
D. S. WHITEHEAD and M. R. D. DAVIES (Cambridge University, Cambridge, England)   Journal of Sound and Vibration (ISSN 0022-460X), vol. 88, May 22, 1983, p. 197-206. Research supported by Rolls-Royce, Ltd.   refs
    A rather simple analytical result is derived for the aerodynamic forces and moments acting on a cascade of unloaded flat plates vibrating in a supersonic flow. The principal assumptions are that the axial velocity is subsonic, that the blades are sufficiently closely spaced so that a Mach wave cannot propagate upstream through the cascade, and that the frequency parameter and inter-blade phase angle are both small. The unique incidence condition is used. Results show that bending vibration is always damped, but flutter in pure torsion is always predicted.   Author

A84-21206
EXCITED ANNULAR JETS OF LARGE INNER DIAMETER
N. W. M. KO (University of Hong Kong, Hong Kong)   Journal of Sound and Vibration (ISSN 0022-460X), vol. 88, June 22, 1983, p. 576-578.
    The effect of large inner diameter on excited vortices of conical and basic annular jets was studied. The jets had an outer diameter of 20 mm and an inner diameter of 13 mm, and the exit Mach number was 0.4. The jets were excited by a spark discharge of 5 J and visualized by a Z-type schlieren system with a horizontal knife-edge. Single exposure schlieren photographs at successive time delays were obtained and are shown. For the conical jet, three excited axisymmetrical vortices were seen and no significant phase shift along the circumference was found, suggesting that axisymmetry is maintained right up to the jet's dissipation. The downstream flow of the basic annular jet is more chaotic than that of the conical jet. The results suggest that introduction of artificial excitation may not necessarily indicate the basic structure of the flow.   C.D.

A84-21279#
VISCOUS HYPERSONIC FLOW OVER COMPLEX BODIES AT HIGH ANGLES OF ATTACK
G. R. SRINIVASAN, W. E. NICOLET, and S. P. SHANKS (Thermal Sciences, Inc., Sunnyvale, CA)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 23 p.   refs
(Contract F33615-80-C-3005)
(AIAA PAPER 84-0015)
    The AFWAL version of the parabolized Navier-Stokes marching procedure in conjunction with the three-dimensional, thin layer, Navier-Stokes blunt body code is applied to calculate the flowfields of the X-24C lifting body and Space Shuttle configurations for many freestream conditions and angles of attack up to 30 deg. Flowfield calculations have been done for X-24C wind tunnel model up to x = 20.5 inches and for Shuttle up to x = 600 inches. Comparison of the computed results with the wind tunnel data show remarkably good agreement for surface pressures for low to moderate angles of attack and fairly good agreement at higher angles of attack. The heat transfer rate distributions show good to fair agreement with experiments for low to moderate angles of incidence.   Author

A84-21282*#   San Jose State Univ., Calif.
EXPERIMENTAL DETERMINATION OF THE BOUNDARY LAYER AT AIR-SAMPLE INLET POSITIONS ON THE NASA CV 990 AIRCRAFT
S. W. BOWEN (San Jose State University, San Jose, CA), J. F. VEDDER, and E. P. CONDON (NASA, Ames Research Center, Moffett Field, CA)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 9 p.
(AIAA PAPER 84-0028)
    Full-scale, in-flight measurements of the boundary-layer thickness, velocity profile, and flow angle have been made at several sample collection stations on the fuselage of the NASA CV 990. These results are given as functions of Mach number, Reynolds number, yaw, and angle of attack.   Author

A84-21290*#   National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THREE-DIMENSIONAL VISCOUS DESIGN METHODOLOGY FOR ADVANCED TECHNOLOGY AIRCRAFT SUPERSONIC INLET SYSTEMS
B. H. ANDERSON (NASA, Lewis Research Center, Cleveland, OH)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 63 p.   refs
(AIAA PAPER 84-0194)
    A broad program to develop advanced, reliable, and user oriented three-dimensional viscous design techniques for supersonic inlet systems, and encourage their transfer into the general user community is discussed. Features of the program include: (1) develop effective methods of computing three-dimensional flows within a zonal modeling methodology; (2) ensure reasonable agreement between said analysis and selective sets of benchmark validation data; (3) develop user orientation into said analysis; and (4) explore and develop advanced numerical methodology. Previously announced in STAR as N84-13190
                    Author

A84-21294*#   Flow Simulations, Inc., Sunnyville, Calif.
NUMERICAL SIMULATION OF THE INTERACTION OF A VORTEX WITH STATIONARY AIRFOIL IN TRANSONIC FLOW
G. R. SRINIVASAN (Flow Simulations, Inc., Sunnyvale, CA), W. J. MCCROSKEY (NASA, Ames Research Center; U.S. Army, Aeromechanics Laboratory, Moffett Field, CA), and P. KUTLER (NASA, Ames Research Center, Moffett Field, CA)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 21 p.   refs
(AIAA PAPER 84-0254)
    A perturbation form of an implicit conservative, noniterative numerical algorithm for the two-dimensional thin layer Navier-Stokes and Euler equations is used to compute the interaction flow-field of a vortex with stationary airfoil. A Lamb-like analytical vortex having a finite core is chosen to interact with a thick (NACA 0012) and a thin (NACA 64A006) airfoil independently in transonic flow. Two different configurations of vortex interaction are studied, viz., (1) when the vortex is fixed at one location in the flowfield, and (2) when the vortex is convecting past the airfoil at freestream velocity. Parallel computations of this interacting flowfield are also done using a version of the Transonic Small Disturbance Code (ATRAN2). A special treatment of the leading edge region for thin airfoils is included in this code. With this, the three methods gave qualitatively similar results for the weaker interactions considered in this study. However, the strongest interactions considered proved to be beyond the capabilities of the small disturbance code. The results also show a far greater influence of the vortex on the airfoil flowfield when the vortex is stationary than when it is convecting with the flow.   Author

A84-21301*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATION OF BLUNT-FIN-INDUCED SHOCK WAVE AND TURBULENT BOUNDARY-LAYER INTERACTION
C.-M. HUNG and P. G. BUNING (NASA, Ames Research Center, Moffett Field, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 19 p. refs
(AIAA PAPER 84-0457)

A supersonic flow over a blunt fin mounted on a flat plate is numerically simulated. The fin shock causes the boundary layer to separate and results in a complicated, three-dimensional shockwave and boundary-layer interaction. The computed result is in good agreement with the measured pressure on the fin and the flat plate. The main features, such as peak pressure on the fin leading edge and a double peak pressure on the plate, are closely predicted. The role of the horseshoe vortex is discussed. The vortex leads to the development of high-speed flow, and, hence, low-pressure regions on the fin and the plate. Different thicknesses of the incoming boundary layer have been studied. Varying the thicknesses by an order of magnitude shows that the size of the horseshoe vortex and therefore the spatial extent of the interaction are inviscid-dominated, and are weakly dependent on the Reynolds number. Colored graphics are used to show details of the interaction flow field. Author

A84-21302*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A COMPARATIVE STUDY OF THE PARABOLIZED NAVIER-STOKES CODE USING VARIOUS GRID-GENERATION TECHNIQUES
U. K. KAUL (NASA, Ames Research Center, Moffett Field; Informatics General Corp., Palo Alto, CA) and D. S. CHAUSSEE (NASA, Ames Research Center, Moffett Field, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 13 p. refs
(AIAA PAPER 84-0459)

The parabolized Navier-Stokes (PNS) equations are used to calculate the flow-field characteristics about the hypersonic research aircraft X-24C. A comparison of the results obtained using elliptic, hyperbolic, and algebraic grid generators is presented. The outer bow shock is treated as a sharp discontinuity, and the discontinuities within the shock layer are captured. Surface pressures and heat-transfer results at angles of attack of 6 deg and 20 deg, obtained using the three grid generators, are compared. The PNS equations are marched downstream over the body in both Cartesian and cylindrical base coordinate systems, and the results are compared. A robust marching procedure is demonstrated by successfully using large marching step sizes with the implicit shock fitting procedure. A correlation is found between the marching step size, Reynolds number, and the angle of attack at fixed values of smoothing and stability coefficients for the marching scheme. Author

A84-21381
AN EVALUATION OF SOME COLLISION MODELS USED FOR MONTE CARLO CALCULATIONS OF DIATOMIC RAREFIELD HYUPERSONIC FLOWS
J. DAVIS, R. G. DOMINY, J. K. HARVEY, and M. N. MACROSSAN (Imperial College of Science and Technology, London, England) Journal of Fluid Mechanics (ISSN 0022-1120), vol. 135, Oct. 1983, p. 355-371. refs

Three intermolecular collision models have been used in Monte Carlo direct-simulation computations. Their merits have been assessed by comparing the predictions given for two contrasting flows with experimental results. In one flow viscous effects were predominant; in the other the rapid compression ahead of a blunt body was the feature concentrated upon. In both examples the flows were rarefied and hypersonic and the gas was diatomic and rotationally excited. Author

A84-21393
THE STRUCTURE OF THE LARGE EDDIES IN FULLY DEVELOPED TURBULENT SHEAR FLOWS. II - THE PLANE WAKE
J. C. MUMFORD (Cambridge University, Cambridge, England) Journal of Fluid Mechanics (ISSN 0022-1120), vol. 137, Dec. 1983, p. 447-456. Research supported by the Science and Engineering Research Council. refs

A set of measurements using arrays of hot-wire anemometers has been performed in the fully developed turbulent wake of a circular cylinder. The data were digitized, recorded on magnetic tape, and processed using the pattern recognition technique described in Part 1 (Mumford, 1982), to yield ensemble averages of the streamwise component of the velocity fields of the large eddies in the flow. The results indicate that the large-scale structures in the turbulent wake are predominantly the inclined 'double-roller' vortices described by Grant (1958). These eddies consist of two contrarotating roller-like vortices with parallel axes displaced in the spanwise direction and approximately aligned with the direction of the strain associated with the mean velocity gradient. It was found that the structures are often confined to either side of the wake centerplane, rather than extending over the entire thickness of the turbulent region. In addition, eddies of similar type tended to occur in pairs or longer groups with their centers separated in the stream direction. Author

A84-21505#
CYLINDRICAL AND CONICAL FLOW REGIMES OF THREE-DIMENSIONAL SHOCK/BOUNDARY-LAYER INTERACTIONS
G. S. SETTLES and H.-Y. TENG (Princeton University, Princeton, NJ) AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 194-200. refs
(Contract F49620-81-K-0018)
Previously cited in issue 15, p. 2345, Accession no. A82-31949

A84-21506#
CALCULATIONS OF VISCOUS TRANSONIC FLOW OVER AIRFOILS
P. BRADSHAW (Imperial College of Science and Technology, London, England) and Z. B. CHEN AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 201-205. refs
Previously cited in issue 15, p. 2346, Accession no. A82-31957

A84-21507*# Old Dominion Univ., Norfolk, Va.
INSTABILITY OF COMPRESSIBLE BOUNDARY LAYERS ALONG CURVED WALLS WITH SUCTION OR COOLING
N. M. EL-HADY (Old Dominion University, Norfolk, VA) and A. K. VERMA AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 206-213. refs
(Contract NSG-1645)
Previously cited in issue 15, p. 2347, Accession no. A82-31966

A84-21510*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FINITE AREA METHOD FOR NONLINEAR SUPERSONIC CONICAL FLOWS
S. S. SRITHARAN (NASA, Langley Research Center, Institute for Computer Applications in Science and Engineering, Hampton, VA) and A. R. SEEBASS (Colorado, University, Boulder, CO) AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 226-233. refs
(Contract AF-AFOSR-81-0107; NGT-03-002-800; N00014-76-C-0182)
Previously cited in issue 18, p. 2841, Accession no. A82-37475

A84-21520#
THE INVERSE PROBLEM FOR SUPERSONIC AIRFOILS
L. SIROVICH (Brown University, Providence, RI) and T. S. LEWIS
AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 295-297.

Lewis and Sirovich (1981) have developed a numerical procedure for calculating supersonic flowfields past given profiles, using streamlines as one of the coordinates and therefore being inherently suited to the inverse problem. This method is presently adapted for the design of two-dimensional supersonic airfoils, incorporating such physical and mathematical aspects of the problem as shock expansion theory in order to facilitate numerical computation. The iterative nature of this method also makes it suitable for the inclusion of boundary layer corrections.   O.C.

A84-21700
AEROFOIL-VORTEX IN A ROTATIONAL AND STRAINED FIELD
J. BURBEA (Pittsburgh, University, Pittsburgh, PA; IBM Thomas J. Watson Research Center, Yorktown Heights, NY)   Royal Society (London), Proceedings, Series A - Mathematical and Physical Sciences (ISSN 0080-4630), vol. 390, no. 1798, Nov. 8, 1983, p. 181-189.   refs

It is shown that a plane region (vortex) of uniform vorticity omega sub 0, whose boundary shape is a certain aerofoil, represents a steady solution of a free-boundary value problem involving the angular velocity and the strain rates of order not exceeding three as bifurcation parameters. A determination is also made of the stability of such steady states. Classical results of Kirchhoff and Love are derived as special cases. The study seeks to test the efficacy of the theory elaborated by Burbea (1982) and Burbea and Landau (1982).   C.R.

A84-21732
COMPUTATIONAL MODELS OF THE INTERACTION BETWEEN VORTICES AND THE PERMEABLE BOUNDARY OF A SUBSONIC FLOW REGION [O RASCHETNYKH MODELIAKH VZAIMODEISTVIIA VIKHREI S PRONITSAEMOI GRANITSEI OBLASTI DOZVUKOVOGO POTOKA]
A. T. FEDORCHENKO (Moskovskii Fiziko-Tekhnicheskii Institut, Moscow, USSR)   Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 273, no. 1, 1983, p. 66-70. In Russian.

An unsteady problem in computational gas dynamics is considered where a series of intense vortices are carried by a subsonic flow of a viscous or an ideal gas through a permeable boundary of a two-dimensional region. The known methods of prescribing local boundary conditions are not applicable to this particular case. Control-type computational algorithms are proposed here for minimizing the conversion of vortex perturbations to acoustic waves during the passage of the vortices through the boundary.   V.L.

A84-21796
A SIMPLE METHOD FOR THE DERIVATION OF ISOLATED AND INSTALLED STORE LOADS
S. H. GOUDIE   Aeronautical Journal (ISSN 0001-9240), vol. 87, Nov. 1983, p. 343-347.   refs

A method is presented for the estimation of store loads which yields good results for normal forces and pitching moments on finned stores, at incidence, in a low speed uniform stream. The accuracy of the estimate is diminished, however, when applied to stores with wings and fins where no account has been taken on interference effects between wing and fin surfaces. Nevertheless, the method gives normal forces accurate to 15 percent, and pitching moments accurate to 3 percent of store length, for a wide variety of store configurations. By taking these inaccuracies into account as tolerances on the basic estimates, a quick assessment may be made of free stream loads. The method may also be extended to provide a simple modification to installed store loads by incrementing the normal forces and pitching moments of previously measured store data to loading data for a store geometry with minor modifications.   O.C.

A84-21851#
EXPERIMENTAL STUDIES OF SURFACE ROUGHNESS SHAPE AND SPACING EFFECTS ON HEAT TRANSFER AND SKIN FRICTION IN SUPERSONIC AND HYPERSONIC FLOWS
M. S. HOLDEN (Calspan Advanced Technology Center, Buffalo, NY)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 79 p.   refs
(Contract F49620-79-C-0003; F49620-82-C-0026)
(AIAA PAPER 84-0016)

The present investigation is concerned with the effects of roughness height, shape, and spacing on the heat transfer and skin friction to highly cooled surfaces in high Reynolds number supersonic and hypersonic flow. Experimental studies were conducted on biconic nosetip configurations and slender conical models coated with sand-grain roughness. Model surfaces were constructed with hemispherical and conical roughness elements set in hexagonal patterns, for a series of spacing rates. Measurements on models with discontinuous change in surface roughness indicate that in hypersonic flow turbulent relaxation is an important effect. The experimental results and theoretical studies conducted by Finson and Wu (1979) suggest that compressibility effects are important in high speed flows over rough, highly-cooled surfaces.   G.R.

A84-21861#
HIGH ALTITUDE EFFECTS ON THREE-DIMENSIONAL NONEQUILIBRIUM VISCOUS SHOCK-LAYER FLOWS
C. H. LEWIS, S. SWAMINATHAN, and D. J. SONG (Virginia Polytechnic Institute and State University, Blacksburg, VA)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 12 p.   refs
(AIAA PAPER 84-0304)

Three-dimensional finite rate chemically reacting viscous shock-layer flows over complex geometries have been analyzed using a two-temperature model. The viscous shock-layer code (VSLNQB11) for analyzing nonequilibrium flow over multiconics using eleven-species air model has been modified to include a two-temperature model. A viscous shock-layer code (VSLNEQ) with seven species air model has been used to study the effects of slip and temperature jump on wall and shock quantities. For the cases under consideration, one reentry and one AOTV problem, the results from the two-temperature model without shock slip agree with those from the one-temperature model. With wall slip the seven-species code predicted negligible effects on the wall-measurable quantities for the reentry problem.   Author

A84-21870#
APPLICATION OF CAE AND CFD TECHNIQUES TO A COMPLETE TACTICAL MISSILE DESIGN
F. S. BILLIG, M. E. WHITE, and D. M. VAN WIE (Johns Hopkins University, Laurel, MD)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 13 p.   refs
(AIAA PAPER 84-0387)

A general plan based on the application of Computer Aided Engineering (CAE) techniques to the design of tactical missile systems is presented. A building block approach using a four-level hierarchy provides the structure of the plan. Examples of the components of the computational structure are included with particular emphasis given to a Sub Element entitled 'Inlet Analysis'. The analysis of the inlet is built on a foundation of Computational Fluid Dynamics (CFD) and therefore is typical of several of the Sub Elements which are concerned with the description of high-speed flows.   Author

A84-21871*# Rockwell International Science Center, Thousand Oaks, Calif.
NONLINEAR COMPUTATION OF WING-BODY-VERTICAL TAIL-WAKE FLOWS AT LOW SUPERSONIC SPEEDS
K.-Y. SZEMA and V. SHANKAR (Rockwell International Science Center, Thousand Oaks, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 12 p. refs
(Contract NAS1-15820)
(AIAA PAPER 84-0427)

A numerical method based on the conservation form of the full potential equation has been applied to the problem of three-dimensional supersonic flows with embedded subsonic regions. The governing equation is cast in a nonorthogonal coordinate system, and the theory of characteristics is used to accurately monitor the type-dependent flow field. A conservative switching scheme is employed to transition from the supersonic marching procedure to a subsonic relaxation algorithm and vice versa. The newly developed computer program can handle arbitrary geometries with fuselage, wing, vertical tail and wake components at combined angle of attack and sideslip. Results are presented for a low supersonic Mach numbers flow over the Shuttle orbiter (including the OMS pods and vertical tail), and for flows over a realistic fighter type configuration. Comparisons with experimental data are shown to be in good agreement for various cases.
Author

A84-21876*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRFOIL COMPUTATION AT HIGH ANGLES OF ATTACK, INVISCID AND VISCOUS PHENOMENA
J. T. BARTON (NASA, Ames Research Center, Moffett Field; Informatics General Corp., Palo Alto, CA) and T. H. PULLIAM (NASA, Ames Research Center, Moffett Field, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 22 p. refs
(Contract NAS2-11555)
(AIAA PAPER 84-0524)

An implicit central difference code is used to calculate two dimensional inviscid and thin-layer Navier-Stokes solutions for flow about an NACA0012 airfoil at high angles of attack. Among the issues addressed are whether separation can occur in an inviscid calculation and what the causes would be of such separation. Examples are shown of inviscid shocked flow with and without separation and shock-free flow with separation. An Euler solution with self-induced oscillation and separation driven by a strong shock is contrasted with a shock-free solution whose separation is caused by numerical error. Computed solutions to the Euler equations are compared to those of the potential equations. Comparisons are also made between experimental data from wind tunnel tests and viscous calculations at similar conditions.
Author

A84-22001
AN INVESTIGATION OF THE FLOW IN TURBINE CASCADES WITH OFF-DESIGN INLET ANGLES. THE PULSATION CHARACTERISTICS OF THE FLOW
M. E. DEICH (Moskovskii Energeticheskii Institut, Moscow, USSR) and L. RAI (Teploenergetika, vol. 30, no. 5, 1983, p. 41-46) Thermal Engineering (ISSN 0040-6015), vol. 30, May 1983, p. 284-289. Translation. refs

Pitot tube and visual methods were used to study the effect of inlet angle of total losses in S-9012A (TS-1A) reaction cascades and R-1514A (TR-OA) impulse cascades with profile chord 125 mm, height 87 mm, and optimal pitch. Pressure distribution profiles of nozzle and moving blade cascades were constructed for both blade profiles. The most typical flow features at large off-design inlet angles are vortices in a Pi-shaped system, displacement and deformation of the stagnant zone before the cascade, and closed and open separation regions in the cascade passages. Low- and high-frequency pulsations were observed and the low-frequency pulsations are identified as creating additional disturbing forces, leading to blade vibration and increased kinetic energy losses in

the cascade. Fluctuating motion in the stagnant zone is transmitted by the vortex filament through the horseshoe vortex, giving rise to large-scale low-frequency pulsations of pressure. J.N.

A84-22168#
COMPUTATION OF THE FLOW AROUND WINGS WITH REAR SEPARATION
K. JACOB (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen, West Germany) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 97, 98; Abridged.

A method for computing the flow around wings with trailing edge stall is briefly described. The method combines an inviscid three-dimensional lifting surface theory with a two-dimensional airfoil theory, which includes boundary-layer calculations and a displacement model for rear separation. The total iterative procedure allows for predicting the complete wing characteristics, including maximum lift, but is restricted to wings with moderate to high aspect ratios, and low sweep and to low Mach numbers. Some results are shown and partly compared to experiments.
Author

A84-22169#
CLOSE-COUPLED CANARD-WING VORTEX INTERACTION
W. CALARESE (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 99, 100. refs
Previously cited in issue 19, p. 2971, Accession no. A82-39132

A84-22170#
FLUTTER ANALYSIS USING NONLINEAR AERODYNAMIC FORCES
E. H. DOWELL (Princeton University, Princeton, NJ) and T. UEDA (Structures, Structural Dynamics and Materials Conference, 23rd, New Orleans, LA, May 10-12, 1982, Collection of Technical Papers. Part 2, p. 462-481) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 101-109. refs
(Contract AF-AFOSR-81-0123)
Previously cited in issue 13, p. 2016, Accession no. A82-30176

A84-22173#
CIRCULATION CONTROLLED STOL WING OPTIMIZATION
J. L. LOTH and M. BOASSON (West Virginia University, Morgantown, WV) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 128-134. refs
Previously cited in issue 05, p. 579, Accession no. A83-16509

A84-22175#
A MULTI-GRID METHOD FOR TRANSONIC WING ANALYSIS AND DESIGN
P. RAJ (Lockheed-California Co., Computational Aerodynamics Dept., Burbank, CA) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 143-150. Research supported by the Lockheed-California Independent Research and Development Program. refs
Previously cited in issue 05, p. 583, Accession no. A83-16618

A84-22249#
MOTION-INDUCED AERIAL FORCES FOR DETACHED FLOW AND THEIR APPLICATION TO THE STUDY OF STRUCTURAL RESPONSE [BEWEGUNGSINDUZIERTE LUFTKRAEFTE BEI ABGELOESTER STROEMUNG UND IHRE UEBERTRAGUNG AUF DIE ERMITTLUNG DER STRUKTURRESPONSE]
J. BECKER Braunschweig, Technische Universitaet, Fakultaet fuer Maschinenbau und Elektrotechnik, Dr.-Ing. Dissertation, 1983, 200 p. In German. refs

The determination of dynamical response at the airfoil surface during flow detachment is investigated. The kinetic forces and processes that occur at aircraft structures during flow detachment are reviewed, and the measurement of stationary and instationary aerodynamic forces in the high angle of attack regime is addressed. The aerodynamic pressure distribution data are analyzed, and the motion-induced aerial forces occurring in the high angle of attack

regime during flow detachment is considered. An analytical investigation of the response behavior of an elastic aircraft is presented. C.D.

A84-22587
SUPERCRITICAL AIRFOIL AND WING DESIGN
H. SOBIECZKY (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Theoretische Stroemungsmechanik, Goettingen, West Germany) and A. R. SEEBASS (Colorado, University, Boulder, CO) IN: Annual review of fluid mechanics. Volume 16 . Palo Alto, CA, Annual Reviews, Inc., 1984, p. 337-363. refs

Design techniques for shock-free supercritical wings and airfoils are reviewed. The economic factors driving the development of efficient supercritical profiles are outlined, and flight at high subsonic Mach numbers is briefly characterized. Discussion is included on compressible-flow models, the nature of shock-free flows, the integration of local supersonic-flow fields, and hodograph and inverse design methods. The direct 'fictitious-gas' method of Sobieczky is explained and illustrated, and the efficiency of modern supercritical designs is stressed: gains in seat-miles/gallon of 100 percent are predicted by the 1990's. D.G.

N84-16131*# Boston Univ., Mass. Dept. of Aerospace and Mechanical Engineering.
SELF-SUSTAINED OSCILLATIONS OF A SHOCK WAVE INTERACTING WITH A BOUNDARY LAYER ON A SUPERCRITICAL AIRFOIL Final Report, Jun. 1982 - Dec. 1983
C. S. VENTRES and M. S. HOWE (Bolt, Beranek and Newman, Inc., Cambridge, Mass.) Oct. 1983 47 p refs
(Contract NAG2-179)
(NASA-CR-175338; NAS 1.26:175338) Avail: NTIS HC A03/MF A01 CSCL 01A

A theory is proposed of the self-sustaining oscillations of a weak shock on an airfoil in steady, transonic flow. The interaction of the shock with the boundary layer on the airfoil produces displacement thickness fluctuations which convect downstream and generate sound by interaction with the trailing edge. A feedback loop is established when this sound impinges on the shock wave, resulting in the production of further fluctuations in the displacement thickness. The details are worked out for an idealized mean boundary layer velocity profile, but strong support for the basic hypotheses of the theory is provided by a comparison with recent experiments involving the generation of acoustic 'tone bursts' by a supercritical airfoil section. Author

N84-16132# Aeronautical Research Labs., Melbourne (Australia).
THE EFFECT OF DISCRETE SPANWISE REGIONS OF BLEED ON PSEUDO-TWO-DIMENSIONAL BASE FLOW AT TRANSONIC SPEEDS
N. POLLOCK Jul. 1983 58 p refs
(ARL-AERO-NOTE-418; AR-002-967) Avail: NTIS HC A04/MF A01

A preliminary experimental study of a new type of pseudo-two-dimensional bluff base consisting of a series of rectangular prismatic protrusions spaced along the span with base bleed into the regions between the protrusions is presented. A base geometry was derived which has less drag at subsonic and transonic speeds than the best reported non-bleed arrangement for bleed mass flow coefficients (based on the mass flux swept by the model frontal area) in the range 0.02 to 0.04. A simple two dimensional bleed arrangement requires a bleed coefficient greater than 0.08 to achieve the same subsonic base drag.
Author

N84-16133# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa). Aeronautics Dept.
THE LINEAR VORTEX DISTRIBUTION USING THE ALTERNATIVE APPROACH
G. J. VANDENBROEK Nov. 1982 18 p refs
(NIAST-82/80; ISBN-0-7988-2610-X) Avail: NTIS HC A02/MF A01

In the USTORE computer code the linear vortex distribution on a wing panel was obtained in an exact manner which is rather complicated. The linear source distribution on a wing panel was obtained using an alternative approach which is approximate but far simpler. In this report it is investigated whether the linear vortex distribution can be treated in the same approximating manner as the linear source distribution. The results show that such an approach is not acceptable for the linear vortex distribution, if the wing panel is tapered. Author

N84-16134*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
PHASE AVERAGED MEASUREMENTS OF THE COHERENT STRUCTURE OF A MACH NUMBER 0.6 JET M.S. Thesis
S. EMAMI Dec. 1983 107 p refs
(Contract NAG1-112)
(NASA-CR-175359; NAS 1.26:175359) Avail: NTIS HC A06/MF A01 CSCL 01A

The existence of a large scale structure in a Mach number 0.6, axisymmetric jet of cold air was proven. In order to further characterize the coherent structure, phase averaged measurements of the axial mass velocity, radial velocity, and the product of the two were made. These measurements yield information about the percent of the total fluctuations contained in the coherent structure. These measured values were compared to the total fluctuation levels for each quantity and the result expressed as a percent of the total fluctuation level contained in the organized structure at a given frequency. These measurements were performed for five frequencies (St=0.16, 0.32, 0.474, 0.95, and 1.26). All of the phase averaged measurements required that the jet be artificially excited. S.L.

N84-16135*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics.
INVESTIGATION TO OPTIMIZE THE PASSIVE SHOCK WAVE-BOUNDARY LAYER CONTROL FOR SUPERCRITICAL AIRFOIL DRAG REDUCTION Semiannual Report, 16 Mar. - 14 Sep. 1983
H. T. NAGAMATSU, R. FICARRA, and R. OROZCO 8 Dec. 1983 59 p refs
(Contract NAG1-330)
(NASA-CR-173276; NAS 1.26:173276) Avail: NTIS HC A04/MF A01 CSCL 01A

The optimization of passive shock wave/boundary layer control for supercritical airfoil drag reduction was investigated in a 3 in. x 15.4 in. Transonic Blowdown Wind Tunnel. A 14% thick supercritical airfoil was tested with 0%, 1.42% and 2.8% porosities at Mach numbers of .70 to .83. The 1.42% case incorporated a linear increase in porosity with the flow direction while the 2.8% case was uniform porosity. The static pressure distributions over the airfoil, the wake impact pressure data for determining the profile drag, and the Schlieren photographs for porous surface airfoils are presented and compared with the results for solid-surface airfoils. While the results show that linear 1.42% porosity actually led to a slight increase in drag it was found that the uniform 2.8% porosity can lead to a drag reduction of 46% at M = .81. S.L.

02 AERODYNAMICS

N84-16137*# National Aeronautics and Space Administration, Washington, D. C.
THE DRAG OF MAGNETICALLY SUSPENDED WIND-TUNNEL MODELS WITH NOSE-CONES OF VARIOUS SHAPES
G. DUBOIS Aug. 1983 19 p refs Transl. into ENGLISH from La Rech. Aeron. (France), no. 87-64, Mar. - Apr. 1962 p 47-54 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASW-3541)
(NASA-TM-77325; NAS 1.15:77325) Avail: NTIS HC A02/MF A01 CSCL 01A
This article concerns the experimental determination of optimum nose-cones (minimum drag) of a body of revolution at supersonic and hypersonic speeds by means of ONERA magnetic suspension. The study concerns two groups of models, specifically: a group whose nose-cone has a profile in the shape of X(n); the AGARD B group whose nose-cone is plotted in accordance with a given law. The results obtained for the first group are comparable to those calculated with the approximations of Cole and Newton and the experiments carried out by Kubota. Author

N84-16138*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPECIAL OPPORTUNITIES IN HELICOPTER AERODYNAMICS
W. J. MCCROSKEY (Army Aviation Research and Development Command) Dec. 1983 34 p refs Presented at the Intern. Symp. on Recent Advan. in Aerodyn. and Aeroacoustics, Stanford, Calif., Aug. 1983
(NASA-TM-84396; A-9465; NAS 1.15:84396; USAAVRADCOM-TR-83-A-15) Avail: NTIS HC A03/MF A01 CSCL 01A
Aerodynamic research relating to modern helicopters includes the study of three dimensional, unsteady, nonlinear flow fields. A selective review is made of some of the phenomenon that hamper the development of satisfactory engineering prediction techniques, but which provides a rich source of research opportunities: flow separations, compressibility effects, complex vortical wakes, and aerodynamic interference between components. Several examples of work in progress are given, including dynamic stall alleviation, the development of computational methods for transonic flow, rotor-wake predictions, and blade-vortex interactions. Author

N84-16139*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPUTATIONAL AERODYNAMICS AND SUPERCOMPUTERS
W. F. BALLHAUS, JR. Jan. 1984 14 p refs
(NASA-TM-85887; A-9583; NAS 1.15:85887) Avail: NTIS HC A02/MF A01 CSCL 01A
Some of the progress in computational aerodynamics over the last decade is reviewed. The Numerical Aerodynamic Simulation Program objectives, computational goals, and implementation plans are described. Author

N84-16140*# Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.
INTERACTING BOUNDARY-LAYER SOLUTIONS FOR LAMINAR SEPARATED FLOW PAST AIRFOILS Final Report, 1 Apr. 1979 - 31 Mar. 1982
O. R. BURGGRAF Jan. 1984 56 p refs
(Contract NSG-1622)
(NASA-CR-172287; NAS 1.26:172287) Avail: NTIS HC A04/MF A01 CSCL 01A
Numerical solutions of the interacting laminar boundary layer equations are presented for two symmetric airfoils at zero incidence: the NACA 0012 and the NACA 66 sub 3-108 airfoils. The potential flow was computed using Carlson's code, and viscous interaction was treated following a Hilbert integral scheme due to Veldman. Effects of various grid parameters are studied, and pressure and skin friction distributions are compared at several Reynolds numbers. For the NACA 0012 airfoil, Reynolds number is varied from a value just below separation (R sub N = 3000) to a value for which extensive separation occurs (R sub N = 100,000). For the 66 sub 3-018 airfoil, results are given at intermediate values (R sub N - 10,000 and 40,000). The method fails to converge for

greater values of Reynolds number, corresponding to the development of very thin well separated shear layers where transition to turbulence would occur naturally. Author

N84-16141*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL STUDY OF BLOWING BOUNDARY-LAYER CONTROL FOR SUBSONIC V/STOL INLETS
D. P. HWANG 1984 15 p refs Presented at the 7th Ann. Energy-Sources Technol. Conf. and Exhibition, New Orleans, 12-16 Feb. 1984
(NASA-TM-83576; E-1963; NAS 1.15:83576) Avail: NTIS HC A02/MF A01 CSCL 01A
The analytical methods used to study blowing boundary-layer control (BLC) for subsonic V/STOL inlets are described. The methods are then shown to give good agreement with experimental results, both with and without blowing BLC. Finally, because of this good agreement, the methods were used to determine analytically the optimum (minimum blowing power required) location and height for a blowing slot within a subsonic V/STOL inlet. S.L.

N84-16143*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPARISON OF CALCULATED AND MEASURED PRESSURES ON STRAIGHT AND SWEPT-TIP MODEL ROTOR BLADES
M. E. TAUBER, I. C. CHANG, D. A. CAUGHEY (Cornell Univ., Ithaca, N.Y.), and J. J. PHILLIPE (Office National d'Etudes et de Recherches Aerospatiales, Paris) Dec. 1983 39 p refs
(NASA-TM-85872; A-9584; NAS 1.15:85872) Avail: NTIS HC A03/MF A01 CSCL 01A
Using the quasi-steady, full potential code, ROT22, pressures were calculated on straight and swept tip model helicopter rotor blades at advance ratios of 0.40 and 0.45, and into the transonic tip speed range. The calculated pressures were compared with values measured in the tip regions of the model blades. Good agreement was found over a wide range of azimuth angles when the shocks on the blade were not too strong. However, strong shocks persisted longer than predicted by ROT22 when the blade was in the second quadrant. Since the unsteady flow effects present at high advance ratios primarily affect shock waves, the underprediction of shock strengths is attributed to the simplifying, quasi-steady, assumption made in ROT22. Author

N84-16144*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A LASER VELOCIMETER SYSTEM FOR LARGE-SCALE AERODYNAMIC TESTING
M. S. REINATH, K. L. ORLOFF, and P. K. SNYDER Jan. 1984 31 p refs
(NASA-TM-84393; A-9524; NAS 1.15:84393) Avail: NTIS HC A03/MF A01 CSCL 01A
A unique laser velocimeter was developed that is capable of sensing two orthogonal velocity components from a variable remote distance of 2.6 to 10 m for use in the 40- by 80-Foot and 80- by 120-Foot Wind Tunnels and the Outdoor Aerodynamic Research Facility at Ames Research Center. The system hardware, positioning instrumentation, and data acquisition equipment are described in detail; system capabilities and limitations are discussed; and expressions for systematic and statistical accuracy are developed. Direct and coupled laboratory measurements taken with the system are compared with measurements taken with a laser velocimeter of higher spatial resolution, and sample data taken in the open circuit exhaust flow of a 1/50-scale model of the 80- by 120-Foot Wind Tunnel are presented. Author

N84-16145*# Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.
RESULTS OF AN EXPERIMENTAL PROGRAM INVESTIGATING THE EFFECTS OF SIMULATED ICE ON THE PERFORMANCE OF THE NACA 63A415 AIRFOIL WITH FLAP Final Report
R. J. ZAGULI, M. B. BRAGG, and G. M. GREGOREK   Jan. 1984
183 p   refs
(Contract NAG3-28)
(NASA-CR-168288; NAS 1.26:168288; AARL-TR-8302) Avail: NTIS HC A09/MF A01   CSCL 01A

Aerodynamic data from a test program in the Icing Research Tunnel are reported for a NACA 63A415 airfoil, with fowler flap, clean and with simulated ice shapes. The effect of three ice shapes on airfoil performance are presented, two of the simulated ice shapes are from earlier Icing Tunnel tests. Lift, drag, and moment coefficients are reported for the airfoil, clean and with ice, for angles of attack from approximately zero lift to maximum lift and for flap deflections of 0, 10, 20, and 30 degrees. Surface pressure distribution plots for the airfoil and flap are presented for all runs. Some preliminary oil flow visualization data are also discussed. Large drag penalties were measured in all instances. Maximum lift penalties were in general serious, and depend upon the ice shape and flap deflection.   S.L.

N84-16146*# Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.
POTENTIAL FLOW ANALYSIS OF GLAZE ICE ACCRETIONS ON AN AIRFOIL Final Report
R. J. ZAGULI   Jan. 1984   87 p   refs
(Contract NAG3-28)
(NASA-CR-168282; NAS 1.26:168282) Avail: NTIS HC A05/MF A01   CSCL 01A

The results of an analytical/experimental study of the flow fields about an airfoil with leading edge glaze ice accretion shapes are presented. Tests were conducted in the Icing Research Tunnel to measure surface pressure distributions and boundary layer separation reattachment characteristics on a general aviation wing section to which was affixed wooden ice shapes which approximated typical glaze ice accretions. Comparisons were made with predicted pressure distributions using current airfoil analysis codes as well as the Bristow mixed analysis/design airfoil panel code. The Bristow code was also used to predict the separation reattachment dividing streamline by inputting the appropriate experimental surface pressure distribution.   S.L.

N84-16147*# Florida Univ., Gainesville.
A LIFTING SURFACE COMPUTER CODE WITH JET-IN-CROSSFLOW INTERFERENCE EFFECTS. VOLUME 1: THEORETICAL DESCRIPTION Contractor Report, Feb. 1981 - May 1983
K. L. FURLONG and R. L. FEARN   Aug. 1983   73 p   refs
(Contract NCC2-133)
(NASA-CR-166524; NAS 1.26:166524) Avail: NTIS HC A04/MF A01   CSCL 01A

A method is proposed to combine a numerical description of a jet in a crossflow with a lifting surface panel code to calculate the jet/aerodynamic-surface interference effects on a V/STOL aircraft. An iterative technique is suggested that starts with a model for the properties of a jet/flat plate configuration and modifies these properties based on the flow field calculated for the configuration of interest. The method would estimate the pressures, forces, and moments on an aircraft out of ground effect. A first-order approximation to the method suggested is developed and applied to two simple configurations. The first-order approximation is a noniterative precedure which does not allow for interactions between multiple jets in a crossflow and also does not account for the influence of lifting surfaces on the jet properties. The jet/flat plate model utilized in the examples presented is restricted to a uniform round jet injected perpendicularly into a uniform crossflow for a range of jet-to-crossflow velocity ratios from three to ten.   B.W.

N84-16148# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Army Ballistic Research Lab.
BOUNDARY-LAYER TRIP EFFECTIVENESS AND COMPUTATIONS OF AERODYNAMIC HEATING FOR XM797 NOSE-TIP CONFIGURATIONS Final Report
W. B. STUREK, L. D. KAYSER, and D. C. MYLIN   Apr. 1983
32 p   refs
(Contract DA PROJ. 1L1-62618-AH-80)
(AD-A128036; ARBRL-MR-03262) Avail: NTIS HC A03/MF A01   CSCL 19A

The Army is examining a new concept for limiting the range of the training round for the M735 projectile. This training round, designated the XM797, now employes an explosive placed within the nose cap which is ignited by aerodynamic heating. Results of a recent firing program conducted at the BRL Transonic Range in which M735 projectiles with modified nose-tips were tested are documented. The effectiveness of boundary-layer trips in generating turbulent boundary layers on the projectile nose are determined. Also reported are results of computations of the in-depth temperature response of XM797 nose-cap configurations for several flight conditions.   Author

N84-16149# Lockheed Missiles and Space Co., Palo Alto, Calif.
NUMERICAL TECHNIQUES FOR HIGH INCIDENCE REENTRY AERODYNAMICS Progress Report, 24 Jun. 1982 - 23 Jun. 1984
R. WHITEHEAD and R. CONTI   23 Sep. 1983   12 p
(Contract N00014-82-C-0690)
(AD-A134178) Avail: NTIS HC A02/MF A01   CSCL 20D

The investigation of reentry flowfields at very high incidence showed that the Lockheed Navier-Stokes computer code is capable of producing accurate flowfield solutions at angles of attack up to about 60 degrees. Current work is centered around: (1) using this code as a tool to investigate the properties of high incidence flows, and (2) extending the present code to allow it to compute flows at incidence beyond 60 degrees, in order to cover the full range of incidence encountered by the reentry vehicles of the Fleet Ballistic Missile (FBM) System.   GRA

N84-16150# Air Force Academy, Colo.
AN INVESTIGATION OF AIRFOIL DYNAMIC STALL WITH LARGE AMPLITUDE MOTIONS Final Report, Jun. 1976 - Jun. 1983
M. S. FRANCIS (AFOSR/NA, Bolling AFB, D.C.), J. E. KEESEE (BMS/SYMS, Norton AFB, Calif.), and J. P. RETELLE, JR. (HRL/MNRTE, Williams AFB, Ariz.)   Oct. 1983   158 p
(Contract AF PROJ. 2307)
(AD-A134230; FJSRL-TR-83-0010) Avail: NTIS HC A08/MF A01   CSCL 20D

The results of an experimental investigation of airfoil dynamic stall involving large amplitude pitching motions are described. The discussion is focused on constant pitch rate motion histories. Measurements of unsteady surface pressure distributions for both NACA 0012 and NACA 64 sub 1 A012(13) profiles have been employed to infer the onset and evolution of an energetic leading edge separation vortex over a wide range of flow and motion conditions. These data have also been integrated to provide estimates of the time histories of the lift, pressure drag and moment coefficients. The effectiveness of the various motions for achieving lift enhancement has been determined through the introduction of a dimensionless impulse parameter which accounts for both the magnitude and duration of the additional lift increment during the post-stall period.   Author (GRA)

N84-16151# Nielsen Engineering and Research, Inc., Mountain View, Calif.
DETERMINATION OF OPTIMUM FIN PLANFORM AND AIRFOIL SECTION FOR MINIMIZING FIN HINGE MOMENT Final Report, 1 Dec. 1981 - 31 Dec. 1982
F. K. GOODWIN and J. N. NIELSEN   Feb. 1983   87 p
(Contract N00014-81-C-0267)
(AD-A134523; NEAR-TR-286)   Avail: NTIS HC A05/MF A01 CSCL 20D
The second phase of an investigation of the hinge moments of all-movable controls as used on cruciform missiles is described. In the first phase, an attempt was made to develop a hinge-moment prediction method as general as possible for speeds ranging from subsonic to hypersonic. In that work, the method was successfully applied for Mach numbers ranging from 1.3 to 3.7. In the present phase of the investigation, the methods from phase one, with some modifications, have been used to develop a procedure for determining the optimum fin planform and airfoil section to minimize the fin hinge moment over a range of Mach numbers, angles of attack, and fin deflection angles. The Mach numbers range is restricted to supersonic. The transonic speed range cannot be handled since methods are not presently available for predicting the center-of-pressure shift due to thickness in this speed range. Experimental data are not available to assess the accuracy of the method at hypersonic speeds.   GRA

N84-16152# Wisconsin Univ., Madison. Mathematics Research Center.
MINIMAL DRAG FOR WINGS WITH PRESCRIBED LIFT, ROLL MOMENT AND YAW MOMENT
K. L. E. NICKEL   Sep. 1983   43 p
(Contract DAAG29-80-C-0041)
(AD-A134572; MRC-TSR-2573)   Avail: NTIS HC A03/MF A01 CSCL 12A
Let L, R, Y be arbitrary real constants. A wing with fixed span which produces lift L, roll moment R, yaw moment Y and which has minimal induced drag D is wanted. This problem arises in airplane engineering. It is solved by means of Prandtl's lifting line theory combined with computation.   Author (GRA)

N84-16153# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
MACH 0.6 TO 3.0 FLOWS OVER RECTANGULAR CAVITIES Final Report, Jun. 1978 - Jun. 1980
L. G. KAUFMAN, II, A. MACIULAITIS, and R. L. CLARK   May 1983   296 p
(Contract AF PROJ. 2404)
(AD-A134579; AFWAL-TR-82-3112)   Avail: NTIS HC A13/MF A01   CSCL 20D
Internal weapons carriage in high performance aircraft is often adversely affected by the severe aeroacoustic environment produced with the weapons bay doors open. To obtain a better understanding of this fluid dynamic problem, basic static and oscillatory pressure data were obtained for Mach 0.6 to 3.0 flows over shallow rectangular cavities in a generic flat plate model. Cavity length to depth ratios were varied from approximately 5 to 10. Static pressure data characteristic of both open and closed cavity flows were obtained. An improved Rossiter method is presented that satisfactorily predicts the possible frequency modes within the cavity. Highest fluctuating pressure occurs on the aft bulkhead, peaking near Mach 1.5 for the conditions tested. Aeroacoustic levels are substantially reduced by installing suppression fences (spoilers) at subsonic and low supersonic conditions. Acoustic levels generally drop rapidly above Mach 1.5.   Author (GRA)

N84-16154# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).   Abt. Zellenaerodynamik.
WAKE VORTICES AND THEIR AERODYNAMIC ALLEVIATION: A REVIEW OF THE LITERATURE
G. STOFFERS   Apr. 1983   50 p   refs   In GERMAN; ENGLISH summary
(DFVLR-MITT-83-07)   Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 20,50
Wake vortex minimization and remedial measures to be taken at the vortex generating aircraft were investigated. Boeing 747, DC 10 and L 1011 aircraft were equiped with spoilers, winglets, ogee tips or splines, and flight tests, wind tunnel and water channel tests were performed. Best results are obtained with spoilers. It is concluded that the additional equipment gives rise to higher engine power delivery at ground approach/take off hence higher noise level and increased fuel consumption.   Author (ESA)

N84-16155# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Forschungsbereich Werstoffe und Bauweisen.
MEASUREMENT OF UNSTEADY AERODYNAMIC PRESSURES
P. BUBLITZ   Jul. 1983   24 p   refs   In GERMAN; ENGLISH summary   Report will also be announced as translation (ESA-TT-834)
(DFVLR-MITT-83-08)   Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 11,50
Requirements of pressure transducers for unsteady pressure measurements are presented. Flutter caused by structural vibration and dynamic response were investigated. It is found that the so-called indirect measuring method (many measuring points and few transducers by means of pressure transmission via change-over switches) is suitable for flutter measurements. The direct method (one transducer per measuring point, constant linear transmission) must be used for dynamic response measurements. It is also shown that the requirements specified for steady aerodynamic pressure distribution measurements such as high resolution, insensitivity to temperature drifts, overloads and accelerations are especially necessary for unsteady pressure measurements.
                                   Author (ESA)

N84-16378# Nagoya Univ. (Japan).   Dept. of Aeronautical Engineering.
QUASI-DOUBLET-LATTICE METHOD FOR OSCILLATING THIN AIRFOILS IN SUBSONIC FLOW
S. ANDO and A. ICHIKAWA   *In* Japan Society for Aeronautical and Space Sciences   Transactions of the Japan Soc. for Aeron. and Space Sci., Vol. 26, No. 73   p 163-173   Nov. 1983   refs
Avail: NTIS HC A04/MF A01
Nonsteady aerodynamics of thin airfoils in subsonic flow was investigated by two kinds of quasi-doublet-lattice method (QDLM). The one contains a special device for a chordwise logarithmic singularity (CLS) resulting from the kernel function, while the other does not. This device improves the convergence characteristics of solutions drastically. A error-index is introduced, which enables comparison of numerous data in a precise and compact manner.
                                   E.A.K.

N84-17127*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WAVE DRAG AS THE OBJECTIVE FUNCTION IN TRANSONIC FIGHTER WING OPTIMIZATION
P. S. PHILLIPS   Feb. 1984   23 p   refs
(NASA-TP-2265; L-15687; NAS 1.60:2265)   Avail: NTIS HC A02/MF A01   CSCL 01A
The original computational method for determining wave drag in a three dimensional transonic analysis method was replaced by a wave drag formula based on the loss in momentum across an isentropic shock. This formula was used as the objective function in a numerical optimization procedure to reduce the wave drag of a fighter wing at transonic maneuver conditions. The optimization procedure minimized wave drag through modifications to the wing section contours defined by a wing profile shape function. A

significant reduction in wave drag was achieved while maintaining a high lift coefficient. Comparisons of the pressure distributions for the initial and optimized wing geometries showed significant reductions in the leading-edge peaks and shock strength across the span.   Author

N84-17128#   Aeronautical Research Labs., Melbourne (Australia).
CALCULATION OF THE AERODYNAMIC FLOW FIELD IN THE VICINITY OF A SEA KING HELICOPTER
K. R. REDDY   Jun. 1983   30 p   refs
(ARL-AERO-REPT-158; AR-002-954)   Avail: NTIS HC A03/MF A01
A mathematical model of the rotor wake in the vicinity of a rotorcraft fuselage is formulated taking into account the mutual interference between the rotor and fuselage. It is assumed that the vortex sheet behind each rotor blade rolls-up into a single, blade tip vortex and that the fuselage can be represented by constant source potential flow panels. The velocity field given by the combined rotor wake and fuselage model is presented for the case of a Sea King helicopter in forward flight.   Author

N84-17129*#   Nielsen Engineering and Research, Inc., Mountain View, Calif.
PREDICTION OF VORTEX SHEDDING FROM CIRCULAR AND NONCIRCULAR BODIES IN SUPERSONIC FLOW Final Report
M. R. MENDENHALL and S. C. PERKINS, JR.   Washington, D.C. NASA   Jan. 1984   198 p   refs
(Contract NAS1-17027)
(NASA-CR-3754; NAS 1.26:3754; NEAR-TR-307)   Avail: NTIS HC A09/MF A01   CSCL 01A
An engineering prediction method and associated computer code NOZVTX to predict nose vortex shedding from circular and noncircular bodies in supersonic flow at angles of attack and roll are presented. The body is represented by either a supersonic panel method for noncircular cross sections or line sources and doublets for circular cross sections, and the lee side vortex wake is modeled by discrete vortices in crossflow planes. The three-dimensional steady flow problem is reduced to a two-dimensional, unsteady, separated flow problem for solution. Comparison of measured and predicted surface pressure distributions, flow field surveys, and aerodynamic characteristics is presented for bodies with circular and noncircular cross-sectional shapes.   Author

N84-17130*#   Grumman Aerospace Corp., Bethpage, N.Y.
THE COREL AND W12SC3 COMPUTER PROGRAMS FOR SUPERSONIC WING DESIGN AND ANALYSIS Final Report
W. H. MASON and B. S. ROSEN   Washington, D.C.   NASA   Dec. 1983   188 p   refs
(Contract NAS1-15351)
(NASA-CR-3676; NAS 1.26:3676)   Avail: NTIS HC A09/MF A01 CSCL 01A
Two computer codes useful in the supersonic aerodynamic design of wings, including the supersonic maneuver case are described. The nonlinear full potential equation COREL code performs an analysis of a spanwise section of the wing in the crossflow plane by assuming conical flow over the section. A subsequent approximate correction to the solution can be made in order to account for nonconical effects. In COREL, the flow-field is assumed to be irrotational (Mach numbers normal to shock waves less than about 1.3) and the full potential equation is solved to obtain detailed results for the leading edge expansion, supercritical crossflow, and any crossflow shockwaves. W12SC3 is a linear theory panel method which combines and extends elements of several of Woodward's codes, with emphasis on fighter applications. After a brief review of the aerodynamic theory used by each method, the use of the codes is illustrated with several examples, detailed input instructions and a sample case.   Author

N84-17131*#   Nielsen Engineering and Research, Inc., Mountain View, Calif.
A STUDY OF PREDICTION METHODS FOR THE HIGH ANGLE-OF-ATTACK AERODYNAMICS OF STRAIGHT WINGS AND FIGHTER AIRCRAFT Final Report, Jun. 1982 - Jul. 1983
O. J. MCMILLAN, M. R. MENDENHALL, and S. C. PERKINS, JR. Washington, D.C.   NASA   Jan. 1984   202 p   refs
(Contract NAS1-17026)
(NASA-CR-3764; NAS 1.26:3764; TR-296)   Avail: NTIS HC A10/MF A01   CSCL 01A
Work is described dealing with two areas which are dominated by the nonlinear effects of vortex flows. The first area concerns the stall/spin characteristics of a general aviation wing with a modified leading edge. The second area concerns the high-angle-of-attack characteristics of high performance military aircraft. For each area, the governing phenomena are described as identified with the aid of existing experimental data. Existing analytical methods are reviewed, and the most promising method for each area used to perform some preliminary calculations. Based on these results, the strengths and weaknesses of the methods are defined, and research programs recommended to improve the methods as a result of better understanding of the flow mechanisms involved.   Author

N84-17132*#   National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THEORETICAL AND EXPERIMENTAL ENGINE-INLET FLOW FIELDS FOR FIGHTER FOREBODIES
S. F. YAROS   Feb. 1984   66 p   refs
(NASA-TP-2270; L-15639; NAS 1.60:2270)   Avail: NTIS HC A04/MF A01   CSCL 01A
The capability of two numerical methods, one for transonic and one for supersonic flows, to predict the flow fields about representative fighter aircraft forebodies in the vicinity of the engine inlets was examined. The Mach number range covered was 0.9 to 2.5 and the angle-of-attack range was 0 deg to 25 deg. The computer progams that implement each of the numerical methods are described as to their features and usage, and results are compared with comprehensive wind tunnel data. Although both prediction methods were inviscid, results show that the aerodynamic effects of the forebody, with and without a wing, can be simulated fairly well. Futher work is needed to include the effects of viscosity, including vortex shedding.   Author

N84-17134*#   National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AERODYNAMIC CHARACTERISTICS OF A SPARROW 3 MISSILE MODEL IN THE FLOW FIELD OF A GENERALIZED PARENT BODY AT MACH 2.86
R. L. STALLINGS, JR.   Feb. 1984   29 p   refs
(NASA-TM-85713; L-15705; NAS 1.15:85713)   Avail: NTIS HC A03/MF A01   CSCL 01A
Longitudinal aerodynamic characteristics of a Sparrow 3 wing control missile model were measured through a range of separation distances relative to a flat plate surface that represented the parent-body configuration. Measurements were obtained with and without two dimensional circular arc protuberances attached to the flat plate surface. The tests were conducted at a Mach number of 2.86 and a Reynolds number per meter of 6.56 million. The behavior of these longitudinal characteristics with varying separation distance in the flow field created by the flat plate and protuberance was generally as would be expected on the basis of flow field boundaries determined from the second order approximation of Friedrich. In general, varying roll angle from 0 deg to 45 deg caused no significant effect on the store separation characteristics.   Author

N84-17135*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOADS AND AEROELASTICITY DIVISION RESEARCH AND TECHNOLOGY ACCOMPLISHMENTS FOR FY 1983 AND PLANS FOR FY 1984
J. E. GARDNER and S. C. DIXON Jan. 1984 163 p refs
(NASA-TM-85740; NAS 1.15:85740) Avail: NTIS HC A08/MF A01 CSCL 01A

Research was done in the following areas: development and validation of solution algorithms, modeling techniques, integrated finite elements for flow-thermal-structural analysis and design, optimization of aircraft and spacecraft for the best performance, reduction of loads and increase in the dynamic structural stability of flexible airframes by the use of active control, methods for predicting steady and unsteady aerodynamic loads and aeroelastic characteristics of flight vehicles with emphasis on the transonic range, and methods for predicting and reducing helicoper vibrations. B.G.

N84-17136*# Kentron International, Inc., Hampton, Va. Technical Center.
TESTS ON A CAST 7 TWO-DIMENSIONAL AIRFOIL IN A STREAMLINING TEST SECTION
M. J. GOODYEAR (Southampton Univ.) Jan. 1984 44 p refs
(Contract NAS1-16000)
(NASA-CR-172291; NAS 1.26:172291) Avail: NTIS HC A03/MF A01 CSCL 01A

A unique opportunity has arisen to test one and the same airfoil model of CAST-7 section in two wind tunnels having adaptive walled test sections. The tunnels are very similar in terms of size and the available range of test conditions, but differ principally in their wall setting algorithms. Detailed data from the tests of the model in the Southampton tunnel, are included with comparisons between various sources of data indicating that both adaptive walled test sections provide low interference test conditions. S.L.

N84-17137*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BIFURCATION ANALYSIS OF AIRCRAFT PITCHING MOTIONS NEAR THE STABILITY BOUNDARY
W. H. HUI (Waterloo Univ.) and M. TOBAK Jan. 1984 33 p refs Presented at the Conf. on Nonlinear Problems in Control and Fluid Dyn., Berkeley, Calif., 31 May - 10 Jun. 1983
(Contract NAGW-130)
(NASA-TM-85881; A-9604; NAS 1.15:85881) Avail: NTIS HC A03/MF A01 CSCL 01A

Bifuraction theory is used to analyze the nonlinear dynamic stability characteristics of an aircraft subject to single degree of freedom pitching-motion perturbations about a large mean angle of attack. The requisite aerodynamic information in the equations of motion is represented in a form equivalent to the response to finite-amplitude pitching oscillations about the mean angle of attack. This information is deduced from the case of infinitesimal-amplitude oscillations. The bifurcation theory analysis reveals that when the mean angle of attack is increased beyond a critical value at which the aerodynamic damping vanishes, new solutions representing finite-amplitude periodic motions bifurcate from the previously stable steady motion. The sign of a simple criterion, cast in terms of aerodynamic properties, determines whether the bifurcating solutions are stable (supercritical) or unstable (subcritical). For flat-plate airfoils flying at supersonic/hypersonic speed, the bifurcation is subcritical, implying either that exchanges of stability between steady and periodic motion are accompanied by hysteresis phenomena, or that potentially large aperiodic departures from steady motion may develop. Author

N84-17139*# Ohio State Univ., Columbus. Lab. for Aeronautical and Astronautical Research.
DOCUMENTATION OF ICE SHAPES ON THE MAIN ROTOR OF A UH-1H HELICOPTER IN HOVER Final Report
J. D. LEE, R. HARDING (Hovey and Assoc., Ltd.), and R. L. PALKO (Calspan Field Services, Inc.) Jan. 1984 30 p refs
(Contract NAG3-273)
(NASA-CR-168332; NAS 1.26:168332) Avail: NTIS HC A03/MF A01 CSCL 01C

A helicopter icing flight test program in the hover mode was conducted with a UH-1H aircraft. The ice formations were documented after landing by means of silicone rubber molds, stereo photography and outline tracings for later use in aerodynamic analyses. The documentation techniques are described and the results presented for a typical flight. S.L.

N84-17140*# Illinois Univ., Urbana. Dept. of Aeronautical and Astronautical Engineering.
TRAILING EDGE FLOW CONDITIONS AS A FACTOR IN AIRFOIL DESIGN Final Report
A. I. ORMSBEE and M. D. MAUGHMER Jan. 1984 186 p refs
(Contract NAG1-76)
(NASA-CR-173294; NAS 1.26:173294; AAE-84-1; UILU-ENG-84-0501) Avail: NTIS HC A09/MF A01 CSCL 01A

Some new developments relevant to the design of single-element airfoils using potential flow methods are presented. In particular, the role played by the non-dimensional trailing edge velocity in design is considered and the relationship between the specified value and the resulting airfoil geometry is explored. In addition, the ramifications of the unbounded trailing edge pressure gradients generally present in the potential flow solution of the flow over an airfoil are examined, and the conditions necessary to obtain a class of airfoils having finite trailing edge pressure gradients developed. The incorporation of these conditions into the inverse method of Eppler is presented and the modified scheme employed to generate a number of airfoils for consideration. The detailed viscous analysis of airfoils having finite trailing edge pressure gradients demonstrates a reduction in the strong inviscid-viscid interactions generally present near the trailing edge of an airfoil. Author

N84-17141*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MATHEMATICAL MODELING OF THE AERODYNAMIC CHARACTERISTICS IN FLIGHT DYNAMICS
M. TOBAK, G. T. CHAPMAN, and L. B. SCHIFF Jan. 1984 28 p refs Presented at the Berkeley-Ames Conf. on Nonlinear Probl. in Control and Fluid Dyn., Berkeley, Calif., 31 May - 10 Jun. 1983
(NASA-TM-85880; A-9603; NAS 1.15:85880) Avail: NTIS HC A03/MF A01 CSCL 01A

Basic concepts involved in the mathematical modeling of the aerodynamic response of an aircraft to arbitrary maneuvers are reviewed. The original formulation of an aerodynamic response in terms of nonlinear functionals is shown to be compatible with a derivation based on the use of nonlinear functional expansions. Extensions of the analysis through its natural connection with ideas from bifurcation theory are indicated. Author

N84-17143*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INVESTIGATION OF FLOW PHENOMENA IN A TRANSONIC FAN ROTOR USING LASER ANEMOMETRY
A. J. STRAZISAR 1984 23 p refs Proposed for presentation at the 29th Ann. Intern. Gas Turbine Conf., Amsterdam, 3-7 Jun. 1984; sponsored by ASME
(NASA-TM-83555; E-1934; NAS 1.15:83555) Avail: NTIS HC A02/MF A01 CSCL 01A

Several flow phenomena including flowfield periodicity, rotor shock oscillation, and rotor shock system geometry were investigated in a transonic low aspect ratio fan rotor using laser anemometry. Flow periodicity is found to increase with increasing

rotor pressure rise, and to correlate with blade geometry variations. Analysis of time-accurate laser anemometer data indicates that the rotor shock oscillates about its mean location with an amplitude of 3 to 4 percent of rotor chord. The shock surface is nearly two-dimensional or levels of rotor pressure rise at and above the peak efficiency level but becomes more complex for lower levels of pressure rise. Spanwise shock lean generates radial flows due to streamline deflection in the hub-to-shroud streamsurface.

Author

N84-17144*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A RECONTOURED, UPPER SURFACE DESIGNED TO INCREASE THE MAXIMUM LIFT COEFFICIENT OF A MODIFIED NACA 65 (0.82) (9.9) AIRFOIL SECTION
R. M. HICKS Feb. 1984 40 p refs
(NASA-TM-85855; A-9514; NAS 1.15:85855) Avail: NTIS HC A03/MF A01 CSCL 01A

A recontoured upper surface was designed to increase the maximum lift coefficient of a modified NACA 65 (0.82)(9.9) airfoil section which was tested at Mach numbers of 0.3 and 0.4 and Reynolds numbers of 2.3x10(6) and 4.3x10(6). The original 6-series section was tested for comparison with the recontoured section. The recontoured profile was found to have a higher maximum lift coefficient at all test conditions than the original airfoil. The recontoured airfoil showed less drag and nearly the same pitching moment characteristics as the original 6-series airfoil at all test conditions. The improvements found for the recontoured airfoil of the present study are similar to those found during previous investigations of recontoured 6-series airfoils with less camber.

Author

N84-17145# Air Force Academy, Colo.
AIR FORCE ACADEMY AERONAUTICS DIGEST - FALL/WINTER 1982 Final Report
J. DEJONGH, W. HEISER, R. HOGGE, M. ARENDS, and A. M. HIGGINS Sep. 1983 153 p
(AD-A135073; USAFA-TR-83-15) Avail: NTIS HC A08/MF A01 CSCL 20D

The Aeronautics Digest contains articles which represent recent scholarly work by students and faculty of the Dept. of Aeronautics, members of other departments of the Academy and the Frank J. Seiler Research Lab., researchers directly or indirectly involved with USAFA-sponsored projects, and authors in fields of interest to the USAFA. This issue includes reports on the following topics: Aerodynamics of square cross-section missiles; A stall-anticipating device for airfoils; Mixing of constant-area annular flows with swirl; New controls for advanced residential heating systems; Some topics on gas flow--Wave propagation (part 1); and Engineers and the art of writing.

GRA

N84-17146# Princeton Univ., N. J.
AEROELASTIC ANALYSIS USING NONLINEAR AERODYNAMIC METHODS Final Scientific Report
E. H. DOWELL Aug. 1983 4 p
(Contract AF-AFOSR-0213-81; AF PROJ. 2307)
(AD-A135133; AFOSR-83-0896TR) Avail: NTIS HC A02/MF A01 CSCL 20D

During the grant year several studies have been undertaken. These are reported fully in References 1, 2, and 3. A summary of the technical highlights follows. An extended nonlinear indicial approach to modeling nonlinear aerodynamic forces for aeroelastic analyses has been developed. The basic approach is based upon describing function ideas.

Author (GRA)

N84-17147# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
THE 2-DIMENSIONAL INEXTENSIBLE LIFTING MEMBRANE AIRFOIL, THEORY AND EXPERIMENT Final Report
S. GREENHALGH 18 Feb. 1983 63 p
(AD-A135251; NADC-83096-60) Avail: NTIS HC A04/MF A01 CSCL 20D

A theoretical solution to the aerodynamic/structural two-dimensional flexible lifting membrane has been developed. The solution predicts lift, membrane shape and excess material length as a function of the tension in the membrane and the angle of attack of the membrane. The method is simpler than existing solutions and the results are in agreement with experiment. Wind tunnel tests on two-dimensional lifting membranes have been conducted at Reynolds numbers of approximately 1.3 million. Basic aerodynamic data and membrane tension data were obtained.

Author (GRA)

N84-17148# Avco Systems Div., Wilmington, Mass.
IRAAM WIND TUNNEL TEST, TASK 3 Final Technical Report
D. DASHCUND 30 Aug. 1983 63 p
(Contract DAAK10-83-D-0009)
(AD-A135256; AVSD-0343-83-RR) Avail: NTIS HC A04/MF A01 CSCL 19A

A deceleration, orientation and stabilization system for the deployment of the anti-armor mine (IRAAM) submunition was developed and tested at the Wright-Patterson vertical wind tunnel facility. The system employs a flexible samara airfoil with a tip mass arranged to provide the proper spin rate, descent rate and coning angle. Samara wings of KEVLAR material were fabricated using a flat webbing construction and also a construction consisting of KEVLAR cords enclosed in a nylon envelope. Blades varied in both area and planform aspect ratio. Blade spans ranged from 2.5 to 10.0 inches. Blade widths varied from 2 to 4 inches. All of the IRAAM models used for testing were dimensionally full scale. One model of the nominal configuration was full weight. The other two models were half weight. The tip weight varied up to 5% of the model weight. The test program is outlined. All test procedures and equipment are described. The test results are analyzed and recommendations are made for future developmental studies.

Author (GRA)

N84-17149*# United Technologies Research Center, East Hartford, Conn.
HELICOPTER ROTOR WAKE GEOMETRY AND ITS INFLUENCE IN FORWARD FLIGHT. VOLUME 1: GENERALIZED WAKE GEOMETRY AND WAKE EFFECT ON ROTOR AIRLOADS AND PERFORMANCE
T. A. EGOLF and A. J. LANDGREBE Oct. 1983 218 p
(Contract NAS1-14568)
(NASA-CR-3726; NAS 1.26:3726; AD-A135555; UTRC/R83-912666-58-VOL-1) Avail: NTIS HC A10/MF A01 CSCL 20D

An analytic investigation to generalize wake geometry of a helicopter rotor in steady level forward flight and to demonstrate the influence of wake deformation in the prediction of rotor airloads and performance is described. Volume 1 presents a first level generalized wake model based on theoretically predicted tip vortex geometries for a selected representative blade design. The tip vortex distortions are generalized in equation form as displacements from the classical undistorted tip vortex geometry in terms of vortex age, blade azimuth, rotor advance ratio, thrust coefficient, and number of blades. These equations were programmed to provide distorted wake coordinates at very low cost for use in rotor airflow and airloads prediction analyses. The sensitivity of predicted rotor airloads, performance, and blade bending moments to the modeling of the tip vortex distortion are demonstrated for low to moderately high advance ratios for a representative rotor and the H-34 rotor. Comparisons with H-34 rotor test data demonstrate the effects of the classical, predicted distorted, and the newly developed generalized wake models on airloads and blade bending moments. Use of distorted wake models results in the occurrence of numerous blade-vortex interactions on the forward and lateral sides of the

rotor disk. The significance of these interactions is related to the number and degree of proximity to the blades of the tip vortices. The correlation obtained with the distorted wake models (generalized and predicted) is encouraging. GRA

N84-17150# Thermal Sciences, Inc., Sunnyvale, Calif.
ASSESSMENT OF REAL GAS EFFECTS ON THE PREDICTION OF THE AERODYNAMICS OF HIGH VELOCITY ARMY SHELLS
Final Report
W. E. NICOLET and G. R. SRINIVASAN Sep. 1983 45 p
(Contract DAAG29-81-D-0100; DA PROJ. 1L1-62618-AH-80)
(AD-A134739; AD-F300341; ARBRL-CR-00517) Avail: NTIS HC A03/MF A01 CSCL 20D
The present study assesses real gas effects in the prediction of flow fields over Army projectiles. Solutions are obtained for a spherically tipped cone-cylinder model flying at three different flight conditions. Real gas effects may be important for the pressure and heat transfer on the spherical tip. Real gas effects are not important for the prediction of pressure and heat transfer on the region of the model aft of the spherical tip. GRA

03

AIR TRANSPORTATION AND SAFETY

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

A84-19604#
TRENDS FOR FUTURE ROTARY WING AIRCRAFT
B. PASQUET and PH. PICOLLET (SocieteNationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 7 p.
The responses to a questionnaire sent to a broad range of helicopter users are discussed. Maintenance is regarded as the main operating cost, in particular, engine maintenance. Pilots would like to increase outside visibility by reducing the size of the instrument panel. Cathode ray tubes are thus seen as promising in this area. With regard to safety, it is found that twins with a lwo level of OEI performance are not considered safer over firm ground than single-engine aircraft with good autorotation capability. It is believed that some of the difficulties encountered by helicopter users could be lessened by revising certain flight regulations. A statistical analysis of the responses is included. C.R.

A84-19605#
THE AS 332 L SUPER PUMA HELICOPTER IN OFFSHORE TRANSPORT AND SAR MISSIONS
G. TEMIME (SocieteNationale Industrielle Aerospatiale, Division Helicopteres, La Courneuve, Seine-Saint-Denis, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p.
The Super Puma AS 332 L, a twin-engined, 19-22 passenger, medium weight helicopter, selected for offshore transportation, particularly in the North Sea, is also proposed for search and rescue missions. With a radius of action of 150 nautical miles and fast cruising speed of 145 knots, the aircraft is also equipped with a modular SAR system incorporating a navigation system, radar, a multifunction display, and a flight management system. J.N.

A84-19606#
AIR RESCUE SERVICE IN THE FEDERAL REPUBLIC OF GERMANY REQUIREMENTS FOR THE HELICOPTER
G. KUGLER (Allgemeiner Deutscher Automobil-Club, Munich, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 14 p.
Operational and technical aspects of rescue helicopters in the Federal Republic of Germany are presented, as well as rescue procedures, for the purpose of supplying surface-accident victims with optimum emergency treatment. Helicopters have radio contact with a hospital and have qualified personnel on board. The combination of the Rigid Rotor System, small rotor diameter, and short helicopter length, allow increased maneuverablity and landing on an area of 20 x 20 meters. The four-blade rotor practically eliminates vibrations. Emphasis is on helicopter readiness and reliability for life-saving purposes. C.M.

A84-19607#
IDEAL CHARACTERISTICS FOR A MOUNTAIN RESCUE HELICOPTER
R. FRAISSINET (Secours Aerien Francais, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 9 p.
A helicopter designed for mountain rescues in Western Europe must be capable of hovering at 15,000 feet, regardless of aerological conditions, with three persons on board and one hanging on the winch. Single-engine helicopters are favored over those with double engines. Perfect visibility in all directions for the pilot is essential. It is also necessary that the helicopter be designed in such a way that the victim can be winched directly into the cabin past the skids. The cabin must have enough space to accommodate the pilot, the assistant, a doctor or mountain guide, and the rescued person. There must also be room for medical equipment. Specifications for an ideal rescue helicopter are given. C.R.

A84-19609#
LOW LEVEL FLIGHT AND NAVIGATION AT NIGHT IN CENTRAL EUROPE
W. METZDORFF and H. HAUCK (Dornier GmbH, Friedrichshafen, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 21 p. refs
Flight experiments accounting for season, time of day, terrain, and weather effects in Central Europe to assess an integrated helicopter nightflying system are outlined. This survey of night vision technologies stresses the human processes of scene understanding and interpretation in the estimation of all flight states necessary for guidance and control of the NOE-flight, i.e., close-contact-to topography flight at zero velocity and at altitudes less than 100 ft. Contrast and contrast limiting effects, atmospheric transmission, illumination and thermal contrast are considered. J.N.

A84-19610#
SYSTEM CONCEPTS FOR HELICOPTER AIR-TO-AIR COMBAT
MR. BRUNELLO, J. C. LETOUZEY, MR. SCARAMUZZINO, and G. CATANI (SocieteNationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. Aug. 1982.
The simulation procedures make use of hardware and software models. The former pertain to fighter helicopters, targets, sensors, and weapons; the latter involve statistical filtering for evaluating target maneuvers and a calculation of weapon pointing. The procedures make it possible to determine the nature and the characteristics of the sensors involved in the various cases of firing control and to define and complete the filtering, weapon-pointing, and pilot-aid algorithms. They also make it

possible to estimate the operating ranges, the response times, and the accuracy of each firing control operation.   C.R.

A84-19611#
IMPORTANCE OF HELICOPTER PERFORMANCE TO AIR-TO-AIR COMBAT
M. FALCO (Grumman Aerospace Corp., Bethpage, NY) and R. SMITH (U.S. Army, Aviation Research and Development Command, St. Louis, MO)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p. refs

A computational investigation was conducted to quantify the impact of maneuver and maximum speed performance on the combat effectiveness of current and advanced design helicopters in one-on-one engagements against specific threats. A newly developed procedure employing a stochastic learing method in conjunction with dynamic simulation of helicopter flight and weapon system operation was used to derive helicopter maneuvering strategies. The derived strategies maximize either survival or kill probability and are in the form of a feedback control based upon threat visual or warning system cues. Maneuverability parameters implicit in the strategy development included maximum longitudinal acceleration and deceleration, maximum sustained and transient load factor turn at forward speed, and maximum pedal turn rate and lateral acceleration at hover. Results are presented in terms of probability of kill for all combat initial conditions for two air-to-air threat categories. In the first category the use of maneuverability is examined in a defensive role against an anti-tank guided missile (ATGM) launched by a threat helicopter. The second is concerned with the impact of maneuverability in both defensive and offensive roles against a gun armed helicopter threat.
                                                                    Author

A84-19612#
AVIATION EXPERIENCE IN HELICOPTER NIGHT FLYING PRACTICE
MR. ARZEL Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 5 p.

The use of helicopters at night by French Army Aviation is surveyed historically. Before night vision equipment was developed, the first step involved the replacement of individual missions carried out by well-trained crews with regimental tactical maneuvers and the deployment of large air mobile detachments. The development of night vision equipment was promoted by the Night Training Center, opened in 1975 as part of French Army Aviation's Advanced Instruction School. It has been found that night vision goggles allow crews to follow the terrain in conditions similar to tactical day flying, thereby enhancing the possibility of surprise while decreasing the helicopter's vulnerability. The night vision goggles will permit the crews to fly missions in forward combat areas. They will also allow them to fly from 0 to 50 m above ground on more than 75 percent of all nights.   C.R.

