NASA

Aeronautical Engineering
A Continuing Bibliography with Indexes

NASA SP-7037(155)
December 1982

National Aeronautics and Space Administration

Aeronautical Engineering
A Continuing Bibliography with Indexes

Pages 543-575

December 1982

NASA SP-7037(155)

ACCESSION NUMBER RANGES

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

STAR (N-10000 Series)	**N82-30282 - N82-32300**
IAA (A-10000 Series)	**A82-41588 - A82-44927**

This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Government Information Systems.

NASA SP-7037(155)

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 155)

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 November 1982 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*

NASA Scientific and Technical Information Branch 1982
National Aeronautics and Space Administration
Washington, DC

This supplement is available as NTISUB/141/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of $5.00 domestic, $10 00 foreign

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 272 reports, journal articles, and other documents originally announced in November 1982 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 in two major sections, *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* and *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Three indexes -- subject, personal author, and contract number -- are included.

An annual cumulative index will be published.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A82-10000 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 $8.00 per document Microfiche[1] of documents announced in *IAA* are available at the rate of $4 00 per microfiche on demand, and at the rate of $1 35 per microfiche for standing orders for all *IAA* microfiche

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 (N82-10000 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, at the standard $4.00 price, 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.

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 *STAR Entries* and *IAA Entries* 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

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 (NST-41)
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
1033 General Services Administration Building
Washington, D.C. 20242

U S. Geological Survey
601 E. Cedar Avenue
Flagstaff, Arizona 86002

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

U S. Geological Survey
Bldg. 25, Denver Federal Center
Denver, Colorado 80225

NTIS PRICE SCHEDULES

Schedule A

STANDARD PAPER COPY PRICE SCHEDULE

(Effective January 1, 1982)

Price Code	Page Range	North American Price	Foreign Price
A01	Microfiche	$ 4 00	$ 8 00
A02	001-025	6 00	12 00
A03	026-050	7 50	15 00
A04	051-075	9 00	18 00
A05	076-100	10 50	21 00
A06	101-125	12 00	24 00
A07	126-150	13 50	27 00
A08	151-175	15 00	30 00
A09	176-200	16 50	33 00
A10	201-225	18 00	36 00
A11	226-250	19 50	39 00
A12	251-275	21 00	42 00
A13	276-300	22 50	45 00
A14	301-325	24 00	48 00
A15	326-350	25 50	51 00
A16	351-375	27 00	54 00
A17	376-400	28 50	57 00
A18	401-425	30 00	60 00
A19	426-450	31 50	63 00
A20	451-475	33 00	66 00
A21	476-500	34 50	69 00
A22	501-525	36 00	72 00
A23	526-550	37 50	75 00
A24	551-575	39 00	78 00
A25	576-600	40 50	81 00
	601-up	-- 1	-- 2

A99 - Write for quote

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