A84-19620#
HELICOPTER NOISE CERTIFICATION AND SENSITIVITY STUDIES ALONG THE PROCEDURAL LINES OF THE NEW ICAO ANNEX 16/CHAPTER 8 REGULATIONS
W. SPLETTSTOESSER, H. HELLER (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick, West Germany), and V. KLOEPPEL (Messerschmitt-Boelkow-Blohm GmbH, Unternehmensbereich Drehfluegler- und Verkehr, Munich, West Germany)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p.

This paper discusses the noise-measurement experience gained in the application of the new ICAO Annex 16/Chapter 8 helicopter noise certification Standard as well as results from recent noise sensitivity studies on two modern-design helicopters. The measurement procedure, the data acquisition and reduction as well as the applied correction procedures are briefly described. Effective Perceived Noise Levels (EPNL) and other noise descriptors are evaluated and related to the present ICAO noise

limits. The reproducibility of noise data is demonstrated for one helicopter. The sensitivity of EPNL on variations in test airspeed, rotorspeed, aircraft weight and flight altitude are shown and the need for a source-noise correction is emphasized.   Author

A84-19621#
HELICOPTER EXTERNAL NOISE - ICAO STANDARDS AND OPERATIONAL REGULATIONS
H. J. MARZE (SocieteNationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p.

Problems of helicopter-noise reduction and regulation are discussed in the light of recent ICAO decisions and local initiatives. The certification rules adopted by the ICAO CAN 6 meeting (1979) and the recommendations of Working Group B to CAN 7 (1983) are summarized, with diagrams and tables of measurement data and standards. The ICAO standards are found to be incapable of protecting the environment from helicopter noise, at least in the short run. Operational regulations imposed by national or local governments are considered. The rules of the Swiss Office Federal de l'Aviation Civile (specifying hourly noise rates for specific inhabited-area types) are summarized, and the effectiveness and economic consequences of such rules are examined. The compromise approach proposed by the HAI is endorsed.   D.G.

A84-19662#
IMPLICATION OF HEAVY LIFT HELICOPTER SIZE EFFECT TRENDS AND MULTILIFT OPTIONS FOR FILLING THE NEED
E. S. CARTER (United Technologies Corp., Sikorsky Aircraft Div., Stratford, CT)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p. refs

The commercial market for helicopters with a heavy-lift capability has been a disappointment, because the demand for the transportation of heavy payloads which cannot be easily broken down into separate parts for shipping is not large enough. For the comparatively few cases in which a heavy payload cannot be conveniently divided, the possibility is considered to harness two or more helicopters to the same payload. This approach, which involves the utilization of the so-called multilift or twin-lift concepts, is reconsidered in the light of the potential offered by technological advances in digital flight controls and composite structures. Attention is given to early history and current status concerning the multilift option, taking into account mission applications, safety considerations, and payload efficiency.   G.R.

A84-19744* Boeing Vertol Co., Philadelphia, Pa.
SIMULATOR INVESTIGATIONS OF SIDE-STICK CONTROLLER/STABILITY AND CONTROL AUGMENTATION SYSTEMS FOR NIGHT NAP-OF-EARTH FLIGHT
K. H. LANDIS (Boeing Vertol Co., Philadelphia, PA) and E. W. AIKEN (U.S. Army, Aeromechanics Laboratory, Moffett Field, CA) American Helicopter Society, Journal (ISSN 0002-8711), vol. 29, Jan. 1984, p. 56-65. refs
(Contract NAS2-10880)

Several night nap-of-the-earth mission tasks were evaluated using a helmet-mounted display which provided a limited field-of-view image with superimposed flight control symbology. A wide range of stability and control augmentation designs was investigated. Variations in controller force-deflection characteristics and the number of axes controlled through an integrated side-stick controller were studied. In general, a small displacement controller is preferred over a stiffstick controller particularly for maneuvering flight. Higher levels of stability augmentation were required for IMC tasks to provide handling qualities comparable to those achieved for the same tasks conducted under simulated visual flight conditions. Previously announced in STAR as N82-23216
                                                                    T.M.

A84-20076
THE UNCONTROLLABLE CABIN FIRE
G. M. BRUGGINK International Journal of Aviation Safety (ISSN 0264-6803), vol. 1, Dec. 1983, p. 261-266.

Cabin fires represent less than 20 percent of all in-flight fires. However, an inordinate number of lives are lost as a result of such fires. Since 1964, there were nine fatal in-flight cabin fires in turbine-powered aircrft, killing 776 persons. The characteristics and the progression of cabin fires are illustrated by discussing two examples of such fires for each of three categories. Two categories are concerned with cases in which the crew made either successful on-airport or off-airport landings, while in accidents of the third category the crew lost aircraft control. Suitable courses of action in the case of a cabin fire are discused. The ideal solution would lie in the prevention of such fires. Unfortunately, however, the outbreak of fire in any of the revenue-producing sections of the fuselage is an always present danger. The only practical solution lies in a systematic approach to the timely detection, suppression, and containment of fire and smoke. G.R.

A84-20077
NEW ICAO OBSTACLE CLEARANCE REQUIREMENTS
J. BOOM International Journal of Aviation Safety (ISSN 0264-6803), vol. 1, Dec. 1983, p. 267-284.

It is pointed out that extensive and radical changes in the ICAO Procedures for Air Navigation Services, dealing with obstacle clearance (PANS-OPS) were implemented in November 1982. The PANS-OPS were again amended in November 1983. A description is provided of the new procedures, taking into account the role of the pilot. The composition of the PANS-OPS is considered along with their scope and objective, general criteria and considerations concerning approch procedures, the design of approach *procedures, arrival, initial and intermediate approach segments,* the final approach segment, the missed approach, circling, and holding. Attention is given to obstacle clearance, instrument approach procedures, minimum sector altitude, categories of aircraft, and obstacle clearance altitude/height. G.R.

A84-20079
SURVIVAL AFTER HELICOPTER DITCHING - A TECHNICAL GUIDE FOR POLICY-MAKERS
D. ALLAN (RAF, Institute of Aviation Medicine, Farnborough, Hants., England) International Journal of Aviation Safety (ISSN 0264-6803), vol. 1, Dec. 1983, p. 291-296. refs

As a result of the discovery of oil beneath the sea, there has been a rapid development of passenger helicopter operations. Many of these operations have to be conducted over cold seas and in hostile weather. Because of the risk of ditching under such conditions, the development of survival suits has been considered. It is believed that in connection with the development of performance specification and policies for the use of such suits the oil industry will have to develop and implement a general Code of Practice. A description is presented of an approach for the development of such a code. Attention is given to questions regarding the need for survival suits, the survival equation and its solution, specifications concerning thermal protection, aspects of testing an immersion suit, and an example for illustrating the involved issues. G.R.

A84-20081
BEYOND V1 - THE DANGERS OF HIGH SPEED ABORTED TAKE-OFFS
J. LAMING International Journal of Aviation Safety (ISSN 0264-6803), vol. 1, Dec. 1983, p. 327-331.

In the case of the occurrence of an engine failure during takeoff, the aircraft may still be capable of good climb performance. However, if a complete engine failure occurs close to V1, at a climb or obstacle limited takeoff weight, the initial climb out phase becomes very crucial. The present study has the objective to examine the latter situation, giving attention to the case in which the engine failure climb gradient just meets the Flight Manual minimum regulatory requirement. It is thought likely that many pilots *are not aware of the relatively poor engine out performance of*

modern jet transports at climb limit weights, simply because of lack of exposure to this area of flight. Attention is given to details regarding the escape route, requirements related to Standard Instrument Departure (SID), an examination of flight paths, and approaches for reducing the risks. G.R.

A84-20085
CIVIL AIRCRAFT ACCIDENT INVESTIGATION IN THE U.S.
G. M. BRUGGINK International Journal of Aviation Safety (ISSN 0264-6803), vol. 1, Dec. 1983, p. 349-358. refs

The investigation of civil aircraft accidents in the U.S. became a federal government prerogative, when Congress passed the Air Commerce Act of 1926. The Act authorized the Secretary of Commerce to 'investigate, record, and make public the causes of accidents in air navigation. The Civil Aeronautics Act of 1938 created within the Department of Commerce the Civil Aeronautics Authority as an independent agency to regulate civil aviation. In 1940 two reorganization plans were adopted by Congress to remedy the fact that the investigatory body cold only make *recommendations for changes in the safety rules. The plans* established two separate agencies within the Department of Commerce, including the Civil Aeronautics Board (CAB) and the Civil Aeronautics Administration (CA). Attention is also given to questions concerning the investigation workload, regulations concerning the aircraft accident investigation, and the major investigation process. G.R.

A84-20087
MODIFICATION TO AN ACCIDENT
A. GIBBONS International Journal of Aviation Safety (ISSN 0264-6803), vol. 1, Dec. 1983, p. 376-382.

A description is presented of accidents involving motor gliders *and a light aircraft. In the case of a motor glider, the wings detached* from the fuselage during the flight. The fuselage then fell vertically to the ground, and both the pilot and the passenger were killed instantly on impact with the ground. An examination of the wreckage revealed that an additional safety pin hole had been drilled below the normal safety pin hole. At the time of the failure of the wing attachment the safety pin had occupied the lower (incorrent) pin hole. This accident and another somewhat similar accident occurring in Finland shows that modifications to structures can have catastrophic consequences. In the case of the light aircraft, difficulties were experienced with respect to the landing gear. It was found that the pilot in picking up a CB microphone had probably knocked the gear selector knob to the UP position. This event illustrates the importance of cockpit ergonomics. G.R.

A84-20106
FAST JET AIRCREW SAFETY - A CHALLENGE TO INDUSTRY
J. FARLEY Aerospace (UK) (ISSN 0305-0831), vol. 11, Jan. 1984, p. 8-14.

A variety of anecdotal material is used as the basis of a *discussion concerning existing and prospective crew safety* equipment standards in the British Royal Navy and Royal Air Force. The equipment suite in question encompasses life preserver, personal equipment connector, anti-g suit, helmet, immersion suit, single seat dinghy, survival pack, emergency intercom, main aircraft and emergency oxygen systems, and seats and harnesses. Emphasis is given to safety equipment experience with the Harrier and Sea Harrier aircraft of the two British services. O.C.

A84-20140
ARMY EVALUATING LESSONS LEARNED IN GRENADA FIGHT
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 131, 133-136.

An assessment is undertaken of operational experiences and combat lessons learned during the U.S. Army's recent intervention in Grenada, where such rotorcraft as the UH-60A 'Black Hawk' sustained ground fire. Although several craft were lost to small arms fire, the Black Hawks were able to survive 23-mm fire while carrying out infantry transport and support tasks. Operational *analysis of Black Hawk performance has led to the formulation of*

requirements for future corrosion protection of the rotor blades, on-site cleaning of subsystems, and the use of engine compressor filters. Additional Black Hawk improvements will extend to increased external lift, multiple role capability, world-wide self-deployment, and expanded adverse environment operational capabilities. Attention is also given to prospective Cobra and CH-47 helicopter improvements.   O.C.

A84-20292
PILOT-INDUCED FACTORS IN FATAL LIGHT AIRCRAFT ACCIDENTS IN THE UNITED KINGDOM - 1969-1981
K. E. UNDERWOOD GROUND (RAF, Institute of Pathology and Tropical Medicine, Aylesbury, Bucks., England) (Joint Committee on Aviation Pathology, Scientific Session, 13th, Toronto, Canada, Oct. 1982) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, Jan. 1984, p. 52-58. refs
A review of 52 personally investigated fatal light aircraft accidents involving 8 professional pilots and 44 private pilots is presented. In 22 of the 52 accidents the presence of any precrash defect or malfunction of airframe, engine, or flying controls was definitely excluded. It is inferred that there was a 'pilot-induced' factor in 35 (69.3 percent) of the 52 fatal accidents. The pilot-induced factors associated with some of these accidents and some of the mechanical defects encountered are discussed.
Author

A84-20295
REDUCTION OF MILITARY HIGH-ALTITUDE PARACHUTE ENTANGLEMENT USING THE CONTROLLED ALTERNATING PARACHUTE EXIT SYSTEM
A. T. HADLEY, III and J. D. HIBST (U.S. Army, 82nd Airborne Div., Fort Bragg, NC) Aviation, Space, and Environmental Medicine (ISSN 0095-0562), vol. 55, Jan. 1984, p. 65-68. refs

A84-20446
A SURVEY OF SERIOUS AIRCRAFT ACCIDENTS INVOLVING FATIGUE FRACTURE
G. S. CAMPBELL and R. LAHEY (National Aeronautical Establishment, Ottawa, Canada) International Journal of Fatigue (ISSN 0142-1123), vol. 6, Jan. 1984, p. 25-30. refs
A world-wide survey of serious aircraft accidents involving fatigue fracture has been carried out. The study includes not only fatal accidents, but also those in which the damage to the airframe was substantial or greater. The accidents cover civil and, to a limited extent, military aircraft. A total of 1885 accidents since 1927 were identified as having fatigue fracture as a related cause, and these accidents resulted in 2240 deaths. Engine/transmission failure and landing-gear failure were the most common cause of recent fixed-wing accidents, while the most prevalent rotary-wing problems were failure of the engine/transmission and of the tail-rotor. Currently there is a yearly average of about 100 serious fatigue accidents (69 fixed-wing and 31 rotary-wing).   Author

A84-21021
HUMAN FACTORS IN LIGHT-AIRCRAFT ACCIDENTS DURING STUNT FLYING [FACTEURS HUMAINS DANS LES ACCIDENTS D'AVIONS LEGERS EN VOLTIGE AERIENNE]
B. FROISSART, A. HERMANT, and A. MILHAUD   Medecine Aeronautique et Spatiale, vol. 22, 3rd Quarter, 1983, p. 253-256. In French.
A statistical analysis of 18 stunt-flying accidents involving light aircraft reported in France during 1967-1980 is presented. The training and experience of the pilot, aircraft type, cause of the accident, and number of persons killed or injured are intercompared in tables and discussed. Low-altitude flight and midair breakup are identified as the primary causes, and the knowledge and attitude of the pilot are linked to these causes.   T.K.

A84-21280#
AN IMPROVED METHOD OF PREDICTING ANTI-ICING FLOW RATES FOR A FLUID ICE PROTECTION SYSTEM
A. E. ALBRIGHT (Kansas, University, Lawrence, KS) and A. E. KOHLMAN (Kohlman Aviation Corp., Lawrence, KS)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 9 p.
(AIAA PAPER 84-0023)
Tunnel tests were conducted in the NASA Lewis Icing Research Tunnel to determine minimum anti-ice flow rates with a fluid ice protection system mounted on a typical general aviation wing section. The experimental anti-ice flow rates, at over 40 different icing conditions, are compared with results from two methods of predicting anti-ice flow rates. The first method presented is a modified approach to that presented in the 'Engineering Summary of Airframe Icing Technical Data.' This modified approach generally predicts flow rates lower than those determined experimentally. The second method is an analytical approach based on the computation of the maximum local water collection efficiency. This method tends to predict flow rates slightly higher than the experimental values. Correction factors from a linear least-squares regression are presented for each method. Considering the uncertainty in the experimental data, it is believed that the accuracy of each method is quite good.   Author

A84-21283*#   National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIR-SAMPLING INLET CONTAMINATION BY AIRCRAFT EMISSIONS ON THE NASA CV-990 AIRCRAFT
E. P. CONDON and J. F. VEDDER (NASA, Ames Research Center, Moffett Field, CA)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 7 p. refs
(AIAA PAPER 84-0029)
Results of an experimental investigation of the contamination of air sampling inlets by aircraft emissions from the NASA CV-990 research aircraft are presented. This four-engine jet aircraft is a NASA facility used for many different atmospheric and meteorological experiments, as well as for developing spacecraft instrumentation for remote measurements. Our investigations were performed to provide information on which to base the selection of sampling locations for a series of multi-instrument missions for measuring tropospheric trace gases. The major source of contamination is the exhaust from the jet engines, which generate many of the same gases that are of interest in atmospheric chemistry, as well as other gases that may interfere with sampling measurements. The engine exhaust contains these gases in mixing ratios many orders of magnitude greater than those that occur in the clean atmosphere which the missions seek to quantify. Pressurized samples of air were collected simultaneously from a scoop located forward of the engines to represent clean air and from other multiport scoops at various aft positions on the aircraft. The air samples were analyzed in the laboratory by gas chromatography for carbon monoxide, an abundant combustion by-product. Data are presented for various scoop locations under various flight conditions.   Author

A84-21286*#   Toledo Univ., Ohio.
PREDICTED ELECTROTHERMAL DEICING OF AIRCRAFT BLADES
T. G. KEITH, JR., K. C. MASIULANIEC, K. J. DEWITT, and D. F. CHAO (Toledo, University, Toledo, OH)   American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 11 p. NASA-supported research. refs
(AIAA PAPER 84-0110)
A finite difference method is presented for the transient two-dimensional simulation of an electrothermal de-icer pad of an aircraft wing or blade. The irregular geometry of the composite ice laden blade is handled by use of a body fitted coordinate transformation. By this approach the various blade layers are mapped into a set of stacked rectangular strips in which the numerical solution takes place. Several heat conduction examples

are presented in order to demonstrate the accuracy of the numerical procedure. Ice melting time predictions are made and compared to earlier predictions where possible. Finally, a new graphical presentation of thermal results is shown. Author

A84-21795
RECENT ADVANCES IN PARACHUTE TECHNOLOGY
D. R. DENNIS (Royal Aircraft Establishment, Farnborough, Hants., England) Aeronautical Journal (ISSN 0001-9240), vol. 87, Nov. 1983, p. 333-342. refs
An assessment is made of the advancements in parachute design which have emerged as a result of research at Britain's Royal Aircraft Establishment, covering paratroop, emergency escape, cruciform, and the new 'gliding ram air' types and their performance characteristics. Attention is given to the various features and operations shared by all four designs, such as the control of parachute inflation characteristics, the stresses and loadings to which parachutes are subjected, stability characteristics during descent, and landing behavior. Also noted are the unique descent and control characteristics of the low aspect ratio wing-like ram air gliding parachute. The airfoil-like canopy of this gliding parachute is kept inflated by the effect of ram air, which enters a spanwise opening at the leading edge. Pitch, bank and turn control can be exercised by the parachute operator through actuation cables. O.C.

A84-22176*# Pennsylvania State Univ., University Park.
THE FALLACY OF USING NII IN ANALYZING AIRCRAFT OPERATIONS
R. G. MELTON (Pennsylvania State University, University Park, PA) and I. D. JACOBSON (Virginia, University, Charlottesville, VA) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 151-154. refs
(Contract NSG-1509)
Three measures of noise annoyance (Noise Impact Index, Level-Weighted Population, and Annoyed Population Number) are compared, regarding their utility in assessing noise reduction schemes for aircraft operations. While NII is intended to measure the average annoyance per person in a community, it is found that the method of averaging can lead to erroneous conclusions, particularly if the population does not have uniform spatial distribution. Level-Weighted Population and Annoyed Population Number are shown to be better indicators of noise annoyance when rating different strategies for noise reduction in a given community. Author

A84-22599
FLIGHT-PLAN COORDINATION IN THE FEDERAL REPUBLIC OF GERMANY [FLUGPLANKOORDINATION IN DER BUNDESREPUBLIK DEUTSCHLAND]
H. K. GERING Ortung und Navigation (ISSN 0474-7550), no. 3, 1983, p. 427-433. In German.
The operation of the flight-plan-coordination service (FPCS) of the FRG Transport Ministry during the last 12 years is reviewed. The responsibilities, personnel, and installations of the FPCS are described, and the importance of cooperation with the Bundesanstalt fuer Flugsicherung is stressed. The procedures introduced to effectively coordinate arrivals and departures of all commercial flights at the 11 civilian airports, regulate overflights and airspace, and monitor compliance with the flight plans are described. The success of the FPCS is attributed to an ability to balance the needs for adherence to flight plans, for flexibility, and freedom of decision. T.K.

N84-16157# Federal Aviation Administration, Atlantic City, N.J.
EFFECTS OF VENTILATION AND PANEL PROPERTIES ON TEMPERATURE RISE FROM AIRCRAFT FIRES Technical Report, May - Nov. 1983
T. I. EKLUND Jan. 1984 25 p refs
(DOT/FAA/CT-TN83/63; ACT-350) Avail: NTIS HC A02/MF A01
A simple model is developed to describe the performance of interior aircraft honeycomb panels in a fire environment. A perfect stirrer analysis is applied to an aircraft cabin in-flight fire of constant size. Heat addition from the fire is offset by heat losses through the aircraft ventilation system and heat transfer through wall and ceiling panels. The ventilation rate is generalized into an effective ventilation rate that includes the panel heat transfer losses. The analysis demonstrates that conduction heat transfer and convection heat transfer can play comparable roles in lowering asymptotic values of enclosure temperature rise. The analysis leads to the definition of both a characteristic ventilation time and a characteristic burning time. The ratio of these times is a dimensionless variable that dominates asymptotic values of temperature. Pyrolysis of panels is further demonstrated as a potential heat sink. An experimental technique is proposed to determine the thermal inertia of a fuselage interior in a non-destructive fashion. Author

N84-16158# Federal Aviation Administration, Atlantic City, N.J.
EXTINGUISHER AGENT BEHAVIOR IN A VENTILATED SMALL AIRCRAFT Final Report, Mar. - Apr. 1983
G. R. SLUSHER, J. WRIGHT, J. E. DEMAREE, and W. E. NEESE Jan. 1984 57 p refs
(Contract FAA PROJ. 181-350-420)
(FAA-CT-83-30; AD-A137657) Avail: NTIS HC A04/MF A01
Hand-held Halon 1211 fire extinguishers were evaluated in a four-place Cessna Model 210C aircraft. The aircraft was operated in an airflow facility under simulated flight conditions. Extinguishers of 2.5 pound capacity were discharged to determine the dissipation rate and toxicity levels of Halon 1211 extinguishing agents. Agent concentrations dissipated rapidly. Analysis of dose calculations demonstrated that 2.5 pound Halon 1211 extinguishers were safe in the four-passenger test aircraft. Dose calculations for the pilot were only 25 percent of the limit for Halon 1211. Ventilation airflow produced air changes in the cabin of 1.16 minutes at 120 miles per hour airspeed and 1 minute at 140 miles per hour. The high cabin ventilation rates together with the effects of agent stratification resulted in safe conditions. The effective air change time found in analysis was of the order of one-third of a minute. This quantity used in the procedures outlined in Advisory Circular AC-20-42B leads to the conclusion that discharge of Halon 1211 weights of 6 pounds can be safely withstood in the C120 under flight conditions. Discharge of a 2.5 pound chemical powder extinguisher adversely affected visibility for over 22 seconds. Author

N84-16159# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Anthropotechnik und Simulation.
EVALUATION AND ANALYSIS OF EXPERIENCE REPORTS CONCERNING WIND SHEAR PROBLEMS
R. UCKERMANN, A. JAGAU, U. TEEGAN, and F. V. SCHICK Mar. 1983 38 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-83-19) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 16
Over 300 pilot reports on personal experiences with wind shear are analyzed. Reports were evaluated by a stepwise information compression method, a tabular systematology, developed for this purpose. Approximately 70% of the reports are related to landing situations, 30% with takeoff. The analysis yields essential factors from the subjective point of view of the pilots, as well as a starting point for a general assessment of danger in windshear situations. Ground approach and landing with speed loss due to wind shear, probably increased by upwinds and downwinds, appear to be the most critical phases. It is concluded that a wind shear indication system helps pilots and improves flight safety. Author (ESA)

N84-17152# Committee on Science and Technology (U. S. House).
AIRPORT AND AIRCRAFT SAFETY RESEARCH AND TECHNOLOGY
Washington, D.C. GPO 1983 58 p Presented by the Subcomm. on Transportation, Aviation and Mater. to the Comm. on Sci. and Technol., 98th Congr., 1st Sess., Oct. 1983
(GPO-26-497) Avail: Subcommittee on Transportation, Aviation and Materials
Various topics relating to airport and aircraft safety research and technology are discussed. Aircraft cabin fire safety research centering on the development of less flammable cabin wall, ceiling, and floor materials is discussed. Anti-misting fuels are discussed. The role of aircraft maintenance is discussed. Airport certification requirements are discussed. R.J.F.

N84-17153# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
DATA ACQUISITION FOR EVALUATION OF AN AIRBORNE LIGHTNING DETECTION SYSTEM Final Report, Jun. - Aug. 1981
L. C. WALKO and M. J. REAZER Sep. 1983 62 p
(Contract DA PROJ. 240-2)
(AD-A135318; AFWAL-TR-83-3083) Avail: NTIS HC A04/MF A01 CSCL 04B
A data acquisition system was flown on a WC-130 aircraft to acquire data for evaluation of the Ryan Stormscope for potential use of such a system on USAF aircraft. The data acquisition system consisted of an instrument panel containing the Stormscope display, an aircraft weather radar display, an IRIG-B time display, and video recording system. Data were acquired during the summer of 1981 in the Florida area during a program conducted jointly by the Air Force Wright Aeronautical Laboratories and the National Oceanographic and Atmospheric Administration for the airborne characterization of lightning. The IRIG-B time reference permitted correlating of the Stormscope data, airborne and ground weather radar data, and electromagnetic measurement data from the lightning characterization program. Typical data acquired are presented along with corresponding data from electromagnetic sensors. A comparative discussion of the data from the various systems is presented. The data will undergo further analysis sponsored by the Warner Robins Air Logistics Center.
Author (GRA)

N84-17154# Naval Weapons Engineering Support Activity, Washington, D. C.
AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE DATA ANALYSES, VOLUME 1 Annual Report, 1 Jan. - 31 Dec. 1979
C. W. STOKES, III, G. R. HERD, F. G. GUILL, and J. F. PALMER 5 Nov. 1983 625 p Presented at 21st Ann. SAFE Symp., San Antonio, 5-8 Nov. 1983
(AD-A134833; NAVWESA-1-83-VOL-1) Avail: NTIS HC A99/MF A01 CSCL 01C
Compilation of papers concerning ejection seat type aircrew automated escape systems (AAES) inservice usage and experience. Subjects include: Problems in using success rates to quantify escape system reliability; The effects of family ties among ejection seats; A critique of U.S. Navy ejection seat design; Test and R&M specifications; Discussions of plans for continuing to analyze escape system usage data; In-service safety aspects of ejection seat type escape systems; Quality assurance planning of escape systems testing and test data acquisition; Analysis of windblast, flail and tumble; Factors influencing frequency and severity of neck injuries sustained by ejectees; Mishap aircrew anthropometry analysis and screening techniques; Discussion of maintenance induced fatalities and injuries; Experience with side-by-side unsequenced ejection seats; Pilot study to ascertain means for enhancing knowledge concerning usage of life support systems during ejections; Injury and equipment damage patterns; The flight surgeon's report (FSR) usefulness; and Proposed field investigator's guides for investigating the emergency use of escape and life support systems. Author (GRA)

N84-17155# Naval Weapons Engineering Support Activity, Washington, D. C.
AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES) IN-SERVICE USAGE DATA ANALYSES, VOLUME 2 Annual Report, 1 Jan. - 31 Dec. 1979
C. W. STOKES, III, G. R. HERD, F. G. GUILL, and J. F. PALMER 5 Nov. 1983 472 p Presented at 21st Ann. SAFE Symp., San Antonio, 5-8 Nov. 1983
(AD-A134834; NAVWESA-1-83-VOL-2) Avail: NTIS HC A20/MF A01 CSCL 01C
Ejection seat type aircrew automated escape systems are discussed. Also discussed are the following topics: The Flight Surgeon's Report from a data user's viewpoint (reprint), Aircrew Life Support Systems (ALSS), Post Emergency Usage Investigation Guides--Aircrew protection helmets, Oxygen equipment; man-mounted; Aircrew personnel flotation equipment (Life preservers), Survival vests, and Integrated torso harness, and Aircrew Life Support Equipment Post-Usage Investigation/Reportage generic decision tree; Associated Data Appendices--Neck injury cases data, Maintenance error major malfunction cases data, and Fault tree Bad Item Out the Gate, drawings. GRA

N84-17156# Federal Aviation Administration, Washington, D.C. Office of Civil Aviation Security.
SEMIANNUAL REPORT TO CONGRESS ON THE EFFECTIVENESS OF THE CIVIL AVIATION SECURITY PROGRAM Report, 1 Jan. - 30 Jun. 1983
21 Oct. 1983 20 p
(AD-A134860; DOT/FAA-ACS-83-1(18)) Avail: NTIS HC A02/MF A01 CSCL 01B
This report provides details on the effectiveness of security screening of passengers and all property intended to be carried in the aircraft cabin in air transportation or intrastate air transportation. It also provides a statistical summary of aircraft hijackings and alleged violations of Federal Aviation regulations pertaining to security screening. Author (GRA)

N84-17157# Boeing Military Airplane Development, Seattle, Wash.
INTEGRATED AIRCRAFT FUEL TANK INERTING AND COMPARTMENT FIRE SUPPRESSION SYSTEM. VOLUME 2: EVALUATION OF NITROGEN-ENRICHED AIR AS A FIRE SUPPRESSANT Final Report, 15 Aug. 1979 - 29 Oct. 1982
L. A. DESMARAIS and F. F. TOLLE Wright-Patterson AFB, Ohio AFWAL Apr. 1983 242 p
(Contract F33615-79-C-2027; AF PROJ. 3048)
(AD-A134883; D180-27265-2; AFWAL-TR-83-2021-VOL-2) Avail: NTIS HC A11/MF A01 CSCL 01C
Aircraft onboard generation of nitrogen-enriched air (NEA) for fuel tank inerting offers significant advantages over the stored nitrogen concept currently in use. Additionally, the excess NEA generated in flight offers a potential fire extinguishing agent. To evaluate this potential, a small scale test apparatus was designed based on a survey of actual aircraft fires. Two configurations were used to simulate fires dominated by either forced convection or free convection. The fire types investigated were pool, spray, hot surface and combat damage. Test variables included air temperature, fuel type, fuel flow rate and surface temperature. Prior to developing conclusions on the effectiveness of NEA, verification tests were run using other common extinguishing agents (CO2, LN2, and Halon 1301). The quantity of agents required corresponded well with accepted levels based on previous tests. Several important findings were made. The data, presented in terms of volume percentage (air + extinguishant flow) of extinguishing agent required for fire knock-down, indicates the hot surface fire type to be the most severe. A volume concentration of 72% NEA9 (9% oxygen by volume) was found to be effective in knocking down the hot surface fire. While this concentration is high, when compared on weight basis, NEA compares favorably with other agents. GRA

N84-17158# Civil Aeromedical Inst., Oklahoma City, Okla. Civil Aeromedical Inst.
THE 1980 AND 1981 ACCIDENT EXPERIENCE OF CIVIL AIRMEN WITH SELECTED VISUAL PATHOLOGY
J. R. DILLE and C. F. BOOZE, JR. Jul. 1983 11 p
(AD-A134898; FAA-AM-83-18) Avail: NTIS HC A02/MF A01
CSCL 01B

In studies of the 1974-76 accident experience of U.S. general aviation pilots with static physical defects, all the significantly increased rates and ratios were for visual defect categories--blindness, or absence of either eye, deficient distant vision, deficient color vision with no operational limitations, and contact lenses. A 1979 study was limited to accident airmen with 19 visual deficiencies. The 1,140 pilots with aphakia and 173 with artificial lens implants had significantly higher rates, but the monocular pilots and contact lens users did not. The present study examined the 1980-81 accident experience of 4,169 monocular pilots, 1,299 with amblyopia, 969 with aphakia, 285 with lens implants, 118 with a history of diplopia, 1,269 with a tropia, 2,601 with hyperphoria >1 diopter, and 2,711 with esophoria or exophoria >6 diopters by class of medical certificate held. Numbers were too small for statistical treatment, but first and second class medical certificate holders, who often have more accidents per 1,000 airmen, consistently had progressively lower accident rates per 100,000 hours. They fly more. Monocular, aphakic, lens implant, and amblyopic accident airmen had higher accident rates than did the total airman population. Bases were found to question the value and adequacy of phoria and field of vision testing. GRA

N84-17159# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
EXPLOSION AND FIRE HAZARDS IN AN OIL-OXYGEN SYSTEM
A. FORSBECK Sep. 1983 23 p refs In SWEDISH; ENGLISH summary
(FOA-C-20507-D1; ISSN-0347-3694) Avail: NTIS HC A02/MF A01

Oil was found in the oxygen refilling-system of the 37 Viggen aircraft. Explosion and fire hazards were investigated. The oil was found in the compressed oxygen cylinders and in the cylinders used for transportation on the ground. The oil probably leaked through filters in a compressor used in cleaning the cylinders. The possible energy release, due to an oil/oxygen reaction, and the quantity of piping material that could be heated to the oil/oxygen mixture combustion temperature were calculated. The released energy (100's of mj) could heat 1 mg metal to an assumed ignition temperature of 500 C. Even if the oil-oxygen mixture is supposed to self-ignite, explosion or fire is unlikely. Author (ESA)

N84-17160# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Hauptabteilung Verkehrforschung.
EFFECTS ON RAIL TRANSPORT CAUSED BY AIR TRANSPORT SUPPLY ALTERNATIVES WITHIN THE FEDERAL REPUBLIC OF GERMANY FOR THE YEAR 2000
R. J. HAUPT Jul. 1983 35 p refs In GERMAN; ENGLISH summary
(DFVLR-MITT-83-14) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 14

Substitution potential from air to rail services in West Germany is evaluated. Travel time, travel destination and travel purpose were analyzed. It is concluded that an average rail speed of 160 km/h will affect the domestic air traffic by 8% to 10%, and that for an average rail speed of 280 Km/hr (e.g., magnetic rail transportation) a substitution ratio of about 50% is expected.
Author (ESA)

N84-17161# British Aerospace Public Ltd. Co., Bristol (England).
DEVELOPMENTS IN CABIN SAFETY AND CRASHWORTHINESS
A. P. SIMMONS 1983 19 p refs
Avail: NTIS HC A02/MF A01

Developments in the basic philosophies and detail design parameters concerning cabin safety which may be available and acceptable from a cost and weight penalty standpoint during the next decade are discussed. The cabin furnishings and equipment fit of a hypothetical Advanced Transport, entering service in 10 years, is considered. Project planning, design and manufacturing lead times dictate that such an aircraft will employ techniques at or just beyond today's state-of-the-art. Author (ESA)

N84-17162# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
COMPUTER MODELING OF AIRCRAFT CABIN FIRES Final Report, Jun. 1981 - Dec. 1982
H. W. EMMONS and H. E. MITLER Jun. 1983 95 p refs
Sponsored in part by FAA
(Contract NB81-NADA-2026)
(PB84-101153; HOME-FIRE-PROJECT-TR-57; NBS-GCR-83-431)
Avail: NTIS HC A05/MF A01 CSCL 01C

Two aspects of the fire that can occur after an aircraft crash landing were considered. Often a crash opens a hole in the cabin. Frequently, the wing damage opens a fuel tank and fuel spread on the ground catches fire. If the fire occurs below the hole in the cabin, fire gases and flames may enter the cabin and set it afire. Furthermore, after the gases enter the cabin, those gases and any generated by fire in the cabin itself flow as a nonsteady ceiling jet down the length of the cabin. Finally, the nature of the fire gas flow into the cabin is influenced by whether or not and where the occupants open a door to escape. Author (GRA)

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

A84-19573
EFFORT AND BENEFIT CONNECTED WITH A BAD WEATHER LANDING [AUFWAND UND NUTZEN DER SCHLECHTWETTERLANDUNG]
G. WESTPHAL (INTERFLUG Gesellschaft fuer internationalen Flugverkehr mbH, Berlin, East Germany) Technisch-Oekonomische Information der zivilen Luftfahrt (ISSN 0232-5012), no. 3, 1983, p. 78-86. In German. refs

A flight is terminated with a successful landing. However, the landing represents the most difficult operation of the flight. Considerable expenditures related to requirements for personnel and technological equipment arise in connection with efforts needed to make a landing also possible under bad weather conditions. It is, therefore, necessary to evaluate these expenditures in comparison to the obtained benefits. The present investigation is mainly concerned with a method which restricts the influence of the weather or makes it ineffective. Attention is given to the definitions of the ICAO with respect to the visibility conditions and the approach, the meteorological situation, technological procedures for providing conditions for a safe landing, the costs of the technical equipment needed, and expenditures arising in connection with the landing of the aircraft at another airport. The benefits related to the possibility of a bad weather landing include benefits for the airline and the passengers. G.R.

A84-19618#
STRAPDOWN INERTIAL NAVIGATION SYSTEMS FOR HELICOPTERS
I. C. MOREAU (Service Technique des Telecommunications et Equipements Aeronautiques, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 11 p.

The development of strapdown-type inertial/Doppler navigation systems for the French HAC and HAP helicopters is reported. Three prototype systems based in part on components developed for missile guidance are briefly characterized, and the results of evaluation and testing are summarized. The Sextan I, 26-SH, and MSD systems have respective alignment delays of 65 sec, 65 sec, and 9 min; leading errors of 0.25 deg (average), less than 0.9 (maximum), and 1.7 deg (2 sigma apart); and tactical-flight position errors (2 sigma apart) of less than 270 m, less than 444 m, and 340 m in 15 min. All three systems meet the military-helicopter specifications and can accommodate weapon-system integration. D.G.

A84-19624#
THEORETICAL AND EXPERIMENTAL STUDY OF INFRARED RADIATION FROM HELICOPTERS
A. M. BOUCHARDY, G. GAUFFRE (ONERA, Chatillon-sous-Bagneux, Hauts-de-Seine, France), E. GIACOMETTI (SocieteNationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France), MR. DURAND, and MR. SELVA Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 9 p.

Infrared radiation from helicopter exhaust jets has been theoretically and experimentally studied. An aircraft infrared radiation computation code was developed and is described, and the theoretical calculation of the aerothermic field of the plume and the radiation of gases is presented. The results of tests run on a jet at the turboshaft-engine outlet are presented, including measurements of the temperature and pressure in the jet and the measurement of the jet infrared emission. The spectral distribution of the radiation is presented, as is the total radiation represented by the sum of energetic intensities generated by the total zones. C.D.

A84-19629#
HELICOPTER INFRARED SIGNATURE AND COUNTERMEASURE EVALUATION
A. M. RICCI, A. N. ALLAVENA, E. JANIS (Rinaldo Piaggio - Industrie Aeronautiche e Meccaniche S.p.A., Finale Ligure, Italy), and E. BRACCI (CNR, Centro Nazionale Universitario di Calcolo Electtronico, Pisa, Italy) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 11 p.

The Helicopter IR Signature and Countermeasure Evaluation Program is an experimental procedure for investigating IR emission signatures from both static or flying helicopters. The procedure yields pictures consisting of 128 x 112-element mosaics, where the effective radiance and temperature of each element depicting the target are given by a 3-digit number. These images are displayed on a high resolution color monitor. Computer software may be applied to enhance the degree of information detail. Results are then quantified in order to select those techniques and materials that will most effectively reduce IR signature to predefined thresholds. O.C.

A84-19674#
AIR NAVIGATION 1950-1980 - CANADA'S CONTRIBUTION
J. G. WRIGHT (JGW Systems Ltd., Ottawa, Canada) (Canadian Aeronautics and Space Institute, Canadian Symposium on Navigation, 5th, Calgary, Alberta, Canada, May 10, 11, 1983) Canadian Aeronautics and Space Journal (ISSN 0008-2821), vol. 29, Sept. 1983, p. 250-258.

An assessment is made of Canada's unique contribution to air navigation techniques' development in the 1950-1980 period. Many of these contributions were prompted by the exceptional distances and high latitudes of the airspace in question. In addition, the need for continental defence against intercontinental bombers placed emphasis on the flight path accuracy of relatively small interceptor aircraft. Radio navigation requirements had to be balanced against radio jamming techniques being developed to affect the hypothetical intruding bomber force. The R Theta (polar) coordinate navigational computer system was one major result of Canadian research, which was then applied to Doppler radar data and led to the development of the Position and Homing Indicator and two Air Navigation and Tactical Systems. O.C.

A84-20083
TURBULENCE DETECTION USING WEATHER RADAR
International Journal of Aviation Safety (ISSN 0264-6803), vol. 1, Dec. 1983, p. 335-342.

This paper provides a technical introduction to the Collins WXR-700 Digital Weather radar with doppler turbulence detection. The following paragraphs describe the operation of the turbulence processor and provide an overview of its operational implications. Author

A84-20142
NEW COCKPITS USE INTEGRATED AVIONICS
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 148-151, 153-156.

Multiprocessor/multibus helicopter avionics concepts which address such future requirements as those of the U.S. Army's 'LHX' advanced scout/attack/utility rotorcraft are undergoing intensive development and evaluation. Also active is the Army Digital Avionics System program, which seeks to apply state-of-the-art digital system technology to the UH-60A Black Hawk helicopter. The three primary technological areas being explored are integrated communications-navigation-identification avionics, digital audio distribution, and voice-interactive avionics. Attention is given to the layouts of several helicopter cockpit instrument and display configurations. O.C.

A84-20373
BOEING DELIVERS B-1B AVIONICS SHIPSETS
B. M. ELSON Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 23, 1984, p. 117, 120, 121 (3 ff).

The delivery of equipment for two shipsets of navigation/weapons control avionics for a B-1B flight test program has begun. The flight test program is scheduled to start this summer. The critical design review of the B-1B offensive avionics system and defensive management system was completed last July. Attention is given to the layout of controls and displays in the B-1B aft crew station, the inertial navigation unit, improvements of the B-1B offensive system compared to the original B-1 system, the coherent pulse Doppler radar, the Doppler velocity sensor, dual radar altimeters, dual signal data converters, and dual terrain-following computers. G.R.

A84-20458
COMMUNICATIONS-ELECTRONICS IN THE RAAF
R. J. NOBLE (Department of Defence, Directorate of Communications and Electronics, Canberra, Australia) Telecommunication Journal of Australia (ISSN 0040-2486), vol. 33, no. 3, 1983, p. 189-194.

Royal Australian Air Force (RAAF) communications-electronics (CE) activities range from airborne communications, navigation, and weapon control systems, through air traffic control and both tactical and strategic CE, to computer systems and an embryonic automated control and command network. RAAF aircraft involved in such CE systems are the F-111C, the F-18A, and the P-3C Orion, which are respectively engaged in low level penetration to target areas, air defense, and antisubmarine warfare. A Hercules C-130-transportable mobile air traffic control system has recently been acquired by the RAAF for support of aircraft deployment. In addition to its own CE activities, the RAAF operates a significant portion of the Australia-wide Integrated Defense Communications Network in conjunction with the Australian Army and Navy. O.C.

A84-20555
ALGORITHM FOR THE DIGITAL PROCESSING OF SIGNALS OF ONBOARD RECEIVING ANTENNA ARRAYS [ALGORITM TSIFROVOI OBRABOTKI SIGNALOV BORTOVYKH PRIEMNYKH ANTENNYKH RESHETOK]
A. S. BOGACHEV   Radiotekhnika (ISSN 0033-8486), Oct. 1983, p. 47-50. In Russian.

An algorithm for the digital processing of signals pertaining to the radiation pattern of receiving phased arrays is extended to the case of flight-vehicle antennas. It is shown that errors in the measurement of the angles of roll, pitch, and bearing lead to an increase in the main lobe of the pattern, a decrease in its maximum value, and a spreading of its minima.   B.J.

A84-20600
KEEPING THE TRAFFIC FLOWING - IS MONOPULSE SSR THE NEXT BIG MARKET?
D. BOYLE   Interavia (ISSN 0020-5168), vol. 39, Jan. 1984, p. 59-61.

A monopulse direction-finding capability has been developed for secondary surveillance radars (SSRs) which allows an accurate bearing angle to be derived from a single pulse received at the aircraft transponder. With two pulses, sufficient correlation is obtained to define a target. The improvement in position accuracy over conventional radar is estimated to be at least twofold, making possible the use of SSR as a stand-alone radar aid without the need for a primary radar to provide plan position accuracy. The identity and altitude of aircraft are derived from the reply pulse train in the conventional manner, and the use of a monopulse SSR does not require modification of the airborne transponder, which is required by US Mode S radars. Monopulse development has reached the stage where it can accurately separate aircraft flying 8 km apart at 320 km from the radar site.   O.C.

A84-20850
THE GROWTH OF THE AVIONICS INDUSTRY IN THE UK
R. TELFORD   Aerospace (UK) (ISSN 0305-0831), vol. 10, Nov.-Dec. 1983, p. 14-20.

An historical account is given of the development of aviation electronics in the United Kingdom. The pre-WW I research of the Marconi company in wireless telegraphy was the basis for subsequent aircraft-based artillery-direction work during the war. The directional properties of aerial antennas were then developed for tracking. During the interwar period, civil aviation became the beneficiary of HF radio equipment. The extension of electronics into navigation by means of direction finding reached a threshold for much greater and more consequential development in 1934, when radar was first demonstrated. While electronics have until now been used to maximize pilot control of aircraft capabilities, novel and future electronically signalled control systems can increase aircraft capabilities themselves, if electronic capabilities are assumed from the outset of design efforts.   O.C.

A84-21550
SAFETY IN NUMBERS. VI - AVIONICS ANALYSED
M. HIRST   Air International (ISSN 0306-5634), vol. 26, Feb. 1984, p. 75-79.

Attention is given to the relationships customarily borne by aircraft computers to such functions as that of the flight control system. A computer-based full authority flight control system, because it would be able to react rapidly to disturbances that may upset human-controlled aircraft, is not restricted in its operations by limitations on acceptable center of gravity range or the combination of simultaneous control surface deflections. A fully 'fly-by-wire' aircraft employing such a computerized control system can operate with less drag and maneuver with fewer operational restrictions than a conventional one. The minimization of catastrophic failures in such systems is accomplished by system multiplexing, often employing four channels for the transmission of control signals. Such high integrity flight control systems are used for terrain-following flight by military aircraft and automatic landing approaches by airliners.   O.C.

A84-21571
ANTENNA SYSTEMS AT CIVIL-AVIATION AIRPORTS [ANTENNYE USTROISTVA AEROPORTOV GRAZHDANSKOI AVIATSII]
L. IA. ILNITSKII and A. A. BOLBOT   Moscow, Izdatel'stvo Transport, 1983, 192 p. In Russian.   refs

The operating conditions, characteristics, and requirements of airport antenna and feed systems are described. Particular consideration is given to the formation of radiation patterns, Loran antenna systems, landing-system antennas, and antenna and feed systems for scanning radars. Attention is also given to antennas for telecommunications and as well as for landing-system radar and meteorological radar.   B.J.

A84-21578
RADIO-NAVIGATION DEVICES AND SYSTEMS IN CIVIL AVIATION [RADIONAVIGATSIONNYE USTROISTVA I SISTEMY GRAZHDANSKOI AVIATSII]
P. V. OLIANIUK, G. P. ASTAFEV, and V. V. GRACHEV   Moscow, Izdatel'stvo Transport, 1983, 320 p. In Russian.   refs

The working principles and areas of application of radio engineering as used in navigation and landing are discussed, along with the technical limitations and advantages of such flight guidance systems. On-board and ground radio direction finders, omnidirectional radio-beacons, goniometer-rangefinder radio-navigation systems, and collision warning systems are considered, as well as long-range (such as satellite systems) and self-contained systems. Flight course and glide path radio-beacons are studied in the SP-50 and ILS landing systems, and microwave landing systems are reviewed.   J.N.

A84-22596
COMPARATIVE ASSESSMENT OF A MONOPULSE SSR SYSTEM AND CONVENTIONAL MOVING-WINDOW PROCESSING [VERGLEICHENDE ERPROBUNG EINES MONOPULS-SSR-SYSTEMS UND DER BISHERIGEN WANDERFENSTERVERARBEITUNG]
D. SIEBERT (Bundesanstalt fuer Flugsicherung, Frankfurt am Main, West Germany)   (Deutsche Gesellschaft fuer Ortung und Navigation, Radarsymposium, Munich, West Germany, Nov. 8, 1983) Ortung und Navigation (ISSN 0474-7550), no. 3, 1983, p. 343-360. In German.

The results of comparative tests of conventional moving-window (MW) and monopulse (MP) processing systems for SSR data are reported. The operating principles of MW and MP systems are reviewed and illustrated. The tests involve both fixed and moving transponders and include garbling situations and artificially incraesed fruit loads. The results are presented in tables and graphs and discussed. Although the SSR installation was not designed for MP operation, significantly better recognition probabilities and azimuth accuracies (especially in garbling and high-fruit-density situations) are obtained with the MP analysis system.   T.K.

A84-22598
RECOGNITION OF MEASUREMENT ERRORS IN DME BY ESTIMATION OF IMPULSE PARAMETERS [ERKENNUNG VON MESSFEHLERN BEIM DME DURCH SCHAETZUNG DER IMPULSPARAMETER]
R. BERNHARDT (Berlin, Technische Universitaet, Berlin, West Germany)   Ortung und Navigation (ISSN 0474-7550), no. 3, 1983, p. 420-426. In German.

An analytical technique to improve the accuracy of DME systems by removing erroneous information (primarily due to reflections) from the demodulated signal is developed. Digital processing of the signal by a parameter-estimation technique is based on a relatively simple mathematical model of the system, permitting one analytical algorithm to give both an estimated trigger point and an assessment of the accuracy of the measurement. Sample results for cosine-squared impulse and one reflection are presented graphically.   T.K.

N84-16124# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
CONTRIBUTIONS OF FLIGHT MECHANICS TO CIVIL AIR TRAFFIC [BEITRAEGE DER FLUGMECHANIK ZUM ZIVILEN LUFTVERKEHR]
P. HAMEL *In its* Lect. of a Flight Mech. Conf. p 47-64 Jul. 1982 In GERMAN
Avail: NTIS HC A07/MF A01
Flight-mechanical problems of the pilot-aircraft system due to the introduction of new technologies are discussed. These technologies (e.g. active control technology) are used to reduce fuel costs. Research on evaluating and improving flight characteristics using an Airbus in-flight simulator is discussed.
Author (ESA)

N84-16160# Congressional Budget Office, Washington, D. C.
IMPROVING THE AIR TRAFFIC CONTROL SYSTEM: AN ASSESSMENT OF THE NATIONAL AIRSPACE SYSTEM PLAN
D. L. LEWIS Aug. 1983 100 p refs
Avail: NTIS HC A05/MF A01
A comprehensive National Airspace System Plan to modernize and improve the efficiency of the nation's air traffic system was formulated. The system today is a blend of several generations' engineering and equipment, much of which has been outmoded by technological advances. Though still adequate to maintain a high standard of safety, the system is already the cause of rising operating costs, and its effectiveness may soon be limited by the demands of increased air traffic. Further, because the system is made up of numerous installations and is heavily labor intensive, there is significant potential for improved effectiveness with fewer facilities and less manpower. The plan would achieve such efficiency gains, but at considerable investment cost both to the federal government and to users of the air traffic control system. If fully implemented, the plan offers the nation a sound economic investment. The cost effectiveness of the plan, however, depends on organizational changes including a consolidation of facilities and a reduction in staff.
S.L.

N84-17165*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A COMPARISON OF TWO POSITION ESTIMATE ALGORITHMS THAT USE ILS LOCALIZER AND DME INFORMATION. SIMULATION AND FLIGHT TEST RESULTS
C. E. KNOX, D. D. VICROY, and C. SCANLON (Arkansas State Univ.) Feb. 1984 39 p refs
(NASA-TP-2281; L-15711; NAS 1.60:2281) Avail: NTIS HC A03/MF A01 CSCL 17G
Simulation and flight tests were conducted to compare the accuracy of two algorithms designed to compute a position estimate with an airborne navigation computer. Both algorithms used ILS localizer and DME radio signals to compute a position difference vector to be used as an input to the navigation computer position estimate filter. The results of these tests show that the position estimate accuracy and response to artificially induced errors are improved when the position estimate is computed by an algorithm that geometrically combines DME and ILS localizer information to form a single component of error rather than by an algorithm that produces two independent components of error, one from a DMD input and the other from the ILS localizer input.
Author

N84-17168*# Ohio Univ., Athens. Dept. of Electrical and Computer Engineering.
PATH DISCREPANCIES BETWEEN GREAT CIRCLE AND RHUMB LINE
R. KAUL Dec. 1983 18 p refs
(Contract NGR-36-009-017)
(NASA-TM-85522; NAS 1.15:85522; TM-89) Avail: NTIS HC A02/MF A01 CSCL 17G
A mathematical model for a comparative analysis of great circle vs. rhumb line navigation in the continental United States has been developed at the Avionics Engineering Center, Ohio University. A FORTRAN simulation of the model has been implemented on the IBM 370 computer. The simulation predicts pertinent navigation information for the two flight paths. The basis for the project, which is a part of an M.S. thesis, is to provide a data base for computing discrepancies between the two flight paths. This document briefly describes the model and discusses the implications of the results obtained.
Author

N84-17169# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Lasertechnik.
RESULTS OF A SLANT RANGE VISIBILITY FIELD TEST IN MUNICH-REIM
C. WERNER, H. HERRMANN, and F. BACHSTEIN (FB Elektronik) Apr. 1983 46 p refs In GERMAN; ENGLISH summary
(DFVLR-MITT-83-09) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 15,80
An eye-safe slant visual range measuring device is presented. It comprises an eye-safe cloud ceilograph connected to a lidar receiver. The system was installed at Munich-Riem airport. Measured values of standard slant visibility in the final approach region were transferred to a computer system. The slant visibility range (SVR) was calculated by using additional information on sky brightness and lamp intensity. The computed values of SVR, and runway visual range were transmitted by air traffic control to approaching aircraft. No improvement of visibility is ascertained, but this may be due to the short duration of the field test.
Author (ESA)

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

A84-19615#
COCKPIT-DESIGN AND SYSTEMS MANAGEMENT FOR LIGHT HELICOPTERS
K. SCHYMANIETZ and R. D. V. RETH (Messerschmitt-Boelkow-Blohm GmbH, Munich, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 22 p. refs
Attention is given to the development status of CRT display technology, with a view to its use in light helicopter cockpit flight monitoring and navigation. The degree of system redundancy required, weight and volume comparisons to conventional avionics, system architecture efficiency in a helicopter of the light (less than 3000-kg) class, and costs, are considered. Among the advantages noted for CRT display technology are greater freedom in cockpit design, reduced pilot workloads, and exceptional reliability and availability. The difficulties identified involve the balancing of system architectural features, such as volume integration and interface fitting, for the large variety of specific light helicopter tasks.
O.C.

A84-19616#
LHX DESIGN FOR IMPROVED SYSTEM PERFORMANCE AND AFFORDABILITY
G. R. MARNER (U.S. Army, Aviation Research and Development Command, St. Louis, MO) and R. R. PRUYN (Boeing Vertol Co., Philadelphia, PA) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 9 p.
Feaster and Borgman (1981) have reported that concept formulation for a new family of light helicopters, designated LHX, has been started. The present investigation is concerned with some of the work conducted in connection with the concept formulation process. Present developments indicate that there will

be a considerable need for new light helicopters by the end of the century. The LHX fleet is to perform a large number of battlefield functions, taking into account the roles of armed scout, light attack, and light armed utility aircraft. Attention is given to performance improvements, the role of reliability in aircraft productivity, avionics design requirements, aspects of design approach and philosophy, problems of system design, the mission reliability predicted for LHX design, the automation needed to enable a single man to perform efficiently the design missions, and questions of affordability.   G.R.

A84-19619#
A DIGITAL SYSTEM FOR HIGHER HARMONIC CONTROL OF A MODEL ROTOR
G. LEHMANN (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Flugmechanik, Brunswick, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 24 p. refs
A computer-based higher harmonic control system has been developed for the DFVLR's four-bladed hingeless model rotor which incorporates an electrohydraulic servoactuator system, a static/dynamic balance system, and a digital 'quick-look' and control system. This last element computes and generates higher harmonic control inputs, monitors and displays prominent sensor signals in the frequency domain studied, and records all sensor signals for off-line data reduction. The three subsystems are used to evaluate essential design criteria for the rotor system. Attention is given to the harmonic control system's hardware and software implementation.   O.C.

A84-19625#
AERO-THERMO ACTIVITIES FOR THE DEVELOPMENT OF A 'PASSIVE INFRARED SUPPRESSOR' FOR HELICOPTER USE
P. SCRIPELLITI, P. MANNELLA, and E. MORDEGLIA (Rinaldo Piaggio - Industrie Aeronautiche S.p.A., Finale Ligure, Italy) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 19 p.
A discussion is presented on the results of a study of powerplant IR emission suppressors for helicopter use, with attention to the most appropriate design methodology applicable to both exhaust plume and hot metal radiation reductions. A proprietary IR suppressor system is presented which uses a two-stage ejector to dilute the hot exhaust gases and cool the device's own walls, whose shape is optimized to shield engine hot components from external observation. Tests are given for three scale models of alternative versions of this device.   O.C.

A84-19626#
DYNAMIC BEHAVIOR OF TRANSMISSION SYSTEMS
F. THIBERT and F. MAQUIN (SocieteNationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 7 p.
When designing a helicopter, it is sought to avoid resonance phenomena which might result from the fact that the natural frequency of an assembly would turn out to be located on the excitation frequencies that helicopter blades pass on to the structure. For instance, the natural frequency of the tail rotor drive must be kept away from the torque excitation generated by the main rotor blades, whose frequency is a multiple of the main rotor rotation speed and of the number of rotor blades. Yet other oscillatory phenomena are likely to occur during the first flight tests of the aircraft: torsional oscillations of the drive system at relatively low frequencies (on the order of 3 to 6 hertz) generally excited by a slight disturbance of the resistant aerodynamic torque applied on the tail rotor. Depending on their specific amplitude and damping, these angular oscillations can be deemed excessive and require that the characteristics of the entire linkage be adjusted in flight.   Author

A84-19628#
THE DEVELOPMENT AND TESTS OF YAN'AN 2 LIGHT HELICOPTER
Z. GUO, Z. GU, L. ZHANG, and S. LIU (Nanjing Aeronautical Institute, Nanjing, People's Republic of China) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 22 p.
The development and ground and flight tests of the Yan'an 2 Light Helicopter in the last two decades are described, and an analysis of the design features is presented. A 275 hp nine-cylinder radial piston engine powers the 1155 kg, 8.0 m long aircraft to a cruising speed of 140 km/h using a 10.0 m diameter rotor. One test prototype was damaged by ground resonance. Solutions to the problems of ground resonance and torsional resistance in the tranmission system were obtained through further tests and analysis.   J.N.

A84-19630#
HELICOPTER GROUND RESONANCE EXPERIMENTAL VALIDATION OF THEORETICAL RESULTS BY THE USE OF A SCALE MODEL
S. P. KING (Westland Helicopters, Ltd., Yeovil, Somerset, England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 21-Sept. 3, 1982, Paper. 17 p. Research supported by the Ministry of Defence (Procurement Executive). refs
The validation of theoretical predictions for the onset and degree of instability in ground resonance has been obtained by the use of a scale model of the Lynx rotor system. The theoretical model is described, as is the experimental rig. The effect of some important parameters which can influence ground resonance - lag stiffness, fuselage frequencies and mode shapes, blade incidence and flap stiffness - is assessed. In general good agreement between the theoretical and experimental results is obtained; sufficient to give confidence in the use of the theory as a design tool.
Author

A84-19633#
EXPERIMENTAL MODAL ANALYSIS
MR. TROUVE and MR. CHABASSIEU (SocieteNationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 7 p.
An experimental modal analysis software program is applied to the dynamic behavior characterization of a structure, in order to identify its vibration modes. The technique is based on the application of transfer function measurements to a multi-degree-of-freedom identification program and a mode shape animation program. This procedure is presently applied to a planetary gear carrier, the complex fluid/structure interaction in helicopter fuel tanks, and a helicopter structure encompassing the forward bottom surfaces, tail boom, and fin assembly.   O.C.

A84-19636#
DESIGN AND DEVELOPMENT OF THE SEA KING COMPOSITE MAIN ROTOR BLADE
A. H. VINCENT (Westland Helicopters, Ltd., Yeovil, Somerset, England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 15 p.
In 1979, a contract for the design and development of a composite main rotor blade for a helicopter was awarded to an aerospace company. The objective of the involved program was to produce a true retrofit blade for the Sea King helicopter which would provide the operator with a replacement blade with lower life cycle costs, longer life, and greater damage tolerance. As part of the requirement to minimize costs it was decided to reproduce the performance and dynamic characteristics of the metal blade. Attention is given to preliminary design, aspects of detail design, the manufacturing process, questions of

substantiation philosophy, structural elements, fatigue and static tests, and additional preflight tests. G.R.

A84-19638*# Analytical Methods, Inc., Bellevue, Wash.
CALCULATION OF ROTOR/AIRFRAME INTERFERENCE FOR REALISTIC CONFIGURATIONS
D. R. CLARK and B. MASKEW (Analytical Methods, Inc., Bellevue, WA) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 25 p. refs
(Contract NAS2-10620; NAS2-8788)
The results of a fully coupled calculation of the flow around representative helicopter configurations are presented. The effect of fuselage components on the rotor flowfield and the overall wake structure is detailed and the aerodynamic interference between the different parts of the aircraft is discussed. In particular, the flowfield developed by the rotor head is followed and the effect of a rotor head cap and pylon modifications in redirecting the rotor head flow are illustrated. Good correlation between measured and calculated fuselage airloads in low-speed flight is achieved and correspondence with observed flowfield behavior is demonstrated. Author

A84-19643#
GROUND FLIGHT TESTS OF A PASSIVE ROTOR ISOLATION SYSTEM FOR HELICOPTER VIBRATION REDUCTION
D. BRAUN (Messerschmitt-Boelkow-Blohm GmbH, Munich, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 18 p. Research supported by the Bundesministerium fuer Forschung und Technologie. refs
The development of a passive nodal rotor isolation system to reduce rotor induced 4/rev cabin vibrations in the BK 117 helicopter is described. The system consists of one lateral and four vertical uniaxial anti-resonance isolators serving as connecting members between fuselage and main gearbox for the specific isolation of rolling moments as well as lateral and vertical forces. Two types of uniaxial isolator elements were applied, one with a mechanically driven pendulum and designed for vertical installation, and the other a lateral isolator fitted with a pendulum with a hydraulic transmission. Results of an on-ground shake test showed a satisfactory isolation efficiency for 4/rev lateral, vertical, and roll excitation. In flight tests of the system the lateral and vertical vibrations were below 0.1 g in the entire forward speed range. A vibration level of 0.15 g was measured in the transition flight region. J.N.

A84-19648#
TRADE-OFF CONSIDERATIONS FOR ENVIRONMENTAL CONTROL SYSTEM ON BOARD OF HELICOPTERS
M. ANDRIANO, V. MARCHIS (Torino, Politecnico, Turin, Italy), and A. MANNINI (Microtecnica-Torino, Turin, Italy) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p. refs
A comparison is made of the cooling capabilities of different Environmental Control Systems (ECS) in helicopters, for the purpose of selecting the best system. To evaluate the systems a coefficient of performance is defined. Despite structure complexity, power penalities are reducible by recirculating cabin air, or by employing a mechanically driven air compressor. Results show the compressed recirculation boot-strap system to be the most efficient, with the pressure throttled systems to be the least efficient. Because of weight penalties, different ECS are recommended depending on the duration of helicopter flights. C.M.

A84-19649#
ON THE ADEQUACY OF MODELING DYNAMIC INFLOW FOR HELICOPTER FLAP-LAG STABILITY
G. H. GAONKAR, V. V. S. S. SASTRY, T. S. R. REDDY (Indian Institute of Science, Bangalore, India), and D. A. PETERS (Washington University, St. Louis, MO) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 31 p. refs
(Contract NSF CME-79-06304)
A hierarchy of thirteen unsteady and quasisteady inflow models is generated for predicting flap-lag damping in hovering and forward flight. It comprises the development of 5x5 inflow-gain matrices in analytic form from available numerical data. It is based on a time-delayed, unsteady momentum theory according to a first-order harmonic description of inflow and on an unsteady actuator-disk theory according to both first and second-order harmonic descriptions of inflow. In the absence of test data, the analytical model from the unsteady actuator-disk theory with a second-order harmonic representation is taken as a base-line model for comparative purposes only. For typical flight regimes (advance ratio mu = 0.2-0.4), the quasisteady treatment of a simplified actuator-disk model adequately predicts lag regressing and collective mode damping, albeit several unexpected subtleties do occur. Author

A84-19650#
NEW ASPECTS ON HELICOPTER ROTOR DYNAMICS
K. HEIER and R. RISCHER (Muenchen, Technische Universitaet, Munich, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 23 p. refs
In dynamic investigations, it is necessary to represent the higher harmonic oscillations of a helicopter rotor blade, since local deviations supply the solutions of blade deflection partial differential equations, such as those derived for flapping, lagging and torsion by Huboldt and Brooks (1958). A Ritz variation formulation is presently used as the basis of a calculation program by means of which blade oscillation modes and bending behavior can be determined. O.C.

A84-19652#
THE ANELASTIC COMPLIANT ROTOR - AN ANALYTIC AND EXPERIMENTAL INVESTIGATION
V. V. UTGOFF (U.S. Naval Academy, Annapolis, MD) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 35 p.
A long-standing objective of the VTOL community is to obtain a performance which is comparable to that achieved by fixed wing aircraft coupled with a vertical takeoff and landing and hover capability. Various types of designs considered with this goal in mind have included varieties of powered lift aircraft, tilt-rotor and tilt-wing machines, and airplanes with stoppable and retractable rotor blades. The present study is concerned with a concept which involves rotor blades fabricated from unidirectional Kevlar fabric impregnated with silicone rubber which serves as the upper and lower surface and carries tensile loads. The obtained blades have essentially zero torsional and flapping rigidity and assume their shape as a result of aerodynamic and inertia forces. G.R.

A84-19653#
AUTOMATIC GENERATION OF HELICOPTER ROTOR AEROELASTIC EQUATIONS OF MOTION
M. P. GIBBONS (Florida State University, Tallahassee, FL) and G. T. S. DONE (City University, London, England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 16 p. Research supported by the Ministry of Defence. refs
The generation of reasonably comprehensive aeroelastic equations of motion for a helicopter rotor requires usually a consideration of several axes of reference in the analysis. The

mathematical work needed in the derivation of these equations can, therefore, become quite involved. The present investigation is concerned with an approach in which the equations of motion are generated automatically on the digital computer, as far as it is possible. Attention is given to the basis of the employed method and the investigations carried out regarding numerical accuracy. The equations of motion in differential form are considered, taking into account general expressions, mass terms, aerodynamic terms, stiffness terms, steady state equations, and equations of motion in perturbation coordinates. G.R.

A84-19661#
EH101 DESIGN - A COLLABORATIVE PROGRAMME
B. J. MAIN (Westland Helicopters, Ltd., Yeovil, Somerset, England) and P. ALLI (Costruzioni Aeronautiche Giovanni Agusta S.p.A., Gallarate, Italy) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 15 p.

The design concept and development strategy of the EH101 3-engine 14,200-kg-maximum-weight naval (ASW) helicopter being developed jointly by the UK and Italy are characterized. The EH101 is intended to replace the current SH3-D by 1989, with first flight scheduled for 1986, and to meet the requirements of civilian customers. The collaborative structure of the development program, involving equal participation by Westland and Agusta, is illustrated with charts and explained. The initial design aims; the design criteria; and the main features, systems, and performance specifications of the defined aircraft are discussed. The EH101 will have a 6.5 x 2.39 x 1.82-m cabin and will be able to transport 30 passengers or 3630 kg of cargo over ranges of 500 and 400 n miles, respectively, with all-weather capability and cruising speed 150 kts at 3000 ft and 20 C. D.G.

A84-19663#
DEVELOPMENT OF THE WESTLAND 30
J. E. CLARK (Westland Helicopter, Ltd., Yeovil, Somerset, England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 20 p.

A new short-range helicopter for the civil market has been produced by an aerospace company in the United Kingdom. This aircraft has now been granted civil certification. Two new versions of this helicopter type have now been designed. A description is presented of the differences between these developments and the basic aircraft, taking into account the performance and other benefits provided by the new developments with respect to the sectors of the civil market for which the two new versions were optimized. The potential for further development is also examined, giving particular attention to the main gearbox, the semirigid rotor head, and a composite main rotor blade. G.R.

A84-19672#
THE DAMAGE TOLERANCE APPROACH TO THE CANADAIR CL-600
D. R. TURNER and C. MANDERS (Canadair Ltd., Saint Laurent, Quebec, Canada) (International Council of the Aeronautical Sciences, Congress, 13th, Seattle, WA, Aug. 23-27, 1982) Canadian Aeronautics and Space Journal (ISSN 0008-2821), vol. 29, Sept. 1983, p. 228-242. refs

The paper presents the program by which Canadair Limited addressed the Damage Tolerance requirements of FAR Part 25.571, Amendment 45. The introduction of this amendment required a detailed study of crack growth rates and critical crack lengths to develop a consistent approach to inspection intervals and inspectability. The analytic and test procedures used for this program are presented, together with a description of the verification methodology. The philosophy of Damage Tolerance as applied to the CL-600 Challenger is also presented. Author

A84-19678
SERVICE LIFE OF SAILPLANES MADE OF CFRP
C. KENSCHE (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart, West Germany) Fibre Science and Technology (ISSN 0015-0568), vol. 18, Feb. 1983, p. 95-108. Research sponsored by the Bundesministerium fuer Verkehr. refs

Attention is given to the design features, performance capabilities and service life values of two spars and one wing constructed from carbon fiber-reinforced plastic for use in a telescopic-wing concept sailplane, the Nimbus 2. Comparisons are made with accumulated performance experience from comparable, glass fiber-reinforced plastic sailplane structures. After dynamic loading tests, the spars and wing were subjected to residual strength tests. Periodic measurements were conducted for stiffness behavior over the course of a simulated 18,000-hour service life. O.C.

A84-19698#
VIBRATION DAMPING FOR A HINGED-BLADE HELICOPTER ROTOR [ELIMINACJA DRGAN PRZEGUBOWEGO WIRNIKA SMIGLOWCA]
B. ZURAKOWSKI Instytut Lotnictwa, Prace (ISSN 0509-6669), no. 93, 1983, p. 3-79. In Polish. refs

The permissible level of vibration in the cockpit and passenger cabin of a helicopter is analyzed, and methods for reducing the vibration level are discussed. The operation of various resonance-type vibration absorbers is considered, and it is shown that the efficiency of an absorber can be improved by the use of a special constant-frequency pendulum (a tautochrone in a centrifugal-force field). These considerations serve as the basis of a new design concept of a rotor vibration absorber for a prototype helicopter. Details of computation and formula derivation are given for the proposed design solution. B.J.

A84-19885#
ELECTRO-IMPULSE DEICING - CONCEPT AND ELECTRODYNAMIC STUDIES
R. L. SCHRAG and G. W. ZUMWALT (Wichita State University, Wichita, KS) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 8 p.
(AIAA PAPER 84-0021)

The operating principles and design of electroimpulse deicing coils for aircraft-wing leading edges are discussed. Flat-wound copper-ribbon coils are placed at a short distance from the leading-edge skin (covered with a highly conductive Cu or Al film doubler) and pulsed with the discharge of a high-voltage capacitor switched by a thyristor. Strong repulsive forces are generated by the eddy current induced in the skin/doubler and by the coil current for periods of aobut 300 microsec. The results of ballistic-pendulum and field-diagnostics experiments on 30-turn, 2-in-diameter, 0.188-in-thick Cu-ribbon coils at gap distances up to 0.1 in, voltages of 700-1225 V, and capacitances of 200-600 microfarad are presented graphically and discussed in terms of design criteria. T.K.

A84-19886*# Wichita State Univ., Kans.
ELECTRO-IMPULSE DEICING - STRUCTURAL DYNAMIC STUDIES, ICING TUNNEL TESTS AND APPLICATIONS
W. D. BERNHART and G. W. ZUMWALT (Wichita State University, Wichita, KS) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. NASA-supported research.
(AIAA PAPER 84-0022)

This paper contains a discussion of the comparison of analytical and experimental results of the dynamic response of a flat rectangular plate subjected to electro-impulse type deicing forces. Early attempts in this correlation have been hampered by the complex leading edge geometries of the airfoils tested to date. The lack of a suitable analytical model for a typical leading edge structure has prompted these preliminary investigations of simple geometries, beginning with a flat plate and to be followed by a

semi-cylindrical leading edge representation. The comparisons reported herein are thus limited to rectangular plate models. Project plans and icing tunnel results are given. Author

A84-20134
ARMY LHX SPURS ROTORCRAFT DESIGN
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 80-83.

The U.S. Army's 'Airland Battle 2000' concept, which envisions the use of large numbers of light scout/attack/utility helicopters designated 'LHX' on a 24-hour, all-weather basis, is becoming the backdrop for U.S. rotorcraft technology development programs. In the near term, the primary focus of industrial research will be the definition of new Army helicopter requirements, such as the air-air combat capability that is anticipated for the Central European theater of operations. Attention is being given to technology demonstration and integration programs, the reduction of size and power requirements, the reduction of manpower requirements, standardization between the LHX and JVX vehicle families, and the simplification of systems and crew workloads through the application of advanced avionics. Aeromechanics, propulsion, structural design, avionics, weapons, and aircraft survivability will be areas of intensive development effort. O.C.

A84-20135
MILITARY SEEKING UPGRADED CAPABILITIES
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 84, 85, 87, 89.

The AH-1 Cobra, UH-1 utility, and OH-58 scout helicopters, as well as the OH-6A scout helicopter, are to be replaced by the LHX family of military rotorcraft. The U.S. Army has formulated its design requirements as two distinct airframes employing common dynamic components and subsystems. One of the airframes, designated 'LHX-SCAT', is to perform the scout and attack missions, while the other, designated LHX-UH, will be employed in utility and observation roles. Army planners note that the LHX family's requirements for small size, light weight, agility, operational simplicity, low life cycle cost, reliability, survivability and mission effectiveness entail the extensive application of advanced composite structures, advanced rotor systems, integrated cockpit controls and displays, interactive voice controls, reduced radar and IR signatures, and an advanced fire control and target acquisition system. O.C.

A84-20136
IMPROVED TESTING METHODS ENHANCING ROTOR RESEARCH
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 101, 103-105.

Attention is given to the accelerated pace of helicopter rotor technology development as a result of improved methods for the measurement of dynamic behavior, enhanced rotor concept simulation and evaluation capabilities, and the increased use of wind tunnel and flight research vehicle testing for novel rotor concepts. One of the key developments in this research climate has been the use of laser velocimeters in measurements of the flow around rotor blades, as well as the vortices generated at the blade tips. The new triservice VTOL craft designated 'JVX', and the U.S. Army's light helicopter 'LHX' family, are the first rotorcraft development programs specifically calling for a wind tunnel testing program. NASA and the U.S. Army are sponsoring several hardware-oriented research programs for both near- and long-term rotorcraft applications. O.C.

A84-20137
EUROPEANS PURSUE ROTOR DEVELOPMENT
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 109, 113, 115.

An assessment is made of current European proprietary helicopter rotor technology development programs. In France, attention has been given to the evaluation of rotor blade shapes, and the examination of test results from the application of the 'Triflex' composite concept to helicopter tail rotors. In West Germany, tests have begun on a BO 105 helicopter equipped with a bearingless main rotor system. In Britain, use has begun to be made of the technology developed in the course of the British Experimental Rotor Program, with the installation of a novel blade design on the prototype Lynx 3 helicopter. Construction methods for this new blade are highly automated, and the blade possesses both a high tolerance to ballistic impact and a low radar signature. French wind tunnel tests indicate that a swept-back parabolic blade rotor tip yields a 5-8 percent reduction in power requirements for a three-blade rotor. O.C.

A84-20141
COMPANIES EXPANDING COMPOSITE USES
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 137, 138, 141 (3 ff.).

The next generation of U.S. Army rotorcraft will constitute the first mass-produced military aircraft having composite material primary structures. Such extensive use of composites will impart to the light rotorcraft (LHX) family and Joint Services Advanced Vertical Lift Aircraft (JVX) not only lighter weight, but also reduced parts counts, improved ballistic impact tolerance, and lower life cycle costs than those of metallic/composite mixed structure rotorcraft. The Army's Advanced Rotorcraft Technology Integration and Advanced Composite Airframe (ACAP) programs are primarily responsible for the development work done to date. Beginning in 1986, ACAP flight test vehicles will be subjected to radar cross section measurement tests which will study radar shaping and shielding concepts and investigate electronic operability problems in composite aircraft. O.C.

A84-20599
THE 'AFFORDABLE' FIGHTER MARKET
B. WANSTALL Interavia (ISSN 0020-5168), vol. 39, Jan. 1984, p. 23-26.

The 'affordability' of the range of fighter aircraft types from cannon-armed advanced trainers to missile-armed, specialized interceptors depends on a country's size, wealth, the international significance of its resources, and the perceived threat. Attention is presently given to the fighter aircraft that are currently available for export in the $5-15 million price range. The low price end of the market encompasses such Soviet-built aircraft as the MiG-21 variants and the Western Hawk 60, Alpha Jet and AMX. The high price aircraft available include the F-16 and Mirage 2000. The JAS39 Gripen and IAI Lavi, currently under development, are also intended for export. The F-20, a Mach 2-capable development of the highly successful F-5 export series aircraft, is expected to be an attractive choice for air forces contemplating a medium price ($10 million) multirole fighter. O.C.

A84-20798
THE EVOLUTION OF THE HELICOPTER FOR THE YEAR 2000 [EVOLUTION DE L'HELICOPTERE AL'HORIZON 2000]
G. BEZIAC and M. POLYCHRONIADIS (SocieteNationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France) L'Aeronautique et l'Astronautique (ISSN 0001-9275), no. 102, 1983, p. 3-14. In French.

The primary objectives of current advanced helicopter design and development projects are reviewed, and predictions for the year 2000 are offered. The present and future civilian and military helicopter markets are characterized, and possible improvements in airframe, main-rotor hub and blades, tail rotor, transmission, auxiliary equipment and flight control, and military systems are discussed and illustrated with drawings, graphs, and photographs of experimental aircraft. A 15-20-percent reduction of drag due to parasitic effects, a 10-percent weight savings by using composite materials, a 15-percent reduction in specific fuel consumption, lower production and maintenance costs, reduced vibration and noise, 15 percent greater cruising speed, and a 50-percent reduction in passenger cost per km are projected. Tilt-rotor configurations are briefly considered. T.K.

A84-20799
THE AMERICAN FIGHTER NORTHRUP F-20 TIGERSHARK [LE CHASSEUR AMERICAIN NORTHROP F-20 TIGERSHARK]
D. LAURENT L'Aeronautique et l'Astronautique (ISSN 0001-9275), no. 102, 1983, p. 50-69. In French. refs

The F-20 aircraft, an improved version of the F-5 designed primarily for export, is characterized in detail. The development history is traced, and the subcontractors and their contributions are listed. The airfoil, horizontal and vertical stabilizers, fuselage, landing gear, propulsion, fuel, flight control, armament, and avionics are discussed and illustrated. Flight-test data are summarized, and the main performance and design parameters are compared with those of similar aircraft in a table.   T.K.

A84-21222* Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
AIRCRAFT INTERIOR NOISE MODELS - SIDEWALL TRIM, STIFFENED STRUCTURES, AND CABIN ACOUSTICS WITH FLOOR PARTITION
L. D. POPE, E. G. WILBY (Bolt Beranek and Newman, Inc., Canoga Park, CA), C. M. WILLIS, and W. H. MAYES (NASA, Langley Research Center, Hampton, VA) Journal of Sound and Vibration (ISSN 0022-460X), vol. 89, Aug. 8, 1983, p. 371-417. refs
(Contract NAS1-15782)

As part of the continuing development of an aircraft interior noise prediction model, in which a discrete modal representation and power flow analysis are used, theoretical results are considered for inclusion of sidewall trim, stiffened structures, and cabin acoustics with floor partition. For validation purposes, predictions of the noise reductions for three test articles (a bare ring-stringer stiffened cylinder, an unstiffened cylinder with floor and insulation, and a ring-stringer stiffened cylinder with floor and sidewall trim) are compared with measurements.   Author

A84-21289*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE DEGRADATION OF A TYPICAL TWIN ENGINE COMMUTER TYPE AIRCRAFT IN MEASURED NATURAL ICING CONDITIONS
R. J. RANAUDO, K. L. MIKKELSEN, R. C. MCKNIGHT (NASA, Lewis Research Center, Cleveland, OH), and P. J. PERKINS, JR. (Analex Corp.., Dayton, OH) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 31 p. refs
(AIAA PAPER 84-0179)

The performance of an aircraft in various measured icing conditions was investigated. Icing parameters such as liquid water content, temperature, cloud droplet sizes and distributions were measured continuously while in icinig. Flight data wre reduced to provide plots of the aircraft drag polars and lift curves (CL vs. alpha) for the measured 'iced' condition as referenced to the uniced aircraft. These data were also reduced to provide plots of thrust horsepower required vs. single engine power available to show how icing affects engine out capability. It is found that performance degradation is primarily influenced by the amount and shape of the accumulated ice. Glaze icing caused the greatest aerodynamic performance penalties in terms of increased drag and reduction in lift while aerodynamic penalties due to rime icing were significantly lower. Previously announced in STAR as N84-13173
                                                Author

A84-21306#
INCORPORATING STOL CAPABILITY INTO TACTICAL FIGHTER AIRCRAFT CONCEPTS
R. H. HENDRICKSON, R. E. KREPSKI (Grumman Aerospace Corp., Bethpage, NY), and R. E. HUDSON, JR. (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 8 p.
(AIAA PAPER 84-0573)

This paper reviews the evolution of a short takeoff and landing (STOL) capable, dual role tactical fighter concept employing near-term technology. With this tactical fighter concept the diverse requirements of missions, weapon loadings, STOL capability and point performance are satisfied by a single, dual role configuration. The performance characteristics postulated for the design were substantiated through an extensive wind tunnel test program conducted at both AEDC and NASA LRC. The wind tunnel test results will be discussed and include performance data correlations, high angle of attack stability and control, and confirmation of canard control capability to 60 degrees angle of attack. Results of a powered model test covering induced power effects, ground proximity effects and control capability of an all-moving canard with blown flap will also be presented. The paper concludes with an appraisal of the impact of advanced technology on the integration of STOL capability into a tactical fighter concept.
                                                Author

A84-21549
THE GIANTS OF GEORGIA
Air International (ISSN 0306-5634), vol. 26, Feb. 1984, p. 61-68, 87-90.

A development history is given for the U.S. Air Force's C-5 airlift aircraft, with attention to the modifications that will be featured in its C-5B variant. While the C-5B will be externally indistinguishable from the C-5A, it will incorporate a new, long service life wing which employs a novel aluminum alloy that exhibits improved resistance to fracture and corrosion caused by stress or exfoliation. A modified wing with charateristics similar to those of the C-5B is also being retrofitted on all C-5As currently in service. The C-5B engine, the TF39-GE-1C, will also be fitted on all C-5As by the end of 1985. Both aircraft will be able to carry such high density loads as two M-1 main battle tanks. Attention is given to the design features and performance characteristics of the C-5B.
                                                O.C.

A84-21797
ASSESSMENT OF CERTAIN MERITS OF FSW AND EFFECT OF THE SIGN OF THE SWEEP ANGLE ON THE STRESSING OF A WING STRUCTURE
A. SOUAHI (Cranfield Institute of Technology, Cranfield, Beds., England) Aeronautical Journal (ISSN 0001-9240), vol. 87, Nov. 1983, p. 348-351. refs

The advantages of forward swept wings (FSW) over aft swept wings (ASW) and the effect of sweep angle sign on wing stress distribution are treated in a comparative design study of the supersonic V/STOL aircraft and by mathematical analysis. The FSW V/STOL requires lower control forces in hover, and the FSW-canard has improved pilot visibility. Compared to AFW, FSW shows a 5 to 10 percent reduced bending moment. However, when bending moment and torque are calculated with mutually perpendicular axes, the spanwise axis coinciding with the shear-center line, the FSW's resolved bending moment along most of the span averages 35 percent higher than that of ASW. FSW resolved torque is opposite in sign and much larger in magnitude than ASW. It is also shown that FSW has a smaller shear force distribution and that its front spar shear load is slightly higher than that of ASW's rear spar.   C.M.

A84-21798
A RECONSIDERATION OF THE TAIL-WHEEL IN AN ACTIVELY CONTROLLED, UNDERCARRIAGE MANAGEMENT SYSTEM
W. G. MOLYNEUX Aeronautical Journal (ISSN 0001-9240), vol. 87, Nov. 1983, p. 352-354.

Advantages of the technologically improved tail-wheel configuration over a nose-wheel configuration for an actively controlled undercarriage management system are presented. A comparison is made between the tail-wheel layout, which has a minimum auxiliary wheel weight when disposed well in the aircraft's rear, and the nose-wheel layout, in which heavy braking does not cause nosing over or overturning. Modern developments in electronics and avionics allow for the following tail-wheel layout improvements: reduction nosing over tendency with heavy braking; decrease of drag-induced instability; elimination of tail drop on touch-down; control of tail leg extension; and improvement of pilot's view. Though performance gains are predicted, a more detailed

assessment is advised to ascertain the system's cost-effectiveness in spite of its additional complexity.   C.M.

A84-21799
A VECTORED-THRUST ROTOR FOR HELICOPTER ANTI-TORQUE APPLICATIONS
W. G. MOLYNEUX   Aeronautical Journal (ISSN 0001-9240), vol. 87, Nov. 1983, p. 357-360. refs

The novel vectored thrust (VT) rotor concept presented, which incorporates a rotating, peripheral array of airfoils whose incidence is varied cyclically at the rotational frequency of the array, generates a thrust vector in any direction within the rotor's sphere of action. It is suggested that a rotor of this configuration may replace the tail unit of the conventional single rotor helicopter, to provide a lighter and more compact configuration with superior performance. Attention is given to the structural and mechanical design problems posed by the VT rotor, and it is noted that they can be solved through exploitation of advanced composite material properties.
                                                                    O.C.

A84-22172*#   Mississippi Univ., University.
BENEFITS OF DUAL WINGS OVER SINGLE WINGS FOR HIGH-PERFORMANCE BUSINESS AIRPLANES
M. D. RHODES and B. P. SELBERG (Missouri-Rolla, University, Rolla, MO)   (International Council of the Aeronautical Sciences, Congress, 13th, and AIAA Aircraft Systems and Technology Conference, Seattle, WA, August 22-27, 1982, Proceedings. Volume 1, p.496-511) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 116-127. refs
(Contract NAG1-26)

Previously cited in issue 20, p. 3149, Accession no. A82-40931

A84-22400
A CANOPY MODULE ESCAPE SYSTEM FOR FUTURE TACTICAL AIRCRAFT
E. R. SCHULTZ (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH)   SAFE Journal, vol. 13, Winter 1983, p. 25-31.

A review of crew escape statistics shows that the high dynamic pressure and low altitude/adverse attitude conditions are the most hazardous areas of flight envelope for crew escape. Attempts to improve system performance in one of these flight regimes have often resulted in degradation in the other area. A need exists for a single crew escape system which provides windblast and acceleration protection at speeds in excess of 700 knots yet reacts fast enough to satisfy the unique low altitude/adverse attitude requirements. The reclined ejection seat coupled with the single piece transparency provides an excellent opportunity to exploit the canopy escape system concept for advanced tactical aircraft. This concept, however, may not react fast enough for the low altitude/adverse attitude situation. Consequently, a hybrid system is proposed combining the advantages of the open ejection seat with those of the canopy escape system. It is concluded that new technologies under development in the USAF in digital adaptive control, selectable thrust rockets and attitude control could provide the basis for developing such a system. It is also concluded that integration of the escape system into the airframe should be achieved in the conceptual design of the aircraft to influence the design of the crew station and aerodynamic stabilizers.   Author

A84-22498
FUTURE AIRLINER FLIGHT DECKS - HARNESSING THE NEW TECHNOLOGY
P. CONDOM   Interavia (ISSN 0020-5168), vol. 39, Feb. 1984, p. 113-116.

Having reached a technology development stage at which there is almost unlimited choice of airliner flight deck display and control system configurations, an attempt is being made to formulate the appropriate design criteria for future aircraft. Studies concerned with the configuration of ergonomic flight decks have been conducted under the European program, designated EPOPEE, whose first phase has resulted in the A310 airliner's flight deck.

EPOPEE studies are giving attention to: (1) symbology for flight and navigation displays, (2) such novel control devices as the side-stick controller, (3) automatic flight control, (4) radio aid management, (5) the control and monitoring of aircraft systems,and (6) the integration of such future avionics as the T-CAS anticollision system, Mode S transponders, and data links.   O.C.

N84-16116*#   Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
ON-BOARD NEAR-OPTIMAL CLIMB-DASH ENERGY MANAGEMENT
A. R. WESTON, E. M. CLIFF, and H. J. KELLEY   *In its* Climb-Dash Real-Time Calculations 6 p   Jul. 1983   refs   Presented at the Am. Control Conf., San Francisco, 22-24 Jun. 1983   Previously announced as N83-16329
(Contract NAG1-203)
Avail: NTIS HC A02/MF A01   CSCL 01B

On-board real time flight control is studied in order to develop algorithms which are simple enough to be used in practice, for a variety of missions involving three dimensional flight. The intercept mission in symmetric flight is emphasized. Extensive computation is required on the ground prior to the mission but the ensuing on-board exploitation is extremely simple. The scheme takes advantage of the boundary layer structure common in singular perturbations, arising with the multiple time scales appropriate to aircraft dynamics. Energy modelling of aircraft is used as the starting point for the analysis. In the symmetric case, a nominal path is generated which fairs into the dash or cruise state.   S.L.

N84-16117*#   Virginia Polytechnic Inst. and State Univ., Blacksburg.
OPTIMAL SYMMETRIC FLIGHT WITH AN INTERMEDIATE VEHICLE MODEL
P. K. A. MENON, H. J. KELLEY, and E. M. CLIFF   *In its* Climb-Dash Real-Time Calculations 11 p   Jul. 1983   refs   Presented at the AIAA Guidance and Control Conf., Gatlinburg, Tenn., 15-17 Aug. 1983   Previously announced as A83-41715
(Contract NAG1-203)
Avail: NTIS HC A02/MF A01   CSCL 01B

The present investigation is concerned with an examination of optimal symmetry flight on the basis of the intermediate vehicle model. The analysis is partly based upon an exploration of Euler solutions for the path-angle-as-control model carried out by Kelley (1958). The current analysis takes into account higher-order optimality conditions and 'chattering-control' phenomena. Attention is given to details regarding the intermediate vehicle model, the Legendre-Clebsch necessary condition, the conjugate-point test, and the numerical solution of the time-range problem. It is found that the flight path angle takes on the role of control variable in the model. From physical considerations, it can be seen that when a positive margin of thrust over drag exists, the maximum-range climb trajectory without time or fuel constraints has no proper maximum nor an upper bound.   G.R. (IAA)

N84-16118*#   Virginia Polytechnic Inst. and State Univ., Blacksburg.
ENERGY STATE REVISITED
H. J. KELLEY, E. M. CLIFF, and A. R. WESTON   *In its* Climb-Dash Real-Time Calculations 5 p   Jul. 1983   refs   Presented at the AIAA Atmospheric Flight Mech. Conf., Gatlinburg, Tenn., 15-17 Aug. 1983   Previously announced as A83-41960
(Contract NAG1-203)
Avail: NTIS HC A02/MF A01   CSCL 01B

Kaiser (1944) has introduced the concept of 'resultant height' in connection with aircraft minimum-time climbs. Its use as a state variable in trajectory work is attractive because it is a 'slower' variable than either altitude or velocity. Kelley (1972, 1973) has made an attempt to synthesize 'slow' state variables in connection with singular-perturbation procedures. In the present investigation, attempts are made to synthesize both 'fast' and 'slow' variables for the minimum-time-climb problem along lines explored by Kelley. Attention is given to climb equations, energy-modeling simplifications, 'slow'-variable choice, 'fast'-variable-choice

considerations, a singular-perturbation analysis, the choise of a 'fast' variable, and the climb-dash problem.　　　　G.R.(IAA)

N84-16126#　Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).　Inst. fuer Flugmechanik.
ESTIMATION OF FLIGHT-MECHANICAL MOTION CHARACTERISTICS WITH KALMAN FILTERS [SCHAETZUNG FLUGMECHANISCHER BEWEGUNGSGROESSEN MITTELS KALMAN-FILTER]
E. PLAETSCHKE　*In its* Lect. of a Flight Mech. Conf. p 85-99 Jul. 1982　refs　In GERMAN
Avail: NTIS HC A07/MF A01
A data evaluation system was developed to estimate flight-mechanical characteristics from in flight test measurements. The measurements concern specific aerodynamic forces, angular velocities, and air data (flight velocity, angle of attack, and sliding angle). The measurement data are incompatible due to zero point drift, false calibrations, and noise. The data evaluation system uses the redundancy between the data through the equations of motion to estimate the errors, resulting in a compatible set of data. The state variables are Kalman filter estimated.
　　　　Author (ESA)

N84-16163*#　Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
WEIGHT AND BALANCE FOR THE AIRMASS INCORPORATED SUNBURST MODEL C ULTRALIGHT
Nov. 1983　92 p　refs
(Contract NAG1-345)
(NASA-CR-175356; NAS 1.26:175356; KU-FRL-6135-2)　Avail: NTIS HC A05/MF A01　CSCL 01C
The results of the weight and balance determination done for an ultralight aircraft are presented. The weight and balance determination encompassed finding weight and center of gravity of each component, determining the center of gravity of the ultralight in an X, Y, Z reference plane, and calculating the mass moments and products of inertia. The relations were calculated for various pilot weights and fuel loadings. The fuel varied from empty to five gallons (31.05 lbs), and the pilots ranged from 90 to 260 pounds. The weighings of components total 277.48 lbs (no pilot and no fuel).　　　　S.L.

N84-16164*#　National Aeronautics and Space Administration, Washington, D. C.
SOLAR-CELL AIRPLANE SOLAIR 1
Mar. 1983　5 p　Transl. into ENGLISH from Aerodurier (West Germany), no. 6, 1982 p 690　Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASW-3541)
(NASA-TM-77061; NAS 1.15:77061)　Avail: NTIS HC A02/MF A01
The article describes the Solair 1 solar cell-powered aircraft. Measures to reduce the weight of the craft are cited.　　Author

N84-16165#　Toronto Univ., Downsview (Ontario).　Inst. for Aerospace Studies.
DESIGN OF A LATERAL RIDE COMFORT CONTROL SYSTEM FOR STOL AIRCRAFT
J. E. BYRNE　Dec. 1983　139 p　refs
(UTIAS-TN-247; ISSN-0082-5263)　Avail: NTIS HC A07/MF A01
A ride comfort control system is designed for a STOL aircraft with the aim of reducing lateral acceleration levels within the passenger compartment. The control laws are designed using both state feedback and gust feedforward loops based upon a rigid aircraft model. The feedback gains are found using linear optimal control theory. The gust feedforward gains are determined from a generalized inverse formulation that minimizes gust excitation of the dutch roll mode. The lateral directional control surfaces available are the existing rudder and ailerons. Control law performance is evaluated using root-mean-square values calculated from the spectral response of the aircraft with a Von Karman gust spectrum input. The turbulent gust input is based upon Etkin's

four-point model which includes linear gust spatial gradients.
　　　　B.W.

N84-16166*#　National Aeronautics and Space Administration, Washington, D. C.
SUN WORSHIPER: MCCREADY'S SOLAR CHALLENGER FLIES OVER THE ENGLISH CHANNEL
H. PENNER　Dec. 1983　12 p　Transl. into ENGLISH from Flug Rev. (West Germany), no. 9, Sep. 1981　p 67-69　Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASW-3541)
(NASA-TM-77327; NAS 1.15:77327)　Avail: NTIS HC A02/MF A01　CSCL 01C
The background for the project of a solar-powered aircraft, designed and built by Dr. Paul McCready of California, is reported with details on the aircraft design and its flight across the English Channel.　　　　Author

N84-16167*#　Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
OPTIMAL SYMMETRIC FLIGHT WITH AN INTERMEDIATE VEHICLE MODEL Interim Report
P. K. A. MENON, H. J. KELLEY, and E. M. CLIFF　Sep. 1983　143 p　refs
(Contract NAG1-203)
(NASA-CR-173181; NAS 1.26:173181)　Avail: NTIS HC A07/MF A01　CSCL 01C
Optimal flight in the vertical plane with a vehicle model intermediate in complexity between the point-mass and energy models is studied. Flight-path angle takes on the role of a control variable. Range-open problems feature subarcs of vertical flight and singular subarcs. The class of altitude-speed-range-time optimization problems with fuel expenditure unspecified is investigated and some interesting phenomena uncovered. The maximum-lift-to-drag glide appears as part of the family, final-time-open, with appropriate initial and terminal transient exceeding level-flight drag, some members exhibiting oscillations. Oscillatory paths generally fail the Jacobi test for durations exceeding a period and furnish a minimum only for short-duration problems.　　　　S.L.

N84-16168*#　National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
X-29 FLIGHT-RESEARCH PROGRAM
T. W. PUTNAM　Jan. 1984　16 p　refs　Presented at the AIAA 2nd Flight Test Conf., Las Vegas, Nev., 16-18 Nov. 1983 Previously announced in IAA as A84-13724　Prepared in cooperation with NASA. Ames Research Center
(NASA-TM-86025; H-1213; NAS 1.15:86025)　Avail: NTIS HC A02/MF A01　CSCL 01C
The X-29A aircraft is the first manned, experimental high-performance aircraft to be fabricated and flown in many years. The approach for expanding the X-29 flight envelope and collecting research data is described including the methods for monitoring wind divergence, flutter, and aeroservoelastic coupling of the aerodynamic forces with the structure and the flight-control system. Examples of the type of flight data to be acquired are presented along with types of aircraft maneuvers that will be flown. A brief description of the program management structure is also presented and the program schedule is discussed.　　　　Author (IAA)

N84-16169#　Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT FROM 1 JANUARY 1962 TO 31 DECEMBER 1982 Semiannual Summary Report
W. J. WILLIAMS　1 May 1983　155 p
(AD-A134289)　Avail: NTIS HC A08/MF A01　CSCL 01A
This report is a specialized summary of normal acceleration data recorded by counting accelerometers. Data are separated by calendar time and mission category. Only data reported in the counting accelerometer program are included.　　Author (GRA)

N84-16170# Boeing Vertol Co., Philadelphia, Pa.
HELICOPTER FLYING QUALITIES CHARACTERISTICS-CH-46E, VOLUME 1 Final Report
Warminster, Pa. Naval Air Development Center 3 Oct. 1983
160 p 4 Vol.
(AD-A134320; NADC-81118-60-VOL-1) Avail: NTIS HC A08/MF A01 CSCL 01B
This document defines the flying qualities characteristics of the CH-46E helicopter. The data are representative of both the metal-bladed and composite-bladed versions. Analytically computed static trim data are presented for a wide range of configurations (gross weight, c.g.) and flight conditions (airspeed, altitude, sideslip, climb, autorotation). Correlation of trim data with available flight test data is provided for validation. Analytically computed static stability and control derivatives are compiled for significant combinations of configuration and flight condition. Time history data relating to dynamic stability, control response and Stability Augmentation System failures are extracted from flight test records obtained during the contractor's CH-46E SLEP 2 flight test program. GRA

N84-16171# Boeing Vertol Co., Philadelphia, Pa.
HELICOPTER FLYING QUALITIES CHARACTERISTICS-CH-46E, VOLUME 2 Final Report
Warminster, Pa. Naval Air Development Center 3 Oct. 1983
26 p 4 Vol.
(AD-A134321; NADC-81118-60-VOL-2) Avail: NTIS HC A03/MF A01 CSCL 01B
This Volume contains plotted trim data obtained from the Boeing Vertol Tandem Rotor Trim and Stability Analysis Program (A-97) for the CH-46E helicopter. Data for the following flight regimes are presented: Level flight; Maximum power climb and autorotation; Constant altitude sideslips; and Sideward flight. For each flight regime considered, the four cockpit control positions, plus helicopter pitch and roll attitudes, are plotted vs. airspeed or sideslip angle. GRA

N84-16172# Boeing Vertol Co., Philadelphia, Pa.
HELICOPTER FLYING QUALITIES CHARACTERISTICS-CH-46E, VOLUME 3 Final Report
Warminster, Pa. Naval Air Development Center 3 Oct. 1983
206 p 4 Vol.
(AD-A134322; NADC-81118-60-VOL-3) Avail: NTIS HC A10/MF A01 CSCL 01B
This volume contains transient time-history data extracted from the CH-46E SLEP 2 flight test program conducted at the Boeing Vertol flight test facility from 20 June to 31 October 1977. Four general types of data record are presented: Dynamic stability (longitudinal pulse response); Control responses (longitudinal, lateral and directional step response); SAS failure (longitudinal, lateral and directional hardover SAS input); and Engine failure (single engine step reduction to ground idle). In each record, the response of the helicopter in the axis of disturbance (control input, SAS failure, etc.) is thoroughly described by time-histories of six to eight relevant parameters in that axis, while interaxis coupling is assessed by a sampling of four parameters from each of the remaining axes. GRA

N84-16173# Boeing Vertol Co., Philadelphia, Pa.
HELICOPTER FLYING QUALITIES CHARACTERISTICS-CH-46E, VOLUME 4 Final Report
Warminster, Pa. Naval Air Development Center 3 Oct. 1983
524 p 4 Vol.
(AD-A134323; NADC-81118-60-VOL-4) Avail: NTIS HC A22/MF A01 CSCL 01B
For complete abstract, See AD-A134320. This volume contains the trim and stability derivative output data obtained from the Boeing Vertol Tandem Rotor Trim and Stability Analysis Program (A-97), for the CH-46E helicopter. GRA

N84-16174# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
EFFECT OF BLADE STRUCTURAL PARAMETERS ON HELICOPTER VIBRATIONAL CHARACTERISTICS Final Report, Mar. 1977 - Aug. 1983
D. A. PETERS Oct. 1983 87 p
(Contract DAAG29-80-C-0092; DAAG29-77-G-0103)
(AD-A134547; ARO-14585.4-EG; ARO-17067.8-EG; FR-3) Avail: NTIS HC A05/MF A01 CSCL 01C
This final report covers 6 1/2 years of ARO-sponsored research into the fundamental mechanisms of rotor vibrations. This research effort has spanned several areas of vibration analysis including structural coupling, rotor-body interaction, dynamic stall, and the computational problems associated therewith (especially rotor trim). The main body of this report consists of reprints of some of the papers written during the reporting period. Topics include: Effect of Blade Structural Parameters on Helicopter Vibrational Characteristics; Coupled Rotor/Airframe Vibration Analysis by a Combined Harmonic-Balance, Impedance Matching Method; Application of an Analytic Stall Model to Time-History and Eigenvalue Analysis of Rotor Blades; and Comparison of Three Numerical Trim Methods for Rotor Air Loads. GRA

N84-16175# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
NOISE LEVELS AND DATA ANALYSES FOR SMALL PROP-DRIVEN AIRCRAFT
J. S. NEWMAN, T. L. BLAND, and S. A. DABOIN Aug. 1983
191 p
(AD-A134598; FAA-EE-83-1) Avail: NTIS HC A09/MF A01 CSCL 01C
During the Summer and Fall of 1982, the FAA Office of Environment and Energy, Noise Abatement Division, conducted a noise measurement program to evaluate proposed revisions of International and U.S. noise certification standards for light-weight propeller-driven aircraft. Tests were conducted using both single-and twin-engine propeller-driven light aircraft. Normally aspirated, turbo-charged, and turboprop engines were included, as were both fixed and variable pitch propellers. Takeoff noise measurements were made for eighteen aircraft. Additional measurements for nine of these aircraft (during level flight) provided sufficient data to examine the relationship of noise level versus helical tip Mach Number and engine power setting. This report presents noise measurements, aircraft position data, meteorological data, and cockpit instrument readings acquired during the test. Data analyses include: corrections to proposed noise certification reference conditions, development of Mach Number and Power Correction functions, empirical examination of sound propagation, regression of noise level versus weight (and the logarithm of weight) and correlation of acoustical intensity (AL) and acoustical dose (SEL) noise metrics. While this report concludes that a takeoff noise certification procedure is feasible and will provide consistent results for a given aircraft, it remains uncertain whether or not equal stringency (or even comparable stringency) can be achieved between the existing certification procedure and the proposed takeoff procedure. GRA

N84-17171*# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
DESIGN OF HELICOPTER ROTOR BLADES FOR OPTIMUM DYNAMIC CHARACTERISTICS Semiannual Status Report, 16 Jul. 1983 - 17 Jan. 1984
D. A. PETERS, T. KO, A. KORN (Southern Illinois Univ., Edwardsville), and M. P. ROSSOW (Southern Illinois Univ., Edwardsville) 17 Jan. 1984 29 p refs
(Contract NAG1-250)
(NASA-CR-175380; NAS 1.26:175380; SASR-4) Avail: NTIS HC A03/MF A01 CSCL 01C
The optimal design of helicopter rotor blades is addressed. The forced response of an initial (i.e., non-optimized) blade to those of a final (optimized) blade are compared. Response of starting design and optimal designs for varying forcing frequencies, blade response to harmonics of rotor speed, and derivation of

mass and stiffness matrices or functions of natural frequencies are discussed. Author

N84-17172*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
DYNAMICS AND CONTROL OF FORWARD SWEPT WING AIRCRAFT Final Report, 1 Nov. 1982 - 31 Dec. 1983
D. K. SCHMIDT and T. A. WEISSHAAR 10 Feb. 1983 43 p refs
(Contract NAG1-305)
(NASA-CR-175369; NAS 1.26:175369) Avail: NTIS HC A03/MF A01 CSCL 01C
Aspects of non-zero differential game theory with application to multivariable control synthesis and optimal linear control law design using optimum parameter sensitivity analysis are discussed. Author

N84-17173*# Rockwell International Corp., Los Angeles, Calif.
AIRLOADS RESEARCH STUDY. VOLUME 1: FLIGHT TEST LOADS ACQUISITION Final Report
M. D. BARTLETT, T. F. FELTZ, A. D. OLSEN, JR., D. B. SMITH, and P. F. WILDERMUTH Jan. 1984 125 p 2 Vol.
(Contract NAS4-2769)
(NASA-CR-170409; NAS 1.26:170409; NA-76-562) Avail: NTIS HC A06/MF A01 CSCL 01C
The acquisition of B-1 aircraft flight loads data for use in subsequent tasks of the Airloads Research Study is described. The basic intent is to utilize data acquired during B-1 aircraft tests, analyze these data beyond the scope of Air Force requirements, and prepare research reports that will add to the technology base for future large flexible aircraft. Flight test data obtained during the airloads survey program included condition-describing parameters, surface pressures, strain gage outputs, and loads derived from pressure and strain gauges. Descriptions of the instrumentation, data processing, and flight load survey program are included. Data from windup-turn and steady yaw maneuvers cover a Mach number range from 0.7 to 2.0 for a wing sweep position of 67.5 deg. Author

N84-17174*# Rockwell International Corp., Los Angeles, Calif.
AIRLOADS RESEARCH STUDY. VOLUME 2: AIRLOAD COEFFICIENTS DERIVED FROM WIND TUNNEL DATA Final Report
M. D. BARTLETT, T. F. FELTZ, A. D. OLSEN, JR., D. B. SMITH, and P. F. WILDERMUTH Jan. 1984 116 p refs 2 Vol.
(Contract NAS4-2769)
(NASA-CR-10410; NAS 1.26:170410; NA-76-563) Avail: NTIS HC A06/MF A01 CSCL 01C
The development of B-1 aircraft rigid wind tunnel data for use in subsequent tasks of the Airloads Research Study is described. Data from the Rockwell International external structural loads data bank were used to generate coefficients of rigid airload shear, bending moment, and torsion at specific component reference stations or both symmetric and asymmetric loadings. Component stations include the movable wing, horizontal and vertical stabilizers, and forward and aft fuselages. The coefficient data cover a Mach number range from 0.7 to 2.2 for a wing sweep position of 67.5 degree. Author

N84-17175*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FRICTION AND WEAR BEHAVIOR OF ALUMINUM AND COMPOSITE AIRPLANE SKINS
K. E. JACKSON Feb. 1984 28 p refs Prepared in cooperation with Army Research and Technology Labs., Fort Eustis, Va.
(Contract DA PROJ. 1L1-61102-AH-45)
(NASA-TP-2262; NAS 1.60:2262; AVSCOM-TR-83-B-7; L-15697) Avail: NTIS HC A03/MF A01 CSCL 01C
Friction and wear behavior was determined for small skin specimens under abrasive loading conditions typical of those occurring on the underside of a transport airplane during emergency belly landing. A test apparatus consisting of a standard belt sander provided the sliding surface. Small test specimens constructed of aluminum, standard graphite-epoxy composite, aramid-epoxy composite, and toughened-resin composites were tested undar a range of pressures, belt velocities, and belt-surface textures. The effects of these test variables on the wear rate and the coefficient of friction are discussed and comparisons are made between the composite materials and aluminum. The effect of fiber orientation in the composite materials on wear rate was also investigated. In addition, tests were performed in which thermocouples were imbedded into the various test specimens to obtain temperature-time histories during abrasion. Author

N84-17176# Simula, Inc., Tempe, Ariz.
CRASHWORTHY CYCLIC CONTROL STICK Final Report, Oct. 1982 - Jun. 1983
D. K. EISENTRAUT and R. E. ZIMMERMAN Nov. 1983 78 p
(Contract DAAK51-82-C-0039; DA PROJ. 1L1-62209-AH-76)
(AD-A135150; TR-83412; USAAVRADCOM-TR-83-D-23) Avail: NTIS HC A05/MF A01 CSCL 01D
In helicopter crashes, a potential source of injury is crewmember impact with the cyclic control stick. This program sought to alleviate that hazard through the development of a crashworthy cyclic control stick retrofittable to the UH-60A Black Hawk and AH-1S Cobra helicopters. Concepts examined for this application included those employing frangible, deformable, telescoping, collapsing, and separating sticks, as well as the cutters. The selected design was a slip joint separating stick, with an energy absorber, activated by crewmember impact. Four prototypes were fabricated and tested, both statically and dynamically. The newly designed sticks were shown to withstand specified emergency loads, while separating at crash impact loads of 1/2 to 1/3 that of conventional sticks. Further, the energy-absorbing capacity of the stick prevents completion of stick delethalization motion for loads of very short duration and thus minimizes the risk of inadvertant separation. Author (GRA)

N84-17177# Information Spectrum, Inc., Arlington, Va.
LESSONS LEARNED--ADVANCED ATTACK HELICOPTER
G. E. MORROW, C. LOWE, and E. H. BIRDSEYE 15 Jul. 1983 117 p
(Contract MDA903-82-G-0055)
(AD-A135521; ISI-V-3835-04) Avail: NTIS HC A06/MF A01 CSCL 05A
This study focuses on the success of the AAH Program Office in coping with problems and issues in such areas as technology, technical risks, business management, and transitioning to production. It identified the following basic factors which contributed to the success of the AAH program: continuity of key personnel within the program management office; innovative planning and effective management of the competition; continuing Army support of the AAH program as an integral part of force modernization; and intensive management when required. Lessons learned include: Recognition that a design-to-cost program may not serve to discipline cost growth; Fabrication of prototypes during engineering or advanced development is necessary; Subsystem integration on a complex weapon system is facilitated by establishment of an interface control working group; Program office personnel at the test site can improve test continuity and provide managers with timely status reports; The magnitude of the logistics support analysis effort must be clearly stated by the Government and well understood by all contractors and subcontractors; Current spare requirements should be based on the current expected failure rates not on the maturity rate which may not be reached for several years; The success of a weapon system acquisition program is as dependent upon overcoming the chaos of the Federal budgetary process, the degree of agreement obtained among executive departments, and the leadership of the program manager as it is upon hardware development. GRA

06

AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

A84-19614#
A PERFORMANCE MONITORING SYSTEM FOR HELICOPTERS
G. F. WALKER (Marconi Avionics, Ltd., Rochester, Kent, England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 17 p.

The present investigation is concerned with the development of a performance monitoring system for helicopters. The technique adopted for the development of the performance model represents an extension of the use of energy concepts for helicopter flight path determination. The considered approach is based on the relationship between the power supplied to the rotor system and power required to overcome losses and to change the flight profile. The detection of helicopter performance degradation in icing encounters is identified as a requirement in order to enhance safety of flight. Attention is given to a method for detecting such degradation, using the principles of energy conservation and rotor dynamics. G.R.

A84-22860#
ACCESS TO MAINTENANCE DATA VIA AIDS - FUTURE ASPECTS OF THE EXPANDED AIDS
H. KALBE (Messerschmitt-Boelkow-Blohm GmbH, Hamburg, West Germany) Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, AIDS-Symposium, 12th, Technische Universitaet Braunschweig, Brunswick, West Germany, Sept. 20-22, 1983, Paper. 27 p.
(MBB-UT-17-83-OE)

The application of an expanded version of the Aircraft Integrated Data System (AIDS) of the A-310 aircraft to the maintenance of selected aircraft systems is discussed. The expanded AIDS developed by Lufthansa is characterized and illustrated with block diagrams and lists of the parameters measured. The parameter-call-up and display, printout, and programmable-real-time-report functions of the current expanded AIDS could be used to aid troubleshooting in the line replaceable units of the ARINC-700 radio-navigation system. Sample interrogations are shown, and the further improvement of AIDS to provide failure isolation and detection for the ARINC systems is recommended. T.K.

N84-16177*# Mitre Corp., McLean, Va.
A CONCEPT FOR REDUCING OCEANIC SEPARATION MINIMA THROUGH THE USE OF A TCAS-DERIVED CDTI Final Report
W. D. LOVE, A. L. MCFARLAND, and J. S. LUDWICK Jan. 1984 165 p refs
(Contract NAS1-17138)
(NASA-CR-172258; NAS 1.26:172258; MTR-83W203) Avail: NTIS HC A08/MF A01 CSCL 01D

A concept for using a cockpit display of traffic information (CDTI), as derived from a modified version of the Traffic Alert and Collision Avoidance System 2 (TCAS 2), to support reductions in air traffic separation minima for an oceanic track system is presented. The concept, and the TCAS modifications required to support it, are described. The feasibility of the concept is examined from a number of standpoints, including expected benefits, maximum alert rates, and possible transition strategies. Various implementation issues are analyzed. Pilot procedures are suggested for dealing with alert situations. Possible variations of the concept are also examined. Finally, recommendations are presented for other studies and simulation experiments which can be used to further verify the feasibility of the concept. Author

N84-16178*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IN-TRAIL DYNAMICS OF MULTIPLE CDTI-EQUIPPED AIRCRAFT QUEUES
J. R. KELLY and T. S. ABBOTT Feb. 1984 28 p refs
(NASA-TM-85699; L-15692; NAS 1.15:85699) Avail: NTIS HC A03/MF A01 CSCL 01D

One of the potential problems of in-trail self-spacing with a Cockpit Display of Traffic Information (CDTI) is whether dynamic oscillations would occur in a queue of aircraft flying an approach, similar to the "accordion" effect seen with the queue of automobiles in stop-and-go traffic. In order to gain some insight into this potential problem, a brief experiment was conducted with the Transport Systems Research Vehicle (TSRV) ground-based simulator equipped with CDTI which presented the position of other aircraft in the area. Three simulation sessions were conducted wherein queues of up to nine aircraft were built, each one self-spacing on the preceding aircraft. The aircraft crews were rotated to ensure that the pilots had no prior knowledge of the lead aircraft behavior they would be following. Two different spacing criteria were employed: a constant time predictor criterion and a constant time delay criterion. The experiment failed to uncover any dynamic oscillatory tendencies in queues of seven to nine aircraft. Author

N84-17178*# Research Triangle Inst., Research Triangle Park, N.C.
CDTI TARGET SELECTION CRITERIA Final Report
C. L. BRITT, C. M. DAVIS, C. B. JACKSON, and V. A. MCCLELLAN Washington, D.C. NASA Feb. 1984 133 p refs
(Contract NAS1-16304)
(NASA-CR-3776; NAS 1.26:3776; RTI/2095/00-01-F) Avail: NTIS HC A07/MF A01 CSCL 01D

A Cockpit Display of Traffic Information (CDTI) is a cockpit instrument which provides information to the aircrew on the relative location of aircraft traffic in the vicinity of their aircraft (township). In addition, the CDTI may provide information to assist in navigation and in aircraft control. It is usually anticipated that the CDTI will be integrated with a horizontal situation indicator used for navigational purposes and/or with a weather radar display. In this study, several sets of aircraft traffic data are analyzed to determine statistics on the number of targets that will be displayed on a CDTI using various target selection criteria. Traffic data were obtained from an Atlanta Terminal Area Simulation and from radar tapes recorded at the Atlanta and Miami terminal areas. Results are given in the form of plots showing the average percentage of time (or probability) that an aircraft equipped with a CDTI would observe from 0 to 10 other aircraft on the display for range settings on the CDTI up to 30 n. mi. and using various target discrimination techniques. Author

N84-17179# Illinois Univ., Urbana. Decision and Control Lab.
CONTROL STRATEGIES FOR COMPLEX SYSTEMS FOR USE IN AEROSPACE AVIONICS Final Scientific Report, 1 Jul. 1978 - 30 Jun. 1983
J. B. CRUZ, JR., P. V. KOKOTOVIC, and W. R. PERKINS Aug. 1983 29 p
(Contract AF-AFOSR-3633-78; AF PROJ. 2304)
(AD-A135072; DC-63; T-129; AFOSR-83-0981TR) Avail: NTIS HC A03/MF A01 CSCL 09C

The research program was focused on investigating new methods of analysis, synthesis, and optimization of control systems, particularly those which contain disturbance inputs, uncertain parameters, and other modeling uncertainties. The general objective was to develop new methods to improve the performance of control systems by counteracting the effects of these modeling uncertainties and disturbance inputs. The new methods can be classified into several general categories; multivariate feedback design in the frequency domain based on the comparison sensitivity matrix and robustness concepts, adaptive observers and adaptive control, multiple time-scale and singular perturbations, chained

aggregation methods, and incentive controllers for hierarchical systems. Author (GRA)

N84-17181# Army Aviation Research and Development Command, St. Louis, Mo.
AN AIRBORNE PROGRAMMABLE DIGITAL TO VIDEO CONVERTER
V. J. ORGANIC and E. A. KARCHER Oct. 1983 38 p
(Contract DA PROJ. 1L1-62202-AH-85)
(AD-A134839; USAAVRADCOM-TR-83-E-2) Avail: NTIS HC A03/MF A01 CSCL 09E
A microprocessor-controlled digital to video converter has been developed for low-level helicopter flight studies. The converter displays digitally generated contour maps in 8 or 16 shades of grey or 8 colors, aircraft symbology, and alphanumerics in a standard television format. Author (GRA)

07

AIRCRAFT PROPULSION AND POWER

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

A84-19627#
EVOLUTION OF TURBOMECA'S TURBINE ENGINES CONTROL SYSTEMS OR DIGITAL ELECTRONICS - WHY AND HOW?
M. DE CENIVAL (Turbomeca, S.A. - Brevets Szydlowski; Bizanos, Pyrenees-Atlantiques, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 10 p.
Attention is given to a proprietary program for the development of digital helicopter engine control systems that are based on inexpensive microprocessors. It is noted that while the weight, volume, and overall cost of such a digital system are at present approximately equal to those of mechanical systems with electronic (analog, rather than digital) ancilliary equipment, the performance obtainable from a digital system and the effects of a learning curve on costs, as the certification of more digital systems is achieved, will decisively favor the microprocessor-based alternative. Design and development costs will be especially reduced, since the production of new units will only entail the adaptation of existing software and the redimensioning of the fuel pump and metering unit. O.C.

A84-19891#
MULTIDIMENSIONAL TURBULENT COMBUSTION - ANALYSIS, APPLICATIONS AND LIMITATIONS
H. C. MONGIA, R. S. REYNOLDS, and R. SRINIVASAN (Garrett Turbine Engine Co., Phoenix, AZ) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 24 p. refs
(AIAA PAPER 84-0477)
In connection with the objective to enhance turbine cycle efficiency, recent trends in turbopropulsion engine development are related to an achievement of higher cycle pressure ratios and increased turbine inlet temperature levels. These goals make it necessary to improve burner characteristics. Multidimensional analytical models have been used in order to complement empirical combustor design procedures. A number of these models for the combustor flow field prediction is described. The application of these models in the design system is discussed along with an evaluation of their merits and limitations, taking into account various submodels of turbulent reactive flows. It is found to be vital to develop a numerical scheme with a higher order of accuracy to minimize numerical errors. G.R.

A84-20025
OBSERVATIONS ON THE HIGHLY CONED PROPELLER
W. G. MOLYNEUX Aeronautical Journal (ISSN 0001-9240), vol. 87, Dec. 1983, p. 394-397. refs
Attention is given to the unique aerodynamic features of highly coned propeller concepts employing cyclic and collective control of blade pitch. Collective pitch control of the blades is associated with the generation of axial thrust, while cyclic pitch control generates a thrust component normal to the axis of rotation together with an associated moment. By an appropriate combination of cyclic and collective pitch control, a thrust vector can in principle be generated in any desired direction within the propeller's sphere of influence. The configuration, however, poses severe structural design problems. While the application of directionally fiber-reinforced composite construction to coned propellers may surmount such problems, a weight penalty which minimizes the attractiveness of such designs must still be anticipated. No outstanding prospective application of the coned propeller concept has been identified. O.C.

A84-20108
HIGH ENERGY IGNITERS - THE DEVELOPMENT OF MATERIALS SUITABLE FOR CONTINUOUS IGNITION
G. N. BURLAND Aerospace (UK) (ISSN 0305-0831), vol. 11, Jan. 1984, p. 24, 25, 28-31.
A high energy (HE) igniter introduces a spark which initiates combustion in gas turbine engines. The spark is produced when the voltage applied between electrodes exceeds the breakdown voltage. Attention is presently given to the operation of the HE igniter and the determinants of its operational life, the effects of oxidation, thermal stresses, electrode spark erosion, the erosion of surface discharge material, and engine application variations. Emphasis is given to the development and testing of the K502 HE igniter material, which has exhibited satisfactory performance in gas turbine environments. O.C.

A84-20138
ARMY, NASA LEAD TESTING OF TURBOSHAFT COMPONENTS
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 117, 118, 123.
The U.S. Army's Aviation Systems Command and NASA are joint sponsors of research and development programs for the smallto medium-sized turboshaft engines and components required by the next generation of military helicopters and tilt-rotor vehicles. Rotorcraft applications in the 1990s are foreseen for the advanced compound turbine-diesel engines, 5000-shp Modern Technology Demonstrator Engine, and 800-1200 shp Advanced Technology Engine which are currently under development. The highest risk technology is that of the compound turbine-diesels, which use a high speed, high pressure two-stroke diesel mounted below the turbine to supplant the conventional combustor section. Nevertheless, this engine offers the greatest potential reduction in specific fuel consumption. O.C.

A84-20139
EUROPEANS STRESS TURBOSHAFT EFFICIENCY
Aviation Week and Space Technology (ISSN 0005-2175), vol. 120, Jan. 16, 1984, p. 125, 126, 128, 129.
European programs for the development of advanced helicopter turboshaft engines are noted to be concentrating on the production of more powerful turbomachinery which are lighter and simpler, accruing longer service lifetimes and lower maintenance costs. Several of these development programs involve multinational cooperation, in keeping with the political and industrial requirements of joint European military helicopter programs which more evenly distribute technical and financial responsibilities among manufacturers. Attention is given to the TM 333 turboshaft engine, which in its modularity for ease of maintenance exemplifies current European development efforts. Also noted are advancements in the application of graphite-reinforced composites to compressor casings, the use of supercritical turbine airfoils, and large ceramic hot section component fabrication methods. O.C.

A84-20400
CT7 - POWER FOR THE NEW COMMUTERS
J. MOXON Flight International (ISSN 0015-3710), vol. 124, Sept. 17, 1983, p. 756-760.

An assessment is made of the design features, operational capabilities, and maintenance and repair advantages of the CT7 family of 1700-hp class turboprop engines for commuter and executive aircraft. The design is distinguished from those of its competitors, which employ two-stage centrifugal compression, by the use of a five-stage axial compressor before the single axial compression stage. The gearbox used replaces the traditional star gear system with a lighter and simpler compound idler layout, and a centrifugal inlet particle separator is used which may eliminate 85-95 percent of all sand and dust. The CT7 turboprop family maintains close commonality with the T700 military turboshaft engine which is the basis of its design. O.C.

A84-20869#
POSSIBILITIES OF RAISING THE EFFICIENCY OF THE COMPRESSION PROCESS IN A CENTRIFUGAL COMPRESSOR ROTOR [MOZLIWOSCI PODWYZSZENIA SPRAWNOSCI PROCESU SPREZANIA W WIRNIKU SPREZARKI ODSRODKOWEJ]
J. TRACZYK and J. BREJNAK Instytut Lotnictwa, Prace (ISSN 0509-6669), no. 92, 1983, p. 3-13. In Polish.

Causes of energy losses in a centrifugal compressor rotor are analyzed. It is shown that the efficiency of the compression process can be improved by optimizing the shape of the compressor housing and by the circumferential grooving of its surface. B.J.

A84-21217
CORRECTION OF FAN NOISE FOR EFFECTS OF FORWARD FLIGHT
R. K. AMIET (United Technologies Research Center, East Hartford, CT) Journal of Sound and Vibration (ISSN 0022-460X), vol. 89, July 22, 1983, p. 243-259. Research supported by the United Technologies Corp. refs

When acoustic measurements are made on a static engine test stand, the data must be corrected for the effects of forward flight to predict correctly the noise characteristics of the engine in flight. A ray tracing approach is used here to relate the static test case to the flight case. The assumptions of isentropic irrotational flow into the fan inlet and a cylindrical shear layer at the fan exhaust lead to slightly different methods for correcting inlet noise and exhaust noise. The forward flight correction method generally involves both an angle and an amplitude correction. The amplitude correction factors for inlet and exhaust noise are the same as that for a dipole and can be as much as 6 dB for a flight Mach number of 0.3. The angle correction for the inlet noise differs from that of the exhaust noise, and both differ from the generally used correction to retarded angle. Author

A84-21297#
NUMERICAL CALCULATIONS OF PRESSURE OSCILLATIONS IN A SIDE-DUMP RAMJET ENGINE
F. E. C. CULICK (California Institute of Technology, Pasadena, CA) and V. YANG American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 9 p. Research supported by the California Institute of Technology. refs
(Contract AF-AFOSR-80-0265)
(AIAA PAPER 84-0365)

Pressure oscillations in a side-dump ramjet engine have been studied, using a one-dimensional numerical analysis. The engine is treated in two parts: the inlet section, including a region of two-phase flow down-stream of fuel injection, and a dump combustor. Each region is treated separately and matched with the other. Following calculation of the mean flow field, the oscillatory characteristics of the engine are determined by its response to a disturbance imposed on the mean flow. Results have shown favorable comparison with experimental data obtained at the Naval Weapons Center, China Lake. Author

A84-21514#
OPTIMIZATION OF PROPELLER BLADE TWIST BY AN ANALYTICAL METHOD
L. K. CHANG and J. P. SULLIVAN (Purdue University, West Lafayette, IN) AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 252-255. refs

Previously cited in issue 17, p. 2688, Accession no. A82-35021

A84-21579
INTEGRATED SYSTEMS FOR THE AUTOMATIC CONTROL OF AIRCRAFT POWERPLANTS [INTEGRAL'NYE SISTEMY AVTOMATICHESKOGO UPRAVLENIIA SILOVYMI USTANOVKAMI SAMOLETOV]
IU. S. BELKIN, B. V. BOEV, O. S. GUREVICH, IU. V. KOVACHICH, T. S. MARTIANOVA, A. A. SHEVIAKOV, and O. K. IUGOV Moscow, Izdatel'stvo Mashinostroenie, 1983, 288 p. In Russian. refs

The design of integrated systems of powerplant control is examined, with attention given to principles underlying the choice of automatic control programs for powerplants with gas turbine engines. Three stages of integration are considered: the integration of control circuits for engine elements; the integration of automatic control systems for the engine and air intake; and the integration of control systems for the powerplant and the aircraft as a whole. Principles governing the design of an integrated digital powerplant control system are elaborated. B.J.

A84-21852*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW VISUALIZATION AND INTERPRETATION OF VISUALIZATION DATA FOR DEFLECTED THRUST V/STOL NOZZLES
H. C. KAO, P. L. BURSTADT, and A. L. JOHNS (NASA, Lewis Research Center, Cleveland, OH) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 50 p. refs
(AIAA PAPER 84-0102)

Flow visualization studies were made for four deflected thrust nozzle models at subsonic speeds. Based on topological rules and the assumption that observed streaks constitute continuous vector fields, available visualization pictures are interpreted and flow patterns on interior surfaces of the nozzles are synthesized. In particular, three dimensional flow structure and separations are discussed. From the synthesized patterns, the overall features of the flow field in a given nozzle can be approximately perceived. Previously announced in STAR as N84-14147 Author

A84-21880#
EFFECTS OF WATER INGESTION INTO JET ENGINE
S. N. B. MURTHY and C. M. EHRESMAN (Purdue University, West Lafayette, IN) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 12 p.
(AIAA PAPER 84-0542)

Attention is given to the problems experienced by aircraft gas turbine engines upon their ingestion of water in the form of runway sprays, condensed moisture, or rain. Ingestion directly affects such aspects of turbomechanical performance as compressor aerodynamics, the thermodynamic efficiency and flame stability of combustors, and the aerodynamic efficiency of inlets and nozzles. Generally, engine component performance matching and control are altered. Attempts have been made to develop instrumentation and experimental facilities for the study of water ingestion effects, as well as to refine analytical methods by which to interpret results and predict performance variations for the components affected. O.C.

A84-21889
THE CARE AND FEEDING OF GAS TURBINES
T. A. LA PLANTE (USAF, Logistics Operations Center, Wright-Patterson AFB, OH) Air Force Magazine (ISSN 0730-6784), vol. 67, Jan. 1984, p. 64-67.

Attention is given to the military aircraft gas turbine performance and maintainability management practices of the U.S. Air Force Aeronautical Systems Division (ASD) and Air Force Logistics Command (AFLC). The ASD's Deputate for Propulsion strives to refine equipment acquisition processes for engines, in order to ensure that the service possesses state-of-the-art technology for new aircraft. Such technology currently includes active cooling circuits for turbines, electronic control systems, and directionally solidified materials. The AFLC is charged with providing support for operational units and reducing the cost of engine ownership. Its operations emphasize the maintenance of required inventory and specified performance levels, as well as the optimization of reliability and maintainability. Attention is given to experience at ASD and AFLC with the F 100 engine of the F-15 and F-16 fighter aircraft. O.C.

A84-22171#
F100 ENGINE DIAGNOSTIC SYSTEM (EDS) - SUMMARY OF RESULTS
J. A. BOYLES (U.S. Air Force Academy, Colorado Springs, CO) and D. C. BUTTS (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 110-115. refs

Previously cited in issue 19, p. 3271, Accession no. A81-42199

A84-22174*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TONE GENERATION BY ROTOR-DOWNSTREAM STRUT INTERACTION
R. P. WOODWARD and J. R. BALOMBIN (NASA, Lewis Research Center, Cleveland, OH) Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 135-142. refs

Previously cited in issue 10, p. 1378, Accession no. A83-25957

A84-22410
INVESTIGATION OF RANDOM VIBRATIONS OF AIRCRAFT ENGINE BLADES [K ISSLEDOVANIIU SLUCHAINYKH KOLEBANII LOPATOK DVIGATELEI LETATEL'NYKH APPARATOV]
A. D. GERSHGORIN and M. L. KEMPNER (Moskovskii Institut Inzhenerov Zheleznodorozhnogo Transporta, Moscow, USSR) Problemy Prochnosti (ISSN 0556-171X), Jan. 1984, p. 65-67. In Russian. refs

Random steady vibrations of a blade with an elongated root and carrying a dry-friction damper are studied. The blade is modeled as an elastic massless rigidly fixed rod with two concentrated masses, and the dynamic loading applied to the blade is simulated as a steady-state centered random process with constant spectral density $S(\omega)$. A solution is obtained with the statistical linearization method. The optimum friction damper force is chosen which reduces to a minimum the larger of the flexural-stress variances in two blade sections. J.N.

A84-22415
A UNIT FOR AGTE SHAFT STRENGTH TESTING UNDER CYCLIC TORQUE AND AXIAL THRUST LOADING [USTANOVKA DLIA ISSLEDOVANIIA PROCHNOSTI VALOV AGTD PRI TSIKLICHESKOM NAGRUZHENII KRUTIASHCHIM MOMENTOM I OSEVOI SILOI]
V. IA. ARTEMCHUK, V. G. BAZHENOV, A. D. BALIUK, and V. P. KOSOVTSOV Problemy Prochnosti (ISSN 0556-171X), Jan. 1984, p. 120, 121. In Russian.

A unit for testing small-cycle fatigue in gas turbine engine fan shafts under variable cyclic loading is described. The unit can accommodate shafts of up to 250 mm in diameter and 3 m in length with an axial temperature distribution from 150 to 450 C.

The maximum applied torque and axial thrust loading are, respectively, 30 kNm and 70 kNm. A test case for an actual fan shaft 2 m long, of variable cross-section, and with an axial temperature drop from 150 to 400 C is considered. J.N.

A84-22572
MODERN METHODS OF TECHNOLOGICAL PROGRESS IN AIRCRAFT ENGINES [LES MOYENS MODERNES DU PROGRES TECHNOLOGIQUE DANS LES MOTEURS D'AVIONS]
A. HABRARD (SNECMA, Division Recherches et Etudes Avancees, Paris, France) (International Symposium on Air-Breathing Engine, 6th, Paris, France, June 6-10, 1983) L'Aeronautique et l'Astronautique (ISSN 0001-9275), no. 103, 1983, p. 3-20. In French.

Current R&D efforts in the field of turbojet aircraft engines are surveyed and illustrated, with an emphasis on numerical methods in design and on advanced measurement techiques. The role of advanced research in general, and of the SNECMA Division, Recherches et Etude Avancees in particular, in the engine-R&D community in France is characterized. Technological fields reviewed include aerodynamics, combustion, the thermal behavior of high-temperature turbines, mechanical scaling, materials and their processing, acoustics, and control systems. Photographs, graphs, drawings, and block diagrams of processes, designs, and actual components are provided. Both increasing costs and the maturity of turbojet designs are seen as driving the trend to greater cooperation among engine manufacturers. T.K.

A84-22747
EFFECTS OF FLAME TEMPERATURE AND FUEL COMPOSITION ON SOOT FORMATION IN GAS TURBINE COMBUSTORS
D. W. NAEGELI, L. E. DODGE, and C. A. MOSES (Southwest Research Institute, San Antonio, TX) Combustion Science and Technology (ISSN 0010-2202), vol. 35, no. 1-4, 1983, p. 117-131. Army-sponsored research. refs

The dependence of relative soot concentration on flame temperature and fuel composition was measured in a small-scale research combustor. The purpose was to gain a better understanding of the correlation of soot formation with H/C ratio. First, the effect of flame temperature on soot concentration was determined by varying the burner inlet temperature. Then, 10 fuels with H/C ratios in the range of 1.98 to 1.55 were used in an experiment to determine the effects of both flame temperature and fuel composition on relative soot concentration. Flame temperatures were calculated and measured optically by the Kurlbaum technique. Flame opacity measurements were used to determine relative soot concentration. The results showed that while soot concentration increased significantly as flame temperature increased, the increase in soot with fuels of lower H/C ratio was much stronger than could be attributed to associated increases in the flame temperature. Author.

A84-22877*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
SIMPLIFIED ANALYTICAL PROCEDURES FOR REPRESENTING MATERIAL CYCLIC RESPONSE
V. MORENO (United Technologies Corp., Pratt and Whitney Group, East Hartford, CT) and A. KAUFMAN (NASA, Lewis Research Center, Cleveland, OH) Auburn University, Southeastern Conference on Theoretical and Applied Mechanics, 12th, Callaway Gardens, GA, May 10, 11, 1984, Paper. 5 p. refs

Requirements for increased durability of gas turbine hot section structural components have made it necessary to place greater emphasis on accurate structural analysis and life prediction. Linear finite-element analysis is generally sufficient for structural analysis applications. However, for structures in the hot part of the engine, nonlinear structural analysis may be required under certain conditions for the accurate prediction of the local stress-strain response. Nonlinear finite element analysis represents a costly effort which is generally incompatible with the iterative nature of the design process. The present investigation is, therefore, concerned with two simplified procedures for estimating the local

hysteretic response produced by cyclic thermal loading. These procedures reduce the need for nonlinear finite-element analysis.

G.R.

A84-22925*# General Dynamics/Convair, Fort Worth, Tex.
THE APPLICATION OF TURBINE BYPASS ENGINES TO HIGH PERFORMANCE V/STOL AIRCRAFT
A. E. SHERIDAN (General Dynamics Corp., Forth Worth, TX) American Institute of Aeronautics and Astronautics and American Helicopter Society, Aircraft Design, Systems and Operations Meeting, Fort Worth, TX, Oct. 17-19, 1983. 10 p. NASA-sponsored research.
(AIAA PAPER 83-2512)

A study of the application of the turbine bypass engine (TBE) concept to high-performance V/STOL aircraft is in progress. The study is designed to identify the most promising TBE cycles for combination with a remote augmentor lift system (RALS), and to compare them with conventional turbofan RALS and lift-plus-lift/cruise concepts. Three cycles chosen for study are 15- and 30-percent-bypass-bleed TBE with simple RALS and 15-percent-bypass-bleed TBE with a turbo-compressor-RALS combination. Aircraft configurations were developed for the 15-percent-bleed TBE with simple and turbocompressor RALS and sized to a naval, supersonic, deck-launched, intercept mission. Early sizing results indicate that these two concepts give comparable airplane performance, although the simple RALS configuration has some potential design drawbacks that are avoided in the turbo-compressor RALS design. Author

N84-16179*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
DETERMINATION OF THE STATIC PERFORMANCE OF A CUYUNA CC MODEL UL-430RR ENGINE
J. ROSKAM Oct. 1983 101 p refs
(Contract NAG1-345)
(NASA-CR-175354; NAS 1.26:175354; KU-FRL-6135-1) Avail: NTIS HC A06/MF A01 CSCL 21A

The results of static performance tests were carried out on an ultralight engine. A Cuyuna 430 cc, 2 stroke, 2 cylinder model was used to measure thrust, torque, propeller RPM, fuel flow, cylinder head temperature, and change in pressure through the propeller. Measurement of each of the above parameters was taken at specific values of RPM. The propeller's RPM's ranged from idle at approximately 750 RPM to a maximum value of 2810 RPM. The test results were then manipulated to obtain thrust coefficient, power coefficient, shaft horse power, and shaft specific fuel consumption. S.L.

N84-16180*# Massachusetts Inst. of Tech., Cambridge. Gas Turbine and Plasma Dynamics Lab.
OPTIMAL MISTUNING FOR ENHANCED AEROELASTIC STABILITY OF TRANSONIC FANS Interim Report
K. C. HALL and E. F. CRAWLEY Nov. 1983 135 p refs
(NASA-CR-173179; NAS 1.26:173179; GTL-176) Avail: NTIS HC A07/MF A01 CSCL 21E

An inverse design procedure was developed for the design of a mistuned rotor. The design requirements are that the stability margin of the eigenvalues of the aeroelastic system be greater than or equal to some minimum stability margin, and that the mass added to each blade be positive. The objective was to achieve these requirements with a minimal amount of mistuning. Hence, the problem was posed as a constrained optimization problem. The constrained minimization problem was solved by the technique of mathematical programming via augmented Lagrangians. The unconstrained minimization phase of this technique was solved by the variable metric method. The bladed disk was modelled as being composed of a rigid disk mounted on a rigid shaft. Each of the blades were modelled with a single tosional degree of freedom. S.L.

N84-16182*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HIGH ALTITUDE AERODYNAMIC PLATFORM CONCEPT EVALUATION AND PROTOTYPE ENGINE TESTING
J. W. AKKERMAN Jan. 1984 124 p refs
(NASA-TM-58256; S-530; NAS 1.15:58256) Avail: NTIS HC A06/MF A01 CSCL 21E

A design concept has been developed for maintaining a 150-pound payload at 60,000 feet altitude for about 50 hours. A 600-pound liftoff weight aerodynamic vehicle is used which operates at sufficient speeds to withstand prevailing winds. It is powered by a turbocharged four-stoke cycle gasoline fueled engine. Endurance time of 100 hours or more appears to be feasible with hydrogen fuel and a lighter payload. A prototype engine has been tested to 40,000 feet simulated altitude. Mismatch of the engine and the turbocharger system flow and problems with fuel/air mixture ratio control characteristics prohibited operation beyond 40,000 feet. But there seems to be no reason why the concept cannot be developed to function as analytically predicted. Author

N84-16183# General Electric Co., Evendale, Ohio. Aircraft Engine Group.
AIRCRAFT GAS TURBINE GUIDE
Oct. 1980 66 p
(GE-AEG-607R(10/80)) Avail: NTIS HC A04/MF A01

The basic technology and operating procedures are applicable to turbojet, turboshaft, turboprop and turbofan gas turbine engines. A general review of the features of axial flow gas turbine engines is presented. Advanced technology and specific features applicable to General Electric designed engines are emphasized. S.L.

N84-16184*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYTESS: A HYPOTHETICAL TURBOFAN ENGINE SIMPLIFIED SIMULATION
W. C. MERRILL, E. C. BEATTIE (United Technologies Corp., East Hartford, Conn.), R. F. LAPRAD (United Technologies Corp., East Hartford, Conn.), S. M. ROCK (Systems Control Technologies, Inc., Palo Alto, Calif.), and M. M. AKHTER (Systems Control Technologies, Inc., Palo Alto, Calif.) Jan. 1984 23 p refs
(NASA-TM-83561; E-1940; NAS 1.15:83561) Avail: NTIS HC A02/MF A01 CSCL 21E

A users manual for a hypothetical turbofan engine simplified simulation is presented. This digital simulation exists as FORTRAN source code. The program is self-contained and was developed to offer those interested in engine dynamics and controls research an efficient, realistic, and easily used engine simulation. The engine is modeled using a state space formulation. Matrix elements within the linear state space structure are nonlinear functions of various engine variables. S.L.

N84-16185*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIGITAL COMPUTER PROGRAM FOR GENERATING DYNAMIC TURBOFAN ENGINE MODELS (DIGTEM)
C. J. DANIELE, S. M. KROSEL, J. R. SZUCH, and E. J. WESTERKAMP Sep. 1983 109 p refs
(NASA-TM-83446; E-1748; NAS 1.15:83446) Avail: NTIS HC A06/MF A01 CSCL 21E

This report describes DIGTEM, a digital computer program that simulates two spool, two-stream turbofan engines. The turbofan engine model in DIGTEM contains steady-state performance maps for all of the components and has control volumes where continuity and energy balances are maintained. Rotor dynamics and duct momentum dynamics are also included. Altogether there are 16 state variables and state equations. DIGTEM features a backward-differnce integration scheme for integrating stiff systems. It trims the model equations to match a prescribed design point by calculating correction coefficients that balance out the dynamic equations. It uses the same coefficients at off-design points and iterates to a balanced engine condition. Transients can also be run. They are generated by defining controls as a function of time (open-loop control) in a user-written subroutine (TMRSP). DIGTEM

has run on the IBM 370/3033 computer using implicit integration with time steps ranging from 1.0 msec to 1.0 sec. DIGTEM is generalized in the aerothermodynamic treatment of components.

B.W.

N84-16186*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN CONCEPTS FOR LOW-COST COMPOSITE ENGINE FRAMES
C. C. CHAMIS 1983 28 p refs Presented at Aircraft Design Systems and Operations Meeting, Fort Worth, Tex., 17-19 Oct. 1983; sponsored by AIAA and AHS Previously announced in IAA as A83-48331
(NASA-TM-83544; E-1916; NAS 1.15:83544) Avail: NTIS HC A03/MF A01 CSCL 21E
Design concepts for low-cost, lightweight composite engine frames were applied to the design requirements for the frame of commercial, high-bypass turbine engines. The concepts consist of generic-type components and subcomponents that could be adapted for use in different locations in the engine and to different engine sizes. A variety of materials and manufacturing methods were assessed with a goal of having the lowest number of parts possible at the lowest possible cost. The evaluation of the design concepts resulted in the identification of a hybrid composite frame which would weigh about 70 percent of the state-of-the-art metal frame and cost would be about 60 percent. Author (IAA)

N84-16188# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
VISCOUS EFFECTS IN TURBOMACHINES
Loughton, England Sep. 1983 380 p refs In ENGLISH and FRENCH Conf. held in Copenhagen, 1-3 Jun. 1983
(AGARD-CP-351; ISBN-92-835-0340-6) Avail: NTIS HC A17/MF A01
Experts and specialists from industry, research institutes, and universities establish the latest state-of-the-art regarding: viscous-inviscid interactions, viscous flow computations, end-wall boundary layers, and experimental measurements from multistage turbomachines.

N84-16190# National Gas Turbine Establishment, Farnborough (England). Turbomachinery and Installations Dept.
APPLICATION OF AN INVISCID-VISCOUS INTERACTION METHOD TO TRANSONIC COMPRESSOR CASCADES
W. J. CALVERT In AGARD Viscous Effects in Turbomachines 13 p Sep. 1983 refs
Avail: NTIS HC A17/MF A01
Results obtained using an inviscid-viscous interaction method to predict the blade-to-blade flow in axial compressors are compared with experimental data from a number to transonic linear cascades. The cascades cover a wide range of duties, with inlet Mach numbers varying from 0.8 to 1.46 and flow deflections from 70 deg to 50 deg. Generally the predictions are in good agreement with the test data. Author

N84-16191# Vrije Universiteit, Brussels (Belgium). Dept. of Fluid Mechanics.
A VISCID INVISCID INTERACTION PROCEDURE FOR TWO DIMENSIONAL CASCADES
P. JANSSENS and C. HIRSCH In AGARD Viscous Effects in Turbomachines 18 p Sep. 1983 refs
Avail: NTIS HC A17/MF A01
A viscous inviscid interaction scheme was developed in order to predict fluid turning and loss coefficients for arbitrary cascade bladings of axial and centrifugal turbomachines. The effects of the blade surface boundary layers, separation of these boundary layers and the wake downstream of the trailing edge are taken into account by the wake displacement body method. The effective separation line between the inviscid outer flow, separated boundary layers and the wake is iteratively searched using a free streamline method. A Kutta Joukowsky condition at the trailing edge corrects the outlet flow angle and ensures zero loading on the wake. The outer potential flow is solved in a finite element Galerkin

approximation and the boundary layer development is predicted with an integral method. Corrections based on Richardson numbers are included for streamline curvature and Coriolis effects on turbulence. Author

N84-16192# Hochschule der Bundeswehr, Munich. (West Germany).
DESIGN OF TRANSONIC COMPRESSOR CASCADES FOR MINIMAL SHOCK LOSSES AND COMPARISON WITH TEST RESULTS
L. FOTTNER and H. J. LICHTFUSS (Motoren- und Turbinen-Union) In AGARD Viscous Effects in Turbomachines 22 p Sep. 1983 refs Sponsored in part by Bundesministerium der Verteidigung
Avail: NTIS HC A17/MF A01
Blading concepts with respect to optimal profile shape take into account the close interdependence between the pressure distribution on profile suction and pressure side and the boundary-layer development (i.e. the losses) on these surfaces. For transonic compressor bladings with minimal losses, the shock and shock/boundary-layer interaction losses have to be carefully considered. For supersonic inlet conditions these losses were reduced by using wedge-type profile shapes in the supersonic part of the profile (wedge-type). On the other hand the diffusion losses in the subsonic region (rear part of the blade) can be reduced by reducing subsonic deflection of a given vector triangle, resulting in a limited supersonic expansion (MCA-type). Thus, a careful optimization process must be done for the partition of supersonic and subsonic deflection. Cascade tests were carried out for the mid section of a rotor blade of a three-stage transonic compressor. The analysis of these tests and additional laser anemometry measurements within the compressor showed good agreement between design and test and proved the low loss design of the special profile types. Author

N84-16197# Cambridge Univ. (England). Dept. of Engineering.
THE DEVELOPMENT OF UNSTEADY BOUNDARY LAYERS ON THE ROTOR OF AN AXIAL-FLOW TURBINE
H. P. HODSON In AGARD Viscous Effects in Turbomachines 18 p Sep. 1983 refs Sponsored in part by the Central Electricity Generating Board and the Science and Engineering Research Council
Avail: NTIS HC A17/MF A01
The effects of rotor-stator interactions upon the efficiency of a large scale, low speed turbine were investigated. A comparison is made between the performance of the mid-span section of the rotor blades and of a rectilinear cascade of identical geometry. Wind tunnels were operated at a Reynolds number of 3.15 x 10(5). Measurements of the blade surface boundary layers and their associated profile losses are presented. The profile loss of the turbine rotor at mid-span was approximately 50 percent higher than that of the rectilinear cascade. The mean velocity profiles of the boundary layers indicate that this difference is mainly due to the higher growth rate of the suction surface boundary layer on the turbine rotor. The time-resolved boundary layer measurements indicate that the increased growth rate is caused by the interaction of the wakes of the upstream nozzle row with the blade surface boundary layers. This results in a localized transition of the otherwise laminar boundary layers. The boundary layers thus alternate between characteristically laminar and turbulent states during one wake passing cycle. M.G.

N84-16198# Pisa Univ. (Italy). Ist. di Macchine.
AERODYNAMIC COMPUTATION METHOD OF AIRFOIL CASCADES SUBJECTED TO VISCOUS FLOW
P. PSARUDAKIS In AGARD Viscous Effects in Turbomachines 17 p Sep. 1983 refs
Avail: NTIS HC A17/MF A01
A computational method for the determination of aerodynamic characteristics of airfoil cascades subjected to viscous flow is presented. The method is based on the determination of the flux perturbation directly due to the local continuous stream velocity over every single cascade airfoil. Particular attention is given to

the development of a method suitable to decrease computation time and, at the same time, to make possible versatile application to physical phenomena simulation. Various comparisons with theoretical and experimental values carried out by other authors confirm the validity of the present method. Author

N84-16199# Newcastle-upon-Tyne Univ. (England). Lab. for Fluid Mechanics and Thermodynamics.
NUMERICAL SIMULATION OF STALLING FLOWS BY AN INTEGRAL EQUATION METHOD
R. I. LEWIS and D. T. C. PORTHOUSE *In* AGARD Viscous Effects in Turbomachines 17 p Sep. 1983 refs
Avail: NTIS HC A17/MF A01

An integral equation method is presented for the solution of the Navier Stokes equations for stalling aerofoil, cascade or bluff body flows. Vorticity created at the aerofoil or body surface at each time step of a numerical procedure, is diffused into the main stream and convected by the local velocity vector. Viscous diffusion is simulated by a model akin to Brownian motion whereby all shed vorticity elements are given random displacements at each time step. Solutions are shown for boundary layers, bluff bodies, aerofoils and a first attempt at a cascade. M.G.

N84-16200# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
COMPUTING THE THREE DIMENSIONAL BOUNDARY LAYER IN A COMPRESSOR [CALCULS DE COUCHE LIMITE TRIDIMENSIONNELLE DANS UN COMPRESSEUR]
B. AUPOIX and J. COUSTEIX *In* AGARD Viscous Effects in Turbomachines 13 p Sep. 1983 refs In FRENCH; In FRENCH; ENGLISH summary
Avail: NTIS HC A17/MF A01

The study of transport equations for turbulent stress on a turning reference mark or on a curved wall revealed two types of effects. There was a stabilization or destabilization of the turbulence due to the longitudinal curvature with the component of the rotation vector parallel to the wall, and a three dimensional effect when the component of the rotation vector is normal at the wall. The stabilizing or destabilizing effect, as well as that of the exterior turbulence was introduced into a mixing length scheme which was then used to construct families of profiles of the speed of the boundary layer by similitude. The analysis of these families of profiles supplied closure relations for an integral method of calculating three dimensional boundary layers. Transl. by A.R.H.

N84-16201# Stuttgart Univ. (West Germany). Inst. fuer Luftfahrt-Antriebe.
VISCOUS EFFECTS AND HEAT TRANSFER IN A CALCULATION METHOD FOR AXIALSYMMETRIC FLOW IN MULTISTAGE TURBOMACHINES USING THE STREAM FUNCTION
W. SANDEL *In* AGARD Viscous Effects in Turbomachines 10 p Sep. 1983 refs Sponsored in part by Deutsche Forschungsgemeinschaft
Avail: NTIS HC A17/MF A01

A method is described for including viscous effects and heat transfer in a through-flow computation procedure based on the stream function approach for steady axialsymmetric flow. Viscous shear stress and heat conduction relations are used within a coarse grid resolution due to storage and computation time limitations in multistage applications. Near the end walls an analytic function is used to model the dissipation rate. The approach allows for energy transport across streamlines. M.G.

N84-16203# Durham Univ. (England). Dept. of Engineering.
SECONDARY FLOWS AND LOSSES IN A TURBINE CASCADE
D. G. GREGORY-SMITH and C. P. GRAVES (Gilbert Gildes and Gordon, Ltd.) *In* AGARD Viscous Effects in Turbomachines 24 p Sep. 1983 refs Sponsored in part by Rolls Royce, Ltd. and the U.K. Ministry of Defence
Avail: NTIS HC A17/MF A01

An investigation was made of the flow in a cascade of large scale rotor blades of some 110 deg of turning. The aspect ratio (span/chord) was 1.77, and the inlet boundary layer on the end walls was varied around 0.2 of the span. The flow was traversed in great detail on ten planes using cobra type probes with a computerized data recording and analysis system. The results are presented graphically using contour and vector plots on various planes through the flow field. The horse-shoe vortex and passage vortex development are clearly seen, with the upstream boundary layer being shed downstream as a loss core. Another region of high loss is related to a counter vortex in the corner between the suction surface and the end wall. The results were also pitch averaged, and compared with predictions of angle and loss distribution. Some traversing was also carried out using hot wire anemometry. Regions of high turbulence intensity and shear stress were identified, associated with the regions of high loss. Some indication is given of the mechanisms of loss production within the cascade. M.G.

N84-16205# Vrije Universiteit, Brussels (Belgium). Dept. of Fluid Mechanics.
END-WALL BOUNDARY LAYER CALCULATIONS IN MULTISTAGE AXIAL COMPRESSORS
J. DERUYCK and C. HIRSCH *In* AGARD Viscous Effects in Turbomachines 16 p Sep. 1983 refs
Avail: NTIS HC A17/MF A01

A previously developed theory for the calculation of a three dimensional boundary layer along any curved axisymmetric wall surface is summarized. In addition, new defect force correlations take into account the interactions between blades and end-wall boundary layer flows, in particular tip clearance effects, relative motion and secondary losses are included. Velocity profiles are reconstructed from the integral boundary layer thicknesses by use of velocity profile models defined in the meridional and angular directions. The different aspects of the theory are tested systematically on various configurations. It is shown that the overall behavior of axial compressor boundary layers can be simulated with the present method and that the defect force correlations are able to simulate all the secondary flow effects. M.G.

N84-16206# Ecole Centrale de Lyon (France). Lab. de Mecanique des Fluides.
EXPERIMENTAL AND THEORETICAL STUDIES OF PARIETAL VISCOUS BOUNDARIES IN A SINGLE STAGE TRANSONIC COMPRESSOR [ETUDES EXPERIMENTALES ET THEORIQUES DES COUCHES VISQUEUSES PARIETALES DANS UN COMPRESSEUR MONO-ETAGE TRANSSONIQUE]
F. LEBOEUF and H. NAVIERE *In* AGARD Viscous Effects in Turbomachines 10 p Sep. 1983 refs In FRENCH; ENGLISH summary
Avail: NTIS HC A17/MF A01

Experimental results obtained in a one-stage transonic axial flow compressor, which is a typical stage of an aeronautical motor are presented. Emphasis is placed on the velocity vector in front of and downstream of the blades, near the hub and the tip of the machine. These flows are studied theoretically. The main characteristics of the method are that the transfer of information is properly realized while changing a frame of reference. Also a very good computational stability is obtained. In this method, two equations for the transport of two vorticity components are used in parallel with the equations which describe, in an integral form, the 3D viscous layer, and with an equation which describes the inviscid flow at the wall. Comparison between the experimental and theoretical results attests to the validity of the method. Author

N84-16209# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Antriebstechnik.

FLOW MEASUREMENTS IN THE STATOR ROW OF A SINGLE-STAGE TRANSONIC AXIAL-FLOW COMPRESSOR WITH CONTROLLED DIFFUSION STATOR BLADES

R. J. DUNKER *In* AGARD Viscous Effects in Turbomachines 13 p Sep. 1983 refs

Avail: NTIS HC A17/MF A01

The time-dependent three dimensional viscous flow downstream of the rotor in a single-stage transonic axial-flow compressor without inlet guide vanes was measured and analyzed at design and off-design operating conditions. Measurements were made between the blade rows and within the stator row which had been recently redesigned using a controlled diffusion blade design method. Detailed measurements of the blade surface pressure distributions were performed in order to investigate whether the favorable behavior of controlled diffusion blades can be obtained under the real flow conditions within a turbomachine, and not only under those conditions in a cascade. These data, as well as laser-velocimetry data, indicate blade boundary layer separation under some operating conditions. The optical measurements were taken at different instantaneous rotor positions relative to the stator. These results give some insight into the unsteady flow within the stator, e.g. the development of the fluctuating velocity vectors, of the turbulence intensity, of the rotor blade wakes, and of the stator blade boundary layers. M.G.

N84-16210# United Technologies Research Center, East Hartford, Conn. Gas Turbine Technology Div.

COMPRESSOR ROTOR AERODYNAMICS

R. P. DRING, H. D. JOSLYN, and J. H. WAGNER *In* AGARD Viscous Effects in Turbomachines 16 p Sep. 1983 refs

(Contract NAS3-23157; F33615-77-C-2083)

Avail: NTIS HC A17/MF A01 CSCL 20E

Although the numerical sophistication of multi-stage turbomachinery through-flow calculations has evolved to a very high level, the aerodynamic inputs of total pressure loss, deviation and blockage are subject to a high degree of empiricism. There is a need for detailed flow field data in a multi-stage environment in order to bring some discipline to this important aspect of turbomachinery design. A survey of some of the initial results of an in-depth investigation of the aerodynamics of the second stage of a large scale two stage axial compressor is presented. The second stage rotor data are compared with data obtained on an isolated rotor with very thin and then very thick inlet hub and tip boundary layers. The single and multi-stage rotor data presented include surface flow visualization and rotating frame radial/circumferential traverse measurements presented in the form of fullspan contour plots of rotary total pressure. Also presented are the spanwise distributions of loss, deviation and blockage. Some implications of these results for through-flow analyses are discussed. M.G.

N84-16211# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

EXPERIMENTAL VERIFICATION OF AN ENDWALL BOUNDARY LAYER PREDICTION METHOD

C. W. ELROD and J. L. BETTNER (Detroit Diesel Allison Div.) *In* AGARD Viscous Effects in Turbomachines 21 p Sep. 1983 refs

Avail: NTIS HC A17/MF A01

An endwall boundary layer code was verified in a low speed compressor facility and used to compute casing blockage and efficiency penalty in a full-scale engine. Detailed endwall boundary layer measurements and overall compressor performance measurements were obtained for various conditions of surface roughness, porosity and tip clearance in the low speed compressor facility. Stage pressure ratio and stall margin were determined for the single-stage compressor at three corrected speeds. Shroud roughness did not markely reduce overall compressor performance at design conditions, but did result in some loss of stall margin. Shroud wall porosity, on the other hand, did reduce design point

performance, but also substantially increased stall margin. The shroud endwall boundary layer code exhibited overall satisfactory agreement with solid smooth/rough endwall experimental results, but was not as effective for the T56-A-100 experimental results. The code was effective in predicting tip clearance effects. Author

N84-17182# Naval Postgraduate School, Monterey, Calif.

VARIABLE AREA EJECTOR-DIFFUSER MODEL TESTS M.S. Thesis

T. H. WALSH Sep. 1983 122 p

(AD-A134843) Avail: NTIS HC A06/MF A01 CSCL 21E

A modular variable area ejector-diffuser was constructed and tested to establish baseline characteristics that could be used for comparison of results obtained from potential geometric reconfiguration. F404 and TF30 engines (afterburning and non-afterburning modes) were modeled with a scale factor of 22.1. The diffuser-ejector had a cylindrical inlet duct (3.47 inch dia.) which transitioned at an L/D of 1.33 to a conical section with a half angle of 8 degrees for an overall length of 24.0 inches, and with a transplanting centerbody composed of four conical sections with differing includes angles. Maximum primary mass flow and total pressure for the F404 without afterburner (smallest engine modeled) were 0.43 lbm/sec. and 2.95 atmospheres. These same parameters for the TF30 with afterburner (largest engine modeled) were 1.74 lbm/sec. and 2.57 atmospheres. GRA

08

AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

A84-19594

A METHOD FOR THE DESIGN OF THE CONTROLLER FOR ACTIVE FLUTTER-SUPPRESSION SYSTEMS [EINE METHODE ZUR AUSLEGUNG DES REGLERS VON AKTIVEN FLATTERUNTERDRUECKUNGSSYSTEMEN]

R. FREYMANN (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Aeroelastik, Goettingen, West Germany) Zeitschrift fuer Flugwissenschaften und Weltraumforschung (ISSN 0342-068X), vol. 7, Nov.-Dec. 1983, p. 407-416. In German. refs

A design algorithm based on structural dynamics is developed to facilitate the definition of compensation circuitry for aircraft flutter-suppression systems (FSS). The problem of flutter in modern fighter aircraft is discussed: high-speed, low-altitude flight with a variety of external-stores configurations is required, and flutter problems must often be corrected after the basic aircraft design is specified. The method presented is based on a comparison of the modal characteristics of a flutter-critical and nonflutter-critical configuration. Sample computations on a sailplane and a fighter are included; the effectiveness of the fighter FSS is demonstrated in wind-tunnel tests. Graphs and drawings illustrating the method and its application are provided. T.K.

A84-19603*# Massachusetts Inst. of Tech., Cambridge.

A SIMPLE SYSTEM FOR HELICOPTER INDIVIDUAL-BLADE-CONTROL AND ITS APPLICATION TO LAG DAMPING AUGMENTATION

N. D. HAM, B. L. BEHAL, and R. M. MCKILLIP, JR. (MIT, Cambridge, MA) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 10 p. NASA-sponsored research. refs

(Contract NSG-2266)

A new, advanced type of active control for helicopters and its application to a system for blade lag damping augmentation is described. The system, based on previously developed M.I.T. Individual-Blade-Control hardware, employs blade-mounted

accelerometers to sense blade lag motion and feeds back rate information to increase the damping of the first lag mode. A linear model of the blade and control system dynamics is used to give guidance in the design process as well as to aid in analysis of experimental results. System performance in wind tunnel tests is described, and evidence is given of the system's ability to provide substantial additional damping to blade lag motion.   Author

A84-19617#
DIGITAL AUTOMATIC FLIGHT CONTROL SYSTEM FOR HELICOPTERS
P. BLOCH (Societede Fabrication d'Instruments de Mesure, Massy, Essonne, France) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 4 p.
The functional modes provided by the AFCS-155 automatic flight-control system for two-engine military or civilian helicopters and its flight director coupler (FDC-155) are briefly characterized. The FDC-155 is a synthesis of the earlier FDC-85 (IFR-transport) and CASM (observation/firing) couplers. The coupler modes include heading, airspeed, altitude, and vertical-speed capture and hold; VOR or navigation-system tracking; ILS; MLS; radio altitude, Doppler velocity, or both; winch operator-stick coupling; and automatic go-around.   D.G.

A84-19637#
STAHR - A PROGRAM FOR STABILITY AND TRIM ANALYSIS OF HELICOPTER ROTORS
M. BORRI, M. LANZ, P. MANTEGAZZA (Milano, Politecnico, Milan, Italy), D. ORLANDI, and A. RUSSO (Costruzioni Aeronautiche Giovanni Agusta S.p.A., Cascina Costa, Italy) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 16 p. refs
The most important capabilities of the STAHR helicopter rotor analysis program are presented, including fundamental characteristics of the rotor structural blade element and the kinematic hinge elements which can be used to model the rotor. The blade element is based on an original large displacements formulation which takes into account all the stress-strain and dynamic couplings typical of modern composite rotor blades. The modeling of the inertia, the structure, the aerodynamics and inflow, and the hinges and control are presented. An illustrative application of the program is given.   C.D.

A84-19639#
NONLINEAR HELICOPTER STABILITY
R. RISCHER and K. HEIER (Muenchen, Technische Universitaet, Munich, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 19 p. refs
Most of the reliable methods for the study of such nonlinear systems as may be encountered in helicopter stability investigations are based on the second method of Lyapunov. Attention is presently given to the characteristics and comparative effectiveness of the alternative method proposed by Roskam (1965). With the aid of energy time histories, important terms can be identified in nonlinear equations of motion.   O.C.

A84-19644#
TECHNIQUES IN THE ASSESSMENT OF HELICOPTER FLYING QUALITIES
M.   OBERMAYER   and   A.   FAULKNER (Messerschmitt-Boelkow-Blohm GmbH, Munich, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 22 p. refs
The reasons why safety, control precision, and passenger comfort are of primary importance in the assessment of helicopter flying qualities are discussed. The benefit of correlating the handling qualities to actual helicopter properties by simulation studies is stressed. A more restricted range of control power and damping

is recommended, contrary to a NASA study. Studies for cross-axis coupling and for pitch and roll cross-coupling do not concur. A pilot questionnaire, parameter identification and frequency response methods are discussed as means of test flight interpretation, facilitated by pulse code manipulation and digital data processing.
        C.M.

A84-19646#
SOME ASPECTS OF OPTIMIZING KIEBITZ/ARGUS FLIGHT DYNAMICS AND CONTROL SYSTEM BY SIMULATION AND FLIGHT TESTING
W. BENNER and A. SCHICK (Dornier GmbH, Friedrichshafen, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p.
A brief system description of the tethered rotorplatform Kiebitz/ARGUS is given, which is designed to lift payloads of 150 kg to 450 m above 1000 m ground level for mission times of up to 24 hours. After a short review of the main dynamic characteristics of an unmanned tethered rotorplatform in comparison to a normal helicopter, requirements for an operational control system are presented. In the second part of the paper the methods used to optimize the control system are described using computer simulations to determine controller parameters and flight tests for verification.   Author

A84-19651#
THE INFLUENCE OF DIFFERENT INFLOW MODELS ON THE COUPLED FLAPPING AND TORSION OF HELICOPTER ROTOR BLADES
A. ROSEN and Z. BEIGELMAN   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 19 p. refs
Recently a model to calculate the influence of elastic pitch variations on the tip path plane dynamics, has been developed. This is a simplified efficient model which is especially suited for stability and control problems of modern helicopters having rotors which are flexible in torsion. In the present paper this model is used in order to investigate the influence of center of mass and aerodynamic center cross sectional locations on the elastic pitch variations and tip path plane steady state and time response. The investigation also includes the comparison between five different models of the induced velocity distribution over the disc. It is shown that all these parameters have a significant influence on the tip path plane dynamics. These influences should be taken into account when stability and control problems of modern rotors are analysed.   Author

A84-19664*#   National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TOWARD A BETTER UNDERSTANDING OF HELICOPTER STABILITY DERIVATIVES
R. S. HANSEN (NASA, Ames Research Center; U.S. Army, Aeromechanics Laboratory, Moffett Field, CA)   Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 24 p. refs
An amended six degree of freedom helicopter stability and control derivative model was developed in which body acceleration and control rate derivatives were included in the Taylor series expansion. These additional derivatives were derived from consideration of the effects of the higher order rotor flapping dynamics, which are known to be inadequately represented in the conventional six degree of freedom, quasistatic stability derivative model. The amended model was a substantial improvement over the conventional model, effectively doubling the usable bandwidth and providing a more accurate representation of the short period and cross axis characteristics. Further investigations assessed the applicability of the two stability derivative model structures for flight test parameter identification. Parameters were identified using simulation data generated from a higher order base line model having sixth order rotor tip path plane dynamics. Three lower order

models were identified: one using the conventional stability derivative model structure, a second using the amended six degree of freedom model structure, and a third model having eight degrees of freedom that included a simplified rotor tip path plane tilt representation. Previously announced in STAR as N82-32376

S.L.

A84-19742* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TOWARD A BETTER UNDERSTANDING OF HELICOPTER STABILITY DERIVATIVES
R. S. HANSEN (NASA, Ames Research Center; U.S. Army, Aeromechanics Laboratory, Moffett Field, CA) American Helicopter Society, Journal (ISSN 0002-8711), vol. 29, Jan. 1984, p. 15-24. refs

An amended six degree of freedom helicopter stability and control derivative model was developed in which body acceleration and control rate derivatives were included in the Taylor series expansion. These additional derivatives were derived from consideration of the effects of the higher order rotor flapping dynamics, which are known to be inadequately represented in the conventional six degree of freedom, quasistatic stability derivative model. The amended model was a substantial improvement over the conventional model, effectively doubling the unstable bandwidth and providing a more accurate representation of the short period and cross axis characteristics. Further investigations assessed the applicability of the two stability derivative model structures for flight test parameter identification. Parameters were identified using simulation data generated from a higher order base line model having sixth order rotor tip path plane dynamics. Three lower order models were identified: one using the conventional stability derivative model structure, a second using the amended six degree of freedom model structure, and a third model having eight degrees of freedom that included a simplified rotor tip path plane tilt representation. Previously announced in STAR as N82-32376

S.L.

A84-19900
OPTIMAL SECOND HARMONIC PITCH CONTROL FOR A TWO-BLADED ARTICULATED ROTOR
L. BEINER (Negev, University, Beersheba, Israel) Vertica (ISSN 0360-5450), vol. 7, no. 4, 1983, p. 321-333. refs

A simple two-bladed hinged rotor model is used to obtain closed form expressions for the optimal 2/rev blade pitch required to suppress the aerodynamic component of the 2/rev hub vertical shear of a two-blade articulated rotor, and the influence of various parameters is determined. The optimal 2/rev pitch amplitude varies approximately as the vertical vibration level with advance ratio, reaching maximum values in the low speed and high speed flight regimes, while also increasing linearly with rotor thrust. A limited comparison with exact numerical results obtained for a two-bladed teetering rotor by using a state-of-the-art simulation program is presented, providing an order of magnitude check for the present analysis.

C.D.

A84-21860*# Tennessee Univ., Tullahoma.
INCORPORATION OF WIND SHEAR TERMS INTO THE GOVERNING EQUATIONS OF AIRCRAFT MOTION
W. FROST (Tennessee, University; FWG Associates, Inc., Tullahoma, TN) and R. U. BOWLES (NASA, Langley Research Center, Hampton, VA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 10 p. Research supported by the National Center for Atmospheric Research and NASA. refs
(AIAA PAPER 84-0275)

Conventional analyses of aircraft motion in the atmosphere have neglected wind speed variability on the scales associated with many atmospheric phenomena such as thunderstorms, low-level jets, etc. These phemonena produce wind shears that have been determined as the probable cause in many recent commercial airline accidents. This paper derives the six degrees equations of motion or an aircraft incorporating the variable wind terms. The equations are presented in several coordinate systems

(i.e., body coordinates, inertial coordinates, etc.). The wind shear terms, including the temporal and spatial gradients of the wind, appear differently in the various coordinate system. These terms are discussed. Also, the influence of wind shear on inputs to computing the aerodynamic coefficients such as the effects of wind velocity vector rotation on relative angular rates of rotation and on the time rate of change of angles of attack and side slip are addressed.

Author

A84-22322
IDENTIFICATION OF LONGITUDINAL FLYING CHARACTERISTICS OF AN AEROPLANE AND THE EFFECT OF NONSTATIONARY AERODYNAMICS
V. KOCKA Zprava VZLU, no. Z-42, 1983, p. 1-8. Translation. refs

The physical-mathematical identification process is examined epistemologically; a method for evaluating identification errors is developed; and a numerical model of nonstationary aircraft aerodynamics is proposed and applied. The aerodynamical model differentiates between 'path' and 'attitude' changes in the aircraft angle of attack and employs normalized dimensionless transfer parameters to describe wing, tailplane,and wing/tailplane contributions to the frequency transfer of the whole aircraft in both types of angle-of-attack change. Weighting functions for the complex aerodynamic derivatives are determined from steady-flight data and used to demonstrate the influence of the Strouhal number. The model and the identification procedures are applied to the A-145 light-transport aircraft, and the results are presented in tables and graphs.

T.K.

A84-22324
HINGE MOMENTS OF A CONTROL SURFACE WITH A SERVOCOMPENSATOR OR A TWO-PART CONTROL SURFACE WITH ALLOWANCE FOR THE DEFORMATION OF THEIR KINEMATIC CONNECTION [ZAVESOVE MOMENTY KORMIDLA S PLOSKOU, POPR. DVOJITEHO KORMIDLA, S UVAZENIM NETUHOSTI JEJICH KINEMATICKE VAZBY]
V. POKORNY Zpravodaj VZLU (ISSN 0044-5355), no. 4, 1983, p. 159-163. In Czech.

Expressions are derived for the hinge-moment derivatives of a two-part control surface with a flexible kinematic connection between the parts. The results can be used to calculate the hinge moments of the two-part control surfaces of modern aircraft and to improve the determination of the hinge-moment derivatives of control surfaces with servocompensators. It is shown that the efficiency of the flexible connection decreases with increasing speed, which may prove useful in reducing deflections of the control surface at high flight speeds.

B.J.

N84-16212*# Grumman Aerospace Corp., Bethpage, N.Y.
CONTROL DEFINITION STUDY FOR ADVANCED VEHICLES
M. LAPINS, R. P. MARTORELLA, R. W. KLEIN, R. C. MEYER, and M. J. STURM Nov. 1983 190 p refs
(Contract NAS1-16636)
(NASA-CR-3738; NAS 1.26:3738) Avail: NTIS HC A09/MF A01 CSCL 01C

The low speed, high angle of attack flight mechanics of an advanced, canard-configured, supersonic tactical aircraft designed with moderate longitudinal relaxed static stability (Static Margin, SM = 16% C sub W at M = 0.4) was investigated. Control laws were developed for the longitudinal axis ("G" or maneuver and angle of attack command systems) and for the lateral/directional axes. The performance of these control laws was examined in engineering simulation. A canard deflection/rate requirement study was performed as part of the "G" command law evaluation at low angles of attack. Simulated coupled maneuvers revealed the need for command limiters in all three aircraft axes to prevent departure from controlled flight. When modified with command/maneuver limiters, the control laws were shown to be adequate to prevent aircraft departure during aggressive air combat maneuvering.

S.L.

N84-16213*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
FLIGHT TEST EXPERIENCE WITH PILOT-INDUCED-OSCILLATION SUPPRESSION FILTERS
M. F. SHAFER, R. E. SMITH, J. F. STEWART, and R. E. BAILEY (Grumman Aerospace Corp., Bethpage, N.Y.) Jan. 1984 18 p refs Presented at the AIAA Atmospheric Flight Mech. Conf., Gatlinburg, Tenn., 15-17 Aug. 1983 Previously announced in IAA as A83-41936 Prepared in cooperation with NASA. Ames Research Center
(NASA-TM-86028; H-1216; NAS 1.15:86028; AIAA-83-2107)
Avail: NTIS HC A02/MF A01 CSCL 01C

Digital flight control systems are popular for their flexibility, reliability, and power; however, their use sometimes results in deficient handling qualities, including pilot-induced oscillation (PIO), which can require extensive redesign of the control system. When redesign is not immediately possible, temporary solutions, such as the PIO suppression (PIOS) filter developed for the Space Shuttle, have been proposed. To determine the effectiveness of such PIOS filters on more conventional, high-performance aircraft, three experiments were performed using the NASA F-8 digital fly-by-wire and USAF/Calspan NT-33 variable-stability aircraft. Two types of PIOS filters were evaluated, using high-gain, precision tasks (close formation, probe-and-drogue refueling, and precision touch-and-go landing) with a time delay or a first-order lag added to make the aircraft prone to PIO. Various configurations of the PIOS filter were evaluated in the flight programs, and most of the PIOS filter configurations reduced the occurrence of PIOs and improved the handling qualities of the PIO-prone aircraft. These experiments also confirmed the influence of high-gain tasks and excessive control system time delay in evoking pilot-induced oscillations. Author

N84-16214*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
OPTIMAL COOPERATIVE CONTROL SYNTHESIS APPLIED TO A CONTROL-CONFIGURED AIRCRAFT
D. K. SCHMIDT and M. INNOCENTI Jan. 1984 33 p refs (Contract NAG4-1)
(NASA-CR-170411; NAS 1.26:170411) Avail: NTIS HC A03/MF A01 CSCL 01C

A multivariable control augmentation synthesis method is presented that is intended to enable the designer to directly optimize pilot opinion rating of the augmented system. The approach involves the simultaneous solution for the augmentation and predicted pilot's compensation via optimal control techniques. In this paper, the methodology is applied to the control law synthesis for a vehicle similar to the AFTI-F-16 control-configured aircraft. The resulting dynamics, expressed in terms of eigen-structure and time/frequency responses, are presented with analytical predictions of closed-loop tracking performance, pilot compensation, and other predictors of pilot acceptance. Author

N84-16215*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONCEPTUAL DESIGN AND SIMULATOR IMPLEMENTATION OF AN AUTOMATIC TERMINAL APPROACH SYSTEM
D. A. HINTON and J. D. SHAUGHNESSY Jan. 1984 75 p refs
(NASA-TM-85667; L-15643; NAS 1.15:85667) Avail: NTIS HC A04/MF A01 CSCL 01C

The pilot-machine interface with aircraft automation to increase the safety and utility of single-pilot IFR (instrument flight rules) operations is addressed. An automatic terminal approach system (ATAS), that uses stored instrument approach data to automatically tune aircraft radios and control the aircraft autopilot, was conceived as a means of improving this critical interface. The ATAS automatically flies instrument approach procedures, including the missed approach, and provides for easy pilot interaction to accommodate air traffic control radar vectors and altitude assignments. A research prototype of an ATAS was developed to the extent necessary for a simulation implementation and piloted

evaluation. The development of the ATAS concept and the software algorithms is described. Author

N84-16216*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A HELICOPTER FLIGHT INVESTIGATION OF ROLL-CONTROL SENSITIVITY, DAMPING AND CROSS COUPLING IN A LOW ALTITUDE LATERAL MANEUVERING TASK
L. D. CORLISS and D. CARICO Dec. 1983 50 p refs Sponsored in part by Army Aviation Research and Development Command
(NASA-TM-84376; A-9431; NAS 1.15:84376) Avail: NTIS HC A03/MF A01 CSCL 01C

A helicopter in-flight simulation was conducted to determine the effects of variations in roll damping, roll sensitivity, and pitch and roll rate cross-coupling on helicopter flying qualities in a low altitude maneuver. The experiment utilized the UH-1H helicopter in-flight simulator, which is equipped with the V/STOLAND avionics system. The response envelope of this vehicle allowed simulation of configurations with low to moderate damping and sensitivity. A visual, low level slalom course was set up, consisting of constant speed and constant altitude S-turns around the 1000 ft makers of an 8000 ft runway. Results are shown in terms of Cooper-Harper pilot ratings, pilot commentary, and statistical and frequency analyses of the lateral characteristics. These results show good consistency with previous ground simulator results and are compared with existing flying qualities criteria. S.L.

N84-17184*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND-TUNNEL FREE-FLIGHT INVESTIGATION OF A MODEL OF A FORWARD-SWEPT-WING FIGHTER CONFIGURATION
D. G. MURRI, L. T. NGUYEN, and S. B. GRAFTON Feb. 1984 71 p refs
(NASA-TP-2230; L-15602; NAS 1.60:2230) Avail: NTIS HC A04/MF A01 CSCL 01C

A wind-tunnel free-flight investigation was conducted to study the dynamic stability characteristics of a model of a forward-swept-wing fighter-airplane configuration at high angles of attack. Various other wind-tunnel techniques employed in the study included static- and dynamic- (forced-oscillation) force tests, free-to-roll tests, and flow-visualization tests. A unique facet of the study was the extreme level of static pitch instability (in excess of negative 32-percent static margin) inherent in the airframe design which precluded free-flight testing without stability augmentation in pitch. Results are presented which emphasize the high-angle-of-attack aerodynamics and the vehicle-component contributions to these characteristics. The effects of these aerodynamic characteristics on the high-angle-of-attack flying qualities of the configuration are discussed in terms of results of the wind-tunnel free-flight tests. Author

N84-17187# Developmental Sciences, Inc., City of Industry, Calif.
DESIGN OF A REMOTELY CONTROLLED HOVERCRAFT VEHICLE FOR SPILL RECONNAISSANCE Final Report, Aug. 1977 - Mar. 1979
H. GUSTAFSON (City of Oxnard Fire Dept.), R. FURR (City of Oxnard Fire Dept.), K. SOUTER, and G. SEEMAN Nov. 1983 47 p
(Contract EPA-R-8053365)
(PB84-124064; EPA-600/2-83-116) Avail: NTIS HC A03/MF A01 CSCL 01C

This program was undertaken to prepare a conceptual design for a practical prototype of a remotely-controlled reconnaissance vehicle for use in hazardous material spill environment. Data from past hazardous material spill were analyzed to determine the type of vehicle best suited for the reconnaissance duty and the vehicle's performance standards. Based on the environmental conditions present at a typical spill, the desired vehicle capabilities, and the level of operated skill that could reasonably be expected, the vehicle selected was a ground effect machine or hovercraft. A

skirted hovercraft design was chosen over a peripheral-jet design because of power requirements.　　　　　　　　Author (GRA)

09

RESEARCH AND SUPPORT FACILITIES (AIR)

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

A84-19673#
THE UTIAS FLIGHT TEST FACILITY
D. M. BERGERON and R. B. MACKENZIE (Toronto, University, Toronto, Canada)　(Canadian Aeronautics and Space Institute, Flight Test Symposium, Hull, Quebec, Canada, March 22, 23, 1983) Canadian Aeronautics and Space Journal (ISSN 0008-2821), vol. 29, Sept. 1983, p. 243-249.

The aim of the University of Toronto Institute for Aerospace Studies (UTIAS) Flight Test Facility is to provide support for the training of UTIAS graduate students in the techniques of dynamic flight testing-based research, as well as to offer consulting services for Canadian agencies and companies having relatively limited flight testing requirements. The Flight Test Facility incorporates a lightweight and portable, microcomputer-based data acquisition system which interfaces with the UTIAS main computer, yielding a powerful field-collected data analysis capability. Attention is given to this system's flexibility before test demands and to the software available for data analysis. A Cessna 310 aircraft has been modified as a test bed to support UTIAS's research aims.　　　O.C.

A84-19928#
THE F2 WIND-TUNNEL AT FAUGA-MAUZAC [LA SOUFFLERIE F2 DU CENTRE DU FAUGA-MAUZAC]
D. AFCHAIN, P. BROUSSAUD, M. FRUGIER, and G. RANCARANI (ONERA, Chatillon-sous-Bagneux, Hauts-de-Seine, France) ONERA, TP, no. 1983-139, 1983, 29 p. In French.　refs
(ONERA, TP NO. 1983-139)

Details on the French subsonic wind-tunnel F2 that becomes operational on July 1983 are presented. Some of the requirements were (1) installation of models on any wall of the facility, (2) good observation points due to transparent walls, (3) smooth flow, (4) a laser velocimeter and (5) easy access and handling. The characteristics include a nonpressurized return circuit, dimensions of 5 x 1.4 x 1.8 m, maximum velocity of 100 m/s and a variable speed fan of 683 kW.　　　　　　　　　　　N.D.

A84-20043#
DECREASING THE SIDE WALL CONTAMINATION IN WIND TUNNELS
T. MOTOHASHI (Southern California, University, Los Angeles, CA; Nihon University, Chiba, Japan) and R. F. BLACKWELDER (Southern California, University, Los Angeles, CA)　ASME, Transactions, Journal of Fluids Engineering (ISSN 0098-2202), vol. 105, Dec. 1983, p. 435-438.　refs
(Contract F49620-78-C-0060)

To study boundary layers in the transitional Reynolds number regime, the useful spanwise and streamwise extent of wind tunnels is often limited by turbulent fluid emanating from the side walls. Some or all of the turbulent fluid can be removed by sucking fluid out at the corners, as suggested by Amini (1978). It is shown that by optimizing the suction slot width, the side wall contamination can be dramatically decreased without a concomitant three-dimensional distortion of the laminar boundary layer.

Author

A84-21521#
SIDEWALL EFFECTS ON AIRFOIL TESTS
U. GANZER, J. ZIEMANN (Berlin, Technische Universitaet, Berlin, West Germany), and E. STANEWSKY (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen, West Germany)　AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 297-299.　refs

A wind tunnel test evaluation is undertaken of theoretical methods for the treatment of wind tunnel sidewall effects. One assumption common to all theories in question is that sidewall interference effects may be accounted for by some global correction to the mainstream flow condition. Usually, a correction to incidence, lift or normal force is given. Some theories also estimate a Mach number correction. The present findings call into question the common assumption cited, since the effects are largely due to the three-dimensional character of the flow originating from the mutual interaction between sidewall boundary layers and the pressure field produced by the airfoil.　　　　　O.C.

A84-22325
A STRAIN-GAGE AERODYNAMIC BALANCE [TENZOMEMETRICKE AERODYNAMICKE VAHY]
K. VICH　Zpravodaj VZLU (ISSN 0044-5355), no. 4, 1983, p. 165-171. In Czech.

The design of an aerodynamic balance with rigid support of the model is described. Theoretical results and practical experience pertaining to the design of this strain-gage balance are summarized.　　　　　　　　　　　　B.J.

A84-22924#
INTEGRATION OF FLIGHT TEST DATA INTO A REAL-TIME SIMULATION
M. W. TAPPAN, T. C. DULL, C. A. HUGHES, and G. M. TADYCH (Northrop Corp., Hawthorne, CA)　American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 12 p.
(AIAA PAPER 84-0552)

Current development trends indicate that future flight simulators will be used to support aircraft marketing, training and tactical deployment as well as the traditional development of such subsystems as flight controls and avionics. The proprietary simulation establishment to whose efforts attention is presently given has, in the interest of development and deployment cost minimization, established a capability for the integration of flight test results into the simulation process. This capability is based on the automated comparison of flight test and simulation data and, where required, the identification of specific parameter modifications which will improve the simulation's representation of an aircraft.　　　　　　　　　　O.C.

N84-16217*#　Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical Engineering.
NEW COHERENT OPTICAL TECHNIQUES FOR NATIONAL TRANSONIC WIND TUNNEL FACILITY Final Technical Report, 1 May 1982 - 1 May 1983
D. CASASENT　15 Dec. 1983　75 p　refs
(Contract NAG1-265)
(NASA-CR-173174; NAS 1.26:173174)　Avail: NTIS HC A04/MF A01　CSCL 14B

The goal of this one year study was to survey the use of optical data processing techniques for distortion-parameter estimation in the National Transonic Facility and to assess, quantify and compare various methods to determine which are best for this specific application. The conventional nondestructive testing techniques studied included interferometry, moire and speckle methods. Projection moire using fringe multiplication was found to provide sufficient accuracy to be a most attractive approach for this application. Several advanced moire techniques for future research are also described. Several correlation techniques were also investigated: space-variant processing, stereo correlation and autocorrelation shape analysis. Stereo correlation is found to have sufficient accuracy and new modified stereo correlation techniques for this application which are most appropriate are described.

Autocorrelation shape analysis is a quite unique approach to distortion-parameter estimation. Finally, several optical feature extraction techniques were considered.　　　　　B.W.

N84-16219*#　National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC CRYOGENIC TEST SECTION FOR THE GOETTINGEN TUBE FACILITY
H. HORNUNG, G. HEFER, P. KROGMANN, and E. STANEWSKY Dec. 1983　20 p　refs　Transl. into ENGLISH of DFVLR report no. IB 222 - 82A (West Germany), 3 May 1982 p 1-19　Revised Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASW-3541)
(NASA-TM-77050; NAS 1.15:77050)　Avail: NTIS HC A02/MF A01　CSCL 14B
The design of modern aircraft requires the solution of problems related to transonic flow at high Reynolds numbers. To investigate these problems experimentally, it is proposed to extend the Ludwieg tube facility by adding a transonic cryogenic test section. After stating the requirements for such a test section, the technical concept is briefly explained and a preliminary estimate of the costs is given.　　　　　S.L.

N84-16221*#　National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATOR SCENE DISPLAY EVALUATION Patent Application
R. F. HAINES, inventor (to NASA)　22 Dec. 1983　15 p
(NASA-CASE-ARC-11504-1; US-PATENT-APPL-SN-565481)
Avail: NTIS HC A02/MF A01　CSCL 14B
An apparatus for aligning and calibrating scene displays in an aircraft simulator has a base on which all of the instruments for the aligning and calibrating are mounted. Laser directs beam at double right prism which is attached to pivoting support on base. The pivot point of the prism is located at the design eye point (DEP) of simulator during the aligning and calibrating. The objective lens in the base is movable on a track to follow the laser beam at different angles within the field of vision at the DEP. An eyepiece and a precision diopter are movable into a position behind the prism during the scene evaluation. A photometer or illuminometer is pivotable about the pivot into and out of position behind the eyepiece.　　　　　NASA

N84-17189*#　Virginia Associated Research Center, Newport News.
TWINTN4: A PROGRAM FOR TRANSONIC FOUR-WALL INTERFERENCE ASSESSMENT IN TWO-DIMENSIONAL WIND TUNNELS Final Report
W. B. KEMP, JR.　Washington, D.C.　NASA　Feb. 1984　48 p refs
(Contract NCC1-69)
(NASA-CR-3777; NAS 1.26:3777)　Avail: NTIS HC A03/MF A01 CSCL 14B
A method for assessing the wall interference in transonic two-dimensional wind tunnel tests including the effects of the tunnel sidewall boundary layer was developed and implemented in a computer program named TWINTN4. The method involves three successive solutions of the transonic small disturbance potential equation to define the wind tunnel flow, the equivalent free air flow around the model, and the perturbation attributable to the model. Required input includes pressure distributions on the model and along the top and bottom tunnel walls which are used as boundary conditions for the wind tunnel flow. The wall-induced perturbation field is determined as the difference between the perturbation in the tunnel flow solution and the perturbation attributable to the model. The methodology used in the program is described and detailed descriptions of the computer program input and output are presented. Input and output for a sample case are given.　　　　　Author

N84-17190#　Dayton Univ., Ohio. Research Inst.
AIRCREW TRAINING DEVICES: UTILITY AND UTILIZATION OF ADVANCED INSTRUCTIONAL FEATURES. PHASE I: TACTICAL AIR COMMAND Interim Report, Mar. - Dec. 1982
D. J. POLZELLA　Brooks AFB, Tex.　Air Force Human Resources Lab.　Nov. 1983　76 p
(Contract F33615-81-C-0005; AF PROJ. 1123)
(AD-A135052; AFHRL-TR-83-22)　Avail: NTIS HC A05/MF A01 CSCL 05I
An Aircrew Training Device (ATD) is not merely a flight simulator. It is also equipped with sophisticated hardware and software capabilities, known as advanced instructional features (AIFs), that permit a flight crew instructor to control, monitor, and record flight simulation training sessions. A survey conducted at five of the principal Tactical Air Command ATD sites revealed that few instructors receive extensive training in AIF use and that most features are not used very often. Several factors appear to have contributed to the low rate of AIF use. These factors include hardware and/or software unreliability, time-consuming implementation, functional limitations, and design deficiencies. Although many AIFs were judged to have significant value in replacement and/or continuation training, some features need to be made more reliable and user-friendly before their training effectiveness can be ascertained. It was recommended that a more formalized intensive training program for ATD instructors be established. Such a program would not only teach instructors how to use AIFs but, more importantly, how to use them effectively.
　　　　　Author (GRA)

N84-17191#　Dayton Univ., Ohio. Research Inst.
INSTRUCTOR STATION DISPLAY FOR USE IN T-37 FLIGHT SIMULATION TRAINING Final Technical Paper
H. D. WARNER　Brooks AFB, Tex.　Air Force Human Resources Lab.　Oct. 1983　86 p
(Contract F33615-81-C-0005; AF PROJ. 1123)
(AD-A134854; AFHRL-TP-83-38)　Avail: NTIS HC A05/MF A01 CSCL 05H
This study produced the design for an integrated visual display for the instructor/operator station (IOS) of the Advanced Simulator for Pilot Training (ASPT). The study was accomplished in two steps. First, a survey of T-37 instructor pilots (IPs) was conducted to define the information requirements for an ASPT IOS integrated visual display for use in T-37 undergraduate pilot training. A questionnaire was developed and used in the survey. It contained a comprehensive listing of flight information items, and the IP subjects were asked to rate each item in terms of the requirements for use in the display. The questionnaire rating data were statistically analyzed to determine which items should be retained for inclusion in the display and which items could be eliminated. In the second step of the study, display symbology was determined for each item retained using MIL-STD-884C and other relevant design specifications, and three integrated display modes of operation were designed. Each display mode design incorporates various display symbols to provide the required display information.
　　　　　Author (GRA)

N84-18088*#　Massachusetts Inst. of Tech., Cambridge.
FLOW BEHAVIOR IN THE WRIGHT BROTHERS FACILITY Final Report
S. GENN　In its A Coop. Program to Stimulate Student Involvement through the MIT Undergraduate Research Opportunity Program 42 p　Jan. 1984
(WBWT-TR-1187)　Avail: NTIS HC A05/MF A01　CSCL 01A
It has become increasingly apparent that a reexamination of the flow characteristics in the low speed Wright Brothers Facility (WBF) is of some importance in view of recent improvements in the precision of the data acquisition system. In particular, the existence of local regions of separation, if any, in back portions of the circuit, and possible related unsteadiness, are of interest. Observations from that initial experiment did indicate some unsteady air flow problems in the cross leg, and thereafter the test region (Section A) was calibrated quantitatively. The intent was to learn something about the effect of upstream intermittent

behavior flow on the test section flow, as well as to provide an extensive calibration as a standard for the effects induced by future alteration of the tunnel. Distributions of total pressure coefficients were measured first at one cross-section plane of the test section, namely the model station. Data were obtained for several tunnel speeds. The reduced data yielded an unexpected distribution involving larger pressures along the inside wall.

Author

11

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

A84-19582
THE CYCLIC FRACTURE TOUGHNESS OF PRESSED PANELS OF D16CHT AND V95PCHT2 ALLOYS IN LIQUID MEDIA [TSIKLICHESKAIA TRESHCHINOSTOIKOST' PRESSOVANNYKH PANELEI IZ SPLAVOV D16CHT I V95PCHT2 V ZHIDKIKH SREDAKH]
S. IA. IAREMA and I. B. POLUTRANKO (Akademiia Nauk Ukrainskoi SSR, Fiziko-Mekhanicheskii Institut, Lvov, Ukrainian SSR) Fiziko-Khimicheskaia Mekhanika Materialov (ISSN 0430-6252), vol. 19, Nov.-Dec. 1983, p. 56-59. In Russian. refs

Disk specimens with a crack cut from pressed panels of D16chT and V95pchT2 alloys were subjected to cyclic loading at 17-20 Hz, with a stress ratio of 0.05, in humid air, distilled water, 3.5-percent NaCl solution, fuel tank residue, and aviation fuel of the RT type. In comparison with humid air, all the media investigated are shown to accelerate crack growth. Their effect on the crack growth rate increases in the following order: fuel, distilled water, 3.5-percent NaCl solution, and fuel tank residue. The effect of iron and silicon impurities on the cyclic fracture toughness of D16chT and V95pchT2 is discussed.

V.L.

A84-19781* State Univ. of New York, Stony Brook.
PHASE ANALYSIS OF PLASMA-SPRAYED ZIRCONIA-YTTRIA COATINGS
N. R. SHANKAR, C. C. BERNDT, and H. HERMAN (New York, State University, Stony Brook, NY) Ceramic Engineering and Science Proceedings (ISSN 0196-6219), vol. 4, Sept.-Oct. 1983, p. 784-787. refs
(Contract NAG3-164)

Phase analysis of plasma-sprayed 8 wt pct-yttria-stabilized zirconia (YSZ) thermal barrier coatings and powders was carried out by X-ray diffraction. Step scanning was used for increased peak resolution. Plasma spraying of the YSZ powder into water or onto a steel substrate to form a coating reduced the cubic and monoclinic phases with a simultaneous increase in the tetragonal phase. Heat treatment of the coating at 1150 C for 10 h in an Ar atmosphere increased the amount of cubic and monoclinic phases. The implications of these transformations on coating performance and integrity are discussed.

Author

A84-19786* General Electric Co., Schenectady, N. Y.
MECHANICAL AND PHYSICAL PROPERTIES OF PLASMA-SPRAYED STABILIZED ZIRCONIA
P. A. SIEMERS and R. L. MEHAN (General Electric Co., Schenectady, NY) Ceramic Engineering and Science Proceedings (ISSN 0196-6219), vol. 4, Sept.-Oct. 1983, p. 828-840. refs
(Contract NAS3-21727)

Physical and mechanical properties were determined for plasma-sprayed MgO- or Y2O3-stabilized ZrO2 thermal barrier coatings. Properties were determined for the ceramic coating in both the freestanding condition and as-bonded to a metal substrate. The properties of the NiCrAlY bond coating were also investigated.

Author

A84-20278
A STUDY OF CREEP CRACK GROWTH IN 2219-T851 ALUMINUM ALLOY USING A COMPUTERIZED TESTING SYSTEM
P. L. BENSUSSAN (Etablissement Technique Central de l'Armement, Arcueil, Val-de-Marne, France), D. A. JABLONSKI (Instron Corp., Research and Applications Laboratory, Canton, MA), and R. M. PELLOUX (MIT, Cambridge, MA) Metallurgical Transactions A - Physical Metallurgy and Materials Science (ISSN 0360-2133), vol. 15A, Jan. 1984, p. 107-120. refs
(Contract AF-AFOSR-82-0087)

Creep Crack Growth is defined as 'the propagation of a single macroscopic crack under sustained load at temperatures well within the creep regime'. In the present investigation of creep crack growth, use is made of a fully automated computerized experimental procedure which was developed to study high temperature crack growth of 2219-T851 aluminum alloy. Crack growth tests were conducted on side-grooved CT specimens, and crack lengths were measured by the compliance technique. Time-dependent creep crack growth and cycle-dependent fatigue crack growth were measured for 2219-T851 aluminum alloy at 175 C in air. The creep crack growth rates are found to be independent of the duration of the hold time at maximum load and loading and unloading rates.

G.R.

A84-22237#
THE EFFECT OF THE MICROSTRUCTURE ON SLOW CRACK PROPAGATION AND THE MECHANICAL PROPERTIES OF HOT-PRESSED SILICON NITRIDE BETWEEN ROOM TEMPERATURE AND 1500 C [EINFLUSS DER MIKROSTRUKTUR AUF DIE LANGSAME RISSAUSBREITUNG UND MECHANISCHE EIGENSCHAFTEN VON HEISSGEPRESSTEM SILIZIUMNITRID ZWISCHEN RAUMTEMPERATUR UND 1500 C]
K. KRIZ Erlangen-Nuernberg, Universitaet, Technische Fakultaet, Dr.-Ing. Dissertation, 1983, 184 p. In German. Research supported by the Bundesministerium fuer Forschung und Technologie. refs

The employment of an operational temperature of 1350 C is being considered in connection with efforts to enhance the thermodynamic efficiency of the gas turbines for automobiles. Metallic alloys are not suited for an employment at the considered temperature, and the use of ceramics has been explored, giving particular attention to the silicon nitride Si3N4. Difficulties regarding a use of Si3N4 are related to its low ductility and its inclination toward static fatigue. Crack propagation could lead to catastrophic failure of the involved component. A study of slow crack propagation at temperatures extending up to the considered operational temperature has, therefore, great significance for an evaluation of the strength of material as a function of time and for an estimation regarding the lifetime of components. The present investigation is concerned with such a study, taking into account the precise determination of crack propagation data and breaking strength in the case of five different commercial hot-pressed sintered silicon nitride materials.

G.R.

A84-22326
ANTIICING FUEL ADDITIVES AND THEIR EFFECT ON THE PROPERTIES OF AVIATION KEROSENE [PRISADY PROTI VYMRZAVANI VODY A JEJICH VLIV NA VLASTNOSTI LETECKEHO PETROLEJE]
J. KROTKY Zpravodaj VZLU (ISSN 0044-5355), no. 4, 1983, p. 173-178. In Czech. refs

The characteristics of antiicing additives to kerosene are investigated. Results are presented which aim to elucidate the effect of these additives on the thermal stability, combustibility, and low-temperature properties of kerosene.

B.J.

A84-22406
INVESTIGATION OF THE THERMOCYCLIC LIFE OF ZHS6U ALLOY IN THE NONUNIFORM THERMOSTRESSED STATE [ISSLEDOVANIE TERMOTSIKLICHESKOI DOLGOVECHNOSTI SPLAVA ZHS6U PRI NEODNORODNOM TERMONAPRIAZHENNOM SOSTOIANII]
G. N. TRETIACHENKO, L. V. KRAVCHUK, and K. P. BUISKIKH (Akademiia Nauk Ukrainskoi SSR, Institut Problem Prochnosti, Kiev, Ukrainian SSR) Problemy Prochnosti (ISSN 0556-171X), Jan. 1984, p. 10-14. In Russian. refs

Wedge-shaped specimens of ZhS6U, fabricated according to techniques similar to those used in the preparation of gas turbine engine blades, were subjected to thermocyclic loading. The problem of unsteady heat transfer for the investigated shapes under experimentally determined first order boundary conditions is solved by numerical methods. Regression analysis methods applied to the results of the thermocyclic bench tests yield an equation for thermal fatigue, relating alloy life to the maximum temperature and maximum thermal loading at the edge, occurring in the cycle. The validity of the blade simulation was verified using the F-criterion.   J.N.

A84-22407
LIFE DISTRIBUTION UNDER VARIOUS OPERATING CONDITIONS OF RANDOM CYCLIC LOADS [O RASPREDELENII DOLGOVECHNOSTI PRI MNOGOREZHIMNYKH SLUCHAINYKH TSIKLICHESKIKH NAGRUZKAKH]
N. A. BORODIN and N. K. ZHELIABINA (Moskovskii Institut Inzhenerov Grazhdanskoi Aviatsii, Moscow, USSR) Problemy Prochnosti (ISSN 0556-171X), Jan. 1984, p. 19-21. In Russian. refs

Statistical simulation is used to estimate the life distribution function for V95 and D16 alloys subjected to multistep loading with random variations in relative loading time at each step. A block program of the experiment was modeled in such a way that the number of cycles to destruction at the i-th step under continuous action is subject to the log-normal law, and that the relative durations for each i-th loading step are subject to the Gaussian distribution law. The results for four-step statistical experiments are presented, including values of the Pearson and Kolmogoroff criteria. Analysis of the present results demonstrates that the best description of life distribution is provided by the log-normal law.
                                                           J.N.

A84-22594
SYNTHETIC FUEL CHARACTER EFFECTS ON A RICH-LEAN GAS TURBINE COMBUSTOR
L. C. ANGELLO, W. C. ROVESTI (Electric Power Research Institute, Palo Alto, CA), T. J. ROSFJORD (United Technologies Research Center, East Hartford, CT), and R. A. SEDERQUIST (United Technologies Corp., South Windsor, CT) IN: Combustion of synthetic fuels; Proceedings of the Symposium, Las Vegas, NV, March 28-April 2, 1982 . Washington, DC, American Chemical Society, 1983, p. 151-171. Research supported by the Electric Power Research Institute.

Five fuels including No. 2 fuel oil, SRC II, H-Coal, and EDS middle distillates, and hydro-treated Paraho shale oil residual were tested in a subscale 5-inch diameter, staged rich-lean combustor at conditions representative of baseload and part power settings of 30-MW utility combustion turbine. A minimum NO(x) emission level corrected to 15 percent oxygen of approximately 35 ppmv was attained for all the fuels despite fuel bound nitrogen levels of up to 0.8 percent by weight. Smoke emissions did depend on fuel properties and ranged between a SAE Smoke Number of 20 to 45 at baseload operation. Indication of increased smoke and liner heating with reduced fuel hydrogen content was observed, although the indicated trends were not as consistent as those for lean combustors.   Author

N84-16337*#   Pratt and Whitney Aircraft, East Hartford, Conn. Engineering Div.
PROGRAM FOR DEVELOPMENT OF STRAIN TOLERANT THERMAL BARRIER COATING SYSTEM
N. P. ANDERSON   30 Jan. 1984   20 p
(Contract NAS3-22548)
(NASA-CR-173214; NAS 1.26:173214; PWA-5777-30)   Avail: NTIS HC A02/MF A01   CSCL 11B

The results of thermal conductivity, thermal expansion and high cycle fatigue tests conducted on coating systems are presented. These results show that the thermal conductivity of coating system 8 at approximately 982 C (1800 F) is substantially higher than system 3 while no significant differences were observed in the thermal expansion measurements up to approximately 1316 C (2400 F). High cycle fatigue (HCF) testing, which was conducted at room temperature and several stress levels, showed both coatings to be extremely resistant to spallation in HCF.   S.L.

N84-16351*#   Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANTIMISTING KEROSENE: BASE FUEL EFFECTS, BLENDING AND QUALITY CONTROL TECHNIQUES Final Report, Aug. 1981 - Sep. 1982
A. H. YAVROUIAN, J. ERNEST, and V. SAROHIA   Atlantic City, N.J.   FAA   Jan. 1984   103 p   refs
(Contract DTFA03-80-A-00215)
(NASA-CR-174509; JPL-PUB-83-96; NAS 1.26:174509; DOT/FAA/CT-83/36; AD-A137852)   Avail: NTIS HC A06/MF A01   CSCL 21D

The problems associated with blending of the AMK additive with Jet A, and the base fuel effects on AMK properties are addressed. The results from the evaluation of some of the quality control techniques for AMK are presented. The principal conclusions of this investigation are: significant compositional differences for base fuel (Jet A) within the ASTM specification DI655; higher aromatic content of the base fuel was found to be beneficial for the polymer dissolution at ambient (20 C) temperature; using static mixer technology, the antimisting additive (FM-9) is in-line blended with Jet A, producing AMK which has adequate fire-protection properties 15 to 20 minutes after blending; degradability of freshly blended and equilibrated AMK indicated that maximum degradability is reached after adequate fire protection is obtained; the results of AMK degradability as measured by filter ratio, confirmed previous RAE data that power requirements to decade freshly blended AMK are significantly higher than equilibrated AMK; blending of the additive by using FM-9 concentrate in Jet A produces equilibrated AMK almost instantly; nephelometry offers a simple continuous monitoring capability and is used as a real time quality control device for AMK; and trajectory (jet thurst) and pressure drop tests are useful laboratory techniques for evaluating AMK quality.   Author

N84-16353*#   Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ATOMIZATION AND COMBUSTION PERFORMANCE OF ANTIMISTING KEROSENE AND JET FUEL Final Report, Aug. 1981 - Aug. 1982
R. FLEETER, P. PARIKH, and V. SAROHIA   Atlantic City, N.J.   FAA   Dec. 1983   66 p   refs
(Contract DTFA03-80-A-00215)
(NASA-CR-174507; NAS 1.26:174507; DOT/FAA/CT-82/150; AD-A137912)   Avail: NTIS HC A04/MF A01   CSCL 21D

Combustion performance of antimisting kerosene (AMK) containing FM-9 polymer was investigated at various levels of degradation (restoration of AMK for normal use in a gas turbine engine). To establish the relationship of degradation and atomization to performance in an aircraft gas turbine combustor, sprays formed by the nozzle of a JT8-D combustor with Jet A and AMK at 1 atmosphere (atm) (14.1 lb/square in absolute) pressure and 22 C at several degradation levels were analyzed. A new spray characterization technique based on digital image analysis of high resolution, wide field spray images formed under pulsed ruby laser sheet illumination was developed. Combustion

tests were performed for these fuels in a JT8-D single can combustor facility to measure combustion efficiency and the lean extinction limit. Correlation of combustion performance under simulated engine operating conditions with nozzle spray Sauter mean diameter (SMD) measured at 1 atm and 22 C were observed. Fuel spray SMD and hence the combustion efficiency are strongly influenced by fuel degradation level. Use of even the most highly degraded AMK tested (filter ratio = 1.2) resulted in an increase in fuel consumption of 0.08% to 0.20% at engine cruise conditions. Author

N84-16354*#   Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANTIMISTING FUEL BREAKUP AND FLAMMABILITY Final Report, Aug. 1981 - Aug. 1982
P. PARIKH, R. FLEETER, and V. SAROHIA   Atlantic City, N.J.
FAA   Dec. 1983   50 p   refs
(Contract DTFA03-80-A-00215)
(NASA-CR-174508; NAS 1.26:174508; DOT/FAA/CT-82/149; AD-A137837)   Avail: NTIS HC A03/MF A01   CSCL 21D
The breakup behavior and flammability of antimisting turbine fuels subjected to aerodynamic shear are investigated. Fuels tested were Jet A containing 0.3% FM-9 polymer at various levels of degradation ranging from virgin AMK to neat Jet A. The misting behavior of the fuels was quantified by droplet size distribution measurements. A technique based on high resolution laser photography and digital image processing of photographic records for rapid determination of droplet size distribution was developed. The flammability of flowing droplet-air mixtures was quantified by direct measurements of temperature rise in a flame established in the wake of a continuous ignition source. The temperature rise measurements were correlated with droplet size measurements. The flame anchoring phenomenon associated with the breakup of a liquid fuel in the wake of bluff body was shown to be important in the context of a survivable crash scenario. A pass/fail criterion for flammability testing of antimisting fuels, based on this flame-anchoring phenomenon, was proposed. The role of various ignition sources and their intensity in ignition and post-ignition behavior of antimisting fuels was also investigated.   S.L.

N84-17293*#   Rensselaer Polytechnic Inst., Troy, N. Y.
COMPOSITE STRUCTURAL MATERIALS Semiannual Progress Report, 30 Apr. - 30 Sep. 1983
G. S. ANSELL, R. G. LOEWY, and S. E. WIBERLEY   Dec. 1983
190 p
(Contract NGL-33-018-003)
(NASA-CR-173259; NAS 1.26:173259; SAPR-45)   Avail: NTIS HC A09/MF A01   CSCL 11D
Progress and plans are reported for investigations of: (1) the mechanical properties of high performance carbon fibers; (2) fatigue in composite materials; (3) moisture and temperature effects on the mechanical properties of graphite-epoxy laminates; (4) the theory of inhomogeneous swelling in epoxy resin; (5) numerical studies of the micromechanics of composite fracture; (6) free edge failures of composite laminates; (7) analysis of unbalanced laminates; (8) compact lug design; (9) quantification of Saint-Venant's principles for a general prismatic member; (10) variation of resin properties through the thickness of cured samples; and (11) the wing fuselage ensemble of the RP-1 and RP-2 sailplanes.   A.R.H.

N84-17296#   Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.   Structures and Dynamics Div.
EFFECTS OF JP-4 FUEL ON GRAPHITE/EPOXY COMPOSITES Final Report, Mar. 1977 - Oct. 1982
B. L. WHITE   Oct. 1983   44 p
(Contract AF PROJ. 2401)
(AD-A135416; AFWAL-TR-83-3086)   Avail: NTIS HC A03/MF A01   CSCL 11D
The primary objective of this program was to determine if structural properties of graphite/epoxy composite laminates could be degraded by subjecting the material to JP-4 fuel under pressure for an extended period of time. The investigation consisted of

three extended evaluations in which a total of 305 specimens were tested in various modes. The study dealt primarily with tensile testing of fuel and ambient environment exposed laminates and oven dried laminates to determine relative strength values. The data shows little to no degradation of the Hercules AS 3501-5A graphite/epoxy material properties after being exposed to JP-4 fuel at a 40 psi pressure for six months.   Author (GRA)

N84-17395#   Ciba-Geigy Corp., Ardsley, N.Y.   Plastics and Additives Div.
DEVELOPMENT OF A STABLE EPOXY RESIN SYSTEM FOR COMPOSITE REPAIR Final Report, 22 Sep. 1981 - 15 Nov. 1982
J. WEISS   Mar. 1983   24 p
(Contract N62269-81-C-0153; R02204001)
(AD-A135390; NADC-81108-60)   Avail: NTIS HC A02/MF A01 CSCL 11I
Novel latent epoxy hardeners which show promise for the field repair of composite structures of naval aircraft have been developed and tested. Two hardeners, phthalamides of 1,2-diaminocyclohexane (DACP) and of m-xylylenediamine, were latent with multifunctional epoxy resins for 4 to 12 months and yield glass transition temperatures of 145C and 130C respectively, when cured at 150C. Fracture toughness (KIC) of a DACP/MY 720 molding is 2.27 kg/mm 3/2. Slightly higher than that of a standard diaminodiphenyl sulfone (DDS)/MY 720 system. Graphite prepreg was made using DACP/MY 720 and DDS/MY 720 matrix resins, and unidirectional, well-consolidated laminates were prepared at low pressure (100 psi). Short-beam-shear and tensile values for the phthalamide laminate range between 72% and 105% of the values determined for the DDS/MY 720 laminate. Dynamic mechanical analysis shows the Tg of the DACP laminate to be 130C and to decrease by about 90C with 1.1% water absorption on aging at 49C and 95% relative humidity. This hot/wet conditioning reduces shear and tensile properties much more than for the DDS/MY 720 control laminate.   GRA

N84-17407*#   United Technologies Research Center, East Hartford, Conn.
AVIATION-FUEL PROPERTY EFFECTS ON COMBUSTION Contractor Final Report
T. J. ROSFJORD   Feb. 1984   147 p   refs
(Contract NAS3-23167)
(NASA-CR-168334; NAS 1.26:168334; UTRC-884-915908-29)
Avail: NTIS HC A07/MF A01   CSCL 21D
The fuel chemical property influence on a gas turbine combustor was studied using 25 test fuels. Fuel physical properties were de-emphasized by using fuel injectors which produce highly-atomized, and hence rapidly vaporizing sprays. A substantial fuel spray characterization effort was conducted to allow selection of nozzles which assured that such sprays were achieved for all fuels. The fuels were specified to cover the following wide ranges of chemical properties: hydrogen, 9.1 to 15 (wt) pct; total aromatics, 0 to 100 (vol) pct; and naphthalene, 0 to 30 (vol) pct. standard fuels (e.g., Jet A, JP4), speciality products (e.g., decalin, xylene tower bottoms) and special fuel blends were included. The latter group included six, 4-component blends prepared to achieve parametric variations in fuel hydrogen, total aromatics and naphthalene contents. The principle influences of fuel chemical properties on the combustor behavior were reflected by the radiation, liner temperature, and exhaust smoke number (or equivalently, soot number density) data. Test results indicated that naphthalene content strongly influenced the radiative heat load while parametric variations in total aromatics did not.   Author

N84-17409# Committee on Science and Technology (U. S. House).
ALTERNATIVE FUELS FOR GENERAL AVIATION
Washington GPO 1983 215 p refs Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., No. 40, 29 Aug. 1983
(GPO-27-618) Avail: Subcommittee on Transportation, Aviation and Materials

The price and availability of fuel continues to be a major barrier to the free expansion of general aviation. Although this increase in fuel prices had a more severe impact on airlines, it has also slowed the demand for general aviation aircraft. With the sales of general aviation aircraft in a depressed state, the development of alternative fuels such as liquid methane, ethanol, methanol, and automobile gasoline can help spur the industry back to health. Recent flight tests of these alternative fuels are examined. B.G.

N84-17410*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering.
EMISSION FTIR ANALYSES OF THIN MICROSCOPIC PATCHES OF JET FUEL RESIDUE DEPOSITED ON HEATED METAL SURFACE Interim Report
J. L. LAUER and P. VOGEL Jan. 1984 32 p refs
(Contract NAG3-205; DAAG24-83-K-0058; AF-AFOSR-0005-81)
(NASA-CR-168331; NAS 1.26:168331) Avail: NTIS HC A03/MF A01 CSCL 21D

Deposits laid down in patches on metal strips in a high pressure/high temperature fuel system simulator operated with aerated fuel at varying flow rates were analyzed by emission FTIR in terms of functional groups. Significant differences were found in the spectra and amounts of deposits derived from fuels to which small concentrations of oxygen-, nitrogen-, or sulfur-containing heterocyclics or metal naphthenates were added. The spectra of deposits generated on strips by heating fuels and air in a closed container were very different from those of the flowing fluid deposits. One such closed-container dodecane deposit on silver gave a strong surface-enhanced Raman spectrum. Author

12

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

A84-19632
FURTHER APPLICATION AND DEVELOPMENT OF STRAIN PATTERN ANALYSIS
A. R. WALKER (Royal Aircraft Establishment, Farnborough, Hants., England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 21 p. refs

Further application of Strain Pattern Analysis (SPA) to the derivation of vibration mode shapes of a rotating blade is described. A model blade representative of a typical semi-rigid rotor system is used as the test structure. Modes are derived for both non-rotating and rotating conditions with the blade shielded from aerodynamic loading in the latter case. The experimentally derived modes are compared with corresponding calculated modes. A discussion of a theoretical exercise undertaken to investigate the distribution of strain measurement stations required for successful application of SPA is also included. Author

A84-19635#
NUMERICAL ANALYSIS AND EXPERIMENTAL VERIFICATION OF ELASTOMERIC BEARINGS
F. OCH and C. SCHLIEKMANN (Messerschmitt-Boelkow-Blohm GmbH, Munich, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 18 p. refs

Finite element computer programs which can analyze elastomeric structures are demonstrated. These programs employ finite elements based on Hermann's principle for linear analysis and the Mooney-Rivlin approach for the nonlinear case. The constitutive equations and variational principles of elastomeric behavior are set forth, and the results of applying the programs to a thick-walled cylinder subjected to internal pressure, rubber bonded between steel plates subjected to compression load, and a spherical/conical thrust bearing are presented. It is concluded that the Mooney-Rivlin approach approximates the exact nonlinear solution and that the linear approach requires much less computer time than the nonlinear one. The additional costs of the latter are justified for strains exceeding 10 percent. The stiffnesses of laminated elastomeric bearings and of stresses in the shims and rubber layers can be analyzed with sufficient accuracy. C.D.

A84-19641#
A GENERAL ALGORITHM FOR QUASILINEARIZATION IN HELICOPTER DYNAMICS
H. ENGMANN (Messerschmitt-Boelkow-Blohm GmbH, Munich, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 17 p. refs

An efficient algorithm for a consistent linearization of the inertial terms in a multibody system with tree structure is presented. The algorithm is general enough to include both rigid and elastic bodies. The same linearization procedure (Taylor expansion) is shown to be applicable to the derivation of the structural, aerodynamical, and gravitational terms in the equations of motion. Exact solutions of the complete nonlinear equations of motion may be obtained by combining Floquet theory and the method of quasilinearization. C.D.

A84-19642#
APPLICATION OF THE LOCAL CIRCULATION METHOD TO THE FLUTTER ANALYSIS OF ROTARY WINGS
A. AZUMA, K. KAWACHI (Tokyo, University, Tokyo, Japan), T. HAYASHI (Nissan Motor Co., Ltd., Tokyo, Japan), and A. ITO (Meiji University, Tokyo, Japan) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p. refs

A simple method of numerical calculation to determine the critical torsional rigidity or the classical flutter boundary of rotary wings has been proposed as an extensive work of the Local Circulation Method (LCM). Exemplified calculations were performed for a helicopter rotor and a windmill rotor. The result for the helicopter rotor shows good correlation with that of the theoretical computation based on the lifting surface theory and with the experimental test. The result for the windmill rotor, which does not have any comparable subject of reference, shows a possibility of calculation for the windmill operating in yawed condition with respect to the wind direction. Author

A84-19645#
VIBRATION OF A STRUCTURE WITH A TANK CONTAINING FLUID
D. A. ROBB and D. J. EWINS (Imperial College of Science and Technology, London, England) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 12 p. Research supported by Westland Helicopters, Ltd.

In the case of structures including containers with liquids, such as fuel tanks, low frequency vibrations may cause the fluid to slosh, thus generating large forces on the structure. Special

conditions apply when the structure is subjected to vibration at frequencies above the fundamental sloshing frequency. In such cases, a considerable proportion of the liquid mass may become decoupled form the vibrating container and effectively remain stationary. The helicopter represents an important example for structures for which the considered situation may apply. The present investigation is concerned with an assessment of the problems of testing structures containing liquids, taking into account theoretical calculations and experiments. It is found that modal testing techniques may be applied to structures containing fluids at frequencies above the fundamental sloshing frequency without major difficulty.   G.R.

A84-19747
THE EFFECT OF MODE III LOADING ON FATIGUE CRACK GROWTH IN A ROTATING SHAFT
K. N. AKHURST, T. C. LINDLEY, and K. J. NIX (Central Electricity Generating Board, Central Electricity Research Laboratories, Leatherhead, Surrey, England) Fatigue of Engineering Materials and Structures (ISSN 0160-4112), vol. 6, no. 4, 1983, p. 345-348. refs
Four particularly pronounced beachmarks have been identified on the fracture surface of a crack rotor. A correlation has been made between these beachmarks and events in the operational record. Fatigue crack growth calculations have been performed for a chordally cracked shaft subject to alternating self-weight bend stresses. The shaft dimensions and loading used correspond to the position of the crack in the rotor and growth rates were calculated over a range of crack depths spanning the positions of the major beachmarks. The results of the calculations agree with the beachmark correlation if allowance is made for the effect of the torsional loading of the shaft.   Author

A84-20024
VORTICES AND TURBULENCE (THE 23RD LANCHESTER MEMORIAL LECTURE)
G. M. LILLEY (Southampton, University, Southampton, England) Aeronautical Journal (ISSN 0001-9240), vol. 87, Dec. 1983, p. 371-393. refs
A comprehensive discussion is presented concerning the phenomena characteristically treated in vortex and turbulence theory, as well as the degree of success achieved by various computation and visualization methods and theoretical models developed for vortex flow behavior prediction. Note is taken of the pioneering research conducted by F. W. Lanchester in 1893-1907, and attention is given to vortex tip and edge generation by rectangular and delta wings, the cool core effect of the Ranque-Hilsch vortex tube, the modeling of shear flows by means of vortex array methods, the classification and modelling of turbulent flows (together with a taxonomy of their calculation methods), and NASA ILLIAC IV computations of two-dimensional channel flow. Also noted are recent results concerning the boundary layer coherent structure of a flat plate at zero pressure gradient, including the regeneration structure and flow distortion and breakdown of a turbulent boundary layer.   O.C.

A84-20725
CXR TESTING OF BOX IEMP EFFECTS DUE TO CHARGE TRANSFER
J. E. TIGNER, R. MILLER, P. MORRISON, D. FREDERICK (Science Applications, Inc., McLean, VA), and S. L. ANDERSON (Honeywell, Inc., Avionics Div., Clearwater, FL) (IEEE, U.S. Defense Nuclear Agency, NASA, et al., Annual Conference on Nuclear and Space Radiation Effects, Gatlinburg, TN, July 18-21, 1983) IEEE Transactions on Nuclear Science (ISSN 0018-9499), vol. NS-30, Dec. 1983, p. 4421-4426. refs
It is shown that the continuous X-ray (CXR) test and analysis technique is applicable to the characterization of direct drive systems-generated-electromagnetic-pulse (SGEMP) effects within a plated wire memory (PWM). The high signal-to-noise ratio associated with the continuous model exposure and the well-characterized X-ray source permit an accurate calibration of SGEMP response models over a wide range of parameters. SGEMP

response models for a PWM are calibrated using the CXR test and analysis method, making it possible to predict with high confidence the response to arbitrary environments. The test results establish that a CXR test of objects as complex as a PWM is feasible.   C.R.

A84-21137
A DIVIDING LAYER IN HIGH-TEMPERATURE FLOWS [RAZDELITEL'NYI SLOI V VYSOKOTEMPERATURNYKH POTOKAKH]
A. A. BOBNEV   PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (ISSN 0044-4626), Nov.-Dec. 1983, p. 138-146. In Russian.
In an earlier study (Bobnev, 1982), an exact solution has been obtained for a high-temperature axisymmetric jet flow for Prandtl numbers less than or equal to unity. It is shown here that this solution also holds for the Prandtl number range 1-3, but only within a limited range of the radial coordinate. Derivations and the results of numerical calculations are presented.   V.L.

A84-21332
DISPLAYS AND SIMULATORS
N. MOHON (Teledyne Brown Engineering, Huntsville, AL) IN: Applied optics and optical engineering. Volume 9 . New York, Academic Press, 1983, p. 203-281.
A 'simulator' is defined as a machine which imitates the behavior of a real system in a very precise manner. The major components of a simulator and their interaction are outlined in brief form, taking into account the major components of an aircraft flight simulator. Particular attention is given to the visual display portion of the simulator, the basic components of the display, their interactions, and their characteristics. Real image displays are considered along with virtual image displays, and image generators. Attention is given to an advanced simulator for pilot training, a holographic pancake window, a scan laser image generator, the construction of an infrared target simulator, and the Apollo Command Module Simulator.   G.R.

A84-21360
PROBABILISTIC FRACTURE MECHANICS AND FATIGUE METHODS: APPLICATIONS FOR STRUCTURAL DESIGN AND MAINTENANCE
J. M. BLOOM, ED. (Babcock and Wilcox Co., Wickliffe, OH) and J. C. EKVALL, ED. (Lockheed-California Co., Burbank, CA) Philadelphia, PA, American Society for Testing and Materials , 1983, 223 p.
Various topics on probabilistic fracture mechanics and statistical aspects of fatigue are addressed. The subjects discussed include: probabilistic defect size analysis using fatigue and cyclic crack growth rate data, statistical methods for estimating crack detection probabilities, characterization of the variability in fatigue crack propagation data, exploratory study of crack-growth-based inspection rationale, reliability and maintainability and cumulative damage, and a method for determining probability of structural failure from aircraft counting accelerometer tracking data.   C.D.

A84-21362
STATISTICAL METHODS FOR ESTIMATING CRACK DETECTION PROBABILITIES
A. P. BERENS and P. W. HOVEY (Dayton, University, Dayton, OH) IN: Probabilistic fracture mechanics and fatigue methods: Applications for structural design and maintenance . Philadelphia, PA, American Society for Testing and Materials, 1983, p. 79-94. refs
(Contract F33615-80-C-5140)
To characterize the uncertainty in nondestructive evaluation (NDE), a probability of crack detection (POD) as a function of crack length is postulated where POD is defined as the proportion of cracks of a given length that would be detected by the NDE technique when applied by inspectors to structural elements in a defined environment. This paper presents a statistical framework for describing the uncertainty in the NDE determinations, and evaluates various characterizations of NDE reliability. The data

from a recent Air Force study on NDE reliability are used to estimate the parameters of the NDE model. For these representative capabilities, NDE reliability experiments are simulated. Different NDE capability characterizations are computed for each simulated experiment and are statistically compared. Author

A84-21364
EXPLORATORY STUDY OF CRACK-GROWTH-BASED INSPECTION RATIONALE
E. K. WALKER (Lockheed-California Co., Burbank, CA) IN: Probabilistic fracture mechanics and fatigue methods: Applications for structural design and maintenance . Philadelphia, PA, American Society for Testing and Materials, 1983, p. 116-130.

A relatively simple probabilistic model is developed having as its basic elements a log-normal representation of crack initiation and crack growth rates, the probability of crack detection, a crack growth curve, and a safety criterion based on a probability of residual strength equal to or less than limit load capability. Interrelationships between these model elements are explored through selected quantified examples. Some resulting internal relationships and trends are discussed. Author

A84-21366
METHOD FOR DETERMINING PROBABILITY OF STRUCTURAL FAILURE FROM AIRCRAFT COUNTING ACCELEROMETER TRACKING DATA
C. E. LARSON and W. R. SHAWVER (Vought Corp., Dallas, TX) IN: Probabilistic fracture mechanics and fatigue methods: Applications for structural design and maintenance . Philadelphia, PA, American Society for Testing and Materials, 1983, p. 147-159; Discussion, p. 160.
(Contract N00019-80-C-0299)

This study develops a methodology that puts the aircraft's stress at critical or reference locations on a probability basis that includes the variability effects of Mach number, altitude, and gross weight. The stress variation due to these variables is then handled probabilistically and applied to the material's cycles to failure (S-N curve) variation to obtain a fatigue life expended (FLE) probability distribution. This FLE probability distribution may be used to derive FLE values that can be expected for the aircraft instead of the single high conservative value that is now being calculated. Author

A84-21367
ANALYSIS OF STRUCTURAL FAILURE PROBABILITY UNDER SPECTRUM LOADING CONDITIONS
C. E. BRONN IN: Probabilistic fracture mechanics and fatigue methods: Applications for structural design and maintenance . Philadelphia, PA, American Society for Testing and Materials, 1983, p. 161-183. refs

A method is presented for computing the probability of failure of structural members exposed to spectrum loading conditions and subjected to periodic inspections. The output is failure probability as a function of service exposure time. The effects of perturbations in the severity of service exposure and variations in inspection effectiveness and inspection period length are demonstrated. Author

A84-21511#
HOLOGRAPHIC VIBRATION MEASURMENT OF A ROTATING FLUTTERING FAN
P. A. STOREY (Rolls-Royce Ltd., Advanced Research Laboratory, Derby, England) AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 234-241. Research supported by the Ministry of Defence (Procurement Executive). refs

Previously cited in issue 17, p. 2746, Accession no. A82-35096

A84-21854*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A NEW TURBULENCE CLOSURE MODEL FOR BOUNDARY LAYER FLOWS WITH STRONG ADVERSE PRESSURE GRADIENTS AND SEPARATION
D. A. JOHNSON and L. S. KING (NASA, Ames Research Center, Moffett Field, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 18 p. refs
(AIAA PAPER 84-0175)

A new turbulence closure model designed specifically to treat two-dimensional, turbulent boundary layers with strong adverse pressure gradients and attendant separation, is presented. The influence of history effects are modeled by using an ordinary differential equation (ODE) derived from the turbulence kinetic-energy equation, to describe the streamwise development of the maximum Reynolds shear stress in conjunction with an assumed eddy-viscosity distribution which has as its velocity scale the maximum Reynolds shear stress. In the outer part of the boundary layer, the eddy viscosity is treated as a free parameter which is adjusted in order to satisfy the ODE for the maximum shear stress. Because of this, the model s not simply an eddy-viscosity model, but contains features of a Reynolds-stress model. Comparisons with experiments are presented which clearly show the proposed model to be superior to the Cebeci-Smith model in treating strongly retarded and separated flows. In contrast to two-equation, eddy-viscosity models, it requires only slightly more computational effort than simple models like the Cebeci-Smith model. Author

A84-21857*# Rockwell International Science Center, Thousand Oaks, Calif.
IMPLICIT TREATMENT OF THE UNSTEADY FULL POTENTIAL EQUATION IN CONSERVATION FORM
V. SHANKAR (Rockwell International Science Center, Thousand Oaks, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 9 p. refs
(Contract NAS1-15820)
(AIAA PAPER 84-0262)

An implicit, conservative treatment for the unsteady full potential equation in two-dimensions is presented. The method employs a local time linearization for density, and introduces flux biasing concepts based on sonic conditions for the generation of artificial viscosity to capture shocks without any overshoots. The boundary condition is treated implicitly using a splitting procedure consistent with the approximate factorization scheme. This allows for extremely large Courant numbers, even for nonorthogonal grid at the body. The method has application not only to unsteady problems, but also to generate the starting blunt body solution for a supersonic full potential marching code. Results are presented for flows over cylinders, spheres and airfoils. Comparisons are made with available Euler and full potential results, and are in excellent agreement. Author

A84-21866#
OPTIMIZING THE USE OF SURFACE SENSORS FOR WIND SHEAR DETECTION - EXPERIMENTAL AND ANALYTICAL CONSIDERATIONS
A. J. BEDARD, JR. (NOAA, Wave Propagation Laboratory, Boulder, Co) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 12 p. refs
(AIAA PAPER 84-0353)

Optimizing the use of surface sensors for wind shear detection involves addressing a broad range of physical processes, time scales, and spatial scales, in addition to operational considerations of providing timely warnings with systems that are practical to install and maintain. Concentrating on thunderstorm gust fronts and downbursts, important properties for detection and warning are reviewed from the perspectives of both analytical calculations and experimental measurements. Calculations of such properties as the forms of the low-level divergence fields and dynamic pressure changes indicate important measurement scales for the

use of combined sensing systems of anemometers and pressure sensors.   Author

A84-22002
THE INCREASE IN EFFICIENCY OF HIGH TEMPERATURE GAS TURBINE PLANTS WITH COOLED TURBINES
V. M. EPIFANOV (Moskovskoe Vysshee Tekhnicheskoe Uchilishche, Moscow, USSR), A. I. LEONTEV, and E. A. MANUSHIN (Teploenergetika; vol. 30, no. 5, 1983, p. 46-49) Thermal Engineering (ISSN 0040-6015), vol. 30, May 1983, p. 290-292. Translation. refs

The efficiency of an ideal thermodynamic cycle with a regenerative cooling system is shown to be higher than that of a noncooled turbine. In regenerative semiclosed cooling (RSC) systems there is no release of air in the blades into the flow section of the turbine, and the compressor blading may be different, with a controlled boundary layer. Characteristics of an air RSC system include: an envelope-type blade to obtain an acceptable temperature field of the blading, independent fixing of the envelope and the rod to allow free thermal expansion of both elements, and tight joints and a tight fit between the envelope and the rod to attain the design air distribution. A method for calculating such parameters of the boundary layer at the surface of permeable blades as pressure losses, leakages, and heat removal, for gas temperatures between 1500 and 1800 K, is presented.   J.N.

A84-22177#
A COMPUTER SYSTEM FOR AIRCRAFT FLYOVER ACOUSTIC DATA ACQUISITION AND ANALYSIS
D. W. BOSTON, E. E. CASHAR, D. A. COPE, and B. M. GLOVER, JR. (Boeing Co., Seattle, WA)   Journal of Aircraft (ISSN 0021-8669), vol. 21, Feb. 1984, p. 155-158.

A minicomputer-based system housed in a mobile trailer was designed for field measurements of aircraft flyover noise. The system was used to accomplish recent Federal Aviation Regulation Part 36 noise certification testing for the new Boeing Models 757 and 767 aircraft. The multiuser system performed acoustic and telemetered data acquisition, analysis, and data base storage. All data were available to on-line color monitors and on hardcopy. One-third octave band acoustic data were acquired and analyzed via microcomputer-controlled digital frequency analyzers. Ground weather data and telemetered data, including upper air weather and airplane position and performance information, were received, stored, and displayed automatically. By integrating all of the data, fully corrected acoustic time histories, spectra, effective perceived noise level values were calculated within minutes of an airplane flyover. On-line data output was used to make test operational decisions and evaluate aircraft noise level predictions. This computer system increased test efficiency by providing high-quality data to personnel for real-time decisionmaking.   Author

A84-22475
CONNECTING ELEMENTS FOR GLASS FIBER-REINFORCED PLASTICS STRUCTURES - MECHANICAL CONNECTIONS FOR HIGHLY-STRESSED STRUCTURES MADE OF FIBER-REINFORCED PLASTICS [VERBINDUNGSELEMENT FUER GFK-STRUKTUREN - MECHANISCHE VERBINDUNGEN VON HOCHBEANSPRUCHTEN KONSTRUKTIONEN AUS FASERVERSTAERKTEN KUNSTSTOFFEN]
G. TURLACH (Kamax-Werke, Osterode, West Germany)   VDI-Z (ISSN 0042-1766), vol. 126, no. 1-2, Jan. 1984, p. 23-30. In German. refs

Fiber-reinforced plastics are now widely used for the design of airframe cells and wing assemblies in the manufacture of aircraft. A significant factor with respect to the manufacturing costs of an aircraft is related to the costs of the fastening elements and the assembly operations involved. The employment of suitable metallic materials for the fasteners is discussed, taking into account bolts, screws, nuts, and problems related to corrosion. Relations between design details and dynamic bearing strength are also examined. It is pointed out that the joining of fiber-reinforced plastics subjected to high stresses by means of screws and bolts involves a very new technical area. The current investigation includes an attempt

to indicate certain problems concerning the use of such assembly methods in the case of carbon-fiber reinforced plastics.   G.R.

A84-22576
ANNUAL REVIEW OF FLUID MECHANICS. VOLUME 16
M. VAN DYKE, ED. (Stanford University, Stanford, CA), J. V. WEHAUSEN, ED. (California, University, Berkeley, CA), and J. L. LUMLEY, ED. (Cornell University, Ithaca, NY)   Palo Alto, CA, Annual Reviews, Inc., 1984, 455 p.

Selected topics in fluid mechanics are examined in reviews of recent theoretical and experimental research. Graphs, diagrams, drawings, and photographs taken from and/or summarizing the publications surveyed are provided. Topics discussed include wave action and wave/mean-flow interaction, numerical simulation of turbulent flows, nonlinear interactions in liquid He II, secondary flow in curved open channels, vortex shedding from oscillating bluff bodies, optical techniques, aeroacoustics of turbulent shear flows, supercritical-wing design, and perturbed free shear layers.
                                                                  D.G.

A84-22622#
STRUCTURE MODEL REFINEMENT USING REANALYSIS TECHNIQUES
B. P. WANG (Texas, University, Arlington, TX) and F. H. CHU (RCA, Astro Electronics Div., Princeton, NJ)   IN: Modal testing and model refinement; Proceedings of the Symposium, Boston, MA, November 13-18, 1983 . New York, American Society of Mechanical Engineers, 1983, p. 135-141. refs

Methods of refining finite element models with localized uncertainties are studied in this paper. With the proposed methods, uncertain parameters in the original models are adjusted to improve the correlation between measured and predicted natural frequencies. The approaches are based on reanalysis formulations. Both approximate and exact reanalysis methods can be applied. In the approximate methods, the models are upgraded interatively by solving a system of linear equations of the order equal to the number of modes used in reanalysis. Using exact reanalysis formulation, the desired parameter adjustment, in certain cases, can be achieved by solving a system of nonlinear algebraic equations. The detailed formulations are presented and applied to a 72-dof space truss model.   Author

A84-22721
FUEL CONTROL SYSTEMS FOR HYDROGEN-FUELED AUTOMOTIVE COMBUSTION ENGINES - A PROGNOSIS
T. KREPEC, T. TEBELIS, and C. KWOK (Concordia University, Montreal, Canada)   International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 9, no. 1-2, 1984, p. 109-114. refs

The state of the art in the field of hydrogen-fueled combustion engines was investigated and conclusions were drawn concerning the future development of fuel control systems for automotive engines using hydrogen as fuel. Assuming the use of modern microprocessor technology together with recently developed linear digital actuators and solenoid operated injectors, basic concepts for fuel control systems were proposed for three mainly used types of combustion engines: gas turbine engine for aircraft propulsion, spark ignition engine for cars and compression ignition engine for vehicles and off-highway equipment. These concepts are based on a liquid hydrogen on-board storage system which seems to be the most feasible for use in the near future.   Author

A84-22851
SUPERPLASTIC FORMING, AN ECONOMICAL SHEET-FORMING PROCESS [SUPERPLASTISCHE UMFORMUNG, EIN WIRTSCHAFTLICHES BLECHUMFORMVERFAHREN]
WINKLER (Messerschmitt-Boelkow-Blohm GmbH, Ottobrunn, West Germany)   Deutsche Gesellschaft fuer Metallkunde, Symposium ueber Blechumformung, Bad Nauheim, Nov. 6, 7, 1983, Paper. 23 p. In German. refs
(MBB-BB-555-83-OE)

The principles of superplasticity are reviewed, and its application to the manufacture of aircraft and spacecraft structures from alloy

sheets is discussed. The importance of the elongation-speed exponent (m) in evaluating alloys for superplastic (SP) forming and the techniques for determining m experimentally are explained. Requirements for an SP alloy include grain size less than 10 microns, structural resistance to grain growth at formation temperature (typicaly 50-60 percent of the melting temperature in C), resistance to pore formation, and low yield stress at forming speeds of 0.00001-0.1/sec. The properties of several alloys are listed in tables, and the advantages of TiAl6V4 are indicated. SP manufacturing techniques are shown to be economical foar smaller quantities (50-3000 pieces), for materials such as TiAl6V4 which cannot be formed in other ways, or when time and material can be saved by reducing SP forming a more complex structure, thus the number of parts in an assembly. Typical applications in helicopter structures and satellite fuel tanks are illustrated with drawings and photographs.   T.K.

A84-22872*#   National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF LASER ANEMOMETRY IN TURBINE ENGINE RESEARCH
R. G. SEASHOLTZ (NASA, Lewis Research Center, Cleveland, OH)   Cleveland Electrical/Electronics Conference and Exposition, Cleveland, OH, Oct. 4-6, 1983, Paper. 7 p.   refs
    The application of laser anemometry to the study of flow fields in turbine engine components is reviewed. Included are discussions of optical configurations, seeding requirements, electronic signal processing, and data processing. Some typical results are presented along with a discussion of ongoing work.   Author

A84-22878*#   Detroit Diesel Allison, Indianapolis, Ind.
CERAMIC COMPONENTS FOR THE AGT 100 ENGINE
H. E. HELMS and P. W. HEITMAN (General Motors Corp., Detroit Diesel Allison Div., Indianapolis, IN)   International Symposium on Ceramic Components for Engines, Hakone, Japan, Oct. 17-21, 1983, Paper. 13 p. Research supported by the U.S. Department of Energy.
(Contract DEN3-168)
    Historically, automotive gas turbines have not been able to meet requirements of the marketplace with respect to cost, performance, and reliability. However, the development of appropriate ceramic materials has overcome problems related to a need for expensive superalloy components and to limitations regarding the operating temperature. An automotive gas turbine utilizing ceramic components has been developed by a U.S. automobile manufacturer. A 100-horsepower, two-shaft, regenerative engine geometry was selected because it is compatible with manual, automatic, and continuously variable transmissions. Attention is given to the ceramic components, the ceramic gasifier turbine rotor development, the ceramic gasifier scroll, ceramic component testing, and the use of advanced nondestructive techniques for the evaluation of the engine components.   G.R.

N84-16374#   Japan Society for Aeronautical and Space Sciences, Tokyo.
TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTICAL AND SPACE SCIENCES, VOL. 26, NO. 73, NOVEMBER 1983
K. KATO, ed. (Tokyo Univ.)   Nov. 1983   58 p   refs
(ISSN-0549-3811)   Avail: NTIS HC A04/MF A01
    Progress and developments in Aeronautics and Space Sciences are reported. Topics presented include: (1) measurements of CARS intensity in hydrogen molecules behind shock waves; (2) rotational temperature measurement by electron beam fluorescence; (3) optimization of laminates cylindrical shells for axial buckling; (4) quasi double lattice method for oscillating thin airfoils in subsonic flow; and (5) analysis of buckling of truncated or complete spherical shells under axial compressive loads.

N84-16384#   Army Cold Regions Research and Engineering Lab., Hanover, N. H. Geotechnical Research Branch.
REVISED PROCEDURE FOR PAVEMENT DESIGN UNDER SEASONAL FROST CONDITIONS
R. L. BERG and T. C. JOHNSON   Sep. 1983   137 p
(Contract DA PROJ. 4A7-62730-AT-42)
(AD-A134480; CRREL-SR-83-27)   Avail: NTIS HC A07/MF A01   CSCL 13B
    This report presents engineering guidance and design criteria for pavements at Army and Air Force facilities in seasonal frost areas. Design methods for controlling surface roughness and loss of subgrade strength during thawing periods are provided. Criteria for using thermal insulating materials and membrane encapsulated soil layers in seasonal frost areas are presented. Six design examples are included.   Author (GRA)

N84-16428*#   Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A USER'S MANUAL FOR THE NASA/JPL SYNTHETIC APERTURE RADAR AND THE NASA/JPL L AND C BAND SCATTEROMETERS
T. W. THOMPSON   1 Jun. 1983   46 p   refs
(Contract NAS7-100)
(NASA-CR-173209; JPL-PUB-83-38; NAS 1.26:173209)   Avail: NTIS HC A03/MF A01   CSCL 17I
    Airborne synthetic aperture radars and scatterometers are operated with the goals of acquiring data to support shuttle imaging radars and support ongoing basic active microwave remote sensing research. The aircraft synthetic aperture radar is an L-band system at the 25-cm wavelength and normally operates on the CV-990 research aircraft. This radar system will be upgraded to operate at both the L-band and C-band. The aircraft scatterometers are two independent radar systems that operate at 6.3-cm and 18.8-cm wavelengths. They are normally flown on the C-130 research aircraft. These radars will be operated on 10 data flights each year to provide data to NASA-approved users. Data flights will be devoted to Shuttle Imaging Radar-B (SIR-B) underflights. Standard data products for the synthetic aperture radars include both optical and digital images. Standard data products for the scatterometers include computer compatible tapes with listings of radar cross sections (sigma-nought) versus angle of incidence. An overview of these radars and their operational procedures is provided by this user's manual.   S.L.

N84-16494*#   National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF BROADENED PROPERTY FUELS ON RADIANT HEAT FLUX TO GAS TURBINE COMBUSTOR LINERS
J. B. HAGGARD, JR.   Dec. 1983   27 p   refs
(NASA-TM-83537; E-1906; NAS 1.15:83537)   Avail: NTIS HC A03/MF A01   CSCL 20D
    The effects of fuel type, inlet air pressure, inlet air temperature, and fuel/air ratio on the combustor radiation were investigated. Combustor liner radiant heat flux measurements were made in the spectral region between 0.14 and 6.5 microns at three locations in a modified commercial aviation can combustor. Two fuels, Jet A and a heavier distillate research fuel called ERBS were used. The use of ERBS fuel as opposed to Jet A under similar operating conditions resulted in increased radiation to the combustor liner and hence increased backside liner temperature. This increased radiation resulted in liner temperature increases always less than 73 C. The increased radiation is shown by way of calculations to be the result of increased soot concentrations in the combustor. The increased liner temperatures indicated can substantially affect engine maintenance costs by reducing combustor liner life up to 1/3 because of the rapid decay in liner material properties when operated beyond their design conditions.   M.G.

N84-16501# Naval Postgraduate School, Monterey, Calif.
REPORT OF TESTS OF A COMPRESSOR CONFIGURATION OF DCA BLADING M.S. Thesis
S. J. HIMES Jun. 1983 181 p
(AD-A133350) Avail: NTIS HC A09/MF A01 CSCL 20D

Results of an experimental program to measure the performance of a compressor stator cascade consisting of 20 double-circular-arc (DCA) blades of chord 5.01 inches, aspect ratio 2.0 and solidity 1.67 under conditions of varying incidence angle and Reynolds number are reported. Flow quality and blade performance data were obtained using pneumatic probe surveys and surface pressure measurements. Changes in Reynolds numbers in the range of 500,000 to 770,000 did not measurably affect either flow quality or blade performance. Changes in incidence angle over the range -15 to 10 degrees produced generally well behaved blade performance parameters. GRA

N84-16529*# Pratt and Whitney Aircraft, West Palm Beach, Fla.
DYNAMIC GAS TEMPERATURE MEASUREMENT SYSTEM, VOLUME 1
D. L. ELMORE, W. W. ROBINSON, and W. B. WATKINS 10 May 1983 138 p refs
(Contract NAS3-23154)
(NASA-CR-168267-VOL-1; NAS 1.26:168267-VOL-1; PWA/GPD-FR-17145-VOL-1) Avail: NTIS HC A07/MF A01 CSCL 14B

A gas temperature measurement system with compensated frequency response of 1 kHz and capability to operate in the exhaust of a gas turbine engine combustor was developed. A review of available technologies which could attain this objective was done. The most promising method was identified as a two wire thermocouple, with a compensation method based on the responses of the two different diameter thermocouples to the fluctuating gas temperature field. In a detailed design of the probe, transient conduction effects were identified as significant. A compensation scheme was derived to include the effects of gas convection and wire conduction. The two wire thermocouple concept was tested in a laboratory burner exhaust to temperatures of about 3000 F and in a gas turbine engine to combustor exhaust temperatures of about 2400 F. Uncompensated and compensated waveforms and compensation spectra are presented. S.L.

N84-16530*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPLICATION OF HOLOGRAPHY TO FLOW VISUALIZATION
G. LEE Jan. 1984 21 p refs
(NASA-TM-84325; A-9540; NAS 1.15:84325) Avail: NTIS HC A02/MF A01 CSCL 14E

Laser holographic interferometry is being applied to many different types of aerodynamics problems. These include two and three dimensional flows in wind tunnels, ballistic ranges, rotor test chambers and turbine facilities. Density over a large field is measured and velocity, pressure, and mach number can be deduced. Author

N84-16563*# National Aeronautics and Space Administration, Washington, D. C.
THE START-UP OF A GAS TURBINE ENGINE USING COMPRESSED AIR TANGENTIALLY FED ONTO THE BLADES OF THE BASIC TURBINE
L. K. SLOBODYANYUK and V. I. DAYNEKO Feb. 1983 8 p refs Transl. into ENGLISH from Energetika (USSR), no. 20, Sep. 1977 p 135-137 Original language doc. announced as A78-24149 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Sevastopol Instrumentation Making Inst., USSR
(NASA-TM-77021; NAS 1.15:77021) Avail: NTIS HC A02/MF A01 CSCL 13I

The use of compressed air was suggested to increase the reliability and motor lifetime of a gas turbine engine. Experiments were carried out and the results are shown in the form of the variation in circumferential force as a function of the entry angle of the working jet onto the turbine blade. The described start-up method is recommended for use with massive rotors. Author

N84-16587*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLUTTER OF SWEPT FAN BLADES
R. E. KIELB and K. R. V. KAZA 1984 12 p refs Proposed for presentation at the 29th Intern. Gas Turbine Conf., Amsterdam, 3-7 Jun. 1984; sponsored by ASME
(NASA-TM-83547; E-1921; NAS 1.15:83547) Avail: NTIS HC A02/MF A01 CSCL 20K

The effect of sweep on fan blade flutter is studied by applying the analytical methods developed for aeroelastic analysis of advance turboprops. Two methods are used. The first method utilizes an approximate structural model in which the blade is represented by a swept, nonuniform beam. The second method utilizes a finite element technique to conduct modal flutter analysis. For both methods the unsteady aerodynamic loads are calculated using two dimensional cascade theories which are modified to account for sweep. An advanced fan stage is analyzed with 0, 15 and 30 degrees of sweep. It is shown that sweep has a beneficial effect on predominantly torsional flutter and a detrimental effect on predominantly bending flutter. This detrimental effect is shown to be significantly destabilizing for 30 degrees of sweep. M.G.

N84-16589*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BENDING FATIGUE OF ELECTRON-BEAM-WELDED FOILS. APPLICATION TO A HYDRODYNAMIC AIR BEARING IN THE CHRYSLER/DOE UPGRADED AUTOMOTIVE GAS TUBINE ENGINE Final Report
J. F. SALTSMAN and G. R. HALFORD Jan. 1984 27 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-83539; DOE/NASA/51040-51; E-1910; NAS 1.15:83539) Avail: NTIS HC A03/MF A01 CSCL 20K

A hydrodynamic air bearing with a compliment surface is used in the gas generator of an upgraded automotive gas turbine engine. In the prototype design, the compliant surface is a thin foil spot welded at one end to the bearing cartridge. During operation, the foil failed along the line of spot welds which acted as a series of stress concentrators. Because of its higher degree of geometric uniformity, electron beam welding of the foil was selected as an alternative to spot welding. Room temperature bending fatigue tests were conducted to determine the fatigue resistance of the electron beam welded foils. Equations were determined relating cycles to crack initiation and cycles to failure to nominal total strain range. A scaling procedure is presented for estimating the reduction in cyclic life when the foil is at its normal operating temperature of 260 C (500 F). S.L.

N84-16590*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF STRUCTURAL FLEXIBILITY ON THE DESIGN OF VIBRATION-ISOLATING MOUNTS FOR AIRCRAFT ENGINES
W. H. PHILLIPS Feb. 1984 24 p refs
(NASA-TM-85725; L-15704; NAS 1.15:85725) Avail: NTIS HC A02/MF A01 CSCL 20K

Previous analyses of the design of vibration-isolating mounts for a rear-mounted engine to decouple linear and rotational oscillations are extended to take into account flexibility of the engine-mount structure. Equations and curves are presented to allow the design of mount systems and to illustrate the results for a range of design conditions. Author

N84-17433*# Arizona State Univ., Tempe. Dept. of Psychology.
HUMAN FACTORS ISSUES ASSOCIATED WITH THE USE OF SPEECH TECHNOLOGY IN THE COCKPIT
Z. A. KERSTEEN and D. DAMOS Dec. 1983 83 p refs
(NASA-CR-166548; NAS 1.26:166548) Avail: NTIS HC A05/MF A01 CSCL 17B

The human factors issues associated with the use of voice technology in the cockpit are summarized. The formulation of the

LHX avionics suite is described and the allocation of tasks to voice in the cockpit is discussed. State-of-the-art speech recognition technology is reviewed. Finally, a questionnaire designed to tap pilot opinions concerning the allocation of tasks to voice input and output in the cockpit is presented. This questionnaire was designed to be administered to operational AH-1G Cobra gunship pilots. Half of the questionnaire deals specifically with the AH-1G cockpit and the types of tasks pilots would like to have performed by voice in this existing rotorcraft. The remaining portion of the questionnaire deals with an undefined rotorcraft of the future and is aimed at determining what types of tasks these pilots would like to have performed by voice technology if anything was possible, i.e. if there were no technological constraints.   S.L.

N84-17435*# Texas Univ., Austin. Applied Research Labs.
APQ-102 IMAGING RADAR DIGITAL IMAGE QUALITY STUDY Final Report, 1 Nov. 1981 - 31 Oct. 1982
C. R. GRIFFIN and J. M. ESTES 11 Nov. 1982 102 p refs
(Contract NAS9-16497)
(NASA-CR-171738; NAS 1.26:171738; ARL-TR-82-68) Avail: NTIS HC A06/MF A01 CSCL 17I
A modified APQ-102 sidelooking radar collected synthetic aperture radar (SAR) data which was digitized and recorded on wideband magnetic tape. These tapes were then ground processed into computer compatible tapes (CCT's). The CCT's may then be processed into high resolution radar images by software on the CYBER computer.   S.L.

N84-17439# Air Force Academy, Colo. Dept. of Electrical Engineering.
PROCEEDINGS OF THE SYMPOSIUM ON MILITARY SPACE COMMUNICATIONS AND OPERATIONS
1983 125 p Proc. held at USAF Acad., Colo., 2-4 Aug. 1983
(AD-A135021) Avail: NTIS HC A06/MF A01 CSCL 05A
This document on military Space Communications and Operations contains papers presented at the following seven sessions: (1) Operational Concepts/Missions; (2) Network Control/Architecture; (3) Space System Survivability/Reliability; (4) Space System Technology/Analysis; (5) DoD Command and Control Centers; (6) Policy, Strategy and Legal Aspects of Space; (7) Simulation and Testing.   GRA

N84-17479*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A MATHEMATICAL MODEL FOR THE DOUBLY-FED WOUND ROTOR GENERATOR, PART 2
F. J. BRADY 1984 8 p refs Proposed for presentation at the Summer Meeting of the Power Eng. Soc., Seattle, 15-20 Jul. 1984; sponsored by IEEE
(Contract DE-AI01-76ET-20320)
(NASA-TM-83581; DOE/NASA/20320-57-PT-2; E-1972-PT-2; NAS 1.15:83581) Avail: NTIS HC A02/MF A01 CSCL 09A
A mathematical analysis of a doubly-fed wound rotor generator is presented. The constraints of constant stator voltage and frequency to the circuit equations were applied and expressions for the currents and voltages in the machine obtained. The derived variables are redefined as direct and quadrature components. In addition, the apparent (complex) power for both the rotor and the stator are derived in terms of these redefined components.   S.L.

N84-17525*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOT-FLOW TESTS OF A SERIES OF 10-PERCENT-SCALE TURBOFAN FORCED MIXING NOZZLES
V. L. HEAD, L. A. POVINELLI, and W. H. GERSTENMAIER Jan. 1984 95 p refs
(NASA-TP-2268; E-1746; NAS 1.60:2268) Avail: NTIS HC A05/MF A01 CSCL 20D
An approximately 1/10-scale model of a mixed-flow exhaust system was tested in a static facility with fully simulated hot-flow cruise and takeoff conditions. Nine mixer geometries with 12 to 24 lobes were tested. The areas of the core and fan stream were held constant to maintain a bypass ratio of approximately 5. The research results presented in this report were obtained as part of a program directed toward developing an improved mixer design methodology by using a combined analytical and experimental approach. The effects of lobe spacing, lobe penetration, lobe-to-centerbody gap, lobe contour, and scalloping of the radial side walls were investigated. Test measurements included total pressure and temperature surveys, flow angularity surveys, and wall and centerbody surface static pressure measurements. Contour plots at various stations in the mixing region are presented to show the mixing effectiveness for the various lobe geometries.
                                        Author

N84-17526*# Massachusetts Inst. of Tech., Cambridge. Lab. for Computational Fluid Dynamics.
COMPUTATION OF POTENTIAL FLOWS WITH EMBEDDED VORTEX RINGS AND APPLICATIONS TO HELICOPTER ROTOR WAKES Final Report
T. W. ROBERTS Sep. 1983 98 p refs
(Contract NGT-22-009-901; NAG2-105)
(NASA-CR-166542; NAS 1.26:166542; CFDL-TR-83-5) Avail: NTIS HC A05/MF A01 CSCL 20D
A finite difference scheme for solving the motion of a number of vortex rings is developed. The method is an adaptation of the 'cloud-in-cell' technique to axisymmetric flows, and is thus a combined Eulerian-Lagrangian technique. A straightforward adaptation of the cloud-in-cell scheme to an axisymmetric flow field is shown to introduce a grid dependent self-induced velocity to each vortex ring. To correct this behavior the potential is considered to consist of two parts, a local and a global field. An improved difference formula is derived, allowing the accurate calculation of the potential at points near vortex locations. The local potential is then subtracted before calculating the velocity, leaving only the influences of the remaining vortices. The correct self-induced velocity is then explicitly added to the vortex velocity. Calculations of the motion of one and two vortex rings are performed, demonstrating the ability of the new method to eliminate the grid dependence of the self-induced velocity. The application of the method to the calculation of helicopter rotor flows in hover is attempted.   M.G.

N84-17536# Florida Univ., Gainesville. Dept. of Mathematics.
THE EFFECT OF THE ARTIFICIAL FAR FIELD BOUNDARY ON A FINITE DIFFERENT APPROXIMATION OF THE NAVIER-STOKES EQUATIONS FOR A COMPRESSIBLE FLUID Final Report, 1 May 1982 - 30 Apr. 1983
P. J. MCKENNA 30 Jun. 1983 54 p
(Contract AF-AFOSR-0171-82; AF PROJ. 2304)
(AD-A135152; AFOSR-83-0928TR) Avail: NTIS HC A04/MF A01 CSCL 20D
During this period the principal investigator has considered the effect of the artificial far field boundary on a finite different approximation of the Navier-Stokes equations for a compressible fluid considered for two dimensional boundary conditions for the far-field boundary can results in some of the following phenomena: (1) reflecting boundary conditions, in which the disturbances in the physical variables represented by the difference between the steady state flow and the initial conditions are not allowed to exit through the far-field boundary but instead continue echoing up and down the grid; (2) under-specified boundary conditions, in which the converged steady state solution may depend on the initial conditions; and (3) over-specified boundary conditions in which large errors are introduced before convergence takes place. The following conclusions may be drawn from the numerical experiments conducted as a part of the research effort: There are four distinct artificial nonreflecting boundaries containing free-stream information, these being the inflow, outflow, top-sidewall and bottom-sidewall. Each of these boundaries must be treated differentially, or errors are introduced into the system.
                                        GRA

N84-17574*# FWG Associates, Inc., Tullahoma, Tenn.
DOPPLER LIDAR SIGNAL AND TURBULENCE STUDY Final Report
W. FROST and K. H. HUANG 23 Dec. 1983 58 p refs
(Contract NAS8-35185)
(NASA-CR-170976; NAS 1.26:170976) Avail: NTIS HC A04/MF A01 CSCL 20E

Wind fields were measured with the ground-based NASA/MSFC lidar are compared with the in situ NASA RB-57 aircraft measurements. The mean wind fields, the turbulence intensities, and the turbulence spectra determined from measurements by both systems are in very good agreement. Turbulence intensities and spectra were calculated from the fluctuations with time in the radial wind speed component. The second moment or Doppler frequency spectral width of the lidar measurements was also compared with turbulence intensities measured by the aircraft. These second moments could only be resolved at the very low altitudes (in three range bins). Turbulence intensities estimated from the spectral width data were an order of magnitude higher than those measured by the aircraft. An interesting boundary layer evolved during the progress of the experiment. The breakup of a stable boundary layer resulted in winds blowing in one direction above 600 m msl and in the opposite direction below that level. Both the aircraft and the lidar systems clearly identified this unusual boundary layer flow and showed the identical trends. A.R.H.

N84-17590*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF DIFFERENT RUB MODELS ON SIMULATED ROTOR DYNAMICS
A. F. KASCAK and J. J. TOMKO Feb. 1984 12 p refs
Presented at the ASME Appl. Mech., Bioeng., and Fluids Eng. Conf., Houston, Tex., 20-22 Jun. 1983 Prepared in cooperation with Army Research and Technology Labs., Cleveland
(NASA-TP-2220; E-1801; NAS 1.60:2220; AFSCOM-TR-83-C-8)
Avail: NTIS HC A02/MF A01 CSCL 13I

Using a direct integration, transient response rotor dynamics computer code, the response of turbine engine rotors to two different blade tip - seal interference rub models was studied. The first model, an abradable seal rub model, is based on an energy-loss-per-unit-volume theory (applicable to a ceramic turbine blade tip seal). The second, a smearin model, is based on viscous hydrodynamic theory (applicable to a metallic blade tip seal). The results from these two models were compared with those from a previously studied model based on dry friction theory. The abradable model was very senitive to small changes in the energy per unit volume, and once a threshold was exceeded, the rotor went into a backward whirl. The amplitude seemed to grow without limit. This was similar to the dry friction model when the coefficient of friction exceeded a particular threshold. The smearing model was not as sensitive to small changes in the viscosity, but a threshold viscosity was found. When it was exceeded, the rotor went into backward whirl, but the amplitude seemed to grow to a finite limit. Author

N84-17610# Sussex Univ., Brighton (England). School of Engineering and Applied Science.
SQUEEZE-FILM DAMPING OF ROTOR-DYNAMIC SYSTEMS
M. DOGAN and R. HOLMES *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 15, No. 9 p 3-9 Sep. 1983 refs
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20K

The roles of the squeeze-film damper when used in parallel with a flexible element in a vibration isolator and when used in a series with flexible pedestals or the frame of a rotor-dynamic system are reviewed. Author

N84-17623# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Structural Integrity Branch.
USE OF SMALL CRACK DATA TO BRING ABOUT AND QUANTIFY IMPROVEMENTS TO AIRCRAFT STRUCTURAL INTEGRITY Final Report, Jan. 1981 - Oct. 1982
J. M. POTTER and B. G. W. YEE Sep. 1983 18 p
(Contract AF PROJ. 2401)
(AD-A135012; AFWAL-TR-83-3096) Avail: NTIS HC A02/MF A01 CSCL 01C

Crack growth information has been used in ways to quantitatively evaluate and predict damage tolerance and slow crack growth life limits of structures. Recent advances in the area of crack growth at small crack sizes (less than one millimeter) have enabled increasingly quantitative studies into the specific mechanisms that affect initiation and growth at structural details. As an example, through the use of small crack data the USAF/General Dynamics study on 'Fastener Hole Quality' was able to identify a manufacturing-related problem causing short structural lives, propose a modification to shop equipment, and quickly and specifically evaluate the resultant flaw growth improvement. The purpose of this paper is to describe the general procedures used in the derivation of small crack data and to present growth data for different structural manufacturing methods. The data will be presented in terms of equivalent initial flaw size populations, crack growth rate, and initiation life to a specific length for fractographically measured cracks within the range of .01 to 1 millimeter in length. Procedures will be discussed to utilize the small crack data from developing and verifying changes in fastener systems and manufacturing methods for improving the fatigue performance of aircraft structures. GRA

13

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

A84-21864*# National Oceanic and Atmospheric Administration, Boulder, Colo.
A CASE STUDY ILLUSTRATING TIME SCALES AND OPERATIONAL RESPONSES FOR A WIND SHEAR EPISODE DURING THE JAWS PROJECT
A. J. BEDARD, JR. (NOAA, Wave Propagation Laboratory, Boulder, CO) and J. MCCARTHY (National Center for Atmospheric Research, Boulder, CO) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 9 p. Research supported by the National Center for Atmospheric Research, NSF, and NOAA; U.S. Department of Transportation.
(Contract DOT-FA01-82-Y-10513; NASA ORDER H-59314-B)
(AIAA PAPER 84-0351)

A microburst event on 14 July 1983 illustrates the short time scales involved in responding to this type of wind shear. The event also illustrates how a controller used information from several sources in helping a number of aircraft avoid a dangerous wind shear situation. The implications of this event are discussed for the design of future wind shear detection systems, and these observations are related to data obtained during the JAWS experiment. Author

A84-21865*# Systems and Applied Sciences Corp., Hampton, Va.
A NUMERICAL WEATHER PREDICTION SYSTEM DESIGNED TO SIMULATE ATMOSPHERIC DOWNBURST PHENOMENA
S. CHUANG, F. H. PROCTOR, J. W. ZACK, and M. L. KAPLAN (Systems and Applied Sciences Corp., Hampton, VA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 16 p. refs
(Contract NAS1-17409)
(AIAA PAPER 84-0352)

It is pointed out that an increase in the understanding of weather-related aircraft accidents can save hundreds of human lives and million of dollars. A better understanding regarding the interaction between aircraft operation and severe weather conditions can be obtained with the aid of flight simulator facilities. It is shown that numerical weather modeling is one of the most precise and cost-effective inputs for flight simulators in the long run. A comprehensive weather modeling system is being developed for the simulation of different scales of atmospheric phenomena. The modeling system utilizes two numerical weather models, including the Mesoscale Atmospheric Simulation system, and the Terminal Area Simulation System. G.R.

A84-21879#
VISIBILITY IN HEAVY PRECIPITATION AND ITS USE IN DIAGNOSING HIGH RAINFALL RATES
P. J. HUFFMAN and P. A. HAINES (Dayton, University, Dayton, OH) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 23 p. refs
(AIAA PAPER 84-0541)

This paper discusses the problem of visibility through rainfall. A semi-empirical development is presented for the power law relation between extinction coefficient and rainrate. The results of several experimental programs are summarized. The experimental results show a good fit to the two parameter power law relation. There are, however, wide variations in the measured values of the parameters. This variation is due to the wide variation observed in raindrop size distributions. There is a need for further measurement and analysis of the correlation between extinction coefficient and rainrate. The empirical relations between visibility and rainfall rates are applied in diagnosing the rainfall rate encountered by Pan American Flight 759 on July 9, 1982. The derived rainrate is consistent with other pertinent rain data.
Author

N84-17763# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Wolkenphysik.
STATUS FOR KNOWLEDGE: METEOROLOGICAL AFFECTED ICING ON AIRCRAFT IN CLOUDS
H. E. HOFFMANN Jun. 1983 66 p refs In GERMAN; ENGLISH summary
(DFVLR-MITT-83-12) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 20,50

The international status of knowledge is presented. Besides a series of special reports the following reports are used as a basis: The Federal Aviation Regulations (FAR) today valid - respectively reports from 1949-1956, on which they are founded - and publications of AGARD and German Military Geophysical Office in the last time. The presentation of status of knowledge is arranged according to the following topics: cloudphysical parameters (temperature, liquid water content, particle size), cloud parameters (class of clouds, range, altitude, orograhy), synoptics (fronts, air masses), calculation of the ice accretion and the derivation of empirical equations and diagrams for the changing of the aerodynamic coefficients.
ESA

15

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

N84-18090*# Massachusetts Inst. of Tech., Cambridge. Lab. for Computational Fluid Dynamics.
CALCULATING C-GRIDS WITH FINE AND EMBEDDED MESH REGIONS Final Report
B. LOYD *In its* A Coop. Program to Stimulate Student Involvement through the MIT Undergraduate Research Opportunity Program 14 p Jan. 1984 refs
(CFDL-TR-83-7) Avail: NTIS HC A05/MF A01 CSCL 09B

A program for calculating a C-type mesh around airfoil like shapes is described. The Jameson/Caughey approach is used: a parabolic transformation coupled with a shearing transformation. The algebraic algorithm is capable of efficiently generating nearly orthogonal grids. A high degree of grid control is possible. The user may specify grid boundaries, number of grid lines, and location of (and spacing in) trailing edge and leading edge fine mesh areas. The capability of embedding fine mesh regions, for use with new adaptive grid techniques, is being developed. Grids generated by the program were used in Euler flow flow calculatons by W. Usab. Results superior to results calculated on previous O-type grids were obtained. Specifically, calculations converged faster using C-grids rather than 0-grids, total pressure loss spikes at the trailing edge of the airfoil were eliminated, and the Ni method converged with zero artificial smoothing for a subcritical case (resulting overall total pressure loss was then nearly zero). These improvements were attributed to higher grid orthogonality, especially at the trailing edge. The program itself is fairly straightforward. Roughly half of the 800 code lines are comment lines.
Author

16

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

A84-19622#
FLUCTUATING FORCES AND ROTOR NOISE DUE TO MAIN ROTOR-TAIL ROTOR INTERACTION
J. SCHREIER (Aachen, Rheinisch-Westfaelische Technische Hochschule, Aachen, West Germany) Association Aeronautique et Astronautique de France, European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug. 31-Sept. 3, 1982, Paper. 13 p. refs

The paper is concerned with the helicopter noise which is generated by the interaction of the tip vortices of the main rotor with the tail rotor. This interaction was simulated by a test facility with two rotors. Sound pressure levels and noise spectra have been measured under various conditions. The unsteady forces on the tail rotor blades as well as the radiated sound field were calculated. Measured and calculated data show a reasonable agreement.
Author

A84-19899* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROGRESS IN ROTOR BROADBAND NOISE RESEARCH
T. F. BROOKS (NASA, Langley Research Center, Hampton, VA) and R. H. SCHLINKER (United Technologies Research Center, East Hartford, CT) Vertica (ISSN 0360-5450), vol. 7, no. 4, 1983, p. 287-307. refs

The current status of research on various rotor broadband noise sources is reviewed. Theoretical modeling techniques which appear to have the most promise in the development of successful noise prediction capabilities are emphasized. The types of noise considered include: turbulence ingestion noise, blade self-noise due to turbulence passing the trailing edge, blade self-noise due to separated flow, and blade self-noise due to vortex shedding. Comparisons with experimental results are given, and present theoretical and experimental limitations are delineated to help identify areas of needed research. C.D.

A84-20049*# Hamilton Standard, Windsor Locks, Conn.
MEASUREMENT AND ANALYSIS OF ACOUSTIC FLIGHT TEST DATA FOR TWO ADVANCED DESIGN HIGH SPEED PROPELLER MODELS
B. M. BROOKS (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and K. G. MACKALL (NASA, Flight Research Center, Edwards, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 14 p. refs
(Contract NAS4-2822)
(AIAA PAPER 84-0250)

The recent test program, in which the SR-2 and SR-3 Prop-Fan models were acoustically tested in flight, is described and the results of analysis of noise data acquired are discussed. The trends of noise levels with flight operating parameters are shown. The acoustic benefits of the SR-3 design with swept blades relative to the SR-2 design with straight blades are shown. Noise data measured on the surface of a small-diameter microphone boom mounted above the fuselage and on the surface of the airplane fuselage are compared to show the effects of acoustic propagation through a boundary layer. Noise level estimates made using a theoretically based prediction methodology are compared with measurements. Author

A84-20050#
CONTROLLED SUPPRESSION OR AMPLIFICATION OF TURBULENT JET NOISE
D. F. LONG, H. KIM, and R. E. A. ARNDT (Minnesota, University, Minneapolis, MN) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 8 p. refs
(Contract F49620-80-C-0053; N00014-83-K-0145)
(AIAA PAPER 84-0401)

As a result of acoustic excitation under very specific tuned conditions, both amplification and suppression of the broadband component of jet noise can be achieved in the same test rig. Associated with the amplification are discrete tones corresponding to the subharmonics of the excitation at the shear layer instability frequency. Associated with the suppression is a general stretching of the jet flow. This is observed by a source location technique known as polar correlation, and also from flow visualization.
Author

A84-21161
SOME REMARKS ON SOURCE COHERENCE AFFECTING JET NOISE
A. MICHALKE (Berlin, Technische Universitaet, Berlin, West Germany) Journal of Sound and Vibration (ISSN 0022-460X), vol. 87, March 8, 1983, p. 1-17. refs

The influence of axial and azimuthal source coherence on the noise radiation has been investigated. For jet noise at small Helmholtz numbers results of a theoretical source model have been compared with measured data. It is found from the noise data that the axial coherence length scales of the sound-radiating turbulence at small Strouhal numbers are relatively large and do increase when the turbulence is excited artificially. Furthermore, the influence of the azimuthal source coherence length scale on the sound radiation from a source ring has been discussed. It is found that the sound field depends remarkably on the azimuthal source coherence, and that a completely incoherent source ring does not radiate sound. If the jet shear noise-source term is modelled, then in the source ring plane the second azimuthal sound component dominates at small Helmholtz numbers, as observed in jet experiments. Author

A84-21212
ON LINEAR ACOUSTIC SOLUTIONS OF HIGH SPEED HELICOPTER IMPULSIVE NOISE PROBLEMS
C. K. W. TAM (Florida State University, Tallahassee, FL) Journal of Sound and Vibration (ISSN 0022-460X), vol. 89, July 8, 1983, p. 119-134. refs

The nature of linear acoustic solutions for a helicopter rotor blade with a blunt leading edge operating at high transonic tip Mach number is studied. As a part of this investigation a very efficient computation procedure for helicopter rotor blade thickness noise according to linear theory is developed. Numerical and analytical results reveal that as the blade tip Mach number approaches unity, the solution develops singularities and a radiating discontinuity. It is shown that these characteristic features are caused by the contributions of the higher harmonics which decrease in magnitude only as $n \exp{-1/2}$ in the limit n tending to infinity. These higher harmonics are generated by the blunt leading edge. The far field wave form at sonic tip Mach number for a blade with a NACA 0012 airfoil section has a singularity of the inverse root type at its front and a logarithmic singularity near its end. Thus caution must be exercised in applying linear acoustic theory to high speed helicopter impulsive noise problems. Author

A84-21213* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PROPELLER TONE BURSTS
G. P. SUCCI (Bolt Beranek and Newman, Inc., Cambridge, MA), D. H. MUNRO (California, University, Lawrence Livermore National Laboratory, Livermore, CA), and K. U. INGARD (MIT, Cambridge, MA) Journal of Sound and Vibration (ISSN 0022-460X), vol. 89, July 22, 1983, p. 145-153. Research supported by the U.S. Environmental Protection Agency. refs
(Contract NAS1-15154)

Intense high frequency (25-38 kHz) tone bursts have been observed in acoustic tests of a scale model of a general aviation propeller. The amplitude of the tone burst is approximately equal to the amplitude of the propeller noise signature. The conditions necessary for the production of these tone bursts are described. The experiments indicate that the origin of these bursts is a periodic flow oscillation on the suction surface of the propeller blade tips which may be due to the interaction between an oscillating shock wave and a laminar boundary layer. Author

A84-21216
SCATTERING OF SOUND BY AN ELASTIC PLATE WITH FLOW
I. D. ABRAHAMS (Manchester, Victoria University, Manchester, England) Journal of Sound and Vibration (ISSN 0022-460X), vol. 89, July 22, 1983, p. 213-231. refs

An elastic plate, set in an infinite baffle and immersed in a fluid moving with a uniform subsonic velocity, is excited by an acoustic source. The scattered sound field is analyzed when fluid-plate coupling is large, and a solution is found by the use of matched asymptotic expansions. The far field is found to approximate to the solution obtained when the elastic plate is absent. At a plate resonance, however, the outer field must include eigensolutions with singularities at the plate edges, and close to the plate the dominant terms are travelling plate waves. These plate waves are found to have a wavelength independent of the frequency of the source. It is also shown that a plate resonance corresponds to a divergence instability of aerodynamic flutter theory and that the stability results found in this paper are in agreement with those obtained by using modal expansions. The limit as the

Mach number goes to zero is found to be singular, suggesting an analysis of the model for small flow velocity. This calculation is performed and the results match smoothly to the respective solutions for a stationary fluid and for a large subsonic flow.
Author

A84-21221
SEPARATED FLOW NOISE OF A FLAT PLATE AT LARGE ATTACK ANGLES
Y. MARUTA (EBARA Corp., Research Laboratory, Fujisawa, Kanagawa, Japan) and S. KOTAKE (Tokyo, University, Tokyo, Japan) Journal of Sound and Vibration (ISSN 0022-460X), vol. 89, Aug. 8, 1983, p. 335-357. refs

Flow noise associated with separated flow of a flat plate with large attack angles was studied experimentally to obtain its acoustic characteristics and to understand its generation mechanism. The acoustic features show that the separated flow noise could be attributed to acoustic dipole sources associated with the wall-pressure fluctuations on the plate surface. The time derivative of the fluctuating wall-surface pressure is highly correlated with the associated pressure. The noise intensity source strength is proportional to the mean-square time derivative of the fluctuating surface pressure and its correlation area, being proportional to the sixth power of the oncoming flow velocity and distributed uniformly over the plate surfaces. The associated acoustic intensity is well predicted by these noise source strength distributions.
Author

A84-21272* Lockheed-Georgia Co., Marietta.
ACOUSTIC POWER DISSIPATION ON RADIATION THROUGH DUCT TERMINATIONS - EXPERIMENTS
M. SALIKUDDIN and K. K. AHUJA (Lockheed-Georgia Co., Marietta, GA) Journal of Sound and Vibration (ISSN 0022-460X), vol. 91, Dec. 22, 1983, p. 479-502. Research sponsored by the Lockheed Independent Research and Development Program. refs
(Contract NAS3-20797)

This paper describes the acoustic transmission characteristics of ducts, nozzles, orifices, and perforated plates, studied under an experimental program using an acoustic impulse technique. In this technique high intensity pulses, generated by discharging a capacitor across a spark gap, were used as the sound source. The test conditions include heated and unheated flows, with and without simulated flight. Results for a straight round duct, three convergent nozzles, a suppressor nozzle, 12 orifice plates, and 10 perforated plates are presented. A low frequency acoustic power loss phenomenon was observed for all configurations at all test conditions including the no flow condition. It was suspected that the power loss phenomenon at the no flow condition could be due to the conversion of acoustic energy into vortical energy due to non-linear propagation of high intensity pulses. However, a small amount of low frequency power loss was noticed even when tests were repeated with a low intensity sound. Detailed flow visualization results were also obtained to complement the acoustic results.
Author

A84-21273* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH FREQUENCY GREEN FUNCTION FOR AERODYNAMIC NOISE IN MOVING MEDIA. I - GENERAL THEORY. II - NOISE FROM A SPREADING JET
P. A. DURBIN (NASA, Lewis Research Center, Cleveland, OH) Journal of Sound and Vibration (ISSN 0022-460X), vol. 91, Dec. 22, 1983, p. 519-525, 527-538. refs

It is shown how a high frequency analysis can be made for general problems involving flow-generated noise. In the parallel shear flow problem treated by Balsa (1976) and Goldstein (1982), the equation governing sound propagation in the moving medium could be transformed into a wave equation for a stationary medium with an inhomogeneous index of refraction. It is noted that the procedure of Avila and Keller (1963) was then used to construct a high frequency Green function. This procedure involves matching a solution valid in an inner region around the point source to an outer, ray-acoustics solution. This same procedure is used here

to construct the Green function for a source in an arbitrary mean flow. In view of the fact that there is no restriction to parallel flow, the governing equations cannot be transformed into a wave equation; the analysis therefore proceeds from the equations of motion themselves.
C.R.

A84-21504#
JET NOISE AT LOW REYNOLDS NUMBER
D. F. LONG and R. E. A. ARNDT (Minnesota, University, Minneapolis, MN) AIAA Journal (ISSN 0001-1452), vol. 22, Feb. 1984, p. 187-193. refs
(Contract F49620-80-C-0053)
Previously cited in issue 01, p. 130, Accession no. A82-10453

A84-21858#
PREDICTION OF SOURCES MOVING AT HIGH SPEED AS APPLIED TO HELICOPTER AND PROPELLER NOISE
S. E. WRIGHT and D. J. LEE (Stanford University, Stanford, CA) American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 22nd, Reno, NV, Jan. 9-12, 1984. 13 p. refs
(AIAA PAPER 84-0251)

This paper analyzes the linear acoustic solution concerning the radiation from a rigid body in motion. The body displacement source is used as the monopole source description, rather than the traditional volume flow rate. The point source behavior, particularly in circular motion, and the onset of noncompactness is considered. The effect of finite source distributions is established and an efficient method developed to calculate the effect of finite chord and span distributions.
Author

A84-22584*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AEROACOUSTICS OF TURBULENT SHEAR FLOWS
M. E. GOLDSTEIN (NASA, Lewis Research Center, Cleveland, OH) IN: Annual review of fluid mechanics. Volume 16 . Palo Alto, CA, Annual Reviews, Inc., 1984, p. 263-285. refs

Recent analytical, numerical-simulation and experimental studies of sound generation by high-Reynolds-number turbulent shear flows are reviewed, with a focus on the application of linear rapid-distortion theory to the calculation of the unsteady flow field producing the sound. This approach is considered the most important alternative to acoustic-analogy methods. Topics surveyed include the linear theory of solid-surface interactions, the jet-noise problem, extensions to more complex turbulent flows, and supersonic flows. Graphs comparing theoretical and experimental results are shown.
D.G.

N84-16941*# Purdue Univ., Lafayette, Ind. Dept. of Mechanical Engineering.
LIGHT AIRCRAFT SOUND TRANSMISSION STUDY Interim Report
K. HEITMAN and R. J. BERNHARD Oct. 1983 22 p refs
(Contract NAG1-58; NAG-0226-52-1288)
(NASA-CR-173175; NAS 1.26:173175; HL-83-40; REPT-0226-7)
Avail: NTIS HC A02/MF A01 CSCL 20A

The plausibility of using the two microphone sound intensity technique to study noise transmission into light aircraft was investigated. In addition, a simple model to predict the interior sound pressure level of the cabin was constructed.
Author

N84-16943*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
ANALYTICAL STUDY OF THE TWIN-JET SHIELDING Final Report
C. H. GERHOLD Dec. 1983 75 p refs
(Contract NAG1-11)
(NASA-CR-175357; NAS 1.26:175357) Avail: NTIS HC A04/MF A01 CSCL 20A

The development of the analytical model of twin-jet shielding is summarized. The models consist of a point noise source impinging on a cylinder of heated flow in which the temperature and flow velocity are uniform cross the cross section. In the formulation of the model, the wave equations are written for the

regions outside the flow and within the flow cylinder. The solutions to the wave equations are matched at the jet boundary under the conditions of continuity of pressure and continuity of the vortex sheet. The solution reduces to an indefinite integral involving Bessel functions. The integral is solved approximately using a saddle point method.   Author

N84-16944*# Wayne State Univ., Detroit, Mich. Dept. of Mathematics.
ANALYSIS OF SOME ACOUSTICS-JET FLOW INTERACTION PROBLEMS Technical Report, 1 Apr. 1981 - 31 Dec. 1983
P. L. CHOW 31 Jan. 1984 25 p refs
(Contract NSG1-113)
(NASA-CR-175340; NAS 1.26:175340) Avail: NTIS HC A02/MF A01 CSCL 20A
    Analytical problems in the interactions between the mean-shear flows and the acoustic field in the planar and circular jets are examined. These problems are basic in understanding the effects of coherent large structure on the generation and complications of sound in a sub-sonic jet. Three problems were investigated: (1) spatial (vs. temporal) normal mode analysis in a planar jets; (2) a slightly divergent, planar jet; and (3) acoustic waves in an axisymmetrical jet.   B.G.

N84-16946*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE OF THE SR-6 PROPELLER MODEL AT 2 DEG AND 4 DEG ANGLES OF ATTACK
J. H. DITTMAR and G. L. STEFKO Nov. 1983 18 p refs
(NASA-TM-83515; E-1864; NAS 1.15:83515) Avail: NTIS HC A02/MF A01 CSCL 20A
    The noise generated by supersonic-tip-speed propellers creates a cabin noise problem for future airplanes powered by these propellers. Noise of a number of propeller models were measured in the NASA Lewis 8- by 6-Foot Wind Tunnel with flow parallel to the propeller axis. In flight, as a result of the induced upwash from the airplane wing, the propeller is at an angle of attack with respect to the incoming flow. Therefore, the 10-blade SR-6 propeller was operated at angle of attack to determine its noise behavior. Higher blade passage tones were observed for the propeller operating at angle of attack in a 0.6 axial Mach number flow. The noise increase was not symmetrical, with one wall of the wind tunnel showing a larger noise increase than the other wall. No noise increase was observed at angle of attack in a 0.8 axial Mach number flow. For this propeller the dominance of thickness noise, which does not increase with angle of attack, explains the lack of noise increase at the higher 0.8 Mach number.   Author

N84-16947*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INVESTIGATION OF FUSELAGE ACOUSTIC TREATMENT FOR A TWIN-ENGINE TURBOPROP AIRCRAFT IN FLIGHT AND LABORATORY TESTS
J. S. MIXSON, R. L. ONEAL (Gulfstream Aerospace Corp.), and F. W. GROSVELD (Bionetics Corp.) Jan. 1984 37 p refs
(NASA-TM-85722; NAS 1.15:85722) Avail: NTIS HC A03/MF A01 CSCL 20A
    A flight and laboratory study of sidewall acoustic treatment for cabin noise control is described. In flight, cabin noise levels were measured at six locations with three treatment configurations. Noise levels from narrow-band analysis are reduced to one-third octave format and used to calculate insertion loss, IL, defined as the reduction of interior noise associated with the addition of a treatment. Laboratory tests used a specially constructed structural panel modeled after the propeller plane section of the aircraft sidewall, and acoustic treatments representing those used in flight. Lab measured transmission loss and absorption values were combined using classical acoustic procedures to obtain a prediction of IL. Comparison with IL values measured in flight for the boundary layer component of the noise indicated general agreement.   S.L.

N84-18014# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LA RECHERCHE AEROSPATIALE BIMONTHLY BULLETIN, NUMBER 1983-3, 214/MAY-JUNE
C. SEVESTRE, ed. Paris ESA Oct. 1983 74 p refs
Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimensuel (Paris), No. 1983-3, 214/May-June, 1983 p 1-72
(ESA-TT-822) Avail: NTIS HC A04/MF A01; print copy in ENGLISH available at ONERA, Paris FF60; original report in FRENCH available at ONERA, Paris FF 60
    Vibrational stabilization of autonomous quadratic systems; computation of three-dimensional viscous flows on transonic wings by boundary layer-inviscid flow interaction; calculation of transonic flows around wing-fuselage combination by a subdomain decomposition approach; an exterior Neumann problem for Helmoltz equation (irregular frequencies) noise generation and propagation in shear flows; effects of airplane flight speed on turbulence and noise generation in jets; and an excitation system for wind tunnel unsteady tests on half-wing models are discussed.
                                                           Author (ESA)

N84-18015*# Oregon Graduate Center for Study and Research, Beaverton.
EVALUATION OF TURBULENCE INDUCED NOISE IN COHERENT ANTI-STOKES RAMAN SCATTERING Final Technical Report, 1 Jun. 1979 - 31 Dec. 1982
R. A. ELLIOTT 31 Dec. 1982 30 p refs
(Contract NSG-2387)
(NASA-CR-166544; NAS 1.26:166544) Avail: NTIS HC A03/MF A01 CSCL 20A
    The effect of turbulence in a transonic wind tunnel on coherent anti-Stokes Raman scattering is considered. The driving pump and Stokes waves are taken to be coaxially propagating Gaussian beam waves which are focused on the Raman active medium through the turbulent boundary layer of the flow tube. The random index of refraction variations in the layer are modeled as phase perturbations of the driving waves which cause a reduction of the mean on-axis field and an increase in the mean diameter of the beams. Effective Gaussian beam parameters are developed and the radiated anti-Stokes power calculated as a function of the phase screen parameters. A significant reduction in signal strength occurs for realistic estimates of the phase screen parameter appropriate to a confined transonic flow. A method for estimating the signal degradation which could be applied to other experimental situations is presented.   Author

N84-18018*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL BLADE VORTEX INTERACTION NOISE CHARACTERISTICS OF A UTILITY HELICOPTER AT 1/4 SCALE
D. A. CONNER and D. R. HOAD Jan. 1984 275 p refs
Prepared in cooperation with Army Aviation Systems Command
(NASA-TM-84653; NAS 1.15:84653; AVSCOM-TR-83-B-1) Avail: NTIS HC A12/MF A01 CSCL 20A
    Models of both the advanced main rotor system and the standard or 'baseline' UH-1 main rotor system were tested at one-quarter scale in the Langley 4- by 7-Meter (V/STOL) Tunnel using the general rotor model system. Tests were conducted over a range of descent angles which bracketed the blade-vortex interaction phenomenon for a range of simulated forward speeds. The tunnel was operated in the open-throat configuration with acoustic treatment to improve the semi-anechoic characteristics of the test chamber. Acoustical data obtained for these two rotor systems operating at similar flight conditions are presented without analysis or discussion.   A.R.H.

N84-18025# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
REDUCTION OF PROPELLER NOISE BY A REFLECTING RUBBER LAYER
R. SOEDERQVIST and S. SOEDERQVIST Aug. 1983 23 p refs In SWEDISH; ENGLISH summary
(FOA-C-20506-E4; ISSN-0347-3694) Avail: NTIS HC A02/MF A01

The pressure pulses from ship propeller blades were reflected by a soft layer of cellrubber coating applied on the underwater part of the stern. The ship treated was a 5000 ton dwt asphalt tanker. The soft layer works in the near field of the propeller blades, which are assumed to be simple acoustic sources with harmonics. Because of the mechanical nonlinearity of the rubber material, useful reflection is obtained only from the second harmonic and upwards. Measured noise reduction is 15 dB at 100 Hz, 5 dB at 45 Hz, and the damping of motor vibrations is 3.5 dB. The first harmonic, at 20 Hz, increases by 5 dB.
Author (ESA)

N84-18045# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
SP-100 PROGRAM: SPACE REACTOR SYSTEM AND SUBSYSTEM INVESTIGATIONS
R. B. HARTY 30 Sep. 1983 59 p refs
(Contract DE-AT03-82SF-11687)
(DE84-003217; ESG-DOE-13414) Avail: NTIS HC A04/MF A01

For a space reactor power system, a comprehensive safety program will be required to assure that no undue risk is present. The nuclear safety review/approval process that is required for a space reactor system is summarized. The documentation requirements are presented along with a summary of the required contents of key documents. Finally, the aerospace safety program conducted for the SNAP-10A reactor system is summarized. The results of this program are presented to show the type of program that is expected and to provide information that could be usable in future programs. DOE

17

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

A84-19969
INFLUENCING DIRECT OPERATING COSTS - WHERE AND HOW
R. M. DEVIN (Bell Helicopter Textron, Fort Worth, TX) Vertiflite (ISSN 0042-4455), vol. 30, Jan.-Feb. 1984, p. 30, 31, 34, 35.

Attention is given to the results of a proprietary research program concerned with the reduction of helicopter airframe and labor direct operating cost (DOC). It is noted that the percentage of cost that can be assigned to airframe spare parts increases with aircraft size. In addition, the manufacturer's options for maintainability increase the DOCs of newer helicopter designs, in the course of tradeoffs between simple, low labor cost removal and replacement and additional costs of repair, inspection, rework, ground testing, calibration and flight testing. Attention is given to a ranking of transmission components according to both replacement frequency and DOC impact, and to the relative share of DOC claimed by fuel, engine maintenance, and airframe maintenance for six helicopter models operating in 1982. O.C.

A84-20150
GOVERNMENT LIABILITY UNDER THE FEDERAL TORT CLAIMS ACT FOR NEGLIGENT INSPECTION AND CERTIFICATION OF AIRCRAFT
W. M. STEVENS Air Law (ISSN 0165-2079), vol. 8, no. 4, 1983, p. 230-237.

The question of FAA liability under the Federal Tort Claims Act (FTCA) for damages resulting from negligent inspection or certification of aircraft is examined in a review of arguments in two cases awaiting appeal to the US Supreme Court. The Ninth Circuit Court of Appeals has ruled in both United Scottish Insurance Co. vs. US and Varig vs. US that Good Samaritan liability provisions of state law apply to the FAA inspection and certification program. The state law is cited and interpreted, the FAA's responsibilities (as defined in the Federal Aviation Act) are outlined, and precedents involving the applicability of the FTCA are surveyed. It is concluded that the Court of Appeals decision, if upheld, will expose the FAA to liability claims in alost every crash case; hence great care in performing and documenting inspections will be required. T.K.

A84-20453
CONSIDERATIONS IN AUTOPILOT LITIGATION
J. E. COOLING and P. V. HERBERS (Happy, Cooling and Herbers, Kansas City, MO) (Southern Methodist University, Annual Air Law Symposium, 17th, Dallas, TX, Mar. 3-5, 1983) Journal of Air Law and Commerce (ISSN 0021-8642), vol. 48, Summer 1983, p. 693-723. refs

The operation of aircraft autopilot systems is discussed, and recent case law involving the use/nonuse or malfunction of autopilots is reviewed. The problem of jury misconceptions is examined, and the function of the main autopilot components (primary pitch control, automatic pitch trim, manual electric trim, roll-axis control and disengagement mechanisms) is explained. Drawings and diagrams are provided, and a glossary of terms is included in an appendix. The FAA autopilot requirements and certification process are outlined, and the treatment of autopilot cases by the US courts is surveyed, including the definition of the autopilot, negligence, strict liability, expert opinions, equipment design and warnings, and the right of a pilot to refuse to fly an unequipped aircraft. Consideration is also given to problems of proof and causation, such as determining whether the autopilot was engaged at the time of crash, the failure of associated equipment, severe-weather effects, and human factors. T.K.

A84-20454
THE LIABILITY OF THE UNITED STATES FOR NEGLIGENT INSPECTION 1983
C. F. KRAUSE (Speiser, Krause and Modole, New York, NY) and J. T. COOK (Speiser, Krause and Modole, Los Angeles, CA) Journal of Air Law and Commerce (ISSN 0021-8642), vol. 48, Summer 1983, p. 725-751. refs

The current status of litigation involving US government liability for negligent inspection of aircraft by the FAA is reviewed. Such liability is based on the exemption from sovereign immunity granted by the Federal Tort Claims Act (FTCA), but specific criteria must be applied because there are numerous exceptions allowed under that act. The regulations governing the FAA certification and inspection of aircraft are explained, and the recent court decisions involving the applicability of the FTCA are surveyed. The two appellate decisions in United Scottish Insurance Company vs US and the decision consolidating Varig Airlines vs US and Mascher vs US are analyzed in detail, considering the absence-of-duty, misrepresentation, and discretionary-function defenses proposed by the US side. In essence, the US is liable when an FAA employee fails negligently, in an actual physical inspection, to detect a defect which is covered by an objectively measurable publicly known regulation and which can be shown to have caused the injury to the plaintiff. T.K.

A84-20455
PUNITIVE DAMAGES IN AVIATION CASES - SOLVING THE INSURANCE COVERAGE DILEMMA
S. C. KENNEY (Maloney, Chase, Fisher and Hurst, San Francisco, CA) Journal of Air Law and Commerce (ISSN 0021-8642), vol. 48, Summer 1983, p. 753-777. refs

The obligation of insurers to indemnify their insureds for punitive damages (PD) is discussed in a review of state legislation, judicial decisions, and contract provisions, focusing on aircraft manufacturers and airline operators as insureds. The complications and problems arising from the fact that 22 states specifically allow for coverage of PD and 20 states prohibit such coverage (mainly on the public-policy ground that PD should affect the guilty party directly) are illustrated in a survey of applicable cases. The impact on the aviation industry, with its interstate activity, potentially large damage claims, and strong economic position (as a major buyer of insurance coverage in a competitive market), is found to be significant. Since no uniform state laws are foreseeable, a simple and strict exclusion of PD payments in general-liability policies is proposed. T.K.

A84-22852#
TRANSFER OF AIRCRAFT TECHNOLOGY INTO OTHER INDUSTRIES EXAMPLES FROM AERODYNAMICS [TRANSFER VON LUFTFAHRTTECHNOLOGIE IN ANDERE INDUSTRIEBEREICHE - BEISPIELE AUS DEM GEBIET DER AERODYNAMIK]
H. MEESSEN (Messerschmitt-Boelkow-Blohm GmbH, Hamburg, West Germany) Deutsche Gesellschaft fuer Luft- und Raumfahrt, Fachsymposium ueber Stroemungen mit Abloesungen, Goettingen, West Germany, Oct. 10-12, 1983, Paper. 21 p. In German.
(MBB-UT-20-83-OE)

The application of aircraft technology to industrial smoke and heat discharge, high-speed railway aerodynamics, dust removal technology, and wind energy installations is discussed. Diagrams of these technologies and performance graphs are presented. .C.D.

N84-17054# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
INFORMATION NEEDS AND SYSTEM SPECIFICATIONS FOR THE B-1B EXECUTIVE INFORMATION SYSTEM M.S. Thesis
D. E. MORGAN and G. H. STILWELL Sep. 1983 110 p
(AD-A134424; AFIT-LSSR-36-83) Avail: NTIS HC A06/MF A01 CSCL 05B

This thesis provides the B-1B Program Office with assistance in development of their executive information system. To achieve this purpose, two research objectives were identified. The first objective was to identify the information needs of the B-1B executive management team not currently satisfied by the existing computer-based information system. The second objective was to determine and document the system specifications to support these needs. To achieve these research objectives, a structured systems approach, IDEFO, was used to develop a functional model of the management activities within the B-1B Program Office. The specific information needs were identified and documented. Also, system specification needs were identified and documented. System specifications identified by the executive managers as most important to them concern security, ease of system operation, trend analysis and forecasting, and interface with contractor information systems. Recommendations to the program office address data base management, centralization/decentralization of software development, system documentation, and operational control of system hardware and software. The results of this study should be applicable to efforts to automate information systems in major weapon system program offices. Author (GRA)

N84-17070# Committee on Public Works and Transportation (U. S. House).
A REVIEW OF US INTERNATIONAL AVIATION POLICY
Washington GPO 1983 1364 p refs Hearings before the Subcomm. on Invest. and Oversight of the Comm. on Public Works and Transportation, 97th Congr., 1st and 2d Sess., 28-30 Jul., 4 Aug., 20 Oct., 9-10 Dec., 1981; 21 Apr., 18 May 1982
(GPO-18-813) Avail: Subcommittee on Investigations and Oversight

International aviation is examined. The open skies, procompettition, proconsumer policy is discussed. N.W.

N84-17072# Committee on Public Works and Transportation (U. S. House).
IMPROVEMENT NEEDED IN THE IMPLEMENTATION OF THE UNITED STATES INTERNATIONAL AVIATION POLICY
Washington GPO 1983 23 p Presented to the Comm. on Public Works and Transportation, 98th Congr., 1st Sess., Aug. 1983
(GPO-23-934) Avail: Subcommittee on Investigations and Oversight

Problems in carrying out the International Air Transportation Competition Act (IACTA) Policies were discussed. The problems addressed were: weaknesses in the bilateral negotiation process, unequal trading of rights in negotiations, costs of adding new U.S. entrants, U.S. policies weakening the international air fare structure, U.S. unsupported carriers versus government supported foreign carriers, and prevalence of unfair/discriminatory practices. B.G.

N84-18086*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
A COOPERATIVE PROGRAM TO STIMULATE STUDENT INVOLVEMENT THROUGH THE MIT UNDERGRADUATE RESEARCH OPPORTUNITY PROGRAM Final Report, 1 Sep. 1982 - 31 Aug. 1983
Jan. 1984 92 p refs
(Contract NSG-1206)
(NASA-CR-173300; NAS 1.26:173300) Avail: NTIS HC A05/MF A01 CSCL 05I

Flow characteristics in the low speed Wright Brothers Wind Tunnel were studied. Calculations to check the precision of the tunnel were conducted. A program for generating computational grids around an airfoil was developed and compared with the wind tunnel model. Low Reynolds number flow phenomenon of periodic vortex shedding in a wake were also studied by applying a hot-wire anomemeter.

N84-18087*# Massachusetts Inst. of Tech., Cambridge.
HOT WIRE IN LOW REYNOLDS NUMBER FLOW Prgress Report
M. A. KOLB and E. E. COVERT *In its* A Coop. Program to Stimulate Student Involvement through the MIT Undergraduate Research Opportunity Program 16 p Jan. 1984
Avail: NTIS HC A05/MF A01 CSCL 05I

Progress reports were issued on the following experiments: (1) low Reynolds number flow phenomenon of periodic vortex shedding in the wake behind a cylinder as studied by applying the hot wire anemometer technique of flow measurement. The downstream diffusion of these shed vortices was of prime concern. An evaluation of the performance of the hot wire at low Reynolds number is also considered. (2) A brief examination of the back sections of the Wright Brothers wind tunnel circuits were conducted to establish whether or not gross flow deviations were present at corners, or turning vane regions. A calibration of the test sections was done. (3) The attractiveness of using rembedded grids for airfoil calculations modeled by the Euler equations was explored. These calculations were extended to C-type grids and then to Navier-Stokes calculations, B.G.

N84-18102*# National Aeronautics and Space Administration, Washington, D. C.
ROTARY WING AIRCRAFT AND TECHNICAL PUBLICATIONS OF NASA, 1970 - 1982
J. D. HIEMSTRA, comp. Jul. 1982 289 p
(NASA-TM-85521; NAS 1.15:85521) Avail: NTIS HC A13
CSCL 05B
This bibliography cites 933 documents in the NASA RECON data base which pertain to rotary wing aircraft. The entries are arranged in descending order by publication data except for the NASA-supported documents which are arranged in descending order by accession date. A.R.H.

N84-18103# Arinc Research Corp., Annapolis, Md.
AUTOMATED DATA BASE IMPLEMENTATION REQUIREMENTS FOR THE AVIONICS PLANNING BASELINE, ARMY
M. SPERATO and R. MEAD Jul. 1983 113 p
(Contract DAAB07-78-A-6606)
(AD-A135259; REPT-2846-01-TR-3062) Avail: NTIS HC A06/MF A01 CSCL 09B
The U.S. Army Avionics Research and Development Activity intends to establish the use of the Avionics Planning Baseline-Army (APB-A) document as an important facet of the formal avionics planning process. The APB-A was designed to maintain maximum compatibility in both form and content with similar avoinics planning documents published by the Air Force and the Navy. This overall compatibility should facilitate the exchange of information among the three services for the identification of avionics standardization opportunities. The first edition of the APB-A was the product of the collection and manual assembly of avionics planning data for current and future planned Army aircraft into a report format similar to that of the Air Force Avionics Planning Baseline and the Navy Avionics Planning Baseline. This technical report addresses the requirements for implementing an automated version of the Army avionics data base compatible with existing Air Force and Navy data base architectures and capable of mechanizing the production of the APB-A. The complete automated system will be documented in a future report. Author (GRA)

19

GENERAL

A84-21574
STUDIES IN THE HISTORY AND THEORY OF THE DEVELOPMENT OF AVIATION AND ROCKET AND SPACE SCIENCE AND TECHNOLOGY. NUMBER 2 [ISSLEDOVANIIA PO ISTORII I TEORII RAZVITIIA AVIATSIONNOI I RAKETNO-KOSMICHESKOI NAUKI I TEKHNIKI. NUMBER 2]
B. V. RAUSHENBAKH, ED. Moscow, Izdatel'stvo Nauka, 1983, 288 p. In Russian.
Papers are presented on such topics as aviation science during 60 years of Soviet history; the ideas of Mendeleev and Tsiolkovskii concerning the development of aeronautics; Prandtl's research in aerodynamics; Tsiolkovskii's work foreshadowing the development of air-cushion vehicles; and the emergence of the delta planform and the swept wing. Consideration is also given to the flight dynamics of ballistic rockets during the 1920's and 1930's; the first work on multistage rockets in the USSR (up to the beginning of the 1940's); the development of the first artificial earth satellite; the first rocket-borne cosmic-ray experiments (1946-1957); the influence of rocket and space technology on the development of new high-temperature structural materials in the USSR (1940's to 1960's); and rocket technology in Hungary in the 19th century. No individual items are abstracted in this volume B.J.

A84-22253
DEUTSCHE FORSCHUNGS-UND VERSUCHSANSTALT FUER LUFT-UND RAUMFAHRT, BEREICH WISSENSCHAFTLICH-TECHNISCHE BETRIEBSEINRICHTUNGEN - SCIENTIFIC-TECHNICAL REPORT: STATUS 1983
Cologne, West Germany, Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, 1983, 117 p. In German.
Research results obtained by the Division of Scientific-Technical Operating Facilities of the German Institute of Research and Development for Air and Space Travel are presented. Results are described and discussed in detail for each of the main subdivisions of the Division, including those for central data processing, air transport, space flight missions, applied data technology, and library sciences. No individual items are abstracted in this volume C.D.

A84-22255
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, ANNUAL REPORT 1982 [DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, JAHRESBERICHT 1982]
Cologne, Deutsche Forschungs- und Versuchsanstalt fuer Luftund Raumfahrt, 1983, 119 p. In German.
The activity of the DFVLR is surveyed for the year 1982. The six main project areas are characterized, and typical programs from each area are discussed in detail and illustrated: transport and communications systems (the COMPAS computer-aided ATC system and the German satellite sea-rescue network), aircraft (new helicopter-rotor profiles), spaceflight technology (reduced-gravity materials-science research in Spacelab and in the TEXUS rocket program), remote-sensing technology (the international meteorological experiment ALPEX), energy and propulsion technology (a new low-energy laser and computer-estimated household energy consumption), and preparatory and supplementary R&D efforts (computer networks and the SNATCH project). The organizational structure of DFVLR; relationships to government, industry, the university system, and foreign institutions; the personnel situation; and the financial status are reviewed. Graphs, photographs, tables, diagrams, and a balance sheet are provided. No individual items are abstracted in this volume T.K.

N84-18152*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RESEARCH AND TECHNOLOGY REPORT, 1983 Annual Report
Nov. 1983 85 p refs
(NASA-TM-85865; A-9560; NAS 1.15:85865) Avail: NTIS HC A05/MF A01 CSCL 05B
Highlights are presented of activities at Ames North and Ames Dryden in the areas of aeronautics, life science, and space science and applications. A.R.H.

S
U
B
J
E
C
T

Typical Subject Index Listing

SUBJECT HEADING

CRACK PROPAGATION
— Fatigue crack growth and low cycle fatigue of two nickel
base superalloys
[NASA-CR-174534]   p 76   N84-10267

TITLE | REPORT NUMBER | PAGE NUMBER | NASA ACCESSION NUMBER
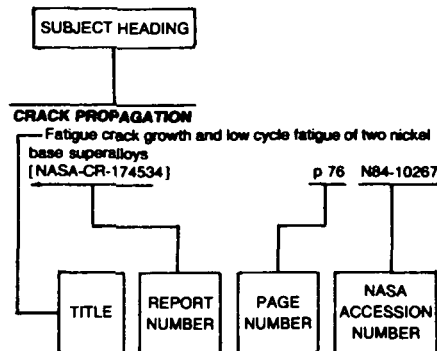
The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, the title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

A

ABLATIVE NOSE CONES
Hypersonic flow of a viscous gas at the surface of a blunt cone with strong injection near the blunt section
          p 264   A84-21133
ACCELERATION (PHYSICS)
Visualization of accelerating flow around an airfoil at high angles of attack   p 261   A84-19592
Design of a lateral ride comfort control system for STOL aircraft
[UTIAS-TN-247]   p 292   N84-16165
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1982
[AD-A134289]   p 292   N84-16169
ACCIDENT INVESTIGATION
Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 2
[AD-A134834]   p 281   N84-17155
ACCIDENT PREVENTION
Reduction of military high-altitude parachute entanglement using the controlled alternating parachute exit system   p 279   A84-20295
Crashworthy cyclic control stick
[AD-A135150]   p 294   N84-17176
ACCURACY
New coherent optical techniques for National Transonic Wind Tunnel Facility
[NASA-CR-173174]   p 306   N84-16217
ACOUSTIC DUCTS
Acoustic power dissipation on radiation through duct terminations - Experiments   p 321   A84-21272
ACOUSTIC EXCITATION
Excited annular jets of large inner diameter
          p 265   A84-21206
Tone generation by rotor-downstream strut interaction
          p 298   A84-22174

ACOUSTIC MEASUREMENT
Helicopter noise certification and sensitivity studies along the procedural lines of the new ICAO Annex 16/Chapter 8 regulations   p 277   A84-19620
ACOUSTIC PROPAGATION
Acoustic power dissipation on radiation through duct terminations - Experiments   p 321   A84-21272
Reduction of propeller noise by a reflecting rubber layer --- ship propellers
[FOA-C-20506-E4]   p 323   N84-18025
ACOUSTIC RETROFITTING
Investigation of fuselage acoustic treatment for a twin-engine turboprop aircraft in flight and laboratory tests
[NASA-TM-85722]   p 322   N84-16947
ACOUSTIC SCATTERING
Scattering of sound by an elastic plate with flow
          p 320   A84-21216
ACROBATICS
Human factors in light-aircraft accidents during stunt flying   p 279   A84-21021
ACTIVE CONTROL
A method for the design of the controller for active flutter-suppression systems   p 302   A84-19594
ACTUATORS
A digital system for higher harmonic control of a model rotor   p 286   A84-19619
ADAPTIVE FILTERS
Flight test experience with pilot-induced-oscillation suppression filters
[NASA-TM-86028]   p 305   N84-16213
AERIAL RECONNAISSANCE
Design of a remotely controlled hovercraft vehicle for spill reconnaissance
[PB84-124064]   p 305   N84-17187
AEROACOUSTICS
Pressure field induced on an airfoil by an unsteady flow   p 261   A84-19623
Progress in rotor broadband noise research
          p 320   A84-19899
Measurement and analysis of acoustic flight test data for two advanced design high speed propeller models
[AIAA PAPER 84-0250]   p 320   A84-20049
Controlled suppression or amplification of turbulent jet noise
[AIAA PAPER 84-0401]   p 320   A84-20050
On linear acoustic solutions of high speed helicopter impulsive noise problems   p 320   A84-21212
Propeller tone bursts   p 320   A84-21213
Scattering of sound by an elastic plate with flow
          p 320   A84-21216
Correction of fan noise for effects of forward flight
          p 297   A84-21217
Separated flow noise of a flat plate at large attack angles   p 321   A84-21221
Jet noise at low Reynolds number
          p 321   A84-21504
Prediction of sources moving at high speed as applied to helicopter and propeller noise
[AIAA PAPER 84-0251]   p 321   A84-21858
Tone generation by rotor-downstream strut interaction
          p 298   A84-22174
Aeroacoustics of turbulent shear flows
          p 321   A84-22584
Mach 0.6 to 3.0 flows over rectangular cavities
[AD-A134579]   p 272   N84-16153
AEROASSIST
High altitude effects on three-dimensional nonequilibrium viscous shock-layer flows
[AIAA PAPER 84-0304]   p 267   A84-21861
AERODYNAMIC BALANCE
STAHR - A program for stability and trim analysis of helicopter rotors   p 303   A84-19637
A strain-gage aerodynamic balance ---
TENSOMETERS   p 306   A84-22325
AERODYNAMIC CHARACTERISTICS
Application of fast free wake analysis techniques to rotors   p 261   A84-19658
The evolution of computational methods in aerodynamics   p 263   A84-19987

Experimental determination of the boundary layer at air-sample inlet positions on the NASA CV 990 aircraft
[AIAA PAPER 84-0028]   p 265   A84-21282
Lectures of a Flight Mechanics Conference --- conferences
[DFVLR-MITT-83-05]   p 259   N84-16120
Helicopter flying qualities characteristics-CH-46E, volume 2
[AD-A134321]   p 293   N84-16171
Helicopter flying qualities characteristics-CH-46E, volume 3
[AD-A134322]   p 293   N84-16172
Transactions of the Japan Society for Aeronautical and Space Sciences, vol. 26, no. 73, November 1983
[ISSN-0549-3811]   p 315   N84-16374
Quasi-doublet-lattice method for oscillating thin airfoils in subsonic flow   p 272   N84-16378
The COREL and W12SC3 computer programs for supersonic wing design and analysis
[NASA-CR-3676]   p 273   N84-17130
Aerodynamic characteristics of a Sparrow 3 missile model in the flow field of a generalized parent body at Mach 2.86
[NASA-TM-85713]   p 273   N84-17134
Mathematical modeling of the aerodynamic characteristics in flight dynamics
[NASA-TM-85880]   p 274   N84-17141
Air Force Academy Aeronautics Digest - Fall/Winter 1982
[AD-A135073]   p 275   N84-17145
The 2-dimensional inextensible lifting membrane airfoil, theory and experiment
[AD-A135251]   p 275   N84-17147
Rotary wing aircraft and technical publications of NASA, 1970 - 1982
[NASA-TM-85521]   p 325   N84-18102
AERODYNAMIC COEFFICIENTS
Design of airfoils for a specified moment coefficient
          p 262   A84-19660
Interacting boundary-layer solutions for laminar separated flow past airfoils
[NASA-CR-172287]   p 270   N84-16140
A recontoured, upper surface designed to increase the maximum lift coefficient of a modified NACA 65 (0.82) (9.9) airfoil section
[NASA-TM-85855]   p 275   N84-17144
AERODYNAMIC CONFIGURATIONS
Aerodynamics of the helicopter rear fuselage upsweep
          p 261   A84-19654
So what's new? --- aircraft design history and future
          p 258   A84-21723
The drag of magnetically suspended wind-tunnel models with nose-cones of various shapes
[NASA-TM-77325]   p 270   N84-16137
SUN WORSHIPER: McCready's Solar Challenger flies over the English Channel
[NASA-TM-77327]   p 292   N84-16166
High altitude aerodynamic platform concept evaluation and prototype engine testing
[NASA-TM-58256]   p 299   N84-16182
A study of prediction methods for the high angle-of-attack aerodynamics of straight wings and fighter aircraft
[NASA-CR-3764]   p 273   N84-17131
Airloads research study. Volume 2: Airload coefficients derived from wind tunnel data
[NASA-CR-10410]   p 294   N84-17174
AERODYNAMIC DRAG
The drag of magnetically suspended wind-tunnel models with nose-cones of various shapes
[NASA-TM-77325]   p 270   N84-16137
Minimal drag for wings with prescribed lift, roll moment and yaw moment
[AD-A134572]   p 272   N84-16152
AERODYNAMIC FORCES
Flutter analysis using nonlinear aerodynamic forces
          p 268   A84-22170
Motion-induced aerial forces for detached flow and their application to the study of structural response --- German thesis   p 268   A84-22249

Hinge moments of a control surface with a servocompensator or a two-part control surface with allowance for the deformation of their kinematic connection   p 304   A84-22324
Aeroelastic analysis using nonlinear aerodynamic methods
[AD-A135133]   p 275   N84-17146

AERODYNAMIC HEATING
Boundary-layer trip effectiveness and computations of aerodynamic heating for XM797 nose-tip configurations
[AD-A128036]   p 271   N84-16148

AERODYNAMIC INTERFERENCE
Calculation of rotor/airframe interference for realistic configurations   p 287   A84-19638
Sidewall effects on airfoil tests   p 306   A84-21521
Special opportunities in helicopter aerodynamics
[NASA-TM-84396]   p 270   N84-16138
Calculation of the aerodynamic flow field in the vicinity of a Sea King helicopter
[ARL-AERO-REPT-158]   p 273   N84-17128
TWINTN4: A program for transonic four-wall interference assessment in two-dimensional wind tunnels
[NASA-CR-3777]   p 307   N84-17189

AERODYNAMIC LOADS
A lifting line theory for curved helicopter blades in hovering and axial flight   p 261   A84-19655
A simple method for the derivation of isolated and installed store loads   p 267   A84-21796
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1982
[AD-A134289]   p 292   N84-16169
Effect of blade structural parameters on helicopter vibrational characteristics
[AD-A134547]   p 293   N84-16174
Helicopter rotor wake geometry and its influence in forward flight. Volume 1: Generalized wake geometry and wake effect on rotor airloads and performance
[NASA-CR-3726]   p 275   N84-17149

AERODYNAMIC NOISE
Propeller tone bursts   p 320   A84-21213
Correction of fan noise for effects of forward flight
                                       p 297   A84-21217
High frequency green function for aerodynamic noise in moving media. I - General theory. II - Noise from a spreading jet   p 321   A84-21273
Prediction of sources moving at high speed as applied to helicopter and propeller noise
[AIAA PAPER 84-0251]   p 321   A84-21858
Experimental blade vortex interaction noise characteristics of a utility helicopter at 1/4 scale
[NASA-TM-84653]   p 322   N84-18018

AERODYNAMIC STABILITY
A method for the design of the controller for active flutter-suppression systems   p 302   A84-19594
Dynamic behavior of transmission systems --- for helicopter drive stability analysis   p 286   A84-19626
A general algorithm for quasilinearization in helicopter dynamics   p 311   A84-19641
Some aspects of optimizing Kiebitz/ARGUS flight dynamics and control system by simulation and flight testing   p 303   A84-19646
Self-sustained oscillations of a shock wave interacting with a boundary layer on a supercritical airfoil
[NASA-CR-175338]   p 269   N84-16131
Helicopter flying qualities characteristics-CH-46E, volume 1
[AD-A134320]   p 293   N84-16170
Helicopter flying qualities characteristics-CH-46E, volume 4
[AD-A134323]   p 293   N84-16173

AERODYNAMIC STALLING
Application of an analytic stall model to dynamic analysis of rotor blades   p 262   A84-19665
Applications of an analytic stall model to time-history and eigenvalue analysis of rotor blades
                                       p 262   A84-19743
Performance degradation of a typical twin engine commuter type aircraft in measured natural icing conditions
[AIAA PAPER 84-0179]   p 290   A84-21289
An investigation of airfoil dynamic stall with large amplitude motions
[AD-A134230]   p 271   N84-16150
Effect of blade structural parameters on helicopter vibrational characteristics
[AD-A134547]   p 293   N84-16174
Numerical simulation of stalling flows by an integral equation method   p 301   N84-16199
Air Force Academy Aeronautics Digest - Fall/Winter 1982
[AD-A135073]   p 275   N84-17145

AERODYNAMICS
Visualization of accelerating flow around an airfoil at high angles of attack   p 261   A84-19592

Impact of computers on aerodynamics research and development   p 262   A84-19903
Supercritical airfoil and wing design
                                       p 269   A84-22587
Transfer of aircraft technology into other industries Examples from aerodynamics
[MBB-UT-20-83-OE]   p 324   A84-22852
Computational aerodynamics and supercomputers
[NASA-TM-85887]   p 270   N84-16139
A laser velocimeter system for large-scale aerodynamic testing
[NASA-TM-84393]   p 270   N84-16144
Numerical techniques for high incidence reentry aerodynamics
[AD-A134178]   p 271   N84-16149

AEROELASTICITY
A general algorithm for quasilinearization in helicopter dynamics   p 311   A84-19641
Application of the local circulation method to the flutter analysis of rotary wings   p 311   A84-19642
New aspects on helicopter rotor dynamics
                                       p 287   A84-19650
The anelastic compliant rotor - An analytic and experimental investigation   p 287   A84-19652
Automatic generation of helicopter rotor aeroelastic equations of motion   p 287   A84-19653
Application of an analytic stall model to dynamic analysis of rotor blades   p 262   A84-19665
Scattering of sound by an elastic plate with flow
                                       p 320   A84-21216
Holographic vibration measurment of a rotating fluttering fan   p 313   A84-21511
Flutter analysis using nonlinear aerodynamic forces
                                       p 268   A84-22170
Optimal mistuning for enhanced aeroelastic stability of transonic fans
[NASA-CR-173179]   p 299   N84-16180
Flutter of swept fan blades
[NASA-TM-83547]   p 316   N84-16587
Loads and aeroelasticity division research and technology accomplishments for FY 1983 and plans for FY 1984
[NASA-TM-85740]   p 274   N84-17135
Aeroelastic analysis using nonlinear aerodynamic methods
[AD-A135133]   p 275   N84-17146
Airloads research study. Volume 1: Flight test loads acquisition
[NASA-CR-170409]   p 294   N84-17173

AERONAUTICAL ENGINEERING
The Prandtl Hergesell project of a National Research Establishment for Aeronautics
[DFVLR-MITT-83-10]   p 260   N84-17123

AERONAUTICS
Studies in the history and theory of the development of aviation and rocket and space science and technology. Number 2 --- Russian   p 325   A84-21574
A review of US international aviation policy
[GPO-18-813]   p 324   N84-17070
Research and technology report, 1983
[NASA-TM-85865]   p 325   N84-18152

AEROSPACE ENGINEERING
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Annual report 1982 --- German book
                                       p 325   A84-22255

AEROSPACE INDUSTRY
The growth of the avionics industry in the UK
                                       p 284   A84-20850
The next 75 years in aerospace   p 258   A84-21721

AEROSPACE SCIENCES
Studies in the history and theory of the development of aviation and rocket and space science and technology. Number 2 --- Russian   p 325   A84-21574
Transactions of the Japan Society for Aeronautical and Space Sciences, vol. 26, no. 73, November 1983
[ISSN-0549-3811]   p 315   N84-16374
Research and technology report, 1983
[NASA-TM-85865]   p 325   N84-18152

AEROSPACE SYSTEMS
Identification of bottlenecks and capacity constraints in F-14, F-15, F-16, and F/A-18 aircraft production
[AD-A134629]   p 259   N84-17121
Control strategies for complex systems for use in aerospace avionics
[AD-A135072]   p 295   N84-17179

AEROSPACE TECHNOLOGY TRANSFER
Transfer of aircraft technology into other industries Examples from aerodynamics
[MBB-UT-20-83-OE]   p 324   A84-22852

AEROTHERMODYNAMICS
Aero-thermo activities for the development of a 'passive infrared suppressor' for helicopter use
                                       p 286   A84-19625
Three-dimensional hypersonic flow of a radiating gas past a wing   p 264   A84-21131

A dividing layer in high-temperature flows
                                       p 312   A84-21137
High altitude effects on three-dimensional nonequilibrium viscous shock-layer flows
[AIAA PAPER 84-0304]   p 267   A84-21861
Digital computer program for generating dynamic turbofan engine models (DIGTEM)
[NASA-TM-83446]   p 299   N84-16185
Assessment of real gas effects on the prediction of the aerodynamics of high velocity Army shells
[AD-A134739]   p 276   N84-17150

AH-1G HELICOPTER
Human factors issues associated with the use of speech technology in the cockpit
[NASA-CR-166548]   p 316   N84-17433

AIR
Integrated aircraft fuel tank inerting and compartment fire suppression system. Volume 2: Evaluation of nitrogen-enriched air as a fire suppressant
[AD-A134883]   p 281   N84-17157

AIR CONDITIONING
Trade-off considerations for Environmental Control System on board of helicopters   p 287   A84-19648

AIR FLOW
Extinguisher agent behavior in a ventilated small aircraft
[FAA-CT-83-30]   p 280   N84-16158

AIR INTAKES
A study of the gas dynamics of a model with combustion in a pulsed wind tunnel   p 264   A84-21129
Air-sampling inlet contamination by aircraft emissions on the NASA CV-990 aircraft
[AIAA PAPER 84-0029]   p 279   A84-21283

AIR LAW
Government liability under the Federal Tort Claims Act for negligent inspection and certification of aircraft
                                       p 323   A84-20150
Considerations in autopilot litigation
                                       p 323   A84-20453
The liability of the United States for negligent inspection 1983   p 323   A84-20454
Punitive damages in aviation cases - Solving the insurance coverage dilemma   p 324   A84-20455

AIR NAVIGATION
Air navigation 1950-1980 - Canada's contribution
                                       p 283   A84-19674
Communications-electronics in the RAAF
                                       p 283   A84-20458

AIR PIRACY
Semiannual report to Congress on the effectiveness of the civil aviation security program
[AD-A134860]   p 281   N84-17156

AIR SAMPLING
Experimental determination of the boundary layer at air-sample inlet positions on the NASA CV 990 aircraft
[AIAA PAPER 84-0028]   p 265   A84-21282
Air-sampling inlet contamination by aircraft emissions on the NASA CV-990 aircraft
[AIAA PAPER 84-0029]   p 279   A84-21283

AIR TO AIR MISSILES
Importance of helicopter performance to air-to-air combat   p 277   A84-19611

AIR TRAFFIC
Contributions of flight mechanics to civil air traffic
                                       p 285   N84-16124
The air traffic planning coordinator of the Federal Republic of Germany
[FACHTHEMEN-5]   p 259   N84-16130
FAA (Federal Aviation Administration) statistical handbook of aviation: Calender year 1982
[PB84-127323]   p 260   N84-17124

AIR TRAFFIC CONTROL
Keeping the traffic flowing - Is monopulse SSR the next big market?   p 284   A84-20600
A case study illustrating time scales and operational responses for a wind shear episode during the JAWS project --- Joint Airport Weather Studies Project
[AIAA PAPER 84-0351]   p 318   A84-21864
Flight-plan coordination in the Federal Republic of Germany   p 280   A84-22599
Improving the air traffic control system: An assessment of the National Airspace System Plan
                                       p 285   N84-16160
A concept for reducing oceanic separation minima through the use of a TCAS-derived CDTI
[NASA-CR-172258]   p 295   N84-16177

AIR TRAFFIC CONTROLLERS (PERSONNEL)
The air traffic planning coordinator of the Federal Republic of Germany
[FACHTHEMEN-5]   p 259   N84-16130

AIR TRANSPORTATION
Civil aircraft accident investigation in the U.S.
                                       p 278   A84-20085

CONTRACT MANAGEMENT
Lessons learned—advanced attack helicopter
[AD-A135521]   p 294 N84-17177
CONTROL
X-29 flight-research program
[NASA-TM-86025]   p 292 N84-16168
CONTROL CONFIGURED VEHICLES
Optimal cooperative control synthesis applied to a
control-configured aircraft
[NASA-CR-170411]   p 305 N84-16214
CONTROL EQUIPMENT
Future airliner flight decks - Harnessing the new
technology   p 291 A84-22498
CONTROL STABILITY
Flight test experience with pilot-induced-oscillation
suppression filters
[NASA-TM-86028]   p 305 N84-16213
CONTROL STICKS
Crashworthy cyclic control stick
[AD-A135150]   p 294 N84-17176
CONTROL SURFACES
Hinge moments of a control surface with a
servocompensator or a two-part control surface with
allowance for the deformation of their kinematic
connection   p 304 A84-22324
CONTROLLABILITY
Techniques in the assessment of helicopter flying
qualities   p 303 A84-19644
Simulator investigations of side-stick controller/stability
and control augmentation systems for night nap-of-earth
flight   p 277 A84-19744
CONTROLLERS
A method for the design of the controller for active
flutter-suppression systems   p 302 A84-19594
Simulator investigations of side-stick controller/stability
and control augmentation systems for night nap-of-earth
flight   p 277 A84-19744
COOLING
Instability of compressible boundary layers along curved
walls with suction or cooling   p 266 A84-21507
COOLING SYSTEMS
Trade-off considerations for Environmental Control
System on board of helicopters   p 287 A84-19648
COST ANALYSIS
Influencing direct operating costs - Where and how
                                       p 323 A84-19969
COST ESTIMATES
Estimating the cost of composite material airframes
using the Rand Corporation Development and
Procurement Costs of Aircraft parametric model (DAPCA
III)
[AD-A134993]   p 259 N84-17120
COUNTERMEASURES
Helicopter infrared signature and countermeasure
evaluation   p 283 A84-19629
COUNTING
Statistical review of counting accelerometer data for
Navy and Marine fleet aircraft from 1 January 1962 to
31 December 1982
[AD-A134289]   p 292 N84-16169
COUPLING
Effect of blade structural parameters on helicopter
vibrational characteristics
[AD-A134547]   p 293 N84-16174
CRACK PROPAGATION
The damage tolerance approach to the Canadair
CL-600   p 288 A84-19672
The effect of mode III loading on fatigue crack growth
in a rotating shaft   p 312 A84-19747
A study of creep crack growth in 2219-T851 aluminum
alloy using a computerized testing system
                                       p 308 A84-20278
Statistical methods for estimating crack detection
probabilities   p 312 A84-21362
Exploratory study of crack-growth-based inspection
rationale   p 313 A84-21364
The effect of the microstructure on slow crack
propagation and the mechanical properties of hot-pressed
silicon nitride between room temperature and 1500 C —
German thesis   p 308 A84-22237
Use of small crack data to bring about and quantify
improvements to aircraft structural integrity
[AD-A135012]   p 318 N84-17623
CRASH LANDING
The uncontrollable cabin fire   p 278 A84-20076
Computer modeling of aircraft cabin fires
[PB84-101153]   p 282 N84-17162
CRASHWORTHINESS
Developments in cabin safety and crashworthiness —
passenger aircraft   p 282 N84-17161
Crashworthy cyclic control stick
[AD-A135150]   p 294 N84-17176
CREEP TESTS
A study of creep crack growth in 2219-T851 aluminum
alloy using a computerized testing system
                                       p 308 A84-20278

CROSS COUPLING
Techniques in the assessment of helicopter flying
qualities   p 303 A84-19644
CROSS FLOW
A lifting surface computer code with jet-in-crossflow
interference effects. Volume 1: Theoretical description
[NASA-CR-166524]   p 271 N84-16147
CRUISING FLIGHT
Helicopter rotor wake geometry and its influence in
forward flight. Volume 1: Generalized wake geometry
and wake effect on rotor airloads and performance
[NASA-CR-3726]   p 275 N84-17149
CRYOGENIC EQUIPMENT
Transonic cryogenic test section for the Goettingen tube
facility
[NASA-TM-77050]   p 307 N84-16219
CURTISS-WRIGHT AIRCRAFT
Were the Wrights right? — canard configuration
applications to fighter aircraft   p 258 A84-20991
CURVATURE
A lifting line theory for curved helicopter blades in
hovering and axial flight   p 261 A84-19655
CV-990 AIRCRAFT
Experimental determination of the boundary layer at
air-sample inlet positions on the NASA CV 990 aircraft
[AIAA PAPER 84-0028]   p 265 A84-21282
Air-sampling inlet contamination by aircraft emissions
on the NASA CV-990 aircraft
[AIAA PAPER 84-0029]   p 279 A84-21283
CYCLIC LOADS
Life distribution under various operating conditions of
random cyclic loads — fatigue strength of aircraft
construction elements   p 309 A84-22407
CYLINDRICAL BODIES
Interaction between a turbulent planar plate boundary
layer and a planar cylinder wake   p 264 A84-20843

D

DATA ACQUISITION
Data acquisition for evaluation of an airborne lightning
detection system
[AD-A135318]   p 281 N84-17153
Airloads research study. Volume 1: Flight test loads
acquisition
[NASA-CR-170409]   p 294 N84-17173
DATA BASES
Aircrew Automated Escape Systems (AAES) In-service
Usage Data Analyses, volume 2
[AD-A134834]   p 281 N84-17155
Automated data base implementation requirements for
the avionics planning baseline, Army
[AD-A135259]   p 325 N84-18103
DATA INTEGRATION
Access to maintenance data via AIDS - Future aspects
of the expanded AIDS — Aircraft Integrated Data
System
[MBB-UT-17-83-OE]   p 295 A84-22860
Integration of flight test data into a real-time simulation
[AIAA PAPER 84-0552]   p 306 A84-22924
DECELERATION
IRAAM wind tunnel test, task 3
[AD-A135256]   p 275 N84-17148
DECONTAMINATION
Decreasing the side wall contamination in wind
tunnels   p 306 A84-20043
DEFENSE PROGRAM
Report from the Bicycle Shop — U.S. Air Force
Aeronautical Systems Division activities
                                       p 258 A84-21888
DEGRADATION
Results of an experimental program investigating the
effects of simulated ice on the performance of the NACA
63A415 airfoil with flap
[NASA-CR-168288]   p 271 N84-16145
Antimisting fuel breakup and flammability
[NASA-CR-174508]   p 310 N84-16354
DEGREES OF FREEDOM
Toward a better understanding of helicopter stability
derivatives   p 303 A84-19664
Toward a better understanding of helicopter stability
derivatives   p 304 A84-19742
DEICERS
Electro-impulse deicing - Concept and electrodynamic
studies
[AIAA PAPER 84-0021]   p 288 A84-19885
An improved method of predicting anti-icing flow rates
for a fluid ice protection system
[AIAA PAPER 84-0023]   p 279 A84-21280
Predicted electrothermal deicing of aircraft blades
[AIAA PAPER 84-0110]   p 279 A84-21286
DEICING
Electro-impulse deicing - Structural dynamic studies,
icing tunnel tests and applications
[AIAA PAPER 84-0022]   p 288 A84-19886

DELTA WINGS
Trailing vortices in homogeneous and density-stratified
media   p 262 A84-19952
DENSITY MEASUREMENT
Application of holography to flow visualization
[NASA-TM-84325]   p 316 N84-16530
DEPOSITS
Emission FTIR analyses of thin microscopic patches of
jet fuel residue deposited on heated metal surface
[NASA-CR-168331]   p 311 N84-17410
DESCENT TRAJECTORIES
IRAAM wind tunnel test, task 3
[AD-A135256]   p 275 N84-17148
DESIGN ANALYSIS
Multidimensional turbulent combustion - Analysis,
applications and limitations
[AIAA PAPER 84-0477]   p 296 A84-19891
A strain-gage aerodynamic balance —
TENSOMETERS   p 306 A84-22325
SP-100 program: Space reactor system and subsystem
investigations
[DE84-003217]   p 323 N84-18045
DIATOMIC GASES
An evaluation of some collision models used for Monte
Carlo calculations of diatomic rarefield hyupersonic flows
                                       p 266 A84-21381
DIGITAL COMPUTERS
Digital computer program for generating dynamic
turbofan engine models (DIGTEM)
[NASA-TM-83446]   p 299 N84-16185
DIGITAL DATA
APQ-102 imaging radar digital image quality study
[NASA-CR-171738]   p 317 N84-17435
DIGITAL FILTERS
Algorithm for the digital processing of signals of onboard
receiving antenna arrays   p 284 A84-20555
DIGITAL RADAR SYSTEMS
Turbulence detection using weather radar
                                       p 283 A84-20083
Comparative assessment of a monopulse SSR system
and conventional moving-window processing
                                       p 284 A84-22596
DIGITAL SYSTEMS
Flight test experience with pilot-induced-oscillation
suppression filters
[NASA-TM-86028]   p 305 N84-16213
DIGITAL TECHNIQUES
A digital system for higher harmonic control of a model
rotor   p 286 A84-19619
Evolution of Turbomeca's turbine engines control
systems or Digital electronics - Why and how?
                                       p 296 A84-19627
Digital computer program for generating dynamic
turbofan engine models (DIGTEM)
[NASA-TM-83446]   p 299 N84-16185
DIGITAL TO ANALOG CONVERTERS
An airborne programmable digital to video converter
[AD-A134839]   p 296 N84-17181
DISPLAY DEVICES
Low level flight and navigation at night in Central
Europe   p 276 A84-19609
Displays and simulators — for pilot flight training
                                       p 312 A84-21332
Future airliner flight decks - Harnessing the new
technology   p 291 A84-22498
A concept for reducing oceanic separation minima
through the use of a TCAS-derived CDTI
[NASA-CR-172258]   p 295 N84-16177
In-trail dynamics of multiple CDTI-equipped aircraft
queues
[NASA-TM-85699]   p 295 N84-16178
Simulator scene display evaluation
[NASA-CASE-ARC-11504-1]   p 307 N84-16221
CDTI target selection criteria
[NASA-CR-3776]   p 295 N84-17178
Instructor station display for use in T-37 flight simulation
training
[AD-A134854]   p 307 N84-17191
DISTANCE MEASURING EQUIPMENT
Recognition of measurement errors in DME by
estimation of impulse parameters   p 284 A84-22598
DITCHING (LANDING)
Survival after helicopter ditching - A technical guide for
policy-makers   p 278 A84-20079
DOORS
Mach 0.6 to 3.0 flows over rectangular cavities
[AD-A134579]   p 272 N84-16153
DOPPLER EFFECT
Doppler lidar signal and turbulence study
[NASA-CR-170976]   p 318 N84-17574
DOPPLER NAVIGATION
Strapdown inertial navigation systems for helicopters
                                       p 283 A84-19618
DRAG REDUCTION
Aerodynamics of the helicopter rear fuselage upsweep
                                       p 261 A84-19654

Investigation to optimize the passive shock wave-boundary layer control for supercritical airfoil drag reduction
[NASA-CR-173276] p 269 N84-16135

Wave drag as the objective function in transonic fighter wing optimization
[NASA-TP-2265] p 272 N84-17127

DUAL WING CONFIGURATIONS
Benefits of dual wings over single wings for high-performance business airplanes
p 291 A84-22172

DYNAMIC CHARACTERISTICS
Design of helicopter rotor blades for optimum dynamic characteristics
[NASA-CR-175380] p 293 N84-17171

DYNAMIC MODELS
Mathematical modeling of the aerodynamic characteristics in flight dynamics
[NASA-TM-85880] p 274 N84-17141

DYNAMIC RESPONSE
Motion-induced aerial forces for detached flow and their application to the study of structural response --- German thesis
p 268 A84-22249

Measurement of unsteady aerodynamic pressures
[DFVLR-MITT-83-08] p 272 N84-16155

DYNAMIC STRUCTURAL ANALYSIS
Further application and development of strain pattern analysis
p 311 A84-19632

Flutter analysis using nonlinear aerodynamic forces
p 268 A84-22170

Structure model refinement using reanalysis techniques
p 314 A84-22622

E

ECONOMIC IMPACT
Punitive damages in aviation cases - Solving the insurance coverage dilemma
p 324 A84-20455

EIGENVALUES
Applications of an analytic stall model to time-history and eigenvalue analysis of rotor blades
p 262 A84-19743

Effect of blade structural parameters on helicopter vibrational characteristics
[AD-A134547] p 293 N84-16174

EJECTION SEATS
Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 1
[AD-A134833] p 281 N84-17154

Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 2
[AD-A134834] p 281 N84-17155

EJECTORS
Variable area ejector-diffuser model tests
[AD-A134843] p 302 N84-17182

ELASTIC DAMPING
Investigation of random vibrations of aircraft engine blades
p 298 A84-22410

ELASTIC PLATES
Scattering of sound by an elastic plate with flow
p 320 A84-21216

ELASTIC PROPERTIES
The influence of different inflow models on the coupled flapping and torsion of helicopter rotor blades
p 303 A84-19651

ELASTODYNAMICS
Motion-induced aerial forces for detached flow and their application to the study of structural response --- German thesis
p 268 A84-22249

ELASTOMERS
Numerical analysis and experimental verification of elastomeric bearings
p 311 A84-19635

ELECTRIC GENERATORS
A mathematical model for the doubly-fed wound rotor generator, part 2
[NASA-TM-83581] p 317 N84-17479

ELECTRIC PULSES
Electro-impulse deicing - Concept and electrodynamic studies
[AIAA PAPER 84-0021] p 288 A84-19885

ELECTRON BEAM WELDING
Bending fatigue of electron-beam-welded foils. Application to a hydrodynamic air bearing in the Chrysler/DOE upgraded automotive gas tubine engine
[NASA-TM-83539] p 316 N84-16589

ELECTRONIC CONTROL
Evolution of Turbomeca's turbine engines control systems or Digital electronics - Why and how?
p 296 A84-19627

ELECTRONIC EQUIPMENT TESTS
CXR testing of box IEMP effects due to charge transfer --- Continuous X-Ray Internal Electromagnetic Pulse
p 312 A84-20725

ELECTRONIC RECORDING SYSTEMS
CXR testing of box IEMP effects due to charge transfer --- Continuous X-Ray Internal Electromagnetic Pulse
p 312 A84-20725

ELLIPSOIDS
The calculation of the laminar boundary layer on a wing-like ellipsoid with incidence p 263 A84-20840

EMERGENCIES
Air rescue service in the Federal Republic of Germany Requirements for the helicopter p 276 A84-19606

ENERGY CONSUMPTION
Energy state revisited p 291 N84-16118

ENERGY CONVERSION EFFICIENCY
The increase in efficiency of high temperature gas turbine plants with cooled turbines p 314 A84-22002

ENERGY DISSIPATION
Possibilities of raising the efficiency of the compression process in a centrifugal compressor rotor
p 297 A84-20869

Acoustic power dissipation on radiation through duct terminations - Experiments p 321 A84-21272

ENGINE CONTROL
Evolution of Turbomeca's turbine engines control systems or Digital electronics - Why and how?
p 296 A84-19627

Integrated systems for the automatic control of aircraft powerplants --- Russian book p 297 A84-21579

ENGINE DESIGN
Army, NASA lead testing of turboshaft components
p 296 A84-20138

Europeans stress turboshaft efficiency
p 296 A84-20139

CT7 - Power for the new commuters
p 297 A84-20400

Modern methods of technological progress in aircraft engines p 298 A84-22572

The application of turbine bypass engines to high performance V/STOL aircraft
[AIAA PAPER 83-2512] p 299 A84-22925

Design concepts for low-cost composite engine frames
[NASA-TM-83544] p 300 N84-16186

ENGINE FAILURE
Beyond V1 - The dangers of high speed aborted take-offs p 278 A84-20081

ENGINE INLETS
Theoretical and experimental engine-inlet flow fields for fighter forebodies
[NASA-TP-2270] p 273 N84-17132

ENGINE MONITORING INSTRUMENTS
F100 Engine Diagnostic System (EDS) - Summary of results p 298 A84-22171

Application of laser anemometry in turbine engine research p 315 A84-22872

ENGINE NOISE
Correction of fan noise for effects of forward flight
p 297 A84-21217

Separated flow noise of a flat plate at large attack angles p 321 A84-21221

Tone generation by rotor-downstream strut interaction
p 298 A84-22174

Noise levels and data analyses for small prop-driven aircraft
[AD-A134598] p 293 N84-16175

ENGINE PARTS
High energy igniters - The development of materials suitable for continuous ignition p 296 A84-20108

Ceramic components for the AGT 100 engine
p 315 A84-22878

Aircraft gas turbine guide
[GE-AEG-607R(10/80)] p 299 N84-16183

ENGINE STARTERS
The start-up of a gas turbine engine using compressed air tangentially fed onto the blades of the basic turbine
[NASA-TM-77021] p 316 N84-16563

ENGINE TESTS
Army, NASA lead testing of turboshaft components
p 296 A84-20138

A unit for AGTE shaft strength testing under cyclic torque and axial thrust loading p 298 A84-22415

High altitude aerodynamic platform concept evaluation and prototype engine testing
[NASA-TM-58256] p 299 N84-16182

ENVIRONMENT PROTECTION
The Fifteenth Sir Richard Fairey Memorial Lecture - The quieter airport p 258 A84-21228

ENVIRONMENTAL CONTROL
Trade-off considerations for Environmental Control System on board of helicopters p 287 A84-19648

ENVIRONMENTAL TESTS
The cyclic fracture toughness of pressed panels of D16chT and V95pchT2 alloys in liquid media
p 308 A84-19582

EPOXY RESINS
Development of a stable epoxy resin system for composite repair
[AD-A135390] p 310 N84-17395

EQUATIONS OF MOTION
Automatic generation of helicopter rotor aeroelastic equations of motion p 287 A84-19653

Incorporation of wind shear terms into the governing equations of aircraft motion
[AIAA PAPER 84-0275] p 304 A84-21860

Bifurcation analysis of aircraft pitching motions near the stability boundary
[NASA-TM-85881] p 274 N84-17137

ERROR ANALYSIS
Aircraft avionic system maintenance cannot duplicate and Retest-OK analytical source analysis
[AD-A134449] p 259 N84-16129

ERRORS
Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 2
[AD-A134834] p 281 N84-17155

ESCAPE SYSTEMS
A canopy module escape system for future tactical aircraft p 291 A84-22400

Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 1
[AD-A134833] p 281 N84-17154

ESTIMATING
Estimation of flight-mechanical motion characteristics with Kalman filters p 292 N84-16126

EULER EQUATIONS OF MOTION
Airfoil computation at high angles of attack, inviscid and viscous phenomena
[AIAA PAPER 84-0524] p 268 A84-21876

Hot wire in low Reynolds number flow
p 324 N84-18087

Calculating C-grids with fine and embedded mesh regions
[CFDL-TR-83-7] p 319 N84-18090

EUROPEAN AIRBUS
Future airliner flight decks - Harnessing the new technology p 291 A84-22498

Access to maintenance data via AIDS - Future aspects of the expanded AIDS --- Aircraft Integrated Data System
[MBB-UT-17-83-OE] p 295 A84-22860

EXHAUST GASES
Theoretical and experimental study of infrared radiation from helicopters p 283 A84-19624

Air-sampling inlet contamination by aircraft emissions on the NASA CV-990 aircraft
[AIAA PAPER 84-0029] p 279 A84-21283

Dynamic gas temperature measurement system, volume 1
[NASA-CR-168267-VOL-1] p 316 N84-16529

EXHAUST NOZZLES
The density distribution of a supersonic jet issuing into a vacuum from a nozzle with a beveled exit section
p 261 A84-19571

EXTERNAL STORE SEPARATION
Aerodynamic characteristics of a Sparrow 3 missile model in the flow field of a generalized parent body at Mach 2.86
[NASA-TM-85713] p 273 N84-17134

EXTERNAL STORES
A simple method for the derivation of isolated and installed store loads p 267 A84-21796

EXTERNALLY BLOWN FLAPS
Circulation controlled STOL wing optimization
p 268 A84-22173

F

F-14 AIRCRAFT
Identification of bottlenecks and capacity constraints in F-14, F-15, F-16, and F/A-18 aircraft production
[AD-A134629] p 259 N84-17121

F-15 AIRCRAFT
F100 Engine Diagnostic System (EDS) - Summary of results p 298 A84-22171

Identification of bottlenecks and capacity constraints in F-14, F-15, F-16, and F/A-18 aircraft production
[AD-A134629] p 259 N84-17121

F-16 AIRCRAFT
A Q-GERT analysis of the effect of improved automatic testing on F-16 aircraft availability
[AD-A134280] p 259 N84-16128

Aircraft avionic system maintenance cannot duplicate and Retest-OK analytical source analysis
[AD-A134449] p 259 N84-16129

Identification of bottlenecks and capacity constraints in F-14, F-15, F-16, and F/A-18 aircraft production
[AD-A134629] p 259 N84-17121

FUEL FLOW
Determination of the static performance of a Cuyuna cc model UL-430RR engine
[NASA-CR-175354]　　　　　p 299　N84-16179
FUEL SYSTEMS
Emission FTIR analyses of thin microscopic patches of jet fuel residue deposited on heated metal surface
[NASA-CR-168331]　　　　　p 311　N84-17410
FUEL TANKS
Vibration of a structure with a tank containing fluid
　　　　　　　　　　　　　　p 311　A84-19645
Integrated aircraft fuel tank inerting and compartment fire suppression system. Volume 2: Evaluation of nitrogen-enriched air as a fire suppressant
[AD-A134883]　　　　　　　p 281　N84-17157
FUEL TESTS
Antiicing fuel additives and their effect on the properties of aviation kerosene　　　p 308　A84-22326
FUEL-AIR RATIO
Synthetic fuel character effects on a rich-lean gas turbine combustor　　　　　　　p 309　A84-22594
FUNCTIONS (MATHEMATICS)
Aeroelastic analysis using nonlinear aerodynamic methods
[AD-A135133]　　　　　　　p 275　N84-17146
FUSELAGES
Aerodynamics of the helicopter rear fuselage upsweep
　　　　　　　　　　　　　　p 261　A84-19654
Rockwell completes first B-1B fuselage
　　　　　　　　　　　　　　p 257　A84-20372
Calculation of the aerodynamic flow field in the vicinity of a Sea King helicopter
[ARL-AERO-REPT-158]　　　p 273　N84-17128

G

GAME THEORY
Dynamics and control of forward swept wing aircraft
[NASA-CR-175369]　　　　　p 294　N84-17172
GAS DYNAMICS
A study of the gas dynamics of a model with combustion in a pulsed wind tunnel　　　p 264　A84-21129
Assessment of real gas effects on the prediction of the aerodynamics of high velocity Army shells
[AD-A134739]　　　　　　　p 276　N84-17150
GAS FLOW
Air Force Academy Aeronautics Digest - Fall/Winter 1982
[AD-A135073]　　　　　　　p 275　N84-17145
GAS INJECTION
Hypersonic flow of a viscous gas at the surface of a blunt cone with strong injection near the blunt section
　　　　　　　　　　　　　　p 264　A84-21133
GAS TEMPERATURE
Dynamic gas temperature measurement system, volume 1
[NASA-CR-168267-VOL-1]　　p 316　N84-16529
GAS TURBINE ENGINES
Multidimensional turbulent combustion - Analysis, applications and limitations
[AIAA PAPER 84-0477]　　　p 296　A84-19891
High energy igniters - The development of materials suitable for continuous ignition　p 296　A84-20108
The care and feeding of gas turbines
　　　　　　　　　　　　　　p 298　A84-21889
The increase in efficiency of high temperature gas turbine plants with cooled turbines　p 314　A84-22002
A unit for AGTE shaft strength testing under cyclic torque and axial thrust loading　　p 298　A84-22415
Synthetic fuel character effects on a rich-lean gas turbine combustor　　　　　　　p 309　A84-22594
Simplified analytical procedures for representing material cyclic response --- for high temperature gas turbine engine analysis　　　　　p 298　A84-22877
Ceramic components for the AGT 100 engine
　　　　　　　　　　　　　　p 315　A84-22878
Aircraft gas turbine guide
[GE-AEG-607R(10/80)]　　　p 299　N84-16183
Digital computer program for generating dynamic turbofan engine models (DIGTEM)
[NASA-TM-83446]　　　　　　p 299　N84-16185
Program for development of strain tolerant thermal barrier coating system
[NASA-CR-173214]　　　　　p 309　N84-16337
Dynamic gas temperature measurement system, volume 1
[NASA-CR-168267-VOL-1]　　p 316　N84-16529
The start-up of a gas turbine engine using compressed air tangentially fed onto the blades of the basic turbine
[NASA-TM-77021]　　　　　　p 316　N84-16563
Bending fatigue of electron-beam-welded foils. Application to a hydrodynamic air bearing in the Chrysler/DOE upgraded automotive gas tubine engine
[NASA-TM-83539]　　　　　　p 316　N84-16589

Aviation-fuel property effects on combustion
[NASA-CR-168334]　　　　　p 310　N84-17407
GAS TURBINES
Effects of flame temperature and fuel composition on soot formation in gas turbine combustors
　　　　　　　　　　　　　　p 298　A84-22747
Alternative fuels for general aviation
[GPO-27-618]　　　　　　　p 311　N84-17409
GAS-SOLID INTERACTIONS
An exact solution for the problem of the interaction of a wedge moving at supersonic velocity with the interface of two gases　　　　　　　p 264　A84-21121
GEARS
Health monitoring of helicopter gearboxes
　　　　　　　　　　　　　　p 257　A84-19631
GENERAL AVIATION AIRCRAFT
Propeller tone bursts　　　　p 320　A84-21213
Benefits of dual wings over single wings for high-performance business airplanes
　　　　　　　　　　　　　　p 291　A84-22172
FAA (Federal Aviation Administration) statistical handbook of aviation: Calender year 1982
[PB84-127323]　　　　　　　p 260　N84-17124
GLASS FIBER REINFORCED PLASTICS
Connecting elements for glass fiber-reinforced plastics structures - Mechanical connections for highly-stressed structures made of fiber-reinforced plastics
　　　　　　　　　　　　　　p 314　A84-22475
GLAZES
Results of an experimental program investigating the effects of simulated ice on the performance of the NACA 63A415 airfoil with flap
[NASA-CR-168288]　　　　　p 271　N84-16145
GLIDERS
Service life of sailplanes made of CFRP
　　　　　　　　　　　　　　p 288　A84-19678
Modification to an accident　　p 278　A84-20087
GOVERNMENT PROCUREMENT
Estimating the cost of composite material airframes using the Rand Corporation Development and Procurement Costs of Aircraft parametric model (DAPCA III)
[AD-A134993]　　　　　　　p 259　N84-17120
Lessons learned--advanced attack helicopter
[AD-A135521]　　　　　　　p 294　N84-17177
GOVERNMENT/INDUSTRY RELATIONS
Government liability under the Federal Tort Claims Act for negligent inspection and certification of aircraft
　　　　　　　　　　　　　　p 323　A84-20150
The liability of the United States for negligent inspection 1983　　　　　　　　　p 323　A84-20454
GRAPHITE-EPOXY COMPOSITES
Friction and wear behavior of aluminum and composite airplane skins
[NASA-TP-2262]　　　　　　p 294　N84-17175
Effects of JP-4 fuel on Graphite/Epoxy composites
[AD-A135416]　　　　　　　p 310　N84-17296
GREAT CIRCLES
Path discrepancies between great circle and rhumb line
[NASA-TM-85522]　　　　　　p 285　N84-17168
GREEN'S FUNCTIONS
High frequency green function for aerodynamic noise in moving media. I - General theory. II - Noise from a spreading jet　　　　　　　p 321　A84-21273
GROUND TESTS
The development and tests of Yan'an 2 Light Helicopter　　　　　　　　p 286　A84-19628
Ground flight tests of a passive rotor isolation system for helicopter vibration reduction　p 287　A84-19643
GROUP THEORY
Invariance groups and reduction of the unsteady transonic small disturbance equation
　　　　　　　　　　　　　　p 263　A84-20215
GUSTS
Lectures of a Flight Mechanics Conference --- conferences
[DFVLR-MITT-83-05]　　　　p 259　N84-16120

H

HARDENERS
Development of a stable epoxy resin system for composite repair
[AD-A135390]　　　　　　　p 310　N84-17395
HARMONICS
Design of helicopter rotor blades for optimum dynamic characteristics
[NASA-CR-175380]　　　　　p 293　N84-17171
HAZARDS
Crashworthy cyclic control stick
[AD-A135150]　　　　　　　p 294　N84-17176

HEAT FLUX
Effects of broadened property fuels on radiant heat flux to gas turbine combustor liners
[NASA-TM-83537]　　　　　　p 315　N84-16494
HEAT RESISTANT ALLOYS
Investigation of the thermocyclic life of ZhS6U alloy in the nonuniform thermostressed state
　　　　　　　　　　　　　　p 309　A84-22406
HEAT TRANSFER
Effects of ventilation and panel properties on temperature rise from aircraft fires
[DOT/FAA/CT-TN83/63]　　　p 280　N84-16157
HEAT TRANSFER COEFFICIENTS
The effect of turbulence on heat transfer near a stagnation point　　　　　　　p 260　A84-19556
Predicted electrothermal deicing of aircraft blades
[AIAA PAPER 84-0110]　　　p 279　A84-21286
HEATING EQUIPMENT
Predicted electrothermal deicing of aircraft blades
[AIAA PAPER 84-0110]　　　p 279　A84-21286
HEAVING
Revised procedure for pavement design under seasonal frost conditions
[AD-A134480]　　　　　　　p 315　N84-16384
HEAVY LIFT HELICOPTERS
Implication of heavy lift helicopter size effect trends and multilift options for filling the need　p 277　A84-19662
HELICOPTER CONTROL
A simple system for helicopter Individual-Blade-Control and its application to lag damping augmentation
　　　　　　　　　　　　　　p 302　A84-19603
Digital automatic flight control system for helicopters
　　　　　　　　　　　　　　p 303　A84-19617
Strapdown inertial navigation systems for helicopters
　　　　　　　　　　　　　　p 283　A84-19618
Techniques in the assessment of helicopter flying qualities　　　　　　　　p 303　A84-19644
Toward a better understanding of helicopter stability derivatives　　　　　　　p 303　A84-19664
Toward a better understanding of helicopter stability derivatives　　　　　　　p 304　A84-19742
Simulator investigations of side-stick controller/stability and control augmentation systems for night nap-of-earth flight　　　　　　　　　p 277　A84-19744
A vectored-thrust rotor for helicopter anti-torque applications　　　　　　　p 291　A84-21799
HELICOPTER DESIGN
Trends for future rotary wing aircraft
　　　　　　　　　　　　　　p 276　A84-19604
Ideal characteristics for a mountain rescue helicopter
　　　　　　　　　　　　　　p 276　A84-19607
Low level flight and navigation at night in Central Europe　　　　　　　　　p 276　A84-19609
Cockpit-design and systems management for light helicopters　　　　　　　p 285　A84-19615
LHX design for improved system performance and affordability　　　　　　　p 285　A84-19616
A digital system for higher harmonic control of a model rotor　　　　　　　　　p 286　A84-19619
Dynamic behavior of transmission systems --- for helicopter drive stability analysis　p 286　A84-19626
The development and tests of Yan'an 2 Light Helicopter　　　　　　　　p 286　A84-19628
Experimental modal analysis --- of helicopter structural vibrations　　　　　　　p 286　A84-19633
Numerical analysis and experimental verification of elastomeric bearings　　　　p 311　A84-19635
Design and development of the Sea King composite main rotor blade　　　　　p 286　A84-19636
STAHR - A program for stability and trim analysis of helicopter rotors　　　　　p 303　A84-19637
Calculation of rotor/airframe interference for realistic configurations　　　　　　p 287　A84-19638
A general algorithm for quasilinearization in helicopter dynamics　　　　　　　p 311　A84-19641
Trade-off considerations for Environmental Control System on board of helicopters　p 287　A84-19648
New aspects on helicopter rotor dynamics
　　　　　　　　　　　　　　p 287　A84-19650
Automatic generation of helicopter rotor aeroelastic equations of motion　　　　p 287　A84-19653
Aerodynamics of the helicopter rear fuselage upsweep
　　　　　　　　　　　　　　p 261　A84-19654
EH101 design - A collaborative programme
　　　　　　　　　　　　　　p 288　A84-19661
Implication of heavy lift helicopter size effect trends and multilift options for filling the need　p 277　A84-19662
Development of the Westland 30　p 288　A84-19663
Vibration damping for a hinged-blade helicopter rotor
　　　　　　　　　　　　　　p 288　A84-19698
The potential impact of technology on VTOL utilization (The Third Nikolsky Lecture)　p 257　A84-19741
Applications of an analytic stall model to time-history and eigenvalue analysis of rotor blades
　　　　　　　　　　　　　　p 262　A84-19743
Army LHX spurs rotorcraft design　p 289　A84-20134

Military seeking upgraded capabilities --- for helicopters p 289 A84-20135
Improved testing methods enhancing rotor research
p 289 A84-20136
Europeans pursue rotor development
p 289 A84-20137
Companies expanding composite uses --- for U.S. Army's light rotorcraft (LHX) and Joint Services Advanced Vertical Lift Aircraft (JVX) p 289 A84-20141
New cockpits use integrated avionics
p 283 A84-20142
The evolution of the helicopter for the year 2000
p 289 A84-20798
HELICOPTER ENGINES
Aero-thermo activities for the development of a 'passive infrared suppressor' for helicopter use
p 286 A84-19625
Evolution of Turbomeca's turbine engines control systems or Digital electronics - Why and how?
p 296 A84-19627
Army, NASA lead testing of turboshaft components
p 296 A84-20138
Europeans stress turboshaft efficiency
p 296 A84-20139
HELICOPTER PERFORMANCE
The AS 332 L Super Puma helicopter in offshore transport and SAR missions p 276 A84-19605
Importance of helicopter performance to air-to-air combat p 277 A84-19611
A performance monitoring system for helicopters
p 295 A84-19614
LHX design for improved system performance and affordability p 285 A84-19616
Health monitoring of helicopter gearboxes
p 257 A84-19631
Nonlinear helicopter stability p 303 A84-19639
Ground flight tests of a passive rotor isolation system for helicopter vibration reduction p 287 A84-19643
Techniques in the assessment of helicopter flying qualities p 303 A84-19644
Vibration of a structure with a tank containing fluid
p 311 A84-19645
EH101 design - A collaborative programme
p 288 A84-19661
Implication of heavy lift helicopter size effect trends and multilift options for filling the need p 277 A84-19662
Development of the Westland 30 p 288 A84-19663
Progress in rotor broadband noise research
p 320 A84-19899
Influencing direct operating costs - Where and how
p 323 A84-19969
Prediction of sources moving at high speed as applied to helicopter and propeller noise
[AIAA PAPER 84-0251] p 321 A84-21858
Helicopter flying qualities characteristics-CH-46E, volume 1
[AD-A134320] p 293 N84-16170
Helicopter flying qualities characteristics-CH-46E, volume 2
[AD-A134321] p 293 N84-16171
Helicopter flying qualities characteristics-CH-46E, volume 3
[AD-A134322] p 293 N84-16172
Helicopter flying qualities characteristics-CH-46E, volume 4
[AD-A134323] p 293 N84-16173
Rotary wing aircraft and technical publications of NASA, 1970 - 1982
[NASA-TM-85521] p 325 N84-18102
HELICOPTER PROPELLER DRIVE
Dynamic behavior of transmission systems --- for helicopter drive stability analysis p 286 A84-19626
HELICOPTER TAIL ROTORS
Dynamic behavior of transmission systems --- for helicopter drive stability analysis p 286 A84-19626
Structure model refinement using reanalysis techniques p 314 A84-22622
HELICOPTER WAKES
On the adequacy of modeling dynamic inflow for helicopter flap-lag stability p 287 A84-19649
Advanced rotor analysis methods for the aerodynamics of vortex/blade interactions in hover
p 261 A84-19657
Calculation of the aerodynamic flow field in the vicinity of a Sea King helicopter
[ARL-AERO-REPT-158] p 273 N84-17128
Helicopter rotor wake geometry and its influence in forward flight. Volume 1: Generalized wake geometry and wake effect on rotor airloads and performance
[NASA-CR-3726] p 275 N84-17149
Computation of potential flows with embedded vortex rings and applications to helicopter rotor wakes
[NASA-CR-166542] p 317 N84-17526
HELICOPTERS
Air rescue service in the Federal Republic of Germany
Requirements for the helicopter p 276 A84-19606

Helicopter noise certification and sensitivity studies along the procedural lines of the new ICAO Annex 16/Chapter 8 regulations p 277 A84-19620
Helicopter external noise - ICAO standards and operational regulations p 277 A84-19621
Theoretical and experimental study of infrared radiation from helicopters p 283 A84-19624
Helicopter infrared signature and countermeasure evaluation p 283 A84-19629
Helicopter ground resonance experimental validation of theoretical results by the use of a scale model
p 286 A84-19630
Survival after helicopter ditching - A technical guide for policy-makers p 278 A84-20079
Special opportunities in helicopter aerodynamics
[NASA-TM-84396] p 270 N84-16138
Helicopter flying qualities characteristics-CH-46E, volume 1
[AD-A134320] p 293 N84-16170
Helicopter flying qualities characteristics-CH-46E, volume 2
[AD-A134321] p 293 N84-16171
Helicopter flying qualities characteristics-CH-46E, volume 3
[AD-A134322] p 293 N84-16172
Helicopter flying qualities characteristics-CH-46E, volume 4
[AD-A134323] p 293 N84-16173
Effect of blade structural parameters on helicopter vibrational characteristics
[AD-A134547] p 293 N84-16174
A helicopter flight investigation of roll-control sensitivity, damping and cross coupling in a low altitude lateral maneuvering task
[NASA-TM-84376] p 305 N84-16216
Sortie duration and helicopter component failures (an empirical study)
[AD-A134745] p 260 N84-17122
HIGH ALTITUDE
High altitude aerodynamic platform concept evaluation and prototype engine testing
[NASA-TM-58256] p 299 N84-16182
HIGH FREQUENCIES
High frequency green function for aerodynamic noise in moving media. I - General theory. II - Noise from a spreading jet p 321 A84-21273
HIGH PRESSURE
Emission FTIR analyses of thin microscopic patches of jet fuel residue deposited on heated metal surface
[NASA-CR-168331] p 311 N84-17410
HIGH PRESSURE OXYGEN
Explosion and fire hazards in an oil-oxygen system --- of an airplane
[FOA-C-20507-D1] p 282 N84-17159
HIGH TEMPERATURE
Emission FTIR analyses of thin microscopic patches of jet fuel residue deposited on heated metal surface
[NASA-CR-168331] p 311 N84-17410
HIGH TEMPERATURE GASES
A dividing layer in high-temperature flows
p 312 A84-21137
The increase in efficiency of high temperature gas turbine plants with cooled turbines p 314 A84-22002
HIGH TEMPERATURE TESTS
The effect of the microstructure on slow crack propagation and the mechanical properties of hot-pressed silicon nitride between room temperature and 1500 C --- German thesis p 308 A84-22237
HINGES
Vibration damping for a hinged-blade helicopter rotor
p 288 A84-19698
Determination of optimum fin planform and airfoil section for minimizing fin hinge moment
[AD-A134523] p 272 N84-16151
HISTORIES
Studies in the history and theory of the development of aviation and rocket and space science and technology. Number 2 --- Russian p 325 A84-21574
The Prandtl Hergesell project of a National Research Establishment for Aeronautics
[DFVLR-MITT-83-10] p 260 N84-17123
HOLOGRAPHIC INTERFEROMETRY
Holographic vibration measurment of a rotating fluttering fan p 313 A84-21511
HOLOGRAPHY
Application of holography to flow visualization
[NASA-TM-84325] p 316 N84-16530
HONEYCOMB STRUCTURES
Effects of ventilation and panel properties on temperature rise from aircraft fires
[DOT/FAA/CT-TN83/63] p 280 N84-16157
HOT-WIRE ANEMOMETERS
The structure of the large eddies in fully developed turbulent shear flows. II - The plane wake
p 266 A84-21393

HOVERCRAFT GROUND EFFECT MACHINES
Design of a remotely controlled hovercraft vehicle for spill reconnaissance
[PB84-124064] p 305 N84-17187
HOVERING
A lifting line theory for curved helicopter blades in hovering and axial flight p 261 A84-19655
Advanced rotor analysis methods for the aerodynamics of vortex/blade interactions in hover
p 261 A84-19657
Documentation of ice shapes on the main rotor of a UH-1H helicopter in hover
[NASA-CR-168332] p 274 N84-17139
HUMAN FACTORS ENGINEERING
Fast jet aircrew safety - A challenge to industry
p 278 A84-20106
Toward the totally integrated airplane
p 258 A84-21887
Conceptual design and simulator implementation of an automatic terminal approach system
[NASA-TM-85667] p 305 N84-16215
Crashworthy cyclic control stick
[AD-A135150] p 294 N84-17176
Human factors issues associated with the use of speech technology in the cockpit
[NASA-CR-166548] p 316 N84-17433
HYDROCARBON COMBUSTION
Explosion and fire hazards in an oil-oxygen system --- of an airplane
[FOA-C-20507-D1] p 282 N84-17159
HYDROELASTICITY
La Recherche Aerospatiale bimonthly bulletin, number 1983-3, 214/May-June
[ESA-TT-822] p 322 N84-18014
HYDROGEN ENGINES
Fuel control systems for hydrogen-fueled automotive combustion engines - A prognosis p 314 A84-22721
HYDROGEN FUELS
Fuel control systems for hydrogen-fueled automotive combustion engines - A prognosis p 314 A84-22721
HYPERSONIC FLOW
Hypersonic nonequilibrium gas flow past a low-aspect-ratio wing p 260 A84-19562
Theory of hypersonic three-dimensional flow around a slender wing of arbitrary aspect ratio by an unsteady stream of relaxing gas p 264 A84-21120
Three-dimensional hypersonic flow of a radiating gas past a wing p 264 A84-21131
Hypersonic flow of a viscous gas at the surface of a blunt cone with strong injection near the blunt section
p 264 A84-21133
Viscous hypersonic flow over complex bodies at high angles of attack
[AIAA PAPER 84-0015] p 265 A84-21279
An evaluation of some collision models used for Monte Carlo calculations of diatomic rarefield hypersonic flows
p 266 A84-21381
Assessment of real gas effects on the prediction of the aerodynamics of high velocity Army shells
[AD-A134739] p 276 N84-17150
HYPERSONIC HEAT TRANSFER
Experimental studies of surface roughness shape and spacing effects on heat transfer and skin friction in supersonic and hypersonic flows
[AIAA PAPER 84-0016] p 267 A84-21851

I

ICE
Potential flow analysis of glaze ice accretions on an airfoil
[NASA-CR-168282] p 271 N84-16146
ICE FORMATION
Performance degradation of a typical twin engine commuter type aircraft in measured natural icing conditions
[AIAA PAPER 84-0179] p 290 A84-21289
Results of an experimental program investigating the effects of simulated ice on the performance of the NACA 63A415 airfoil with flap
[NASA-CR-168288] p 271 N84-16145
Documentation of ice shapes on the main rotor of a UH-1H helicopter in hover
[NASA-CR-168332] p 274 N84-17139
Status for knowledge: Meteorological affected icing on aircraft in clouds
[DFVLR-MITT-83-12] p 319 N84-17763
ICE PREVENTION
An improved method of predicting anti-icing flow rates for a fluid ice protection system
[AIAA PAPER 84-0023] p 279 A84-21280
Predicted electrothermal deicing of aircraft blades
[AIAA PAPER 84-0110] p 279 A84-21286

IDEAL GAS

An exact solution for the problem of the interaction of a wedge moving at supersonic velocity with the interface of two gases   p 264 A84-21121

Computational models of the interaction between vortices and the permeable boundary of a subsonic flow region   p 267 A84-21732

IGNITERS

High energy igniters - The development of materials suitable for continuous ignition   p 296 A84-20108

IMAGE PROCESSING

APQ-102 imaging radar digital image quality study
[NASA-CR-171738]   p 317 N84-17435

IN-FLIGHT MONITORING

A performance monitoring system for helicopters
p 295 A84-19614

Access to maintenance data via AIDS - Future aspects of the expanded AIDS --- Aircraft Integrated Data System
[MBB-UT-17-83-OE]   p 295 A84-22860

INCOMPRESSIBLE FLOW

On the method of pseudo compressibility for numerically solving incompressible flows
[AIAA PAPER 84-0252]   p 262 A84-19889

The linear vortex distribution using the alternative approach
[NIAST-82/80]   p 269 N84-16133

INERTIAL NAVIGATION

Algorithm for the digital processing of signals of onboard receiving antenna arrays   p 284 A84-20555

INFINITE SPAN WINGS

Excitation of Tollmein-Schlichting waves in the boundary layer on the vibrating surface of a swept wing of infinite span   p 264 A84-21117

INFRARED INSTRUMENTS

Aviation experience in helicopter night flying practice
p 277 A84-19612

INFRARED RADIATION

Theoretical and experimental study of infrared radiation from helicopters   p 283 A84-19624

INFRARED SIGNATURES

Theoretical and experimental study of infrared radiation from helicopters   p 283 A84-19624

Helicopter infrared signature and countermeasure evaluation   p 283 A84-19629

INFRARED SUPPRESSION

Aero-thermo activities for the development of a 'passive infrared suppressor' for helicopter use
p 286 A84-19625

INGESTION (ENGINES)

Effects of water ingestion into jet engine
[AIAA PAPER 84-0542]   p 297 A84-21880

INLET FLOW

Calculation of transonic inlet flows
p 263 A84-20839

Experimental determination of the boundary layer at air-sample inlet positions on the NASA CV 990 aircraft
[AIAA PAPER 84-0028]   p 265 A84-21282

Three-dimensional viscous design methodology for advanced technology aircraft supersonic inlet systems
[AIAA PAPER 84-0194]   p 265 A84-21290

An investigation of the flow in turbine cascades with off-design inlet angles. The pulsation characteristics of the flow   p 268 A84-22001

Theoretical and experimental engine-inlet flow fields for fighter forebodies
[NASA-TP-2270]   p 273 N84-17132

INSTRUMENT APPROACH

New ICAO obstacle clearance requirements
p 278 A84-20077

INSTRUMENT ERRORS

Recognition of measurement errors in DME by estimation of impulse parameters   p 284 A84-22598

INSTRUMENT FLIGHT RULES

Conceptual design and simulator implementation of an automatic terminal approach system
[NASA-TM-85667]   p 305 N84-16215

INSTRUMENT LANDING SYSTEMS

A comparison of two position estimate algorithms that use ILS localizer and DME information. Simulation and flight test results
[NASA-TP-2281]   p 285 N84-17165

INTAKE SYSTEMS

Analytical study of blowing boundary-layer control for subsonic V/STOL inlets
[NASA-TM-83576]   p 270 N84-16141

INTEGRAL EQUATIONS

Numerical simulation of stalling flows by an integral equation method   p 301 N84-16199

Computing the three dimensional boundary layer in a compressor   p 301 N84-16200

INTERACTIONAL AERODYNAMICS.

Pressure field induced on an airfoil by an unsteady flow   p 261 A84-19623

Advanced rotor analysis methods for the aerodynamics of vortex/blade interactions in hover
p 261 A84-19657

Disturbance of a planar turbulent wake by a compression shock   p 263 A84-20841

Interaction between a turbulent planar plate boundary layer and a planar cylinder wake   p 264 A84-20843

An exact solution for the problem of the interaction of a wedge moving at supersonic velocity with the interface of two gases   p 264 A84-21121

Numerical simulation of the interaction of a vortex with stationary airfoil in transonic flow
[AIAA PAPER 84-0254]   p 265 A84-21294

Simulation of blunt-fin-induced shock wave and turbulent boundary-layer interaction
[AIAA PAPER 84-0457]   p 266 A84-21301

Cylindrical and conical flow regimes of three-dimensional shock/boundary-layer interactions   p 266 A84-21505

INTERNATIONAL COOPERATION

EH101 design - A collaborative programme
p 288 A84-19661

A review of US international aviation policy
[GPO-18-813]   p 324 N84-17070

Improvement needed in the implementation of the United States International Aviation Policy
[GPO-23-934]   p 324 N84-17072

INVARIANCE

Invariance groups and reduction of the unsteady transonic small disturbance equation
p 263 A84-20215

INVISCID FLOW

Airfoil computation at high angles of attack, inviscid and viscous phenomena
[AIAA PAPER 84-0524]   p 268 A84-21876

Viscous Effects in Turbomachines
[AGARD-CP-351]   p 300 N84-16188

Application of an inviscid-viscous interaction method to transonic compressor cascades   p 300 N84-16190

A viscid inviscid interaction procedure for two dimensional cascades   p 300 N84-16191

ITERATION

A lifting surface computer code with jet-in-crossflow interference effects. Volume 1: Theoretical description
[NASA-CR-166524]   p 271 N84-16147

J

JET AIRCRAFT

Beyond V1 - The dangers of high speed aborted take-offs   p 278 A84-20081

Fast jet aircrew safety - A challenge to industry
p 278 A84-20106

JET AIRCRAFT NOISE

Controlled suppression or amplification of turbulent jet noise
[AIAA PAPER 84-0401]   p 320 A84-20050

Some remarks on source coherence affecting jet noise   p 320 A84-21161

Jet noise at low Reynolds number
p 321 A84-21504

Tone generation by rotor-downstream strut interaction
p 298 A84-22174

Analytical study of the twin-jet shielding
[NASA-CR-175357]   p 321 N84-16943

Analysis of some acoustics-jet flow interaction problems
[NASA-CR-175340]   p 322 N84-16944

JET ENGINE FUELS

Antimisting fuel breakup and flammability
[NASA-CR-174508]   p 310 N84-16354

Effects of broadened property fuels on radiant heat flux to gas turbine combustor liners
[NASA-TM-83537]   p 315 N84-16494

Aviation-fuel property effects on combustion
[NASA-CR-168334]   p 310 N84-17407

JET ENGINES

Effects of water ingestion into jet engine
[AIAA PAPER 84-0542]   p 297 A84-21880

JET EXHAUST

Theoretical and experimental study of infrared radiation from helicopters   p 283 A84-19624

JET FLOW

The effect of turbulence on heat transfer near a stagnation point   p 260 A84-19556

A dividing layer in high-temperature flows
p 312 A84-21137

Excited annular jets of large inner diameter
p 265 A84-21206

K

KALMAN FILTERS

Lectures of a Flight Mechanics Conference --- conferences
[DFVLR-MITT-83-05]   p 259 N84-16120

Estimation of flight-mechanical motion characteristics with Kalman filters   p 292 N84-16126

KEROSENE

Antiicing fuel additives and their effect on the properties of aviation kerosene   p 308 A84-22326

KINETIC ENERGY

Nonlinear helicopter stability   p 303 A84-19639

L

LAMINAR BOUNDARY LAYER

The calculation of the laminar boundary layer on a wing-like ellipsoid with incidence   p 263 A84-20840

Interacting boundary-layer solutions for laminar separated flow past airfoils
[NASA-CR-172287]   p 270 N84-16140

LAMINATES

Effects of JP-4 fuel on Graphite/Epoxy composites
[AD-A135416]   p 310 N84-17296

LANDING AIDS

Antenna systems at civil-aviation airports --- Russian book   p 284 A84-21571

Evaluation and analysis of experience reports concerning wind shear problems
[DFVLR-FB-83-19]   p 280 N84-16159

LANDING GEAR

A reconsideration of the tail-wheel in an actively controlled, undercarriage management system
p 290 A84-21798

LASER ANEMOMETERS

Application of laser anemometry in turbine engine research   p 315 A84-22872

Investigation of flow phenomena in a transonic fan rotor using laser anemometry
[NASA-TM-83555]   p 274 N84-17143

LASER APPLICATIONS

A laser velocimeter system for large-scale aerodynamic testing
[NASA-TM-84393]   p 270 N84-16144

Transactions of the Japan Society for Aeronautical and Space Sciences, vol. 26, no. 73, November 1983
[ISSN-0549-3811]   p 315 N84-16374

LASER DOPPLER VELOCIMETERS

Application of laser anemometry in turbine engine research   p 315 A84-22872

LASER INTERFEROMETRY

Application of holography to flow visualization
[NASA-TM-84325]   p 316 N84-16530

LATERAL CONTROL

A helicopter flight investigation of roll-control sensitivity, damping and cross coupling in a low altitude lateral maneuvering task
[NASA-TM-84376]   p 305 N84-16216

LEADING EDGES

Electro-impulse deicing - Structural dynamic studies, icing tunnel tests and applications
[AIAA PAPER 84-0022]   p 288 A84-19886

Potential flow analysis of glaze ice accretions on an airfoil
[NASA-CR-168282]   p 271 N84-16146

Calculating C-grids with fine and embedded mesh regions
[CFDL-TR-83-7]   p 319 N84-18090

LEGAL LIABILITY

Government liability under the Federal Tort Claims Act for negligent inspection and certification of aircraft
p 323 A84-20150

The liability of the United States for negligent inspection 1983   p 323 A84-20454

Punitive damages in aviation cases - Solving the insurance coverage dilemma   p 324 A84-20455

LIFE SCIENCES

Research and technology report, 1983
[NASA-TM-85865]   p 325 N84-18152

LIFT

Application of an analytic stall model to dynamic analysis of rotor blades   p 262 A84-19665

Interacting boundary-layer solutions for laminar separated flow past airfoils
[NASA-CR-172287]   p 270 N84-16140

A recontoured, upper surface designed to increase the maximum lift coefficient of a modified NACA 65 (0.82) (9.9) airfoil section
[NASA-TM-85855]   p 275 N84-17144

LIFT DEVICES

The 2-dimensional inextensible lifting membrane airfoil, theory and experiment
[AD-A135251]   p 275 N84-17147

Q

QUEUEING THEORY
In-trail dynamics of multiple CDTI-equipped aircraft queues
[NASA-TM-85699]   p 295 N84-16178

R

RADAR DETECTION
Turbulence detection using weather radar
                                 p 283 A84-20083
RADAR EQUIPMENT
Keeping the traffic flowing - Is monopulse SSR the next big market?   p 284 A84-20600
RADAR NAVIGATION
Comparative assessment of a monopulse SSR system and conventional moving-window processing
                                 p 284 A84-22596
RADIATION MEASUREMENT
Helicopter infrared signature and countermeasure evaluation   p 283 A84-19629
RADIATIVE HEAT TRANSFER
Three-dimensional hypersonic flow of a radiating gas past a wing   p 264 A84-21131
RADIO ANTENNAS
Antenna systems at civil-aviation airports --- Russian book   p 284 A84-21571
RADIO NAVIGATION
Antenna systems at civil-aviation airports --- Russian book   p 284 A84-21571
Radio-navigation devices and systems in civil aviation --- Russian book   p 284 A84-21578
RAIL TRANSPORTATION
Effects on rail transport caused by air transport supply alternatives within the Federal Republic of Germany for the year 2000
[DFVLR-MITT-83-14]   p 282 N84-17160
RAINDROPS
Visibility in heavy precipitation and its use in diagnosing high rainfall rates
[AIAA PAPER 84-0541]   p 319 A84-21879
RAMAN SPECTRA
Evaluation of turbulence induced noise in coherent anti-Stokes Raman scattering
[NASA-CR-166544]   p 322 N84-18015
RAMJET ENGINES
Numerical calculations of pressure oscillations in a side-dump ramjet engine
[AIAA PAPER 84-0365]   p 297 A84-21297
RANDOM LOADS
Life distribution under various operating conditions of random cyclic loads --- fatigue strength of aircraft construction elements   p 309 A84-22407
RANDOM VIBRATION
Investigation of random vibrations of aircraft engine blades   p 298 A84-22410
RANGE ERRORS
Recognition of measurement errors in DME by estimation of impulse parameters   p 284 A84-22598
RAREFIED GAS DYNAMICS
An evaluation of some collision models used for Monte Carlo calculations of diatomic rarefield hyupersonic flows
                                 p 266 A84-21381
REACTOR SAFETY
SP-100 program: Space reactor system and subsystem investigations
[DE84-003217]   p 323 N84-18045
REAL TIME OPERATION
Integration of flight test data into a real-time simulation
[AIAA PAPER 84-0552]   p 306 A84-22924
On-board near-optimal climb-dash energy management   p 291 N84-16116
RECTANGULAR WINGS
Trailing vortices in homogeneous and density-stratified media   p 262 A84-19952
A study of prediction methods for the high angle-of-attack aerodynamics of straight wings and fighter aircraft
[NASA-CR-3764]   p 273 N84-17131
REENTRY PHYSICS
High altitude effects on three-dimensional nonequilibrium viscous shock-layer flows
[AIAA PAPER 84-0304]   p 267 A84-21861
REENTRY VEHICLES
Numerical techniques for high incidence reentry aerodynamics
[AD-A134178]   p 271 N84-16149
SP-100 program: Space reactor system and subsystem investigations
[DE84-003217]   p 323 N84-18045
REGENERATIVE COOLING
The increase in efficiency of high temperature gas turbine plants with cooled turbines p 314 A84-22002

RELIABILITY
Aircrew training devices: Utility and utilization of advanced instructional features. Phase I: Tactical Air Command
[AD-A135052]   p 307 N84-17190
RELIABILITY ENGINEERING
Design and development of the Sea King composite main rotor blade   p 286 A84-19636
REMOTE CONTROL
Design of a remotely controlled hovercraft vehicle for spill reconnaissance
[PB84-124064]   p 305 N84-17187
RESCUE OPERATIONS
The AS 332 L Super Puma helicopter in offshore transport and SAR missions   p 276 A84-19605
Air rescue service in the Federal Republic of Germany Requirements for the helicopter   p 276 A84-19606
Ideal characteristics for a mountain rescue helicopter
                                 p 276 A84-19607
RESEARCH
Research and technology report, 1983
[NASA-TM-85865]   p 325 N84-18152
RESEARCH AIRCRAFT
Air-sampling inlet contamination by aircraft emissions on the NASA CV-990 aircraft
[AIAA PAPER 84-0029]   p 279 A84-21283
Airborne observatories - Astronomy at high altitudes
                                 p 259 A84-22348
RESEARCH AND DEVELOPMENT
Impact of computers on aerodynamics research and development   p 262 A84-19903
Improved testing methods enhancing rotor research
                                 p 289 A84-20136
Europeans pursue rotor development
                                 p 289 A84-20137
Studies in the history and theory of the development of aviation and rocket and space science and technology. Number 2 --- Russian   p 325 A84-21574
So what's new? --- aircraft design history and future
                                 p 258 A84-21723
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bereich wissenschaftlich-technische Betriebseinrichtungen - Scientific-technical report: Status 1983 --- German book   p 325 A84-22253
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Annual report 1982 --- German book
                                 p 325 A84-22255
A canopy module escape system for future tactical aircraft   p 291 A84-22400
Modern methods of technological progress in aircraft engines   p 298 A84-22572
RESEARCH FACILITIES
The F2 wind-tunnel at Fauga-Mauzac
[ONERA, TP NO. 1983-139]   p 306 A84-19928
The Prandtl Hergesell project of a National Research Establishment for Aeronautics
[DFVLR-MITT-83-10]   p 260 N84-17123
RESISTANCE HEATING
Electro-impulse deicing - Concept and electrodynamic studies
[AIAA PAPER 84-0021]   p 288 A84-19885
Electro-impulse deicing - Structural dynamic studies, icing tunnel tests and applications
[AIAA PAPER 84-0022]   p 288 A84-19886
RESONANCE
Helicopter ground resonance experimental validation of theoretical results by the use of a scale model
                                 p 286 A84-19630
RESONANCE TESTING
Vibration damping for a hinged-blade helicopter rotor
                                 p 288 A84-19698
RESONANT FREQUENCIES
Structure model refinement using reanalysis techniques   p 314 A84-22622
REYNOLDS NUMBER
Transonic cryogenic test section for the Goettingen tube facility
[NASA-TM-77050]   p 307 N84-16219
Report of tests of a compressor configuration of DCA blading
[AD-A133350]   p 316 N84-16501
Hot wire in low Reynolds number flow
                                 p 324 N84-18087
REYNOLDS STRESS
Close-coupled canard-wing vortex interaction
                                 p 268 A84-22169
ROCKET VEHICLES
Studies in the history and theory of the development of aviation and rocket and space science and technology. Number 2 --- Russian   p 325 A84-21574
ROLLING MOMENTS
Minimal drag for wings with prescribed lift, roll moment and yaw moment
[AD-A134572]   p 272 N84-16152

ROTARY STABILITY
A simple system for helicopter Individual-Blade-Control and its application to lag damping augmentation
                                 p 302 A84-19603
STAHR - A program for stability and trim analysis of helicopter rotors   p 303 A84-19637
Effects of different rub models on simulated rotor dynamics
[NASA-TP-2220]   p 318 N84-17590
ROTARY WING AIRCRAFT
Trends for future rotary wing aircraft
                                 p 276 A84-19604
Rotary wing aircraft and technical publications of NASA, 1970 - 1982
[NASA-TM-85521]   p 325 N84-18102
ROTARY WINGS
A simple system for helicopter Individual-Blade-Control and its application to lag damping augmentation
                                 p 302 A84-19603
A digital system for higher harmonic control of a model rotor   p 286 A84-19619
Fluctuating forces and rotor noise due to main rotor-tail rotor interaction   p 319 A84-19622
Further application and development of strain pattern analysis   p 311 A84-19632
Experimental modal analysis --- of helicopter structural vibrations   p 286 A84-19633
Design and development of the Sea King composite main rotor blade   p 286 A84-19636
STAHR - A program for stability and trim analysis of helicopter rotors   p 303 A84-19637
Application of the local circulation method to the flutter analysis of rotary wings   p 311 A84-19642
Ground flight tests of a passive rotor isolation system for helicopter vibration reduction p 287 A84-19643
New aspects on helicopter rotor dynamics
                                 p 287 A84-19650
The influence of different inflow models on the coupled flapping and torsion of helicopter rotor blades
                                 p 303 A84-19651
A lifting line theory for curved helicopter blades in hovering and axial flight   p 261 A84-19655
Application of an analytic stall model to dynamic analysis of rotor blades   p 262 A84-19665
Vibration damping for a hinged-blade helicopter rotor
                                 p 288 A84-19698
Applications of an analytic stall model to time-history and eigenvalue analysis of rotor blades
                                 p 262 A84-19743
Progress in rotor broadband noise research
                                 p 320 A84-19899
Optimal second harmonic pitch control for a two-bladed articulated rotor   p 304 A84-19900
Observations on the highly coned propeller --- for helicopters   p 296 A84-20025
Europeans pursue rotor development
                                 p 289 A84-20137
Separated flow past bodies with fixed separation sites
                                 p 263 A84-20178
On linear acoustic solutions of high speed helicopter impulsive noise problems   p 320 A84-21212
Predicted electrothermal deicing of aircraft blades
[AIAA PAPER 84-0110]   p 279 A84-21286
A vectored-thrust rotor for helicopter anti-torque applications   p 291 A84-21799
Prediction of sources moving at high speed as applied to helicopter and propeller noise
[AIAA PAPER 84-0251]   p 321 A84-21858
Comparison of calculated and measured pressures on straight and swept-tip model rotor blades
[NASA-TM-85872]   p 270 N84-16143
Calculation of the aerodynamic flow field in the vicinity of a Sea King helicopter
[ARL-AERO-REPT-158]   p 273 N84-17128
Documentation of ice shapes on the main rotor of a UH-1H helicopter in hover
[NASA-CR-168332]   p 274 N84-17139
Design of helicopter rotor blades for optimum dynamic characteristics
[NASA-CR-175380]   p 293 N84-17171
Computation of potential flows with embedded vortex rings and applications to helicopter rotor wakes
[NASA-CR-166542]   p 317 N84-17526
Experimental blade vortex interaction noise characteristics of a utility helicopter at 1/4 scale
[NASA-TM-84653]   p 322 N84-18018
ROTATING BODIES
Holographic vibration measurment of a rotating fluttering fan   p 313 A84-21511
ROTATING SHAFTS
The effect of mode III loading on fatigue crack growth in a rotating shaft   p 312 A84-19747
ROTOR AERODYNAMICS
A simple system for helicopter Individual-Blade-Control and its application to lag damping augmentation
                                 p 302 A84-19603

Fluctuating forces and rotor noise due to main rotor-tail
rotor interaction
p 319 A84-19622

Calculation of rotor/airframe interference for realistic
configurations
p 287 A84-19638

A general algorithm for quasilinearization in helicopter
dynamics
p 311 A84-19641

Application of the local circulation method to the flutter
analysis of rotary wings
p 311 A84-19642

On the adequacy of modeling dynamic inflow for
helicopter flap-lag stability
p 287 A84-19649

New aspects on helicopter rotor dynamics
p 287 A84-19650

The influence of different inflow models on the coupled
flapping and torsion of helicopter rotor blades
p 303 A84-19651

Automatic generation of helicopter rotor aeroelastic
equations of motion
p 287 A84-19653

Advanced rotor analysis methods for the aerodynamics
of vortex/blade interactions in hover
p 261 A84-19657

Practical computation of unsteady lift
p 262 A84-19659

Application of an analytic stall model to dynamic analysis
of rotor blades
p 262 A84-19665

Progress in rotor broadband noise research
p 320 A84-19899

Optimal second harmonic pitch control for a two-bladed
articulated rotor
p 304 A84-19900

Possibilities of raising the efficiency of the compression
process in a centrifugal compressor rotor
p 297 A84-20869

The development of unsteady boundary layers on the
rotor of an axial-flow turbine
p 300 N84-16197

Aerodynamic computation method of airfoil cascades
subjected to viscous flow
p 300 N84-16198

Secondary flows and losses in a turbine cascade
p 301 N84-16203

Compressor rotor aerodynamics
p 302 N84-16210

Experimental verification of an endwall boundary layer
prediction method
p 302 N84-16211

Investigation of flow phenomena in a transonic fan rotor
using laser anemometry
[NASA-TM-83555]
p 274 N84-17143

Effects of different rub models on simulated rotor
dynamics
[NASA-TP-2220]
p 318 N84-17590

ROTOR BLADES

Design and development of the Sea King composite
main rotor blade
p 286 A84-19636

The anelastic compliant rotor - An analytic and
experimental investigation
p 287 A84-19652

Applications of an analytic stall model to time-history
and eigenvalue analysis of rotor blades
p 262 A84-19743

Optimal second harmonic pitch control for a two-bladed
articulated rotor
p 304 A84-19900

Europeans pursue rotor development
p 289 A84-20137

ROTOR BLADES (TURBOMACHINERY)

The development of unsteady boundary layers on the
rotor of an axial-flow turbine
p 300 N84-16197

Effects of different rub models on simulated rotor
dynamics
[NASA-TP-2220]
p 318 N84-17590

ROTOR BODY INTERACTIONS

Dynamic behavior of transmission systems --- for
helicopter drive stability analysis
p 286 A84-19626

Helicopter ground resonance experimental validation of
theoretical results by the use of a scale model
p 286 A84-19630

Calculation of rotor/airframe interference for realistic
configurations
p 287 A84-19638

A general algorithm for quasilinearization in helicopter
dynamics
p 311 A84-19641

Tone generation by rotor-downstream strut interaction
p 298 A84-22174

ROTOR LIFT

Practical computation of unsteady lift
p 262 A84-19659

ROTORS

Application of fast free wake analysis techniques to
rotors
p 261 A84-19658

The development of unsteady boundary layers on the
rotor of an axial-flow turbine
p 300 N84-16197

A mathematical model for the doubly-fed wound rotor
generator, part 2
[NASA-TM-83581]
p 317 N84-17479

RUBBER COATINGS

Reduction of propeller noise by a reflecting rubber layer
--- ship propellers
[FOA-C-20506-E4]
p 323 N84-18025

RUDDERS

Hinge moments of a control surface with a
servocompensator or a two-part control surface with
allowance for the deformation of their kinematic
connection
p 304 A84-22324

S

SADDLE POINTS

Analytical study of the twin-jet shielding
[NASA-CR-175357]
p 321 N84-16943

SAFETY DEVICES

Survival after helicopter ditching - A technical guide for
policy-makers
p 278 A84-20079

Fast jet aircrew safety - A challenge to industry
p 278 A84-20106

SAFETY MANAGEMENT

Survival after helicopter ditching - A technical guide for
policy-makers
p 278 A84-20079

Civil aircraft accident investigation in the U.S.
p 278 A84-20085

Reduction of military high-altitude parachute
entanglement using the controlled alternating parachute
exit system
p 279 A84-20295

SAMPLING

Aircraft avionic system maintenance cannot duplicate
and Retest-OK analytical source analysis
[AD-A134449]
p 259 N84-16129

SCALE MODELS

Helicopter ground resonance experimental validation of
theoretical results by the use of a scale model
p 286 A84-19630

SCATTEROMETERS

A user's manual for the NASA/JPL synthetic aperture
radar and the NASA/JPL L and C band scatterometers
[NASA-CR-173209]
p 315 N84-16428

SCENE ANALYSIS

Simulator scene display evaluation
[NASA-CASE-ARC-11504-1]
p 307 N84-16221

SCHLIEREN PHOTOGRAPHY

Excited annular jets of large inner diameter
p 265 A84-21206

SECONDARY FLOW

Secondary flows and losses in a turbine cascade
p 301 N84-16203

SECONDARY RADAR

Keeping the traffic flowing - Is monopulse SSR the next
big market?
p 284 A84-20600

Comparative assessment of a monopulse SSR system
and conventional moving-window processing
p 284 A84-22596

SEPARATED FLOW

Separated flow past bodies with fixed separation sites
p 263 A84-20178

Separated flow noise of a flat plate at large attack
angles
p 321 A84-21221

A new turbulence closure model for boundary layer flows
with strong adverse pressure gradients and separation
[AIAA PAPER 84-0175]
p 313 A84-21854

Airfoil computation at high angles of attack, inviscid and
viscous phenomena
[AIAA PAPER 84-0524]
p 268 A84-21876

Computation of the flow around wings with rear
separation
p 268 A84-22168

Motion-induced aerial forces for detached flow and their
application to the study of structural response --- German
thesis
p 268 A84-22249

SERVICE LIFE

Service life of sailplanes made of CFRP
p 288 A84-19678

SERVOCONTROL

Hinge moments of a control surface with a
servocompensator or a two-part control surface with
allowance for the deformation of their kinematic
connection
p 304 A84-22324

SH-3 HELICOPTER

Calculation of the aerodynamic flow field in the vicinity
of a Sea King helicopter
[ARL-AERO-REPT-158]
p 273 N84-17128

SHEAR FLOW

The structure of the large eddies in fully developed
turbulent shear flows. II - The plane wake
p 266 A84-21393

Aeroacoustics of turbulent shear flows
p 321 A84-22584

Antimisting fuel breakup and flammability
[NASA-CR-174508]
p 310 N84-16354

Analysis of some acoustics-jet flow interaction
problems
[NASA-CR-175340]
p 322 N84-16944

SHEAR LAYERS

Disturbance of a planar turbulent wake by a compression
shock
p 263 A84-20841

A lifting surface computer code with jet-in-crossflow
interference effects. Volume 1: Theoretical description
[NASA-CR-166524]
p 271 N84-16147

SHIELDING

Analytical study of the twin-jet shielding
[NASA-CR-175357]
p 321 N84-16943

SHIPS

Reduction of propeller noise by a reflecting rubber layer
--- ship propellers
[FOA-C-20506-E4]
p 323 N84-18025

SHOCK LAYERS

High altitude effects on three-dimensional
nonequilibrium viscous shock-layer flows
[AIAA PAPER 84-0304]
p 267 A84-21861

SHOCK WAVE CONTROL

Design of transonic compressor cascades for minimal
shock losses and comparison with test results
p 300 N84-16192

SHOCK WAVE INTERACTION

Geometric characteristics of the separation of a turbulent
boundary layer during the interaction with a normal shock
in conical flows
p 260 A84-19555

The transonic interaction of a normal shock with a mildly
separated turbulent boundary layer
p 261 A84-19593

Disturbance of a planar turbulent wake by a compression
shock
p 263 A84-20841

Simulation of blunt-fin-induced shock wave and turbulent
boundary-layer interaction
[AIAA PAPER 84-0457]
p 266 A84-21301

Cylindrical and conical flow regimes of three-dimensional
shock/boundary-layer interactions
p 266 A84-21505

SHOCK WAVE PROPAGATION

Self-sustained oscillations of a shock wave interacting
with a boundary layer on a supercritical airfoil
[NASA-CR-175338]
p 269 N84-16131

SHOCK WAVES

Investigation to optimize the passive shock
wave-boundary layer control for supercritical airfoil drag
reduction
[NASA-CR-173276]
p 269 N84-16135

SHORT HAUL AIRCRAFT

The potential impact of technology on VTOL utilization
(The Third Nikolsky Lecture)
p 257 A84-19741

SHORT TAKEOFF AIRCRAFT

Incorporating STOL capability into tactical fighter aircraft
concepts
[AIAA PAPER 84-0573]
p 290 A84-21306

Circulation controlled STOL wing optimization
p 268 A84-22173

Design of a lateral ride comfort control system for STOL
aircraft
[UTIAS-TN-247]
p 292 N84-16165

SIDE-LOOKING RADAR

APQ-102 imaging radar digital image quality study
[NASA-CR-171738]
p 317 N84-17435

SIGNAL PROCESSING

Algorithm for the digital processing of signals of onboard
receiving antenna arrays
p 284 A84-20555

SILICON NITRIDES

The effect of the microstructure on slow crack
propagation and the mechanical properties of hot-pressed
silicon nitride between room temperature and 1500 C ---
German thesis
p 308 A84-22237

SIZE (DIMENSIONS)

Implication of heavy lift helicopter size effect trends and
multilift options for filling the need
p 277 A84-19662

SKIN (STRUCTURAL MEMBER)

Friction and wear behavior of aluminum and composite
airplane skins
[NASA-TP-2262]
p 294 N84-17175

SKIN FRICTION

Experimental studies of surface roughness shape and
spacing effects on heat transfer and skin friction in
supersonic and hypersonic flows
[AIAA PAPER 84-0016]
p 267 A84-21851

SLENDER CONES

Experimental studies of surface roughness shape and
spacing effects on heat transfer and skin friction in
supersonic and hypersonic flows
[AIAA PAPER 84-0016]
p 267 A84-21851

SLENDER WINGS

Theory of hypersonic three-dimensional flow around a
slender wing of arbitrary aspect ratio by an unsteady stream
of relaxing gas
p 264 A84-21120

SMALL PERTURBATION FLOW

Invariance groups and reduction of the unsteady
transonic small disturbance equation
p 263 A84-20215

SOILS

Revised procedure for pavement design under seasonal
frost conditions
[AD-A134480]
p 315 N84-16384

SOLAR CELLS

Solar-cell airplane Solair 1
[NASA-TM-77061]
p 292 N84-16164

SUN WORSHIPER: McCready's Solar Challenger flies
over the English Channel
[NASA-TM-77327]
p 292 N84-16166

SOLAR POWERED AIRCRAFT

Solar-cell airplane Solair 1
[NASA-TM-77061]
p 292 N84-16164

SUN WORSHIPER: McCready's Solar Challenger flies over the English Channel
[NASA-TM-77327] p 292 N84-16166

SOLAR PROPULSION
Solar-cell airplane Solair 1
[NASA-TM-77061] p 292 N84-16164

SOLAR RADIATION
SUN WORSHIPER: McCready's Solar Challenger flies over the English Channel
[NASA-TM-77327] p 292 N84-16166

SOOT
Effects of flame temperature and fuel composition on soot formation in gas turbine combustors
p 298 A84-22747
Effects of broadened property fuels on radiant heat flux to gas turbine combustor liners
[NASA-TM-83537] p 315 N84-16494

SOUND FIELDS
Some remarks on source coherence affecting jet noise
p 320 A84-21161

SOUND GENERATORS
Self-sustained oscillations of a shock wave interacting with a boundary layer on a supercritical airfoil
[NASA-CR-175338] p 269 N84-16131
Analysis of some acoustics-jet flow interaction problems
[NASA-CR-175340] p 322 N84-16944

SOUND TRANSMISSION
Light aircraft sound transmission study
[NASA-CR-173175] p 321 N84-16941

SPACE COMMUNICATION
Proceedings of the Symposium on Military Space Communications and Operations
[AD-A135021] p 317 N84-17439

SPACE EXPLORATION
Research and technology report, 1983
[NASA-TM-85865] p 325 N84-18152

SPACE FLIGHT
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bereich wissenschaftlich-technische Betriebseinrichtungen - Scientific-technical report: Status 1983 --- German book
p 325 A84-22253

SPACE PERCEPTION
Results of a slant range visibility field test in Munich-Reim
[DFVLR-MITT-83-09] p 285 N84-17169

SPACE POWER REACTORS
SP-100 program: Space reactor system and subsystem investigations
[DE84-003217] p 323 N84-18045

SPACE SHUTTLE ORBITERS
Viscous hypersonic flow over complex bodies at high angles of attack
[AIAA PAPER 84-0015] p 265 A84-21279

SPACEBORNE ASTRONOMY
Airborne observatories - Astronomy at high altitudes
p 259 A84-22348

SPACECRAFT CONSTRUCTION MATERIALS
Composite structural materials
[NASA-CR-173259] p 310 N84-17293

SPACECRAFT STRUCTURES
Superplastic forming, an economical sheet-forming process
[MBB-BB-555-83-OE] p 314 A84-22851

SPALLATION
Program for development of strain tolerant thermal barrier coating system
[NASA-CR-173214] p 309 N84-16337

SPANWISE BLOWING
Close-coupled canard-wing vortex interaction
p 268 A84-22169

SPARK IGNITION
High energy igniters - The development of materials suitable for continuous ignition
p 296 A84-20108

SPARROW 3 MISSILE
Aerodynamic characteristics of a Sparrow 3 missile model in the flow field of a generalized parent body at Mach 2.86
[NASA-TM-85713] p 273 N84-17134

SPECIFICATIONS
Information needs and system specifications for the B-1B executive information system
[AD-A134424] p 324 N84-17054

SPECTRAL EMISSION
Helicopter infrared signature and countermeasure evaluation
p 283 A84-19629

SPEECH RECOGNITION
Human factors issues associated with the use of speech technology in the cockpit
[NASA-CR-166548] p 316 N84-17433

SPILLING
Design of a remotely controlled hovercraft vehicle for spill reconnaissance
[PB84-124064] p 305 N84-17187

SPRAYED COATINGS
Phase analysis of plasma-sprayed zirconia-yttria coatings
p 308 A84-19781
Mechanical and physical properties of plasma-sprayed stabilized zirconia
p 308 A84-19786

SQUEEZE FILMS
Squeeze-film damping of rotor-dynamic systems
p 318 N84-17610

STABILITY
Wind-tunnel free-flight investigation of a model of a forward-swept-wing fighter configuration
[NASA-TP-2230] p 305 N84-17184

STABILITY AUGMENTATION
Simulator investigations of side-stick controller/stability and control augmentation systems for night nap-of-earth flight
p 277 A84-19744

STABILITY DERIVATIVES
Toward a better understanding of helicopter stability derivatives
p 303 A84-19664
Toward a better understanding of helicopter stability derivatives
p 304 A84-19742

STABILIZERS (FLUID DYNAMICS)
IRAAM wind tunnel test, task 3
[AD-A135256] p 275 N84-17148

STAGNATION POINT
The effect of turbulence on heat transfer near a stagnation point
p 260 A84-19556

STANDARDIZATION
Automated data base implementation requirements for the avionics planning baseline, Army
[AD-A135259] p 325 N84-18103

STATIC PRESSURE
Hot-flow tests of a series of 10-percent-scale turbofan forced mixing nozzles
[NASA-TP-2268] p 317 N84-17525

STATIC STABILITY
Control definition study for advanced vehicles
[NASA-CR-3738] p 304 N84-16212

STATISTICAL ANALYSIS
Statistical methods for estimating crack detection probabilities
p 312 A84-21362
FAA (Federal Aviation Administration) statistical handbook of aviation: Calender year 1982
[PB84-127323] p 260 N84-17124

STATOR BLADES
Flow measurements in the stator row of a single-stage transonic axial-flow compressor with controlled diffusion stator blades
p 302 N84-16209

STATORS
Flow measurements in the stator row of a single-stage transonic axial-flow compressor with controlled diffusion stator blades
p 302 N84-16209
Report of tests of a compressor configuration of DCA blading
[AD-A133350] p 316 N84-16501
A mathematical model for the doubly-fed wound rotor generator, part 2
[NASA-TM-83581] p 317 N84-17479

STEADY STATE
Digital computer program for generating dynamic turbofan engine models (DIGTEM)
[NASA-TM-83446] p 299 N84-16185

STORMS (METEOROLOGY)
A numerical weather prediction system designed to simulate atmospheric downburst phenomena
[AIAA PAPER 84-0352] p 319 A84-21865

STRAIN GAGE BALANCES
A strain-gage aerodynamic balance --- TENSOMETERS
p 306 A84-22325

STRAIN GAGES
Further application and development of strain pattern analysis
p 311 A84-19632

STRAIN RATE
Aerofoil-vortex in a rotational and strained field
p 267 A84-21700

STRAPDOWN INERTIAL GUIDANCE
Strapdown inertial navigation systems for helicopters
p 283 A84-19618

STRATIFIED FLOW
Trailing vortices in homogeneous and density-stratified media
p 262 A84-19952

STREAM FUNCTIONS (FLUIDS)
Viscous effects and heat transfer in a calculation method for axialsymmetric flow in multistage turbomachines using the stream function
p 301 N84-16201

STRESS CORROSION CRACKING
The cyclic fracture toughness of pressed panels of D16chT and V95pchT2 alloys in liquid media
p 308 A84-19582

STRESS-STRAIN DIAGRAMS
Simplified analytical procedures for representing material cyclic response --- for high temperature gas turbine engine analysis
p 298 A84-22877

STROUHAL NUMBER
Periodic vortex shedding in the supersonic wake of a planar plate
p 263 A84-20842

Some remarks on source coherence affecting jet noise
p 320 A84-21161

STRUCTURAL ANALYSIS
Numerical analysis and experimental verification of elastomeric bearings
p 311 A84-19635
Effect of blade structural parameters on helicopter vibrational characteristics
[AD-A134547] p 293 N84-16174
Transactions of the Japan Society for Aeronautical and Space Sciences, vol. 26, no. 73, November 1983
[ISSN-0549-3811] p 315 N84-16374
Use of small crack data to bring about and quantify improvements to aircraft structural integrity
[AD-A135012] p 318 N84-17623

STRUCTURAL DESIGN
Probabilistic fracture mechanics and fatigue methods: Applications for structural design and maintenance
p 312 A84-21360

STRUCTURAL DESIGN CRITERIA
Effect of structural flexibility on the design of vibration-isolating mounts for aircraft engines
[NASA-TM-85725] p 316 N84-16590

STRUCTURAL ENGINEERING
Use of small crack data to bring about and quantify improvements to aircraft structural integrity
[AD-A135012] p 318 N84-17623

STRUCTURAL FAILURE
Modification to an accident p 278 A84-20087
A survey of serious aircraft accidents involving fatigue fracture
p 279 A84-20446
Method for determining probability of structural failure from aircraft counting accelerometer tracking data
p 313 A84-21366
Analysis of structural failure probability under spectrum loading conditions
p 313 A84-21367

STRUCTURAL STABILITY
Application of the local circulation method to the flutter analysis of rotary wings
p 311 A84-19642

STRUCTURAL VIBRATION
Further application and development of strain pattern analysis
p 311 A84-19632
Experimental modal analysis --- of helicopter structural vibrations
p 286 A84-19633
Vibration of a structure with a tank containing fluid
p 311 A84-19645

SUBSONIC FLOW
High frequency green function for aerodynamic noise in moving media. I - General theory. II - Noise from a spreading jet
p 321 A84-21273
Computational models of the interaction between vortices and the permeable boundary of a subsonic flow region
p 267 A84-21732
Quasi-doublet-lattice method for oscillating thin airfoils in subsonic flow
p 272 N84-16378

SUBSONIC SPEED
Flow visualization and interpretation of visualization data for deflected thrust V/STOL nozzles
[AIAA PAPER 84-0102] p 297 A84-21852

SUBSONIC WIND TUNNELS
The F2 wind-tunnel at Fauga-Mauzac
[ONERA, TP NO. 1983-139] p 306 A84-19928
Report of tests of a compressor configuration of DCA blading
[AD-A133350] p 316 N84-16501

SUCTION
Instability of compressible boundary layers along curved walls with suction or cooling
p 266 A84-21507

SUPERCRITICAL WINGS
A multi-grid method for transonic wing analysis and design
p 268 A84-22175
Supercritical airfoil and wing design
p 269 A84-22587
Investigation to optimize the passive shock wave-boundary layer control for supercritical airfoil drag reduction
[NASA-CR-173276] p 269 N84-16135

SUPERPLASTICITY
Superplastic forming, an economical sheet-forming process
[MBB-BB-555-83-OE] p 314 A84-22851

SUPERSONIC AIRCRAFT
Control definition study for advanced vehicles
[NASA-CR-3738] p 304 N84-16212

SUPERSONIC AIRFOILS
The inverse problem for supersonic airfoils
p 267 A84-21520

SUPERSONIC DIFFUSERS
Variable area ejector-diffuser model tests
[AD-A134843] p 302 N84-17182

SUPERSONIC FLOW
Separated flow past bodies with fixed separation sites
p 263 A84-20178
Disturbance of a planar turbulent wake by a compression shock
p 263 A84-20841

An exact solution for the problem of the interaction of a wedge moving at supersonic velocity with the interface of two gases   p 264   A84-21121

A study of the gas dynamics of a model with combustion in a pulsed wind tunnel   p 264   A84-21129

An actuator disc analysis of unsteady supersonic cascade flow   p 265   A84-21189

Simulation of blunt-fin-induced shock wave and turbulent boundary-layer interaction
[AIAA PAPER 84-0457]   p 266   A84-21301

Instability of compressible boundary layers along curved walls with suction or cooling   p 266   A84-21507

Finite area method for nonlinear supersonic conical flows   p 266   A84-21510

The inverse problem for supersonic airfoils
                                  p 267   A84-21520

Prediction of vortex shedding from circular and noncircular bodies in supersonic flow
[NASA-CR-3754]   p 273   N84-17129

The COREL and W12SC3 computer programs for supersonic wing design and analysis
[NASA-CR-3676]   p 273   N84-17130

SUPERSONIC FLUTTER
Holographic vibration measurment of a rotating fluttering fan   p 313   A84-21511

SUPERSONIC HEAT TRANSFER
Experimental studies of surface roughness shape and spacing effects on heat transfer and skin friction in supersonic and hypersonic flows
[AIAA PAPER 84-0016]   p 267   A84-21851

SUPERSONIC INLETS
Three-dimensional viscous design methodology for advanced technology aircraft supersonic inlet systems
[AIAA PAPER 84-0194]   p 265   A84-21290

SUPERSONIC JET FLOW
The density distribution of a supersonic jet issuing into a vacuum from a nozzle with a beveled exit section
                                  p 261   A84-19571

SUPERSONIC SPEEDS
Nonlinear computation of wing-body-vertical tail-wake flows at low supersonic speeds
[AIAA PAPER 84-0427]   p 268   A84-21871

Noise of the SR-6 propeller model at 2 deg and 4 deg angles of attack
[NASA-TM-83515]   p 322   N84-16946

Aerodynamic characteristics of a Sparrow 3 missile model in the flow field of a generalized parent body at Mach 2.86
[NASA-TM-85713]   p 273   N84-17134

SUPERSONIC WAKES
Periodic vortex shedding in the supersonic wake of a planar plate   p 263   A84-20842

SURFACE ROUGHNESS EFFECTS
Experimental studies of surface roughness shape and spacing effects on heat transfer and skin friction in supersonic and hypersonic flows
[AIAA PAPER 84-0016]   p 267   A84-21851

SURVEILLANCE RADAR
Keeping the traffic flowing - Is monopulse SSR the next big market?   p 284   A84-20600

Comparative assessment of a monopulse SSR system and conventional moving-window processing
                                  p 284   A84-22596

SURVEYS
Trends for future rotary wing aircraft
                                  p 276   A84-19604

SURVIVAL EQUIPMENT
Survival after helicopter ditching - A technical guide for policy-makers   p 278   A84-20079

SWEEP ANGLE
Assessment of certain merits of FSW and effect of the sign of the sweep angle on the stressing of a wing structure   p 290   A84-21797

SWEEP EFFECT
Flutter of swept fan blades
[NASA-TM-83547]   p 316   N84-16587

SWEEPBACK
Cylindrical and conical flow regimes of three-dimensional shock/boundary-layer interactions p 266   A84-21505

SWEPT FORWARD WINGS
Assessment of certain merits of FSW and effect of the sign of the sweep angle on the stressing of a wing structure   p 290   A84-21797

Benefits of dual wings over single wings for high-performance business airplanes
                                  p 291   A84-22172

X-29 flight-research program
[NASA-TM-86025]   p 292   N84-16168

Dynamics and control of forward swept wing aircraft
[NASA-CR-175369]   p 294   N84-17172

SWEPT WINGS
Separated flow past bodies with fixed separation sites
                                  p 263   A84-20178

Excitation of Tollmein-Schlichting waves in the boundary layer on the vibrating surface of a swept wing of infinite span   p 264   A84-21117

Wind-tunnel free-flight investigation of a model of a forward-swept-wing fighter configuration
[NASA-TP-2230]   p 305   N84-17184

SWEPTBACK WINGS
Benefits of dual wings over single wings for high-performance business airplanes
                                  p 291   A84-22172

SYNOPTIC METEOROLOGY
Status for knowledge: Meteorological affected icing on aircraft in clouds
[DFVLR-MITT-83-12]   p 319   N84-17763

SYNTHETIC APERTURE RADAR
A user's manual for the NASA/JPL synthetic aperture radar and the NASA/JPL L and C band scatterometers
[NASA-CR-173209]   p 315   N84-16428

APQ-102 imaging radar digital image quality study
[NASA-CR-171738]   p 317   N84-17435

SYNTHETIC FUELS
Synthetic fuel character effects on a rich-lean gas turbine combustor   p 309   A84-22594

Alternative fuels for general aviation
[GPO-27-618]   p 311   N84-17409

SYSTEM EFFECTIVENESS
Semiannual report to Congress on the effectiveness of the civil aviation security program
[AD-A134860]   p 281   N84-17156

Aircrew training devices: Utility and utilization of advanced instructional features. Phase I: Tactical Air Command
[AD-A135052]   p 307   N84-17190

SYSTEM GENERATED ELECTROMAGNETIC PULSES
CXR testing of box IEMP effects due to charge transfer --- Continuous X-Ray Internal Electromagnetic Pulse
                                  p 312   A84-20725

SYSTEM IDENTIFICATION
Identification of longitudinal flying characteristics of an aeroplane and the effect of nonstationary aerodynamics
                                  p 304   A84-22322

Lectures of a Flight Mechanics Conference --- conferences
[DFVLR-MITT-83-05]   p 259   N84-16120

SYSTEMS ANALYSIS
Information needs and system specifications for the B-1B executive information system
[AD-A134424]   p 324   N84-17054

Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 2
[AD-A134834]   p 281   N84-17155

SYSTEMS ENGINEERING
F100 Engine Diagnostic System (EDS) - Summary of results   p 298   A84-22171

SYSTEMS INTEGRATION
Integrated systems for the automatic control of aircraft powerplants --- Russian book   p 297   A84-21579

Toward the totally integrated airplane
                                  p 258   A84-21887

SYSTEMS MANAGEMENT
Cockpit-design and systems management for light helicopters   p 285   A84-19615

SYSTEMS SIMULATION
Nonlinear helicopter stability   p 303   A84-19639

T

TAIL ASSEMBLIES
A reconsideration of the tail-wheel in an actively controlled, undercarriage management system
                                  p 290   A84-21798

TAKEOFF
Evaluation and analysis of experience reports concerning wind shear problems
[DFVLR-FB-83-19]   p 280   N84-16159

Noise levels and data analyses for small prop-driven aircraft
[AD-A134598]   p 293   N84-16175

TAKEOFF RUNS
Beyond V1 - The dangers of high speed aborted take-offs   p 278   A84-20081

TECHNOLOGICAL FORECASTING
Trends for future rotary wing aircraft
                                  p 276   A84-19604

The potential impact of technology on VTOL utilization (The Third Nikolsky Lecture)   p 257   A84-19741

The evolution of the helicopter for the year 2000
                                  p 289   A84-20798

The next 75 years in aerospace   p 258   A84-21721

Future airliner flight decks - Harnessing the new technology   p 291   A84-22498

Fuel control systems for hydrogen-fueled automotive combustion engines - A prognosis   p 314   A84-22721

Effects on rail transport caused by air transport supply alternatives within the Federal Republic of Germany for the year 2000
[DFVLR-MITT-83-14]   p 282   N84-17160

Developments in cabin safety and crashworthiness --- passenger aircraft   p 282   N84-17161

TECHNOLOGY ASSESSMENT
The growth of the avionics industry in the UK
                                  p 284   A84-20850

Studies in the history and theory of the development of aviation and rocket and space science and technology. Number 2 --- Russian   p 325   A84-21574

Recent advances in parachute technology
                                  p 280   A84-21795

Transfer of aircraft technology into other industries Examples from aerodynamics
[MBB-UT-20-83-OE]   p 324   A84-22852

TECHNOLOGY UTILIZATION
The potential impact of technology on VTOL utilization (The Third Nikolsky Lecture)   p 257   A84-19741

TELEVISION SYSTEMS
An airborne programmable digital to video converter
[AD-A134839]   p 296   N84-17181

TEMPERATURE MEASUREMENT
Determination of the static performance of a Cuyuna cc model UL-430RR engine
[NASA-CR-175354]   p 299   N84-16179

Dynamic gas temperature measurement system, volume 1
[NASA-CR-168267-VOL-1]   p 316   N84-16529

TENSILE PROPERTIES
Effects of JP-4 fuel on Graphite/Epoxy composites
[AD-A135416]   p 310   N84-17296

TERMINAL GUIDANCE
Conceptual design and simulator implementation of an automatic terminal approach system
[NASA-TM-85667]   p 305   N84-16215

THERMAL CONDUCTIVITY
Program for development of strain tolerant thermal barrier coating system
[NASA-CR-173214]   p 309   N84-16337

THERMAL CONTROL COATINGS
Phase analysis of plasma-sprayed zirconia-yttria coatings   p 308   A84-19781

Mechanical and physical properties of plasma-sprayed stabilized zirconia   p 308   A84-19786

Program for development of strain tolerant thermal barrier coating system
[NASA-CR-173214]   p 309   N84-16337

THERMAL CYCLING TESTS
Investigation of the thermocyclic life of ZhS6U alloy in the nonuniform thermostressed state
                                  p 309   A84-22406

Simplified analytical procedures for representing material cyclic response --- for high temperature gas turbine engine analysis   p 298   A84-22877

THERMAL EXPANSION
Program for development of strain tolerant thermal barrier coating system
[NASA-CR-173214]   p 309   N84-16337

THERMAL FATIGUE
Investigation of the thermocyclic life of ZhS6U alloy in the nonuniform thermostressed state
                                  p 309   A84-22406

A unit for AGTE shaft strength testing under cyclic torque and axial thrust loading   p 298   A84-22415

Simplified analytical procedures for representing material cyclic response --- for high temperature gas turbine engine analysis   p 298   A84-22877

THERMODYNAMIC EFFICIENCY
The increase in efficiency of high temperature gas turbine plants with cooled turbines   p 314   A84-22002

THERMODYNAMIC PROPERTIES
Transactions of the Japan Society for Aeronautical and Space Sciences, vol. 26, no. 73, November 1983
[ISSN-0549-3811]   p 315   N84-16374

THERMOPLASTICITY
Simplified analytical procedures for representing material cyclic response --- for high temperature gas turbine engine analysis   p 298   A84-22877

THIN AIRFOILS
Invariance groups and reduction of the unsteady transonic small disturbance equation
                                  p 263   A84-20215

THREE DIMENSIONAL BOUNDARY LAYER
The calculation of the laminar boundary layer on a wing-like ellipsoid with incidence   p 263   A84-20840

Excitation of Tollmein-Schlichting waves in the boundary layer on the vibrating surface of a swept wing of infinite span   p 264   A84-21117

Computing the three dimensional boundary layer in a compressor   p 301   N84-16200

Experimental and theoretical studies of parietal viscous boundaries in a single stage transonic compressor
                                  p 301   N84-16206

THREE DIMENSIONAL FLOW
Hypersonic nonequilibrium gas flow past a low-aspect-ratio wing   p 260   A84-19562

Theory of hypersonic three-dimensional flow around a slender wing of arbitrary aspect ratio by an unsteady stream of relaxing gas p 264 A84-21120

Three-dimensional hypersonic flow of a radiating gas past a wing p 264 A84-21131

Viscous hypersonic flow over complex bodies at high angles of attack
[AIAA PAPER 84-0015] p 265 A84-21279

Three-dimensional viscous design methodology for advanced technology aircraft supersonic inlet systems
[AIAA PAPER 84-0194] p 265 A84-21290

High altitude effects on three-dimensional nonequilibrium viscous shock-layer flows
[AIAA PAPER 84-0304] p 267 A84-21861

Comparison of calculated and measured pressures on straight and swept-tip model rotor blades
[NASA-TM-85872] p 270 N84-16143

Flow measurements in the stator row of a single-stage transonic axial-flow compressor with controlled diffusion stator blades p 302 N84-16209

THRUST
Determination of the static performance of a Cuyuna cc model UL-430RR engine
[NASA-CR-175354] p 299 N84-16179

THRUST BEARINGS
Numerical analysis and experimental verification of elastomeric bearings p 311 A84-19635

THRUST LOADS
A unit for AGTE shaft strength testing under cyclic torque and axial thrust loading p 298 A84-22415

THRUST VECTOR CONTROL
A vectored-thrust rotor for helicopter anti-torque applications p 291 A84-21799

THUNDERSTORMS
Optimizing the use of surface sensors for wind shear detection - Experimental and analytical considerations
[AIAA PAPER 84-0353] p 313 A84-21866

Data acquisition for evaluation of an airborne lightning detection system
[AD-A135318] p 281 N84-17153

TILT ROTOR AIRCRAFT
Civil benefits of the JVX --- Joint Services Advanced Lift Aircraft p 257 A84-19968

Army, NASA lead testing of turboshaft components p 296 A84-20138

TOLERANCES (MECHANICS)
The damage tolerance approach to the Canadair CL-600 p 288 A84-19672

TOLLMEIN-SCHLICHTING WAVES
Excitation of Tollmein-Schlichting waves in the boundary layer on the vibrating surface of a swept wing of infinite span p 264 A84-21117

TOPOLOGY
Flow visualization and interpretation of visualization data for deflected thrust V/STOL nozzles
[AIAA PAPER 84-0102] p 297 A84-21852

TORQUE
Determination of the static performance of a Cuyuna cc model UL-430RR engine
[NASA-CR-175354] p 299 N84-16179

TORSION
The influence of different inflow models on the coupled flapping and torsion of helicopter rotor blades p 303 A84-19651

TRAILING EDGES
Compatibility of transonic flows at thick trailing edge in turbine blade row p 260 A84-19413

Turbulent flow near the trailing edge of a plate at zero angle of attack p 260 A84-19553

Self-sustained oscillations of a shock wave interacting with a boundary layer on a supercritical airfoil
[NASA-CR-175338] p 269 N84-16131

Trailing edge flow conditions as a factor in airfoil design
[NASA-CR-173294] p 274 N84-17140

Calculating C-grids with fine and embedded mesh regions
[CFDL-TR-83-7] p 319 N84-18090

TRAILING-EDGE FLAPS
Circulation controlled STOL wing optimization p 268 A84-22173

TRAINING AIRCRAFT
The UTIAS Flight Test Facility p 306 A84-19673

TRAINING DEVICES
Aircrew training devices: Utility and utilization of advanced instructional features. Phase I: Tactical Air Command
[AD-A135052] p 307 N84-17190

TRAINING SIMULATORS
Displays and simulators --- for pilot flight training p 312 A84-21332

TRANSIENT RESPONSE
Effects of different rub models on simulated rotor dynamics
[NASA-TP-2220] p 318 N84-17590

TRANSMISSION LOSS
Light aircraft sound transmission study
[NASA-CR-173175] p 321 N84-16941

TRANSMISSIONS (MACHINE ELEMENTS)
Dynamic behavior of transmission systems --- for helicopter drive stability analysis p 286 A84-19626

TRANSONIC COMPRESSORS
Application of an inviscid-viscous interaction method to transonic compressor cascades p 300 N84-16190

Design of transonic compressor cascades for minimal shock losses and comparison with test results p 300 N84-16192

Experimental and theoretical studies of parietal viscous boundaries in a single stage transonic compressor p 301 N84-16206

TRANSONIC FLIGHT
Wave drag as the objective function in transonic fighter wing optimization
[NASA-TP-2265] p 272 N84-17127

TRANSONIC FLOW
Compatibility of transonic flows at thick trailing edge in turbine blade row p 260 A84-19413

Invariance groups and reduction of the unsteady transonic small disturbance equation p 263 A84-20215

Calculation of transonic inlet flows p 263 A84-20839

Disturbance of a planar turbulent wake by a compression shock p 263 A84-20841

Numerical simulation of the interaction of a vortex with stationary airfoil in transonic flow
[AIAA PAPER 84-0254] p 265 A84-21294

Calculations of viscous transonic flow over airfoils p 266 A84-21506

A multi-grid method for transonic wing analysis and design p 268 A84-22175

Supercritical airfoil and wing design p 269 A84-22587

Self-sustained oscillations of a shock wave interacting with a boundary layer on a supercritical airfoil
[NASA-CR-175338] p 269 N84-16131

The effect of discrete spanwise regions of bleed on pseudo-two-dimensional base flow at transonic speeds
[ARL-AERO-NOTE-418] p 269 N84-16132

Comparison of calculated and measured pressures on straight and swept-tip model rotor blades
[NASA-TM-85872] p 270 N84-16143

Application of an inviscid-viscous interaction method to transonic compressor cascades p 300 N84-16190

Investigation of flow phenomena in a transonic fan rotor using laser anemometry
[NASA-TM-83555] p 274 N84-17143

TWINTN4: A program for transonic four-wall interference assessment in two-dimensional wind tunnels
[NASA-CR-3777] p 307 N84-17189

La Recherche Aerospatiale bimonthly bulletin, number 1983-3, 214/May-June
[ESA-TT-822] p 322 N84-18014

TRANSONIC FLUTTER
Flutter analysis using nonlinear aerodynamic forces p 268 A84-22170

TRANSONIC SPEED
The transonic interaction of a normal shock with a mildly separated turbulent boundary layer p 261 A84-19593

On linear acoustic solutions of high speed helicopter impulsive noise problems p 320 A84-21212

TRANSONIC WIND TUNNELS
New coherent optical techniques for National Transonic Wind Tunnel Facility
[NASA-CR-173174] p 306 N84-16217

Transonic cryogenic test section for the Goettingen tube facility
[NASA-TM-77050] p 307 N84-16219

Tests on a CAST 7 two-dimensional airfoil in a streamlining test section
[NASA-CR-172291] p 274 N84-17136

Evaluation of turbulence induced noise in coherent anti-Stokes Raman scattering
[NASA-CR-166544] p 322 N84-18015

TRANSPORT AIRCRAFT
Beyond V1 - The dangers of high speed aborted take-offs p 278 A84-20081

TU-134 AIRCRAFT
Maintenance center for the aircraft type Tu-134 p 257 A84-19574

TUNING
Optimal mistuning for enhanced aeroelastic stability of transonic fans
[NASA-CR-173179] p 299 N84-16180

TURBINE BLADES
Compatibility of transonic flows at thick trailing edge in turbine blade row p 260 A84-19413

An investigation of the flow in turbine cascades with off-design inlet angles. The pulsation characteristics of the flow p 268 A84-22001

Investigation of the thermocyclic life of ZhS6U alloy in the nonuniform thermostressed state p 309 A84-22406

Investigation of random vibrations of aircraft engine blades p 298 A84-22410

TURBINE ENGINES
Evolution of Turbomeca's turbine engines control systems or Digital electronics - Why and how? p 296 A84-19627

Europeans stress turboshaft efficiency p 296 A84-20139

The effect of the microstructure on slow crack propagation and the mechanical properties of hot-pressed silicon nitride between room temperature and 1500 C --- German thesis p 308 A84-22237

Application of laser anemometry in turbine engine research p 315 A84-22872

The application of turbine bypass engines to high performance V/STOL aircraft
[AIAA PAPER 83-2512] p 299 A84-22925

TURBINE WHEELS
Optimal mistuning for enhanced aeroelastic stability of transonic fans
[NASA-CR-173179] p 299 N84-16180

TURBOCOMPRESSORS
Application of an inviscid-viscous interaction method to transonic compressor cascades p 300 N84-16190

A viscid inviscid interaction procedure for two dimensional cascades p 300 N84-16191

End-wall boundary layer calculations in multistage axial compressors p 301 N84-16205

Experimental and theoretical studies of parietal viscous boundaries in a single stage transonic compressor p 301 N84-16206

Flow measurements in the stator row of a single-stage transonic axial-flow compressor with controlled diffusion stator blades p 302 N84-16209

Experimental verification of an endwall boundary layer prediction method p 302 N84-16211

TURBOFAN ENGINES
F100 Engine Diagnostic System (EDS) - Summary of results p 298 A84-22171

Tone generation by rotor-downstream strut interaction p 298 A84-22174

HYTESS: A hypothetical turbofan engine simplified simulation
[NASA-TM-83561] p 299 N84-16184

Hot-flow tests of a series of 10-percent-scale turbofan forced mixing nozzles
[NASA-TP-2268] p 317 N84-17525

TURBOJET ENGINES
Modern methods of technological progress in aircraft engines p 298 A84-22572

TURBOMACHINE BLADES
Aerodynamic computation method of airfoil cascades subjected to viscous flow p 300 N84-16198

TURBOMACHINERY
The effect of mode III loading on fatigue crack growth in a rotating shaft p 312 A84-19747

Viscous Effects in Turbomachines
[AGARD-CP-351] p 300 N84-16188

Viscous effects and heat transfer in a calculation method for axialsymmetric flow in multistage turbomachines using the stream function p 301 N84-16201

TURBOPROP AIRCRAFT
Investigation of fuselage acoustic treatment for a twin-engine turboprop aircraft in flight and laboratory tests
[NASA-TM-85722] p 322 N84-16947

TURBOPROP ENGINES
Measurement and analysis of acoustic flight test data for two advanced design high speed propeller models
[AIAA PAPER 84-0250] p 320 A84-20049

CT7 - Power for the new commuters p 297 A84-20400

TURBOSHAFTS
Army, NASA lead testing of turboshaft components p 296 A84-20138

Europeans stress turboshaft efficiency p 296 A84-20139

A unit for AGTE shaft strength testing under cyclic torque and axial thrust loading p 298 A84-22415

TURBULENCE EFFECTS
The effect of turbulence on heat transfer near a stagnation point p 260 A84-19556

Evaluation of turbulence induced noise in coherent anti-Stokes Raman scattering
[NASA-CR-166544] p 322 N84-18015

TURBULENT BOUNDARY LAYER
Turbulent flow near the trailing edge of a plate at zero angle of attack p 260 A84-19553

Geometric characteristics of the separation of a turbulent boundary layer during the interaction with a normal shock in conical flows p 260 A84-19555

The transonic interaction of a normal shock with a mildly separated turbulent boundary layer p 261 A84-19593

ZIRCONIUM OXIDES

Phase analysis of plasma-sprayed zirconia-yttria coatings   p 308   A84-19781

Mechanical and physical properties of plasma-sprayed stabilized zirconia   p 308   A84-19786

PERSONAL AUTHOR INDEX

Typical Personal Author
Index Listing

PERSONAL AUTHOR

STONE, R. H.
— Flight service evaluation of Kevlar-49 epoxy composite panels in wide-bodies commercial transport aircraft
[NASA-CR-166065]   p 75   N84-10188

TITLE   REPORT NUMBER   PAGE NUMBER   NASA ACCESSION NUMBER
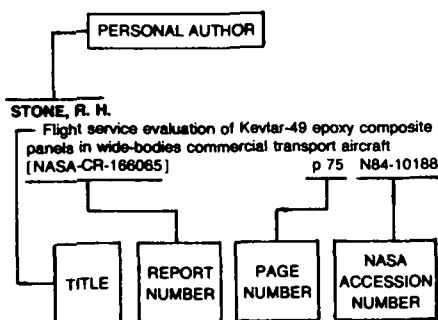
Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

A

ABBOTT, T. S.
In-trail dynamics of multiple CDTI-equipped aircraft queues
[NASA-TM-85699]   p 295   N84-16178
ABRAHAMS, I. D.
Scattering of sound by an elastic plate with flow
          p 320   A84-21216
AFCHAIN, D.
The F2 wind-tunnel at Fauga-Mauzac
[ONERA, TP NO. 1983-139]   p 306   A84-19928
AHUJA, K. K.
Acoustic power dissipation on radiation through duct terminations - Experiments   p 321   A84-21272
AIKEN, E. W.
Simulator investigations of side-stick controller/stability and control augmentation systems for night nap-of-earth flight   p 277   A84-19744
AKHTER, M. M.
HYTESS: A hypothetical turbofan engine simplified simulation
[NASA-TM-83561]   p 299   N84-16184
AKHURST, K. N.
The effect of mode III loading on fatigue crack growth in a rotating shaft   p 312   A84-19747
AKKERMAN, J. W.
High altitude aerodynamic platform concept evaluation and prototype engine testing
[NASA-TM-58256]   p 299   N84-16182
ALBRIGHT, A. E.
An improved method of predicting anti-icing flow rates for a fluid ice protection system
[AIAA PAPER 84-0023]   p 279   A84-21280
ALLAN, D.
Survival after helicopter ditching - A technical guide for policy-makers   p 278   A84-20079
ALLAVENA, A. N.
Helicopter infrared signature and countermeasure evaluation   p 283   A84-19629
ALLEN, J.
The next 75 years in aerospace   p 258   A84-21721
ALLI, P.
EH101 design - A collaborative programme
          p 288   A84-19661

AMIET, R. K.
Correction of fan noise for effects of forward flight
          p 297   A84-21217
ANDERSON, B. H.
Three-dimensional viscous design methodology for advanced technology aircraft supersonic inlet systems
[AIAA PAPER 84-0194]   p 265   A84-21290
ANDERSON, N. P.
Program for development of strain tolerant thermal barrier coating system
[NASA-CR-173214]   p 309   N84-16337
ANDERSON, S. L.
CXR testing of box IEMP effects due to charge transfer   p 312   A84-20725
ANDO, S.
Quasi-doublet-lattice method for oscillating thin airfoils in subsonic flow   p 272   N84-16378
ANDRIANO, M.
Trade-off considerations for Environmental Control System on board of helicopters   p 287   A84-19648
ANGELLO, L. C.
Synthetic fuel character effects on a rich-lean gas turbine combustor   p 309   A84-22594
ANSELL, G. S.
Composite structural materials
[NASA-CR-173259]   p 310   N84-17293
ARBEY, H.
Pressure field induced on an airfoil by an unsteady flow   p 261   A84-19623
ARENDS, M.
Air Force Academy Aeronautics Digest - Fall/Winter 1982
[AD-A135073]   p 275   N84-17145
ARNDT, R. E. A.
Controlled suppression or amplification of turbulent jet noise
[AIAA PAPER 84-0401]   p 320   A84-20050
Jet noise at low Reynolds number
          p 321   A84-21504
ARTEMCHUK, V. IA.
A unit for AGTE shaft strength testing under cyclic torque and axial thrust loading   p 298   A84-22415
ARZEL, MR.
Aviation experience in helicopter night flying practice
          p 277   A84-19612
ASTAFEV, G. P.
Radio-navigation devices and systems in civil aviation
          p 284   A84-21578
ASTRIDGE, D. G.
Health monitoring of helicopter gearboxes
          p 257   A84-19631
AUPOIX, B.
Computing the three dimensional boundary layer in a compressor   p 301   N84-16200
AZUMA, A.
Application of the local circulation method to the flutter analysis of rotary wings   p 311   A84-19642

B

BACHSTEIN, F.
Results of a slant range visibility field test in Munich-Reim
[DFVLR-MITT-83-09]   p 285   N84-17169
BAEV, V. K.
A study of the gas dynamics of a model with combustion in a pulsed wind tunnel   p 264   A84-21129
BAILEY, R. E.
Flight test experience with pilot-induced-oscillation suppression filters
[NASA-TM-86028]   p 305   N84-16213
BALIUK, A. D.
A unit for AGTE shaft strength testing under cyclic torque and axial thrust loading   p 298   A84-22415
BALLHAUS, W. F., JR.
Computational aerodynamics and supercomputers
[NASA-TM-85887]   p 270   N84-16139
BALOMBIN, J. R.
Tone generation by rotor-downstream strut interaction
          p 298   A84-22174

BANK, W.
Visualization of accelerating flow around an airfoil at high angles of attack   p 261   A84-19592
BARTLETT, M. D.
Airloads research study. Volume 1: Flight test loads acquisition
[NASA-CR-170409]   p 294   N84-17173
Airloads research study. Volume 2: Airload coefficients derived from wind tunnel data
[NASA-CR-10410]   p 294   N84-17174
BARTON, J. T.
Airfoil computation at high angles of attack, inviscid and viscous phenomena
[AIAA PAPER 84-0524]   p 268   A84-21876
BAZHENOV, V. G.
A unit for AGTE shaft strength testing under cyclic torque and axial thrust loading   p 298   A84-22415
BEATTIE, E. C.
HYTESS: A hypothetical turbofan engine simplified simulation
[NASA-TM-83561]   p 299   N84-16184
BECKER, J.
Motion-induced aerial forces for detached flow and their application to the study of structural response
          p 268   A84-22249
BEDARD, A. J., JR.
A case study illustrating time scales and operational responses for a wind shear episode during the JAWS project
[AIAA PAPER 84-0351]   p 318   A84-21864
Optimizing the use of surface sensors for wind shear detection - Experimental and analytical considerations
[AIAA PAPER 84-0353]   p 313   A84-21866
BEDDOES, T. S.
Practical computation of unsteady lift
          p 262   A84-19659
BEHAL, B. L.
A simple system for helicopter Individual-Blade-Control and its application to lag damping augmentation
          p 302   A84-19603
BEIGELMAN, Z.
The influence of different inflow models on the coupled flapping and torsion of helicopter rotor blades
          p 303   A84-19651
BEINER, L.
Optimal second harmonic pitch control for a two-bladed articulated rotor   p 304   A84-19900
BELKIN, IU. S.
Integrated systems for the automatic control of aircraft powerplants   p 297   A84-21579
BELOTSERKOVSKII, O. M.
Separated flow past bodies with fixed separation sites
          p 263   A84-20178
BELOTSERKOVSKII, S. M.
Separated flow past bodies with fixed separation sites
          p 263   A84-20178
BENNER, J. C.
A Q-GERT analysis of the effect of improved automatic testing on F-16 aircraft availability
[AD-A134280]   p 259   N84-16128
BENNER, W.
Some aspects of optimizing Kiebitz/ARGUS flight dynamics and control system by simulation and flight testing   p 303   A84-19646
BENSUSSAN, P. L.
A study of creep crack growth in 2219-T851 aluminum alloy using a computerized testing system
          p 308   A84-20278
BERENS, A. P.
Statistical methods for estimating crack detection probabilities   p 312   A84-21362
BERG, R. L.
Revised procedure for pavement design under seasonal frost conditions
[AD-A134480]   p 315   N84-16384
BERGERON, D. M.
The UTIAS Flight Test Facility   p 306   A84-19673
BERNDT, C. C.
Phase analysis of plasma-sprayed zirconia-yttria coatings   p 308   A84-19781

A
U
T
H
O
R

FRANCIS, M. S.
    An investigation of airfoil dynamic stall with large
    amplitude motions
    [AD-A134230]   p 271 N84-16150
FREDERICK, D.
    CXR testing of box IEMP effects due to charge
    transfer   p 312 A84-20725
FREYMANN, R.
    A method for the design of the controller for active
    flutter-suppression systems   p 302 A84-19594
FREYMUTH, P.
    Visualization of accelerating flow around an airfoil at
    high angles of attack   p 261 A84-19592
FROISSART, B.
    Human factors in light-aircraft accidents during stunt
    flying   p 279 A84-21021
FROST, W.
    Incorporation of wind shear terms into the governing
    equations of aircraft motion
    [AIAA PAPER 84-0275]   p 304 A84-21860
    Doppler lidar signal and turbulence study
    [NASA-CR-170976]   p 318 N84-17574
FRUGIER, M.
    The F2 wind-tunnel at Fauga-Mauzac
    [ONERA, TP NO. 1983-139]   p 306 A84-19928
FURLONG, K. L.
    A lifting surface computer code with jet-in-crossflow
    interference effects. Volume 1: Theoretical description
    [NASA-CR-166524]   p 271 N84-16147
FURR, R.
    Design of a remotely controlled hovercraft vehicle for
    spill reconnaissance
    [PB84-124064]   p 305 N84-17187

G

GANZER, U.
    Sidewall effects on airfoil tests   p 306 A84-21521
GAONKAR, G. H.
    On the adequacy of modeling dynamic inflow for
    helicopter flap-lag stability   p 287 A84-19649
GARDNER, J. E.
    Loads and aeroelasticity division research and
    technology accomplishments for FY 1983 and plans for
    FY 1984
    [NASA-TM-85740]   p 274 N84-17135
GAUFFRE, G.
    Theoretical and experimental study of infrared radiation
    from helicopters   p 283 A84-19624
GEISSLER, G.
    Maintenance center for the aircraft type Tu-134
                                    p 257 A84-19574
GEMAS, G. L.
    Aircraft avionic system maintenance cannot duplicate
    and Retest-OK analytical source analysis
    [AD-A134449]   p 259 N84-16129
GENN, S.
    Flow behavior in the Wright Brothers Facility
    [WBWT-TR-1187]   p 307 N84-18088
GERHOLD, C. H.
    Analytical study of the twin-jet shielding
    [NASA-CR-175357]   p 321 N84-16943
GERING, H. K.
    Flight-plan coordination in the Federal Republic of
    Germany   p 280 A84-22599
    The air traffic planning coordinator of the Federal
    Republic of Germany
    [FACHTHEMEN-5]   p 259 N84-16130
GERSHGORIN, A. D.
    Investigation of random vibrations of aircraft engine
    blades   p 298 A84-22410
GERSTENMAIER, W. H.
    Hot-flow tests of a series of 10-percent-scale turbofan
    forced mixing nozzles
    [NASA-TP-2268]   p 317 N84-17525
GIACOMETTI, E.
    Theoretical and experimental study of infrared radiation
    from helicopters   p 283 A84-19624
GIBBONS, A.
    Modification to an accident   p 278 A84-20087
GIBBONS, M. P.
    Automatic generation of helicopter rotor aeroelastic
    equations of motion   p 287 A84-19653
GIESE, U.
    Calculation of transonic inlet flows
                                    p 263 A84-20839
GLOVER, B. M., JR.
    A computer system for aircraft flyover acoustic data
    acquisition and analysis   p 314 A84-22177
GOLDSTEIN, M. E.
    Aeroacoustics of turbulent shear flows
                                    p 321 A84-22584
GOLUBINSKII, A. I.
    Hypersonic nonequilibrium gas flow past a
    low-aspect-ratio wing   p 260 A84-19562

Three-dimensional hypersonic flow of a radiating gas
    past a wing   p 264 A84-21131
GOLUBKIN, V. N.
    Hypersonic nonequilibrium gas flow past a
    low-aspect-ratio wing   p 260 A84-19562
    Three-dimensional hypersonic flow of a radiating gas
    past a wing   p 264 A84-21131
GOODWIN, F. K.
    Determination of optimum fin planform and airfoil section
    for minimizing fin hinge moment
    [AD-A134523]   p 272 N84-16151
GOODYEAR, M. J.
    Tests on a CAST 7 two-dimensional airfoil in a
    streamlining test section
    [NASA-CR-172291]   p 274 N84-17136
GOTWALS, E.
    Sortie duration and helicopter component failures (an
    empirical study)
    [AD-A134745]   p 260 N84-17122
GOUDIE, S. H.
    A simple method for the derivation of isolated and
    installed store loads   p 267 A84-21796
GRACHEV, V. V.
    Radio-navigation devices and systems in civil aviation
                                    p 284 A84-21578
GRAFTON, S. B.
    Wind-tunnel free-flight investigation of a model of a
    forward-swept-wing fighter configuration
    [NASA-TP-2230]   p 305 N84-17184
GRAVES, C. P.
    Secondary flows and losses in a turbine cascade
                                    p 301 N84-16203
GREENHALGH, S.
    The 2-dimensional inextensible lifting membrane airfoil,
    theory and experiment
    [AD-A135251]   p 275 N84-17147
GREGOREK, G. M.
    Results of an experimental program investigating the
    effects of simulated ice on the performance of the NACA
    63A415 airfoil with flap
    [NASA-CR-168288]   p 271 N84-16145
GREGORY-SMITH, D. G.
    Secondary flows and losses in a turbine cascade
                                    p 301 N84-16203
GRIFFIN, C. R.
    APQ-102 imaging radar digital image quality study
    [NASA-CR-171738]   p 317 N84-17435
GROSVELD, F. W.
    Investigation of fuselage acoustic treatment for a
    twin-engine turboprop aircraft in flight and laboratory
    tests
    [NASA-TM-85722]   p 322 N84-16947
GU, Z.
    The development and tests of Yan'an 2 Light
    Helicopter   p 286 A84-19628
GUILL, F. G.
    Aircrew Automated Escape Systems (AAES) In-service
    Usage Data Analyses, volume 1
    [AD-A134833]   p 281 N84-17154
    Aircrew Automated Escape Systems (AAES) In-service
    Usage Data Analyses, volume 2
    [AD-A134834]   p 281 N84-17155
GUO, Z.
    The development and tests of Yan'an 2 Light
    Helicopter   p 286 A84-19628
GUREVICH, O. S.
    Integrated systems for the automatic control of aircraft
    powerplants   p 297 A84-21579
GUSTAFSON, H.
    Design of a remotely controlled hovercraft vehicle for
    spill reconnaissance
    [PB84-124064]   p 305 N84-17187

H

HABRARD, A.
    Modern methods of technological progress in aircraft
    engines   p 298 A84-22572
HADLEY, A. T., III
    Reduction of military high-altitude parachute
    entanglement using the controlled alternating parachute
    exit system   p 279 A84-20295
HAGGARD, J. B., JR.
    Effects of broadened property fuels on radiant heat flux
    to gas turbine combustor liners
    [NASA-TM-83537]   p 315 N84-16494
HAINES, P. A.
    Visibility in heavy precipitation and its use in diagnosing
    high rainfall rates
    [AIAA PAPER 84-0541]   p 319 A84-21879
HAINES, R. F.
    Simulator scene display evaluation
    [NASA-CASE-ARC-11504-1]   p 307 N84-16221

HALFORD, G. R.
    Bending fatigue of electron-beam-welded foils.
    Application to a hydrodynamic air bearing in the
    Chrysler/DOE upgraded automotive gas tubine engine
    [NASA-TM-83539]   p 316 N84-16589
HALL, K. C.
    Optimal mistuning for enhanced aeroelastic stability of
    transonic fans
    [NASA-CR-173179]   p 299 N84-16180
HALLION, R. P.
    Ad inexplorata   p 258 A84-21722
HAM, N. D.
    A simple system for helicopter Individual-Blade-Control
    and its application to lag damping augmentation
                                    p 302 A84-19603
HAMEL, P.
    Contributions of flight mechanics to civil air traffic
                                    p 285 N84-16124
HANSEN, R. S.
    Toward a better understanding of helicopter stability
    derivatives   p 303 A84-19664
    Toward a better understanding of helicopter stability
    derivatives   p 304 A84-19742
HARDING, R.
    Documentation of ice shapes on the main rotor of a
    UH-1H helicopter in hover
    [NASA-CR-168332]   p 274 N84-17139
HARTY, R. B.
    SP-100 program: Space reactor system and subsystem
    investigations
    [DE84-003217]   p 323 N84-18045
HARVEY, J. K.
    An evaluation of some collision models used for Monte
    Carlo calculations of diatomic rarefield hyupersonic flows
                                    p 266 A84-21381
HAUCK, H.
    Low level flight and navigation at night in Central
    Europe   p 276 A84-19609
HAUPT, R. J.
    Effects on rail transport caused by air transport supply
    alternatives within the Federal Republic of Germany for
    the year 2000
    [DFVLR-MITT-83-14]   p 282 N84-17160
HAYASHI, H.
    Compatibility of transonic flows at thick trailing edge in
    turbine blade row   p 260 A84-19413
HAYASHI, T.
    Application of the local circulation method to the flutter
    analysis of rotary wings   p 311 A84-19642
HEAD, V. L.
    Hot-flow tests of a series of 10-percent-scale turbofan
    forced mixing nozzles
    [NASA-TP-2268]   p 317 N84-17525
HEFER, G.
    Transonic cryogenic test section for the Goettingen tube
    facility
    [NASA-TM-77050]   p 307 N84-16219
HEIER, K.
    Nonlinear helicopter stability   p 303 A84-19639
    New aspects on helicopter rotor dynamics
                                    p 287 A84-19650
HEISER, W.
    Air Force Academy Aeronautics Digest - Fall/Winter
    1982
    [AD-A135073]   p 275 N84-17145
HEITMAN, K.
    Light aircraft sound transmission study
    [NASA-CR-173175]   p 321 N84-16941
HEITMAN, P. W.
    Ceramic components for the AGT 100 engine
                                    p 315 A84-22878
HELLER, H.
    Helicopter noise certification and sensitivity studies
    along the procedural lines of the new ICAO Annex
    16/Chapter 8 regulations   p 277 A84-19620
HELMS, H. E.
    Ceramic components for the AGT 100 engine
                                    p 315 A84-22878
HENDRICKSON, R. H.
    Incorporating STOL capability into tactical fighter aircraft
    concepts
    [AIAA PAPER 84-0573]   p 290 A84-21306
HERBERS, P. V.
    Considerations in autopilot litigation
                                    p 323 A84-20453
HERD, G. R.
    Aircrew Automated Escape Systems (AAES) In-service
    Usage Data Analyses, volume 1
    [AD-A134833]   p 281 N84-17154
    Aircrew Automated Escape Systems (AAES) In-service
    Usage Data Analyses, volume 2
    [AD-A134834]   p 281 N84-17155
HERMAN, H.
    Phase analysis of plasma-sprayed zirconia-yttria
    coatings   p 308 A84-19781

HERMANT, A.
Human factors in light-aircraft accidents during stunt
flying   p 279   A84-21021

HERRMANN, H.
Results of a slant range visibility field test in
Munich-Reim
[DFVLR-MITT-83-09]   p 285   N84-17169

HIBST, J. D.
Reduction of military high-altitude parachute
entanglement using the controlled alternating parachute
exit system   p 279   A84-20295

HICKS, R. M.
A recontoured, upper surface designed to increase the
maximum lift coefficient of a modified NACA 65 (0.82) (9.9)
airfoil section
[NASA-TM-85855]   p 275   N84-17144

HIEMSTRA, J. D.
Rotary wing aircraft and technical publications of NASA,
1970 - 1982
[NASA-TM-85521]   p 325   N84-18102

HIGGINS, A. M.
Air Force Academy Aeronautics Digest - Fall/Winter
1982
[AD-A135073]   p 275   N84-17145

HIMES, S. J.
Report of tests of a compressor configuration of DCA
blading
[AD-A133350]   p 316   N84-16501

HINTON, D. A.
Conceptual design and simulator implementation of an
automatic terminal approach system
[NASA-TM-85667]   p 305   N84-16215

HIRSCH, C.
A viscid inviscid interaction procedure for two
dimensional cascades   p 300   N84-16191
End-wall boundary layer calculations in multistage axial
compressors   p 301   N84-16205

HIRST, M.
Safety in numbers. VI - Avionics analysed
                                p 284   A84-21550

HOAD, D. R.
Experimental blade vortex interaction noise
characteristics of a utility helicopter at 1/4 scale
[NASA-TM-84653]   p 322   N84-18018

HODSON, H. P.
The development of unsteady boundary layers on the
rotor of an axial-flow turbine   p 300   N84-16197

HOFFMAN, I. L.
Identification of bottlenecks and capacity constraints in
F-14, F-15, F-16, and F/A-18 aircraft production
[AD-A134629]   p 259   N84-17121

HOFFMANN, H. E.
Status for knowledge: Meteorological affected icing on
aircraft in clouds
[DFVLR-MITT-83-12]   p 319   N84-17763

HOGGE, R.
Air Force Academy Aeronautics Digest - Fall/Winter
1982
[AD-A135073]   p 275   N84-17145

HOLDEN, M. S.
Experimental studies of surface roughness shape and
spacing effects on heat transfer and skin friction in
supersonic and hypersonic flows
[AIAA PAPER 84-0016]   p 267   A84-21851

HOLMES, R.
Squeeze-film damping of rotor-dynamic systems
                                p 318   N84-17610

HORNUNG, H.
Transonic cryogenic test section for the Goettingen tube
facility
[NASA-TM-77050]   p 307   N84-16219

HOVEY, P. W.
Statistical methods for estimating crack detection
probabilities   p 312   A84-21362

HOWE, M. S.
Self-sustained oscillations of a shock wave interacting
with a boundary layer on a supercritical airfoil
[NASA-CR-175338]   p 269   N84-16131

HUANG, K. H.
Doppler lidar signal and turbulence study
[NASA-CR-170976]   p 318   N84-17574

HUDSON, R. E., JR.
Incorporating STOL capability into tactical fighter aircraft
concepts
[AIAA PAPER 84-0573]   p 290   A84-21306

HUFFMAN, P. J.
Visibility in heavy precipitation and its use in diagnosing
high rainfall rates
[AIAA PAPER 84-0541]   p 319   A84-21879

HUGHES, C. A.
Integration of flight test data into a real-time simulation
[AIAA PAPER 84-0552]   p 306   A84-22924

HUI, W. H.
Bifurcation analysis of aircraft pitching motions near the
stability boundary
[NASA-TM-85881]   p 274   N84-17137

HUNG, C.-M.
Simulation of blunt-fin-induced shock wave and turbulent
boundary-layer interaction
[AIAA PAPER 84-0457]   p 266   A84-21301

HWANG, D. P.
Analytical study of blowing boundary-layer control for
subsonic V/STOL inlets
[NASA-TM-83576]   p 270   N84-16141

I

IAREMA, S. IA.
The cyclic fracture toughness of pressed panels of
D16chT and V95pchT2 alloys in liquid media
                                p 308   A84-19582

IAROSLAVTSEV, M. I.
A study of the gas dynamics of a model with combustion
in a pulsed wind tunnel   p 264   A84-21129

ICHIKAWA, A.
Quasi-doublet-lattice method for oscillating thin airfoils
in subsonic flow   p 272   N84-16378

IKUI, T.
Compatibility of transonic flows at thick trailing edge in
turbine blade row   p 260   A84-19413

ILNITSKII, L. IA.
Antenna systems at civil-aviation airports
                                p 284   A84-21571

INGARD, K. U.
Propeller tone bursts   p 320   A84-21213

INNOCENTI, M.
Optimal cooperative control synthesis applied to a
control-configured aircraft
[NASA-CR-170411]   p 305   N84-16214

INOUE, M.
Compatibility of transonic flows at thick trailing edge in
turbine blade row   p 260   A84-19413

ITO, A.
Application of the local circulation method to the flutter
analysis of rotary wings   p 311   A84-19642

IUGOV, O. K.
Integrated systems for the automatic control of aircraft
powerplants   p 297   A84-21579

J

JABLONSKI, D. A.
A study of creep crack growth in 2219-T851 aluminum
alloy using a computerized testing system
                                p 308   A84-20278

JACKSON, C. B.
CDTI target selection criteria
[NASA-CR-3776]   p 295   N84-17178

JACKSON, K. E.
Friction and wear behavior of aluminum and composite
airplane skins
[NASA-TP-2262]   p 294   N84-17175

JACOB, K.
Computation of the flow around wings with rear
separation   p 268   A84-22168

JACOBSON, I. D.
The fallacy of using NII in analyzing aircraft operations
                                p 280   A84-22176

JAGAU, A.
Evaluation and analysis of experience reports
concerning wind shear problems
[DFVLR-FB-83-19]   p 280   N84-16159

JAMESON, A.
The evolution of computational methods in
aerodynamics   p 263   A84-19987

JANIS, E.
Helicopter infrared signature and countermeasure
evaluation   p 283   A84-19629

JANSSENS, P.
A viscid inviscid interaction procedure for two
dimensional cascades   p 300   N84-16191

JARRETT, P.
So what's new?   p 258   A84-21723

JOHNS, A. L.
Flow visualization and interpretation of visualization data
for deflected thrust V/STOL nozzles
[AIAA PAPER 84-0102]   p 297   A84-21852

JOHNSON, D. A.
A new turbulence closure model for boundary layer flows
with strong adverse pressure gradients and separation
[AIAA PAPER 84-0175]   p 313   A84-21854

JOHNSON, T. C.
Revised procedure for pavement design under seasonal
frost conditions
[AD-A134480]   p 315   N84-16384

JOSLYN, H. D.
Compressor rotor aerodynamics   p 302   N84-16210

K

KAGE, G. D., II
Estimating the cost of composite material airframes
using the Rand Corporation Development and
Procurement Costs of Aircraft parametric model (DAPCA
III)
[AD-A134993]   p 259   N84-17120

KALBE, H.
Access to maintenance data via AIDS - Future aspects
of the expanded AIDS
[MBB-UT-17-83-OE]   p 295   A84-22860

KAO, H. C.
Flow visualization and interpretation of visualization data
for deflected thrust V/STOL nozzles
[AIAA PAPER 84-0102]   p 297   A84-21852

KAPLAN, M. L.
A numerical weather prediction system designed to
simulate atmospheric downburst phenomena
[AIAA PAPER 84-0352]   p 319   A84-21865

KARCHER, E. A.
An airborne programmable digital to video converter
[AD-A134839]   p 296   N84-17181

KASCAK, A. F.
Effects of different rub models on simulated rotor
dynamics
[NASA-TP-2220]   p 318   N84-17590

KATO, K.
Transactions of the Japan Society for Aeronautical and
Space Sciences, vol. 26, no. 73, November 1983
[ISSN-0549-3811]   p 315   N84-16374

KAUFMAN, A.
Simplified analytical procedures for representing
material cyclic response   p 298   A84-22877

KAUFMAN, L. G., II
Mach 0.6 to 3.0 flows over rectangular cavities
[AD-A134579]   p 272   N84-16153

KAUL, R.
Path discrepancies between great circle and rhumb
line
[NASA-TM-85522]   p 285   N84-17168

KAUL, U. K.
A comparative study of the parabolized Navier-Stokes
code using various grid-generation techniques
[AIAA PAPER 84-0459]   p 266   A84-21302

KAWACHI, K.
Application of the local circulation method to the flutter
analysis of rotary wings   p 311   A84-19642

KAYSER, L. D.
Boundary-layer trip effectiveness and computations of
aerodynamic heating for XM797 nose-tip configurations
[AD-A128036]   p 271   N84-16148

KAZA, K. R. V.
Flutter of swept fan blades
[NASA-TM-83547]   p 316   N84-16587

KEESEE, J. E.
An investigation of airfoil dynamic stall with large
amplitude motions
[AD-A134230]   p 271   N84-16150

KEITH, T. G., JR.
Predicted electrothermal deicing of aircraft blades
[AIAA PAPER 84-0110]   p 279   A84-21286

KELLEY, H. J.
On-board near-optimal climb-dash energy
management   p 291   N84-16116
Optimal symmetric flight with an intermediate vehicle
model   p 291   N84-16117
Energy state revisited   p 291   N84-16118
Optimal symmetric flight with an intermediate vehicle
model
[NASA-CR-173181]   p 292   N84-16167

KELLY, J. R.
In-trail dynamics of multiple CDTI-equipped aircraft
queues
[NASA-TM-85699]   p 295   N84-16178

KEMP, W. B., JR.
TWINTN4: A program for transonic four-wall
interference assessment in two-dimensional wind
tunnels
[NASA-CR-3777]   p 307   N84-17189

KEMPNER, M. L.
Investigation of random vibrations of aircraft engine
blades   p 298   A84-22410

KENNEY, S. C.
Punitive damages in aviation cases - Solving the
insurance coverage dilemma   p 324   A84-20455

KENSCHE, C.
Service life of sailplanes made of CFRP
                                p 288   A84-19678

KERSTEEN, Z. A.
Human factors issues associated with the use of speech
technology in the cockpit
[NASA-CR-166548]   p 316   N84-17433

KIELB, R. E.
Flutter of swept fan blades
[NASA-TM-83547]   p 316   N84-16587

MARTIANOVA, T. S.
Integrated systems for the automatic control of aircraft powerplants p 297 A84-21579
MARTORELLA, R. P.
Control definition study for advanced vehicles
[NASA-CR-3738] p 304 N84-16212
MARUTA, Y.
Separated flow noise of a flat plate at large attack angles p 321 A84-21221
MARZE, H. J.
Helicopter external noise - ICAO standards and operational regulations p 277 A84-19621
MASIULANIEC, K. C.
Predicted electrothermal deicing of aircraft blades
[AIAA PAPER 84-0110] p 279 A84-21286
MASKEW, B.
Calculation of rotor/airframe interference for realistic configurations p 287 A84-19638
MASON, W. H.
The COREL and W12SC3 computer programs for supersonic wing design and analysis
[NASA-CR-3676] p 273 N84-17130
MAUGHMER, M. D.
Trailing edge flow conditions as a factor in airfoil design
[NASA-CR-173294] p 274 N84-17140
MAYES, W. H.
Aircraft interior noise models - Sidewall trim, stiffened structures, and cabin acoustics with floor partition
p 290 A84-21222
MCCARTHY, J.
A case study illustrating time scales and operational responses for a wind shear episode during the JAWS project
[AIAA PAPER 84-0351] p 318 A84-21864
MCCLELLAN, V. A.
CDTI target selection criteria
[NASA-CR-3776] p 295 N84-17178
MCCROSKEY, W. J.
Numerical simulation of the interaction of a vortex with stationary airfoil in transonic flow
[AIAA PAPER 84-0254] p 265 A84-21294
Special opportunities in helicopter aerodynamics
[NASA-TM-84396] p 270 N84-16138
MCFARLAND, A. L.
A concept for reducing oceanic separation minima through the use of a TCAS-derived CDTI
[NASA-CR-172258] p 295 N84-16177
MCKENNA, P. J.
The effect of the artificial far field boundary on a finite different approximation of the Navier-Stokes equations for a compressible fluid
[AD-A135152] p 317 N84-17536
MCKILLIP, R. M., JR.
A simple system for helicopter Individual-Blade-Control and its application to lag damping augmentation
p 302 A84-19603
MCKNIGHT, R. C.
Performance degradation of a typical twin engine commuter type aircraft in measured natural icing conditions
[AIAA PAPER 84-0179] p 290 A84-21289
MCMILLAN, O. J.
A study of prediction methods for the high angle-of-attack aerodynamics of straight wings and fighter aircraft
[NASA-CR-3764] p 273 N84-17131
MCMULLEN, T. H.
Report from the Bicycle Shop p 258 A84-21888
MEAD, R.
Automated data base implementation requirements for the avionics planning baseline, Army
[AD-A135259] p 325 N84-18103
MEESSEN, H.
Transfer of aircraft technology into other industries Examples from aerodynamics
[MBB-UT-20-83-OE] p 324 A84-22852
MEHAN, R. L.
Mechanical and physical properties of plasma-sprayed stabilized zirconia p 308 A84-19786
MELTON, R. G.
The fallacy of using NII in analyzing aircraft operations
p 280 A84-22176
MENDENHALL, M. R.
Prediction of vortex shedding from circular and noncircular bodies in supersonic flow
[NASA-CR-3754] p 273 N84-17129
A study of prediction methods for the high angle-of-attack aerodynamics of straight wings and fighter aircraft
[NASA-CR-3764] p 273 N84-17131
MENON, P. K. A.
Optimal symmetric flight with an intermediate vehicle model p 291 N84-16117

Optimal symmetric flight with an intermediate vehicle model
[NASA-CR-173181] p 292 N84-16167
MERRILL, W. C.
HYTESS: A hypothetical turbofan engine simplified simulation
[NASA-TM-83561] p 299 N84-16184
METZDORFF, W.
Low level flight and navigation at night in Central Europe p 276 A84-19609
MEYER, R. C.
Control definition study for advanced vehicles
[NASA-CR-3738] p 304 N84-16212
MICHALKE, A.
Some remarks on source coherence affecting jet noise p 320 A84-21161
MIKKELSEN, K. L.
Performance degradation of a typical twin engine commuter type aircraft in measured natural icing conditions
[AIAA PAPER 84-0179] p 290 A84-21289
MILHAUD, A.
Human factors in light-aircraft accidents during stunt flying p 279 A84-21021
MILLER, R.
CXR testing of box IEMP effects due to charge transfer p 312 A84-20725
MILLER, R. H.
Application of fast free wake analysis techniques to rotors p 261 A84-19658
The potential impact of technology on VTOL utilization (The Third Nikolsky Lecture) p 257 A84-19741
MITLER, H. E.
Computer modeling of aircraft cabin fires
[PB84-101153] p 282 N84-17162
MIXSON, J. S.
Investigation of fuselage acoustic treatment for a twin-engine turboprop aircraft in flight and laboratory tests
[NASA-TM-85722] p 322 N84-16947
MOHON, N.
Displays and simulators p 312 A84-21332
MOLYNEUX, W. G.
Observations on the highly coned propeller
p 296 A84-20025
A reconsideration of the tail-wheel in an actively controlled, undercarriage management system
p 290 A84-21798
A vectored-thrust rotor for helicopter anti-torque applications p 291 A84-21799
MONGIA, H. C.
Multidimensional turbulent combustion - Analysis, applications and limitations
[AIAA PAPER 84-0477] p 296 A84-19891
MORDEGLIA, E.
Aero-thermo activities for the development of a 'passive infrared suppressor' for helicopter use
p 286 A84-19625
MOREAU, I. C.
Strapdown inertial navigation systems for helicopters
p 283 A84-19618
MORENO, V.
Simplified analytical procedures for representing material cyclic response p 298 A84-22877
MORGAN, D. E.
Information needs and system specifications for the B-1B executive information system
[AD-A134424] p 324 N84-17054
MORRISON, P.
CXR testing of box IEMP effects due to charge transfer p 312 A84-20725
MORROW, G. E.
Lessons learned--advanced attack helicopter
[AD-A135521] p 294 N84-17177
MOSES, C. A.
Effects of flame temperature and fuel composition on soot formation in gas turbine combustors
p 298 A84-22747
MOTOHASHI, T.
Decreasing the side wall contamination in wind tunnels p 306 A84-20043
MOXON, J.
CT7 - Power for the new commuters
p 297 A84-20400
MUMFORD, J. C.
The structure of the large eddies in fully developed turbulent shear flows. II - The plane wake
p 266 A84-21393
MUNRO, D. H.
Propeller tone bursts p 320 A84-21213
MURRI, D. G.
Wind-tunnel free-flight investigation of a model of a forward-swept-wing fighter configuration
[NASA-TP-2230] p 305 N84-17184

MURTHY, S. N. B.
Effects of water ingestion into jet engine
[AIAA PAPER 84-0542] p 297 A84-21880
MYLIN, D. C.
Boundary-layer trip effectiveness and computations of aerodynamic heating for XM797 nose-tip configurations
[AD-A128036] p 271 N84-16148

N

NAEGELI, D. W.
Effects of flame temperature and fuel composition on soot formation in gas turbine combustors
p 298 A84-22747
NAGAMATSU, H. T.
Investigation to optimize the passive shock wave-boundary layer control for supercritical airfoil drag reduction
[NASA-CR-173276] p 269 N84-16135
NAVIERE, H.
Experimental and theoretical studies of parietal viscous boundaries in a single stage transonic compressor
p 301 N84-16206
NEESE, W. E.
Extinguisher agent behavior in a ventilated small aircraft
[FAA-CT-83-30] p 280 N84-16158
NEWMAN, J. S.
Noise levels and data analyses for small prop-driven aircraft
[AD-A134598] p 293 N84-16175
NGUYEN, L. T.
Wind-tunnel free-flight investigation of a model of a forward-swept-wing fighter configuration
[NASA-TP-2230] p 305 N84-17184
NICKEL, K. L. E.
Minimal drag for wings with prescribed lift, roll moment and yaw moment
[AD-A134572] p 272 N84-16152
NICOLET, W. E.
Viscous hypersonic flow over complex bodies at high angles of attack
[AIAA PAPER 84-0015] p 265 A84-21279
Assessment of real gas effects on the prediction of the aerodynamics of high velocity Army shells
[AD-A134739] p 276 N84-17150
NIELSEN, J. N.
Determination of optimum fin planform and airfoil section for minimizing fin hinge moment
[AD-A134523] p 272 N84-16151
NISHT, M. I.
Separated flow past bodies with fixed separation sites
p 263 A84-20178
NIX, K. J.
The effect of mode III loading on fatigue crack growth in a rotating shaft p 312 A84-19747
NOBLE, R. J.
Communications-electronics in the RAAF
p 283 A84-20458
NOWLIN, D. V.
Identification of bottlenecks and capacity constraints in F-14, F-15, F-16, and F/A-18 aircraft production
[AD-A134629] p 259 N84-17121

O

OBERMAYER, M.
Techniques in the assessment of helicopter flying qualities p 303 A84-19644
OCH, F.
Numerical analysis and experimental verification of elastomeric bearings p 311 A84-19635
OLIANIUK, P. V.
Radio-navigation devices and systems in civil aviation
p 284 A84-21578
OLSEN, A. D., JR.
Airloads research study. Volume 1: Flight test loads acquisition
[NASA-CR-170409] p 294 N84-17173
Airloads research study. Volume 2: Airload coefficients derived from wind tunnel data
[NASA-CR-10410] p 294 N84-17174
ONEAL, R. L.
Investigation of fuselage acoustic treatment for a twin-engine turboprop aircraft in flight and laboratory tests
[NASA-TM-85722] p 322 N84-16947
ONEILL, P. M.
A Q-GERT analysis of the effect of improved automatic testing on F-16 aircraft availability
[AD-A134280] p 259 N84-16128
ORGANIC, V. J.
An airborne programmable digital to video converter
[AD-A134839] p 296 N84-17181

RUSSO, A.
STAHR - A program for stability and trim analysis of helicopter rotors   p 303   A84-19637

S

SALIKUDDIN, M.
Acoustic power dissipation on radiation through duct terminations - Experiments   p 321   A84-21272
SALTSMAN, J. F.
Bending fatigue of electron-beam-welded foils. Application to a hydrodynamic air bearing in the Chrysler/DOE upgraded automotive gas tubine engine
[NASA-TM-83539]   p 316   N84-16589
SANDEL, W.
Viscous effects and heat transfer in a calculation method for axisymmetric flow in multistage turbomachines using the stream function   p 301   N84-16201
SAROHIA, V.
Antimisting kerosene: Base fuel effects, blending and quality control techniques
[NASA-CR-174509]   p 309   N84-16351
Atomization and combustion performance of antimisting kerosene and jet fuel
[NASA-CR-174507]   p 309   N84-16353
Antimisting fuel breakup and flammability
[NASA-CR-174508]   p 310   N84-16354
SARPKAYA, T.
Trailing vortices in homogeneous and density-stratified media   p 262   A84-19952
SASTRY, V. V. S. S.
On the adequacy of modeling dynamic inflow for helicopter flap-lag stability   p 287   A84-19649
SCANLON, C.
A comparison of two position estimate algorithms that use ILS localizer and DME information. Simulation and flight test results
[NASA-TP-2281]   p 285   N84-17165
SCARAMUZZINO, MR.
System concepts for helicopter air-to-air combat
p 276   A84-19610
SCHICK, A.
Some aspects of optimizing Kiebitz/ARGUS flight dynamics and control system by simulation and flight testing   p 303   A84-19646
SCHICK, F. V.
Evaluation and analysis of experience reports concerning wind shear problems
[DFVLR-FB-83-19]   p 280   N84-16159
SCHIFF, L. B.
Mathematical modeling of the aerodynamic characteristics in flight dynamics
[NASA-TM-85880]   p 274   N84-17141
SCHLIEKMANN, C.
Numerical analysis and experimental verification of elastomeric bearings   p 311   A84-19635
SCHLINKER, R. H.
Progress in rotor broadband noise research
p 320   A84-19899
SCHMID-BURGK, J.
Airborne observatories - Astronomy at high altitudes
p 259   A84-22348
SCHMIDT, D. K.
Optimal cooperative control synthesis applied to a control-configured aircraft
[NASA-CR-170411]   p 305   N84-16214
Dynamics and control of forward swept wing aircraft
[NASA-CR-175369]   p 294   N84-17172
SCHRAG, R. L.
Electro-impulse deicing - Concept and electrodynamic studies
[AIAA PAPER 84-0021]   p 288   A84-19885
SCHREIER, J.
Fluctuating forces and rotor noise due to main rotor-tail rotor interaction   p 319   A84-19622
SCHULTZ, J.
A canopy module escape system for future tactical aircraft   p 291   A84-22400
SCHWAMBORN, D.
The calculation of the laminar boundary layer on a wing-like ellipsoid with incidence   p 263   A84-20840
SCHYMANIETZ, K.
Cockpit-design and systems management for light helicopters   p 285   A84-19615
SCRIPELLITI, P.
Aero-thermo activities for the development of a 'passive infrared suppressor' for helicopter use
p 286   A84-19625
SEASHOLTZ, R. G.
Application of laser anemometry in turbine engine research   p 315   A84-22872
SEDDON, J.
Aerodynamics of the helicopter rear fuselage upsweep
p 261   A84-19654

SEDERQUIST, R. A.
Synthetic fuel character effects on a rich-lean gas turbine combustor   p 309   A84-22594
SEEBASS, A. R.
Finite area method for nonlinear supersonic conical flows   p 266   A84-21510
Supercritical airfoil and wing design
p 269   A84-22587
SEEMAN, G.
Design of a remotely controlled hovercraft vehicle for spill reconnaissance
[PB84-124064]   p 305   N84-17187
SELBERG, B. P.
Benefits of dual wings over single wings for high-performance business airplanes
p 291   A84-22172
SELVA, MR.
Theoretical and experimental study of infrared radiation from helicopters   p 283   A84-19624
SETTLES, G. S.
Cylindrical and conical flow regimes of three-dimensional shock/boundary-layer interactions   p 266   A84-21505
SEVESTRE, C.
La Recherche Aerospatiale bimonthly bulletin, number 1983-3, 214/May-June
[ESA-TT-822]   p 322   N84-18014
SHAFER, M. F.
Flight test experience with pilot-induced-oscillation suppression filters
[NASA-TM-86028]   p 305   N84-16213
SHANKAR, N. R.
Phase analysis of plasma-sprayed zirconia-yttria coatings   p 308   A84-19781
SHANKAR, V.
Implicit treatment of the unsteady full potential equation in conservation form
[AIAA PAPER 84-0262]   p 313   A84-21857
Nonlinear computation of wing-body-vertical tail-wake flows at low supersonic speeds
[AIAA PAPER 84-0427]   p 268   A84-21871
SHANKS, S. P.
Viscous hypersonic flow over complex bodies at high angles of attack
[AIAA PAPER 84-0015]   p 265   A84-21279
SHAUGHNESSY, J. D.
Conceptual design and simulator implementation of an automatic terminal approach system
[NASA-TM-85667]   p 305   N84-16215
SHAWVER, W. R.
Method for determining probability of structural failure from aircraft counting accelerometer tracking data
p 313   A84-21366
SHERIDAN, A. E.
The application of turbine bypass engines to high performance V/STOL aircraft
[AIAA PAPER 83-2512]   p 299   A84-22925
SHEVIAKOV, A. A.
Integrated systems for the automatic control of aircraft powerplants   p 297   A84-21579
SHUMSKII, V. V.
A study of the gas dynamics of a model with combustion in a pulsed wind tunnel   p 264   A84-21129
SIEBERT, D.
Comparative assessment of a monopulse SSR system and conventional moving-window processing
p 284   A84-22596
SIEMERS, P. A.
Mechanical and physical properties of plasma-sprayed stabilized zirconia   p 308   A84-19786
SIMMONS, A. P.
Developments in cabin safety and crashworthiness
p 282   N84-17161
SIROVICH, L.
The inverse problem for supersonic airfoils
p 267   A84-21520
SLOBODYANYUK, L. K.
The start-up of a gas turbine engine using compressed air tangentially fed onto the blades of the basic turbine
[NASA-TM-77021]   p 316   N84-16563
SLUSHER, G. R.
Extinguisher agent behavior in a ventilated small aircraft
[FAA-CT-83-30]   p 280   N84-16158
SMITH, B. A.
Rockwell completes first B-1B fuselage
p 257   A84-20372
SMITH, D. B.
Airloads research study. Volume 1: Flight test loads acquisition
[NASA-CR-170409]   p 294   N84-17173
Airloads research study. Volume 2: Airload coefficients derived from wind tunnel data
[NASA-CR-10410]   p 294   N84-17174
SMITH, R.
Importance of helicopter performance to air-to-air combat   p 277   A84-19611

SMITH, R. E.
Flight test experience with pilot-induced-oscillation suppression filters
[NASA-TM-86028]   p 305   N84-16213
SNYDER, P. K.
A laser velocimeter system for large-scale aerodynamic testing
[NASA-TM-84393]   p 270   N84-16144
SOBIECZKY, H.
Supercritical airfoil and wing design
p 269   A84-22587
SOEDERQVIST, R.
Reduction of propeller noise by a reflecting rubber layer
[FOA-C-20506-E4]   p 323   N84-18025
SOEDERQVIST, S.
Reduction of propeller noise by a reflecting rubber layer
[FOA-C-20506-E4]   p 323   N84-18025
SONG, D. J.
High altitude effects on three-dimensional nonequilibrium viscous shock-layer flows
[AIAA PAPER 84-0304]   p 267   A84-21861
SOUAHI, A.
Assessment of certain merits of FSW and effect of the sign of the sweep angle on the stressing of a wing structure   p 290   A84-21797
SOUTER, K.
Design of a remotely controlled hovercraft vehicle for spill reconnaissance
[PB84-124064]   p 305   N84-17187
SPERATO, M.
Automated data base implementation requirements for the avionics planning baseline, Army
[AD-A135259]   p 325   N84-18103
SPLETTSTOESSER, W.
Helicopter noise certification and sensitivity studies along the procedural lines of the new ICAO Annex 16/Chapter 8 regulations   p 277   A84-19620
SRINIVASAN, G. R.
Viscous hypersonic flow over complex bodies at high angles of attack
[AIAA PAPER 84-0015]   p 265   A84-21279
Numerical simulation of the interaction of a vortex with stationary airfoil in transonic flow
[AIAA PAPER 84-0254]   p 265   A84-21294
Assessment of real gas effects on the prediction of the aerodynamics of high velocity Army shells
[AD-A134739]   p 276   N84-17150
SRINIVASAN, R.
Multidimensional turbulent combustion - Analysis, applications and limitations
[AIAA PAPER 84-0477]   p 296   A84-19891
SRITHARAN, S. S.
Finite area method for nonlinear supersonic conical flows   p 266   A84-21510
STALLINGS, R. L., JR.
Aerodynamic characteristics of a Sparrow 3 missile model in the flow field of a generalized parent body at Mach 2.86
[NASA-TM-85713]   p 273   N84-17134
STANEWSKY, E.
Sidewall effects on airfoil tests   p 306   A84-21521
Transonic cryogenic test section for the Goettingen tube facility
[NASA-TM-77050]   p 307   N84-16219
STEFKO, G. L.
Noise of the SR-6 propeller model at 2 deg and 4 deg angles of attack
[NASA-TM-83515]   p 322   N84-16946
STEVENS, W. M.
Government liability under the Federal Tort Claims Act for negligent inspection and certification of aircraft
p 323   A84-20150
STEWART, J. F.
Flight test experience with pilot-induced-oscillation suppression filters
[NASA-TM-86028]   p 305   N84-16213
STILWELL, G. H.
Information needs and system specifications for the B-1B executive information system
[AD-A134424]   p 324   N84-17054
STOFFERS, G.
Wake vortices and their aerodynamic alleviation: A review of the literature
[DFVLR-MITT-83-07]   p 272   N84-16154
STOKES, C. W., III
Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 1
[AD-A134833]   p 281   N84-17154
Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 2
[AD-A134834]   p 281   N84-17155
STOREY, P. A.
Holographic vibration measurment of a rotating fluttering fan   p 313   A84-21511

STRAMPP, W.
  Invariance groups and reduction of the unsteady transonic small disturbance equation
                                   p 263   A84-20215
STRAZISAR, A. J.
  Investigation of flow phenomena in a transonic fan rotor using laser anemometry
  [NASA-TM-83555]   p 274   N84-17143
STUREK, W. B.
  Boundary-layer trip effectiveness and computations of aerodynamic heating for XM797 nose-tip configurations
  [AD-A128036]   p 271   N84-16148
STURM, M. J.
  Control definition study for advanced vehicles
  [NASA-CR-3738]   p 304   N84-16212
SUCCI, G. P.
  Propeller tone bursts   p 320   A84-21213
SULLIVAN, J. P.
  Optimization of propeller blade twist by an analytical method   p 297   A84-21514
SUMMA, J. M.
  Advanced rotor analysis methods for the aerodynamics of vortex/blade interactions in hover
                                   p 261   A84-19657
SWAMINATHAN, S.
  High altitude effects on three-dimensional nonequilibrium viscous shock-layer flows
  [AIAA PAPER 84-0304]   p 267   A84-21861
SZEMA, K.-Y.
  Nonlinear computation of wing-body-vertical tail-wake flows at low supersonic speeds
  [AIAA PAPER 84-0427]   p 268   A84-21871
SZUCH, J. R.
  Digital computer program for generating dynamic turbofan engine models (DIGTEM)
  [NASA-TM-83446]   p 299   N84-16185

T

TADYCH, G. M.
  Integration of flight test data into a real-time simulation
  [AIAA PAPER 84-0552]   p 306   A84-22924
TAM, C. K. W.
  On linear acoustic solutions of high speed helicopter impulsive noise problems   p 320   A84-21212
TAPPAN, M. W.
  Integration of flight test data into a real-time simulation
  [AIAA PAPER 84-0552]   p 306   A84-22924
TAUBER, M. E.
  Comparison of calculated and measured pressures on straight and swept-tip model rotor blades
  [NASA-TM-85872]   p 270   N84-16143
TEBELIS, T.
  Fuel control systems for hydrogen-fueled automotive combustion engines - A prognosis   p 314   A84-22721
TEEGAN, U.
  Evaluation and analysis of experience reports concerning wind shear problems
  [DFVLR-FB-83-19]   p 280   N84-16159
TELFORD, R.
  The growth of the avionics industry in the UK
                                   p 284   A84-20850
TEMIME, G.
  The AS 332 L Super Puma helicopter in offshore transport and SAR missions   p 276   A84-19605
TENG, H.-Y.
  Cylindrical and conical flow regimes of three-dimensional shock/boundary-layer interactions   p 266   A84-21505
THIBERT, F.
  Dynamic behavior of transmission systems
                                   p 286   A84-19626
THOMPSON, T. W.
  A user's manual for the NASA/JPL synthetic aperture radar and the NASA/JPL L and C band scatterometers
  [NASA-CR-173209]   p 315   N84-16428
THUM, C.
  Airborne observatories - Astronomy at high altitudes
                                   p 259   A84-22348
TIGNER, J. E.
  CXR testing of box IEMP effects due to charge transfer   p 312   A84-20725
TOBAK, M.
  Bifurcation analysis of aircraft pitching motions near the stability boundary
  [NASA-TM-85881]   p 274   N84-17137
  Mathematical modeling of the aerodynamic characteristics in flight dynamics
  [NASA-TM-85880]   p 274   N84-17141
TOLLE, F. F.
  Integrated aircraft fuel tank inerting and compartment fire suppression system. Volume 2: Evaluation of nitrogen-enriched air as a fire suppressant
  [AD-A134883]   p 281   N84-17157

TOMKO, J. J.
  Effects of different rub models on simulated rotor dynamics
  [NASA-TP-2220]   p 318   N84-17590
TRACZYK, J.
  Possibilities of raising the efficiency of the compression process in a centrifugal compressor rotor
                                   p 297   A84-20869
TRETIACHENKO, G. N.
  Investigation of the thermocyclic life of ZhS6U alloy in the nonuniform thermostressed state
                                   p 309   A84-22406
TROUVE, MR.
  Experimental modal analysis   p 286   A84-19633
TSIOLAKIS, E. P.
  Interaction between a turbulent planar plate boundary layer and a planar cylinder wake   p 264   A84-20843
TUGAZAKOV, R. IA.
  An exact solution for the problem of the interaction of a wedge moving at supersonic velocity with the interface of two gases   p 264   A84-21121
TUMIN, A. M.
  Excitation of Tollmein-Schlichting waves in the boundary layer on the vibrating surface of a swept wing of infinite span   p 264   A84-21117
TURLACH, G.
  Connecting elements for glass fiber-reinforced plastics structures - Mechanical connections for highly-stressed structures made of fiber-reinforced plastics
                                   p 314   A84-22475
TURNER, D. R.
  The damage tolerance approach to the Canadair CL-600   p 288   A84-19672

U

UCKERMANN, R.
  Evaluation and analysis of experience reports concerning wind shear problems
  [DFVLR-FB-83-19]   p 280   N84-16159
UEDA, T.
  Flutter analysis using nonlinear aerodynamic forces
                                   p 268   A84-22170
ULRICH, C.
  The air traffic planning coordinator of the Federal Republic of Germany
  [FACHTHEMEN-5]   p 259   N84-16130
UNDERWOOD GROUND, K. E.
  Pilot-induced factors in fatal light aircraft accidents in the United Kingdom - 1969-1981   p 279   A84-20292
UTGOFF, V. V.
  The anelastic compliant rotor - An analytic and experimental investigation   p 287   A84-19652

V

VAN DYKE, M.
  Annual review of fluid mechanics. Volume 16
                                   p 314   A84-22576
VAN WIE, D. M.
  Application of CAE and CFD techniques to a complete tactical missile design
  [AIAA PAPER 84-0387]   p 267   A84-21870
VANDENBROEK, G. J.
  The linear vortex distribution using the alternative approach
  [NIAST-82/80]   p 269   N84-16133
VEDDER, J. F.
  Experimental determination of the boundary layer at air-sample inlet positions on the NASA CV 990 aircraft
  [AIAA PAPER 84-0028]   p 265   A84-21282
  Air-sampling inlet contamination by aircraft emissions on the NASA CV-990 aircraft
  [AIAA PAPER 84-0029]   p 279   A84-21283
VELICHKO, S. A.
  Turbulent flow near the trailing edge of a plate at zero angle of attack   p 260   A84-19553
VENTRES, C. S.
  Self-sustained oscillations of a shock wave interacting with a boundary layer on a supercritical airfoil
  [NASA-CR-175338]   p 269   N84-16131
VERMA, A. K.
  Instability of compressible boundary layers along curved walls with suction or cooling   p 266   A84-21507
VICH, K.
  A strain-gage aerodynamic balance
                                   p 306   A84-22325
VICROY, D. D.
  A comparison of two position estimate algorithms that use ILS localizer and DME information. Simulation and flight test results
  [NASA-TP-2281]   p 285   N84-17165

VINCENT, A. H.
  Design and development of the Sea King composite main rotor blade   p 286   A84-19636
VOGEL, P.
  Emission FTIR analyses of thin microscopic patches of jet fuel residue deposited on heated metal surface
  [NASA-CR-168331]   p 311   N84-17410

W

WAGNER, J. H.
  Compressor rotor aerodynamics   p 302   N84-16210
WALKER, A. R.
  Further application and development of strain pattern analysis   p 311   A84-19632
WALKER, E. K.
  Exploratory study of crack-growth-based inspection rationale   p 313   A84-21364
WALKER, G. F.
  A performance monitoring system for helicopters
                                   p 295   A84-19614
WALKO, L. C.
  Data acquisition for evaluation of an airborne lightning detection system
  [AD-A135318]   p 281   N84-17153
WALSH, T. H.
  Variable area ejector-diffuser model tests
  [AD-A134843]   p 302   N84-17182
WANG, B. P.
  Structure model refinement using reanalysis techniques   p 314   A84-22622
WANSTALL, B.
  The 'affordable' fighter market   p 289   A84-20599
WARNER, H. D.
  Instructor station display for use in T-37 flight simulation training
  [AD-A134854]   p 307   N84-17191
WATKINS, W. B.
  Dynamic gas temperature measurement system, volume 1
  [NASA-CR-168267-VOL-1]   p 316   N84-16529
WEHAUSEN, J. V.
  Annual review of fluid mechanics. Volume 16
                                   p 314   A84-22576
WEISS, J.
  Development of a stable epoxy resin system for composite repair
  [AD-A135390]   p 310   N84-17395
WEISSHAAR, T. A.
  Dynamics and control of forward swept wing aircraft
  [NASA-CR-175369]   p 294   N84-17172
WERNER, C.
  Results of a slant range visibility field test in Munich-Reim
  [DFVLR-MITT-83-09]   p 285   N84-17169
WESTERKAMP, E. J.
  Digital computer program for generating dynamic turbofan engine models (DIGTEM)
  [NASA-TM-83446]   p 299   N84-16185
WESTON, A. R.
  On-board near-optimal climb-dash energy management   p 291   N84-16116
  Energy state revisited   p 291   N84-16118
WESTPHAL, G.
  Effort and benefit connected with a bad weather landing   p 282   A84-19573
WHITE, B. L.
  Effects of JP-4 fuel on Graphite/Epoxy composites
  [AD-A135416]   p 310   N84-17296
WHITE, M. E.
  Application of CAE and CFD techniques to a complete tactical missile design
  [AIAA PAPER 84-0387]   p 267   A84-21870
WHITEHEAD, D. S.
  An actuator disc analysis of unsteady supersonic cascade flow   p 265   A84-21189
WHITEHEAD, R.
  Numerical techniques for high incidence reentry aerodynamics
  [AD-A134178]   p 271   N84-16149
WIBERLEY, S. E.
  Composite structural materials
  [NASA-CR-173259]   p 310   N84-17293
WILBY, E. G.
  Aircraft interior noise models - Sidewall trim, stiffened structures, and cabin acoustics with floor partition
                                   p 290   A84-21222
WILDERMUTH, P. F.
  Airloads research study. Volume 1: Flight test loads acquisition
  [NASA-CR-170409]   p 294   N84-17173
  Airloads research study. Volume 2: Airload coefficients derived from wind tunnel data
  [NASA-CR-10410]   p 294   N84-17174

WILLIAMS, W. J.
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1982
[AD-A134289]   p 292   N84-16169

WILLIS, C. M.
Aircraft interior noise models - Sidewall trim, stiffened structures, and cabin acoustics with floor partition
                                  p 290   A84-21222

WINKLER
Superplastic forming, an economical sheet-forming process
[MBB-BB-555-83-OE]   p 314   A84-22851

WOODWARD, R. P.
Tone generation by rotor-downstream strut interaction
                                  p 298   A84-22174

WRIGHT, J.
Extinguisher agent behavior in a ventilated small aircraft
[FAA-CT-83-30]   p 280   N84-16158

WRIGHT, J. G.
Air navigation 1950-1980 - Canada's contribution
                                  p 283   A84-19674

WRIGHT, S. E.
Prediction of sources moving at high speed as applied to helicopter and propeller noise
[AIAA PAPER 84-0251]   p 321   A84-21858

X

XING, W. F.
Periodic vortex shedding in the supersonic wake of a planar plate   p 263   A84-20842

Y

YAMAGUCHI, S.
Compatibility of transonic flows at thick trailing edge in turbine blade row   p 260   A84-19413

YANG, V.
Numerical calculations of pressure oscillations in a side-dump ramjet engine
[AIAA PAPER 84-0365]   p 297   A84-21297

YAROS, S. F.
Theoretical and experimental engine-inlet flow fields for fighter forebodies
[NASA-TP-2270]   p 273   N84-17132

YAVROUIAN, A. H.
Antimisting kerosene: Base fuel effects, blending and quality control techniques
[NASA-CR-174509]   p 309   N84-16351

YEE, B. G. W.
Use of small crack data to bring about and quantify improvements to aircraft structural integrity
[AD-A135012]   p 318   N84-17623

Z

ZACK, J. W.
A numerical weather prediction system designed to simulate atmospheric downburst phenomena
[AIAA PAPER 84-0352]   p 319   A84-21865

ZAGULI, R. J.
Results of an experimental program investigating the effects of simulated ice on the performance of the NACA 63A415 airfoil with flap
[NASA-CR-168288]   p 271   N84-16145
Potential flow analysis of glaze ice accretions on an airfoil
[NASA-CR-168282]   p 271   N84-16146

ZHANG, L.
The development and tests of Yan'an 2 Light Helicopter   p 286   A84-19628

ZHELIABINA, N. K.
Life distribution under various operating conditions of random cyclic loads   p 309   A84-22407

ZIEMANN, J.
Sidewall effects on airfoil tests   p 306   A84-21521

ZIMMERMAN, R. E.
Crashworthy cyclic control stick
[AD-A135150]   p 294   N84-17176

ZUBIN, M. A.
Geometric characteristics of the separation of a turbulent boundary layer during the interaction with a normal shock in conical flows   p 260   A84-19555

ZUK, J.
Civil benefits of the JVX   p 257   A84-19968

ZUMWALT, G. W.
Electro-impulse deicing - Concept and electrodynamic studies
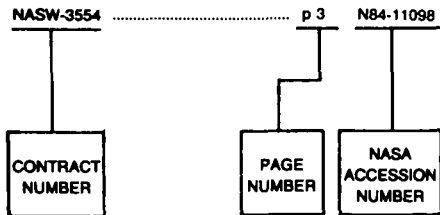[AIAA PAPER 84-0021]   p 288   A84-19885
Electro-impulse deicing - Structural dynamic studies, icing tunnel tests and applications
[AIAA PAPER 84-0022]   p 288   A84-19886

ZURAKOWSKI, B.
Vibration damping for a hinged-blade helicopter rotor
                                  p 288   A84-19698

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing

CORPORATE SOURCE

General Dynamics/Fort Worth, Tex.
— Advanced Ultra-Violet (UV) aircraft fire detection system.
Volume 3: Ground Support Equipment (GSE) for system
check-out
[AD-A130298]   p 28   N84-10039

TITLE | REPORT NUMBER | PAGE NUMBER | NASA ACCESSION NUMBER
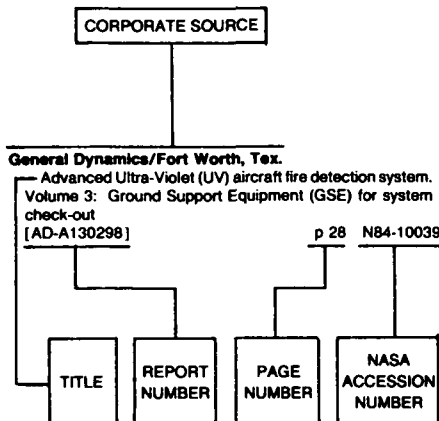
Listings in this index are arranged alphabetically by
corporate source. The title of the document is used
to provide a brief description of the subject matter.
The page number and the accession number are
included in each entry to assist the user in locating
the abstract in the abstract section. If applicable, a
report number is also included as an aid in
identifying the document.

A

Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
Viscous Effects in Turbomachines
[AGARD-CP-351]   p 300   N84-16188

Aeronautical Research Labs., Melbourne (Australia).
The effect of discrete spanwise regions of bleed on pseudo-two-dimensional base flow at transonic speeds
[ARL-AERO-NOTE-418]   p 269   N84-16132
Calculation of the aerodynamic flow field in the vicinity of a Sea King helicopter
[ARL-AERO-REPT-158]   p 273   N84-17128

Air Force Academy, Colo.
An investigation of airfoil dynamic stall with large amplitude motions
[AD-A134230]   p 271   N84-16150
Air Force Academy Aeronautics Digest - Fall/Winter 1982
[AD-A135073]   p 275   N84-17145
Proceedings of the Symposium on Military Space Communications and Operations
[AD-A135021]   p 317   N84-17439

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A Q-GERT analysis of the effect of improved automatic testing on F-16 aircraft availability
[AD-A134280]   p 259   N84-16128
Aircraft avionic system maintenance cannot duplicate and Retest-OK analytical source analysis
[AD-A134449]   p 259   N84-16129
Information needs and system specifications for the B-1B executive information system
[AD-A134424]   p 324   N84-17054
Estimating the cost of composite material airframes using the Rand Corporation Development and Procurement Costs of Aircraft parametric model (DAPCA III)
[AD-A134993]   p 259   N84-17120

Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
Mach 0.6 to 3.0 flows over rectangular cavities
[AD-A134579]   p 272   N84-16153
Experimental verification of an endwall boundary layer prediction method
                                      p 302   N84-16211
Data acquisition for evaluation of an airborne lightning detection system
[AD-A135318]   p 281   N84-17153
Effects of JP-4 fuel on Graphite/Epoxy composites
[AD-A135416]   p 310   N84-17296
Use of small crack data to bring about and quantify improvements to aircraft structural integrity
[AD-A135012]   p 318   N84-17623

Analytical Methods, Inc., Bellevue, Wash.
Calculation of rotor/airframe interference for realistic configurations
                                      p 287   A84-19638

Arinc Research Corp., Annapolis, Md.
Automated data base implementation requirements for the avionics planning baseline, Army
[AD-A135259]   p 325   N84-18103

Arizona State Univ., Tempe.
Human factors issues associated with the use of speech technology in the cockpit
[NASA-CR-166548]   p 316   N84-17433

Army Armament Research and Development Command, Aberdeen Proving Ground, Md.
Boundary-layer trip effectiveness and computations of aerodynamic heating for XM797 nose-tip configurations
[AD-A128036]   p 271   N84-16148

Army Aviation Research and Development Command, Moffett Field, Calif.
A helicopter flight investigation of roll-control sensitivity, damping and cross coupling in a low altitude lateral maneuvering task
[NASA-TM-84376]   p 305   N84-16216

Army Aviation Research and Development Command, St. Louis, Mo.
An airborne programmable digital to video converter
[AD-A134839]   p 296   N84-17181

Army Aviation Systems Command, St. Louis, Mo.
Experimental blade vortex interaction noise characteristics of a utility helicopter at 1/4 scale
[NASA-TM-84653]   p 322   N84-18018

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
Revised procedure for pavement design under seasonal frost conditions
[AD-A134480]   p 315   N84-16384

Army Inventory Research Office, Philadelphia, Pa.
Sortie duration and helicopter component failures (an empirical study)
[AD-A134745]   p 260   N84-17122

Army Research and Technology Labs., Cleveland, Ohio.
Effects of different rub models on simulated rotor dynamics
[NASA-TP-2220]   p 318   N84-17590

Army Research and Technology Labs., Fort Eustis, Va.
Friction and wear behavior of aluminum and composite airplane skins
[NASA-TP-2262]   p 294   N84-17175

Army Research and Technology Labs., Moffett Field, Calif.
Toward a better understanding of helicopter stability derivatives   p 303   A84-19664
Toward a better understanding of helicopter stability derivatives   p 304   A84-19742
Simulator investigations of side-stick controller/stability and control augmentation systems for night nap-of-earth flight   p 277   A84-19744
Numerical simulation of the interaction of a vortex with stationary airfoil in transonic flow
[AIAA PAPER 84-0254]   p 265   A84-21294

Avco Systems Div., Wilmington, Mass.
IRAAM wind tunnel test, task 3
[AD-A135256]   p 275   N84-17148

B

Boeing Military Airplane Development, Seattle, Wash.
Integrated aircraft fuel tank inerting and compartment fire suppression system. Volume 2: Evaluation of nitrogen-enriched air as a fire suppressant
[AD-A134883]   p 281   N84-17157

Boeing Vertol Co., Philadelphia, Pa.
Simulator investigations of side-stick controller/stability and control augmentation systems for night nap-of-earth flight   p 277   A84-19744
Helicopter flying qualities characteristics-CH-46E, volume 1
[AD-A134320]   p 293   N84-16170
Helicopter flying qualities characteristics-CH-46E, volume 2
[AD-A134321]   p 293   N84-16171
Helicopter flying qualities characteristics-CH-46E, volume 3
[AD-A134322]   p 293   N84-16172
Helicopter flying qualities characteristics-CH-46E, volume 4
[AD-A134323]   p 293   N84-16173

Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
Propeller tone bursts   p 320   A84-21213

Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
Aircraft interior noise models - Sidewall trim, stiffened structures, and cabin acoustics with floor partition
                                      p 290   A84-21222

Boston Univ., Mass.
Self-sustained oscillations of a shock wave interacting with a boundary layer on a supercritical airfoil
[NASA-CR-175338]   p 269   N84-16131

British Aerospace Public Ltd. Co., Bristol (England).
Developments in cabin safety and crashworthiness
                                      p 282   N84-17161

C

California Univ., Livermore. Lawrence Livermore Lab.
Propeller tone bursts   p 320   A84-21213

Cambridge Univ. (England).
The development of unsteady boundary layers on the rotor of an axial-flow turbine   p 300   N84-16197

Carnegie-Mellon Univ., Pittsburgh, Pa.
New coherent optical techniques for National Transonic Wind Tunnel Facility
[NASA-CR-173174]   p 306   N84-16217

Ciba-Geigy Corp., Ardsley, N.Y.
Development of a stable epoxy resin system for composite repair
[AD-A135390]   p 310   N84-17395

Civil Aeromedical Inst., Oklahoma City, Okla.
The 1980 and 1981 accident experience of civil airmen with selected visual pathology
[AD-A134898]   p 282   N84-17158

Colorado Univ., Boulder.
Finite area method for nonlinear supersonic conical flows   p 266   A84-21510

Committee on Public Works and Transportation (U. S. House).
A review of US international aviation policy
[GPO-18-813]   p 324   N84-17070
Improvement needed in the implementation of the United States International Aviation Policy
[GPO-23-934]   p 324   N84-17072

Committee on Science and Technology (U. S. House).
Airport and aircraft safety research and technology
[GPO-26-497]   p 281   N84-17152
Alternative fuels for general aviation
[GPO-27-618]   p 311   N84-17409

Congressional Budget Office, Washington, D. C.
Improving the air traffic control system: An assessment of the National Airspace System Plan
                                      p 285   N84-16160

S O U R C E

D

Dayton Univ., Ohio.
Aircrew training devices: Utility and utilization of advanced instructional features. Phase I: Tactical Air Command
[AD-A135052] p 307 N84-17190
Instructor station display for use in T-37 flight simulation training
[AD-A134854] p 307 N84-17191
Detroit Diesel Allison, Indianapolis, Ind.
Ceramic components for the AGT 100 engine
p 315 A84-22878
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
Lectures of a Flight Mechanics Conference
[DFVLR-MITT-83-05] p 259 N84-16120
Contributions of flight mechanics to civil air traffic
p 285 N84-16124
Estimation of flight-mechanical motion characteristics with Kalman filters p 292 N84-16126
Wake vortices and their aerodynamic alleviation: A review of the literature
[DFVLR-MITT-83-07] p 272 N84-16154
Evaluation and analysis of experience reports concerning wind shear problems
[DFVLR-FB-83-19] p 280 N84-16159
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
Flow measurements in the stator row of a single-stage transonic axial-flow compressor with controlled diffusion stator blades p 302 N84-16209
Effects on rail transport caused by air transport supply alternatives within the Federal Republic of Germany for the year 2000
[DFVLR-MITT-83-14] p 282 N84-17160
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
Measurement of unsteady aerodynamic pressures
[DFVLR-MITT-83-08] p 272 N84-16155
The Prandtl Hergesell project of a National Research Establishment for Aeronautics
[DFVLR-MITT-83-10] p 260 N84-17123
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
Results of a slant range visibility field test in Munich-Reim
[DFVLR-MITT-83-09] p 285 N84-17169
Status for knowledge: Meteorological affected icing on aircraft in clouds
[DFVLR-MITT-83-12] p 319 N84-17763
Developmental Sciences, Inc., City of Industry, Calif.
Design of a remotely controlled hovercraft vehicle for spill reconnaissance
[PB84-124064] p 305 N84-17187
Durham Univ. (England).
Secondary flows and losses in a turbine cascade
p 301 N84-16203

E

Ecole Centrale de Lyon (France).
Experimental and theoretical studies of parietal viscous boundaries in a single stage transonic compressor
p 301 N84-16206

F

Federal Aviation Administration, Atlantic City, N.J.
Effects of ventilation and panel properties on temperature rise from aircraft fires
[DOT/FAA/CT-TN83/63] p 280 N84-16157
Extinguisher agent behavior in a ventilated small aircraft
[FAA-CT-83-30] p 280 N84-16158
Federal Aviation Administration, Washington, D.C.
Noise levels and data analyses for small prop-driven aircraft
[AD-A134598] p 293 N84-16175
FAA (Federal Aviation Administration) statistical handbook of aviation: Calender year 1982
[PB84-127323] p 260 N84-17124
Semiannual report to Congress on the effectiveness of the civil aviation security program
[AD-A134860] p 281 N84-17156
Florida Univ., Gainesville.
A lifting surface computer code with jet-in-crossflow interference effects. Volume 1: Theoretical description
[NASA-CR-166524] p 271 N84-16147
The effect of the artificial far field boundary on a finite different approximation of the Navier-Stokes equations for a compressible fluid
[AD-A135152] p 317 N84-17536

Flow Simulations, Inc., Sunnyville, Calif.
Numerical simulation of the interaction of a vortex with stationary airfoil in transonic flow
[AIAA PAPER 84-0254] p 265 A84-21294
Flughafen, Frankfurt am Main (West Germany).
The air traffic planning coordinator of the Federal Republic of Germany
[FACHTHEMEN-5] p 259 N84-16130
FWG Associates, Inc., Tullahoma, Tenn.
Incorporation of wind shear terms into the governing equations of aircraft motion
[AIAA PAPER 84-0275] p 304 A84-21860
Doppler lidar signal and turbulence study
[NASA-CR-170976] p 318 N84-17574

G

General Dynamics/Convair, Fort Worth, Tex.
The application of turbine bypass engines to high performance V/STOL aircraft
[AIAA PAPER 83-2512] p 299 A84-22925
General Electric Co., Evendale, Ohio.
Aircraft gas turbine guide
[GE-AEG-607R(10/80)] p 299 N84-16183
General Electric Co., Schenectady, N. Y.
Mechanical and physical properties of plasma-sprayed stabilized zirconia p 308 A84-19786
Grumman Aerospace Corp., Bethpage, N.Y.
Control definition study for advanced vehicles
[NASA-CR-3738] p 304 N84-16212
The COREL and W12SC3 computer programs for supersonic wing design and analysis
[NASA-CR-3676] p 273 N84-17130

H

Hamilton Standard, Windsor Locks, Conn.
Measurement and analysis of acoustic flight test data for two advanced design high speed propeller models
[AIAA PAPER 84-0250] p 320 A84-20049
Harvard Univ., Cambridge, Mass.
Computer modeling of aircraft cabin fires
[PB84-101153] p 282 N84-17162
Hochschule der Bundeswehr, Munich. (West Germany).
Design of transonic compressor cascades for minimal shock losses and comparison with test results
p 300 N84-16192

I

Illinois Univ., Urbana.
Trailing edge flow conditions as a factor in airfoil design
[NASA-CR-173294] p 274 N84-17140
Control strategies for complex systems for use in aerospace avionics
[AD-A135072] p 295 N84-17179
Industrial Coll. of the Armed Forces, Washington, D.C.
Identification of bottlenecks and capacity constraints in F-14, F-15, F-16, and F/A-18 aircraft production
[AD-A134629] p 259 N84-17121
Informatics General Corp., Palo Alto, Calif.
A comparative study of the parabolized Navier-Stokes code using various grid-generation techniques
[AIAA PAPER 84-0459] p 266 A84-21302
Informatics, Inc., Palo Alto, Calif.
Airfoil computation at high angles of attack, inviscid and viscous phenomena
[AIAA PAPER 84-0524] p 268 A84-21876
Information Spectrum, Inc., Arlington, Va.
Lessons learned--advanced attack helicopter
[AD-A135521] p 294 N84-17177

J

Japan Society for Aeronautical and Space Sciences, Tokyo.
Transactions of the Japan Society for Aeronautical and Space Sciences, vol. 26, no. 73, November 1983
[ISSN-0549-3811] p 315 N84-16374
Jet Propulsion Lab., California Inst. of Tech., Pasadena.
Antimisting kerosene: Base fuel effects, blending and quality control techniques
[NASA-CR-174509] p 309 N84-16351
Atomization and combustion performance of antimisting kerosene and jet fuel
[NASA-CR-174507] p 309 N84-16353
Antimisting fuel breakup and flammability
[NASA-CR-174508] p 310 N84-16354
A user's manual for the NASA/JPL synthetic aperture radar and the NASA/JPL L and C band scatterometers
[NASA-CR-173209] p 315 N84-16428

K

Kansas Univ. Center for Research, Inc., Lawrence.
Weight and balance for the airmass incorporated sunburst model C ultralight
[NASA-CR-175356] p 292 N84-16163
Determination of the static performance of a Cuyuna cc model UL-430RR engine
[NASA-CR-175354] p 299 N84-16179
Kentron International, Inc., Hampton, Va.
Tests on a CAST 7 two-dimensional airfoil in a streamlining test section
[NASA-CR-172291] p 274 N84-17136

L

Lockheed-Georgia Co., Marietta.
Acoustic power dissipation on radiation through duct terminations - Experiments p 321 A84-21272
Lockheed Missiles and Space Co., Palo Alto, Calif.
Numerical techniques for high incidence reentry aerodynamics
[AD-A134178] p 271 N84-16149

M

Massachusetts Inst. of Tech., Cambridge.
A simple system for helicopter Individual-Blade-Control and its application to lag damping augmentation
p 302 A84-19603
Propeller tone bursts p 320 A84-21213
Optimal mistuning for enhanced aeroelastic stability of transonic fans
[NASA-CR-173179] p 299 N84-16180
Computation of potential flows with embedded vortex rings and applications to helicopter rotor wakes
[NASA-CR-166542] p 317 N84-17526
A cooperative program to stimulate student involvement through the MIT Undergraduate Research Opportunity Program
[NASA-CR-173300] p 324 N84-18086
Hot wire in low Reynolds number flow
p 324 N84-18087
Flow behavior in the Wright Brothers Facility
[WBWT-TR-1187] p 307 N84-18088
Calculating C-grids with fine and embedded mesh regions
[CFDL-TR-83-7] p 319 N84-18090
Mississippi Univ., University.
Benefits of dual wings over single wings for high-performance business airplanes
p 291 A84-22172
Mitre Corp., McLean, Va.
A concept for reducing oceanic separation minima through the use of a TCAS-derived CDTI
[NASA-CR-172258] p 295 N84-16177

N

Nagoya Univ. (Japan).
Quasi-doublet-lattice method for oscillating thin airfoils in subsonic flow p 272 N84-16378
National Aeronautics and Space Administration, Washington, D. C.
Civil benefits of the JVX p 257 A84-19968
The drag of magnetically suspended wind-tunnel models with nose-cones of various shapes
[NASA-TM-77325] p 270 N84-16137
Solar-cell airplane Solair 1
[NASA-TM-77061] p 292 N84-16164
SUN WORSHIPER: McCready's Solar Challenger flies over the English Channel
[NASA-TM-77327] p 292 N84-16166
Transonic cryogenic test section for the Goettingen tube facility
[NASA-TM-77050] p 307 N84-16219
The start-up of a gas turbine engine using compressed air tangentially fed onto the blades of the basic turbine
[NASA-TM-77021] p 316 N84-16563
Rotary wing aircraft and technical publications of NASA, 1970 - 1982
[NASA-TM-85521] p 325 N84-18102
National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
Toward a better understanding of helicopter stability derivatives p 303 A84-19664
Toward a better understanding of helicopter stability derivatives p 304 A84-19742
On the method of pseudo compressibility for numerically solving incompressible flows
[AIAA PAPER 84-0252] p 262 A84-19889
Impact of computers on aerodynamics research and development p 262 A84-19903

Experimental determination of the boundary layer at air-sample inlet positions on the NASA CV 990 aircraft
[AIAA PAPER 84-0028] p 265 A84-21282

Air-sampling inlet contamination by aircraft emissions on the NASA CV-990 aircraft
[AIAA PAPER 84-0029] p 279 A84-21283

Numerical simulation of the interaction of a vortex with stationary airfoil in transonic flow
[AIAA PAPER 84-0254] p 265 A84-21294

Simulation of blunt-fin-induced shock wave and turbulent boundary-layer interaction
[AIAA PAPER 84-0457] p 266 A84-21301

A comparative study of the parabolized Navier-Stokes code using various grid-generation techniques
[AIAA PAPER 84-0459] p 266 A84-21302

A new turbulence closure model for boundary layer flows with strong adverse pressure gradients and separation
[AIAA PAPER 84-0175] p 313 A84-21854

Airfoil computation at high angles of attack, inviscid and viscous phenomena
[AIAA PAPER 84-0524] p 268 A84-21876

Special opportunities in helicopter aerodynamics
[NASA-TM-84396] p 270 N84-16138

Computational aerodynamics and supercomputers
[NASA-TM-85887] p 270 N84-16139

Comparison of calculated and measured pressures on straight and swept-tip model rotor blades
[NASA-TM-85872] p 270 N84-16143

A laser velocimeter system for large-scale aerodynamic testing
[NASA-TM-84393] p 270 N84-16144

X-29 flight-research program
[NASA-TM-86025] p 292 N84-16168

Flight test experience with pilot-induced-oscillation suppression filters
[NASA-TM-86028] p 305 N84-16213

A helicopter flight investigation of roll-control sensitivity, damping and cross coupling in a low altitude lateral maneuvering task
[NASA-TM-84376] p 305 N84-16216

Simulator scene display evaluation
[NASA-CASE-ARC-11504-1] p 307 N84-16221

Application of holography to flow visualization
[NASA-TM-84325] p 316 N84-16530

Bifurcation analysis of aircraft pitching motions near the stability boundary
[NASA-TM-85881] p 274 N84-17137

Mathematical modeling of the aerodynamic characteristics in flight dynamics
[NASA-TM-85880] p 274 N84-17141

A recontoured, upper surface designed to increase the maximum lift coefficient of a modified NACA 65 (0.82) (9.9) airfoil section
[NASA-TM-85855] p 275 N84-17144

Research and technology report, 1983
[NASA-TM-85865] p 325 N84-18152

National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.

X-29 flight-research program
[NASA-TM-86025] p 292 N84-16168

Flight test experience with pilot-induced-oscillation suppression filters
[NASA-TM-86028] p 305 N84-16213

National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

Measurement and analysis of acoustic flight test data for two advanced design high speed propeller models
[AIAA PAPER 84-0250] p 320 A84-20049

National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

High altitude aerodynamic platform concept evaluation and prototype engine testing
[NASA-TM-58256] p 299 N84-16182

National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

Progress in rotor broadband noise research
p 320 A84-19899

Aircraft interior noise models - Sidewall trim, stiffened structures, and cabin acoustics with floor partition
p 290 A84-21222

Finite area method for nonlinear supersonic conical flows
p 266 A84-21510

Incorporation of wind shear terms into the governing equations of aircraft motion
[AIAA PAPER 84-0275] p 304 A84-21860

In-trail dynamics of multiple CDTI-equipped aircraft queues
[NASA-TM-85699] p 295 N84-16178

Conceptual design and simulator implementation of an automatic terminal approach system
[NASA-TM-85667] p 305 N84-16215

Effect of structural flexibility on the design of vibration-isolating mounts for aircraft engines
[NASA-TM-85725] p 316 N84-16590

Investigation of fuselage acoustic treatment for a twin-engine turboprop aircraft in flight and laboratory tests
[NASA-TM-85722] p 322 N84-16947

Wave drag as the objective function in transonic fighter wing optimization
[NASA-TP-2265] p 272 N84-17127

Theoretical and experimental engine-inlet flow fields for fighter forebodies
[NASA-TP-2270] p 273 N84-17132

Aerodynamic characteristics of a Sparrow 3 missile model in the flow field of a generalized parent body at Mach 2.86
[NASA-TM-85713] p 273 N84-17134

Loads and aeroelasticity division research and technology accomplishments for FY 1983 and plans for FY 1984
[NASA-TM-85740] p 274 N84-17135

A comparison of two position estimate algorithms that use ILS localizer and DME information. Simulation and flight test results
[NASA-TP-2281] p 285 N84-17165

Friction and wear behavior of aluminum and composite airplane skins
[NASA-TP-2262] p 294 N84-17175

Wind-tunnel free-flight investigation of a model of a forward-swept-wing fighter configuration
[NASA-TP-2230] p 305 N84-17184

Experimental blade vortex interaction noise characteristics of a utility helicopter at 1/4 scale
[NASA-TM-84653] p 322 N84-18018

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

High frequency green function for aerodynamic noise in moving media. I - General theory. II - Noise from a spreading jet
p 321 A84-21273

Performance degradation of a typical twin engine commuter type aircraft in measured natural icing conditions
[AIAA PAPER 84-0179] p 290 A84-21289

Three-dimensional viscous design methodology for advanced technology aircraft supersonic inlet systems
[AIAA PAPER 84-0194] p 265 A84-21290

Flow visualization and interpretation of visualization data for deflected thrust V/STOL nozzles
[AIAA PAPER 84-0102] p 297 A84-21852

Tone generation by rotor-downstream strut interaction
p 298 A84-22174

Aeroacoustics of turbulent shear flows
p 321 A84-22584

Application of laser anemometry in turbine engine research
p 315 A84-22872

Simplified analytical procedures for representing material cyclic response
p 298 A84-22877

Analytical study of blowing boundary-layer control for subsonic V/STOL inlets
[NASA-TM-83576] p 270 N84-16141

HYTESS: A hypothetical turbofan engine simplified simulation
[NASA-TM-83561] p 299 N84-16184

Digital computer program for generating dynamic turbofan engine models (DIGTEM)
[NASA-TM-83446] p 299 N84-16185

Design concepts for low-cost composite engine frames
[NASA-TM-83544] p 300 N84-16186

Effects of broadened property fuels on radiant heat flux to gas turbine combustor liners
[NASA-TM-83537] p 315 N84-16494

Flutter of swept fan blades
[NASA-TM-83547] p 316 N84-16587

Bending fatigue of electron-beam-welded foils. Application to a hydrodynamic air bearing in the Chrysler/DOE upgraded automotive gas tubine engine
[NASA-TM-83539] p 316 N84-16589

Noise of the SR-6 propeller model at 2 deg and 4 deg angles of attack
[NASA-TM-83515] p 322 N84-16946

Investigation of flow phenomena in a transonic fan rotor using laser anemometry
[NASA-TM-83555] p 274 N84-17143

A mathematical model for the doubly-fed wound rotor generator, part 2
[NASA-TM-83581] p 317 N84-17479

Hot-flow tests of a series of 10-percent-scale turbofan forced mixing nozzles
[NASA-TP-2268] p 317 N84-17525

Effects of different rub models on simulated rotor dynamics
[NASA-TP-2220] p 318 N84-17590

National Center for Atmospheric Research, Boulder, Colo.

A case study illustrating time scales and operational responses for a wind shear episode during the JAWS project
[AIAA PAPER 84-0351] p 318 A84-21864

National Gas Turbine Establishment, Farnborough (England).

Application of an inviscid-viscous interaction method to transonic compressor cascades p 300 N84-16190

National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).

The linear vortex distribution using the alternative approach
[NIAST-82/80] p 269 N84-16133

National Oceanic and Atmospheric Administration, Boulder, Colo.

A case study illustrating time scales and operational responses for a wind shear episode during the JAWS project
[AIAA PAPER 84-0351] p 318 A84-21864

Naval Air Development Center, Warminster, Pa.

Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1982
[AD-A134289] p 292 N84-16169

The 2-dimensional inextensible lifting membrane airfoil, theory and experiment
[AD-A135251] p 275 N84-17147

Naval Postgraduate School, Monterey, Calif.

Report of tests of a compressor configuration of DCA blading
[AD-A133350] p 316 N84-16501

Variable area ejector-diffuser model tests
[AD-A134843] p 302 N84-17182

Naval Weapons Engineering Support Activity, Washington, D. C.

Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 1
[AD-A134833] p 281 N84-17154

Aircrew Automated Escape Systems (AAES) In-service Usage Data Analyses, volume 2
[AD-A134834] p 281 N84-17155

Newcastle-upon-Tyne Univ. (England).

Numerical simulation of stalling flows by an integral equation method p 301 N84-16199

Nielsen Engineering and Research, Inc., Mountain View, Calif.

Determination of optimum fin planform and airfoil section for minimizing fin hinge moment
[AD-A134523] p 272 N84-16151

Prediction of vortex shedding from circular and noncircular bodies in supersonic flow
[NASA-CR-3754] p 273 N84-17129

A study of prediction methods for the high angle-of-attack aerodynamics of straight wings and fighter aircraft
[NASA-CR-3764] p 273 N84-17131

O

Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

La Recherche Aerospatiale bimonthly bulletin, number 1983-3, 214/May-June
[ESA-TT-822] p 322 N84-18014

Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).

Computing the three dimensional boundary layer in a compressor p 301 N84-16200

Ohio State Univ., Columbus.

Interacting boundary-layer solutions for laminar separated flow past airfoils
[NASA-CR-172287] p 270 N84-16140

Results of an experimental program investigating the effects of simulated ice on the performance of the NACA 63A415 airfoil with flap
[NASA-CR-168288] p 271 N84-16145

Potential flow analysis of glaze ice accretions on an airfoil
[NASA-CR-168282] p 271 N84-16146

Documentation of ice shapes on the main rotor of a UH-1H helicopter in hover
[NASA-CR-168332] p 274 N84-17139

Ohio Univ., Athens.

Path discrepancies between great circle and rhumb line
[NASA-TM-85522] p 285 N84-17168

Old Dominion Univ., Norfolk, Va.

Instability of compressible boundary layers along curved walls with suction or cooling p 266 A84-21507

Oregon Graduate Center for Study and Research, Beaverton.

Evaluation of turbulence induced noise in coherent anti-Stokes Raman scattering
[NASA-CR-166544] p 322 N84-18015

P

Pennsylvania State Univ., University Park.
The fallacy of using NII in analyzing aircraft operations
p 280 A84-22176
Pisa Univ. (Italy).
Aerodynamic computation method of airfoil cascades
subjected to viscous flow p 300 N84-16198
Pratt and Whitney Aircraft, East Hartford, Conn.
Program for development of strain tolerant thermal
barrier coating system
[NASA-CR-173214] p 309 N84-16337
Pratt and Whitney Aircraft, West Palm Beach, Fla.
Dynamic gas temperature measurement system, volume
1
[NASA-CR-168267-VOL-1] p 316 N84-16529
Pratt and Whitney Aircraft Group, East Hartford, Conn.
Simplified analytical procedures for representing
material cyclic response p 298 A84-22877
Princeton Univ., N. J.
Aeroelastic analysis using nonlinear aerodynamic
methods
[AD-A135133] p 275 N84-17146
Purdue Univ., Lafayette, Ind.
Optimal cooperative control synthesis applied to a
control-configured aircraft
[NASA-CR-170411] p 305 N84-16214
Light aircraft sound transmission study
[NASA-CR-173175] p 321 N84-16941
Dynamics and control of forward swept wing aircraft
[NASA-CR-175369] p 294 N84-17172

R

Rensselaer Polytechnic Inst., Troy, N. Y.
Investigation to optimize the passive shock
wave-boundary layer control for supercritical airfoil drag
reduction
[NASA-CR-173276] p 269 N84-16135
Composite structural materials
[NASA-CR-173259] p 310 N84-17293
Emission FTIR analyses of thin microscopic patches of
jet fuel residue deposited on heated metal surface
[NASA-CR-168331] p 311 N84-17410
Research Inst. of National Defence, Stockholm (Sweden).
Explosion and fire hazards in an oil-oxygen system
[FOA-C-20507-D1] p 282 N84-17159
Reduction of propeller noise by a reflecting rubber
layer
[FOA-C-20506-E4] p 323 N84-18025
Research Triangle Inst., Research Triangle Park, N.C.
CDTI target selection criteria
[NASA-CR-3776] p 295 N84-17178
Rockwell International Corp., Canoga Park, Calif.
On the method of pseudo compressibility for numerically
solving incompressible flows
[AIAA PAPER 84-0252] p 262 A84-19889
SP-100 program: Space reactor system and subsystem
investigations
[DE84-003217] p 323 N84-18045
Rockwell International Corp., Los Angeles, Calif.
Airloads research study. Volume 1: Flight test loads
acquisition
[NASA-CR-170409] p 294 N84-17173
Airloads research study. Volume 2: Airload coefficients
derived from wind tunnel data
[NASA-CR-10410] p 294 N84-17174
Rockwell International Science Center, Thousand Oaks, Calif.
Implicit treatment of the unsteady full potential equation
in conservation form
[AIAA PAPER 84-0262] p 313 A84-21857
Nonlinear computation of wing-body-vertical tail-wake
flows at low supersonic speeds
[AIAA PAPER 84-0427] p 268 A84-21871

S

San Jose State Univ., Calif.
Experimental determination of the boundary layer at
air-sample inlet positions on the NASA CV 990 aircraft
[AIAA PAPER 84-0028] p 265 A84-21282
Simula, Inc., Tempe, Ariz.
Crashworthy cyclic control stick
[AD-A135150] p 294 N84-17176
State Univ. of New York, Stony Brook.
Phase analysis of plasma-sprayed zirconia-yttria
coatings p 308 A84-19781
Stuttgart Univ. (West Germany).
Viscous effects and heat transfer in a calculation method
for axialsymmetric flow in multistage turbomachines using
the stream function p 301 N84-16201

Sussex Univ., Brighton (England).
Squeeze-film damping of rotor-dynamic systems
p 318 N84-17610
Systems and Applied Sciences Corp., Hampton, Va.
A numerical weather prediction system designed to
simulate atmospheric downburst phenomena
[AIAA PAPER 84-0352] p 319 A84-21865

T

Tennessee Univ., Tullahoma.
Incorporation of wind shear terms into the governing
equations of aircraft motion
[AIAA PAPER 84-0275] p 304 A84-21860
Texas A&M Univ., College Station.
Phase averaged measurements of the coherent
structure of a mach number 0.6 jet
[NASA-CR-175359] p 269 N84-16134
Analytical study of the twin-jet shielding
[NASA-CR-175357] p 321 N84-16943
Texas Univ., Austin.
APQ-102 imaging radar digital image quality study
[NASA-CR-171738] p 317 N84-17435
Thermal Sciences, Inc., Sunnyvale, Calif.
Assessment of real gas effects on the prediction of the
aerodynamics of high velocity Army shells
[AD-A134739] p 276 N84-17150
Toledo Univ., Ohio.
Predicted electrothermal deicing of aircraft blades
[AIAA PAPER 84-0110] p 279 A84-21286
Toronto Univ., Downsview (Ontario).
Design of a lateral ride comfort control system for STOL
aircraft
[UTIAS-TN-247] p 292 N84-16165

U

United Technologies Research Center, East Hartford, Conn.
Progress in rotor broadband noise research
p 320 A84-19899
Compressor rotor aerodynamics p 302 N84-16210
Helicopter rotor wake geometry and its influence in
forward flight. Volume 1: Generalized wake geometry
and wake effect on rotor airloads and performance
[NASA-CR-3726] p 275 N84-17149
Aviation-fuel property effects on combustion
[NASA-CR-168334] p 310 N84-17407

V

Virginia Associated Research Center, Newport News.
TWINTN4: A program for transonic four-wall
interference assessment in two-dimensional wind
tunnels
[NASA-CR-3777] p 307 N84-17189
Virginia Polytechnic Inst. and State Univ., Blacksburg.
On-board near-optimal climb-dash energy
management p 291 N84-16116
Optimal symmetric flight with an intermediate vehicle
model p 291 N84-16117
Energy state revisited p 291 N84-16118
Optimal symmetric flight with an intermediate vehicle
model
[NASA-CR-173181] p 292 N84-16167
Virginia Univ., Charlottesville.
The fallacy of using NII in analyzing aircraft operations
p 280 A84-22176
Vrije Universiteit, Brussels (Belgium).
A viscid inviscid interaction procedure for two
dimensional cascades p 300 N84-16191
End-wall boundary layer calculations in multistage axial
compressors p 301 N84-16205

W

Washington Univ., St. Louis, Mo.
Effect of blade structural parameters on helicopter
vibrational characteristics
[AD-A134547] p 293 N84-16174
Design of helicopter rotor blades for optimum dynamic
characteristics
[NASA-CR-175380] p 293 N84-17171
Wayne State Univ., Detroit, Mich.
Analysis of some acoustics-jet flow interaction
problems
[NASA-CR-175340] p 322 N84-16944
Wichita State Univ., Kans.
Electro-impulse deicing - Structural dynamic studies,
icing tunnel tests and applications
[AIAA PAPER 84-0022] p 288 A84-19886

Wisconsin Univ., Madison.
Minimal drag for wings with prescribed lift, roll moment
and yaw moment
[AD-A134572] p 272 N84-16152

Typical Contract Number Index Listing

NASW-3554 .... p 3   N84-11098

| CONTRACT NUMBER | | PAGE NUMBER | NASA ACCESSION NUMBER |

Listings in this index are arranged alphanumerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order with the AIAA accession numbers appearing first. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

C
O
N
T
R
A
C
T

D-1

Typical Report Number Index Listing

REPORT NUMBER

NASA ACCESSION NUMBER

MICROFICHE SYMBOL

AD-A130144 .... p 28   N84-10037* #

PAGE NUMBER

NASA DOCUMENT SYMBOL
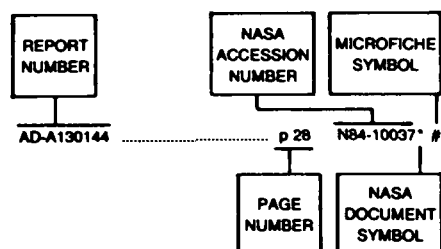
Listings in this index are arranged alphanumerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

REPORT

ACCESSION NUMBER INDEX

Typical Accession Number
Index Listing

A84-10573 * #   p 45

ACCESSION NUMBER	NASA DOCUMENT SYMBOL	MICROFICHE SYMBOL	PAGE NUMBER
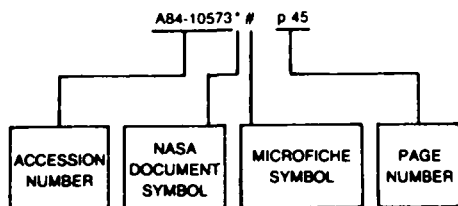
Listings in this index are arranged alphanumerically by accession number. The page number listed to the right indicates the page on which the citation is located. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

ACCESSION

1. Report No. NASA SP-7037(174)	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Aeronautical Engineering A Continuing Bibliography (Supplement 174)		5. Report Date May 1984
		6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No.
		10. Work Unit No.
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D.C. 20546		11. Contract or Grant No.
		13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address		
		14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This bibliography lists 466 reports, articles and other documents introduced into the NASA scientific and technical information system in April 1984.

17. Key Words (Suggested by Author(s)) Aeronautical Engineering Aeronautics Bibliographies	18. Distribution Statement Unclassified - Unlimited		
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 132	22. Price* $6.00 HC

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to eleven special libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley

COLORADO
University of Colorado, Boulder

DISTRICT OF COLUMBIA
Library of Congress

GEORGIA
Georgia Institute of Technology, Atlanta

ILLINOIS
The John Crerar Library, Chicago

MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge

MISSOURI
Linda Hall Library, Kansas City

NEW YORK
Columbia University, New York

OKLAHOMA
University of Oklahoma, Bizzell Library

PENNSYLVANIA
Carnegie Library of Pittsburgh

WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an '*' following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library

COLORADO
Denver Public Library

CONNECTICUT
Hartford Public Library

MARYLAND
Enoch Pratt Free Library, Baltimore

MASSACHUSETTS
Boston Public Library

MICHIGAN
Detroit Public Library

MINNESOTA
Minneapolis Public Library and Information
Center

NEW JERSEY
Trenton Public Library

NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library

OHIO
Akron Public Library
Cincinnati and Hamilton County Public Library
Cleveland Public Library
Dayton Public Library
Toledo and Lucas County Public Library

TEXAS
Dallas Public Library
Fort Worth Public Library

WASHINGTON
Seattle Public Library

WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. By virtue of arrangements other than with NASA, the British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy of microfiche of NASA and NASA-sponsored documents, those identified by both the symbols '#' and '*', from: ESA - Information Retrieval Service, European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.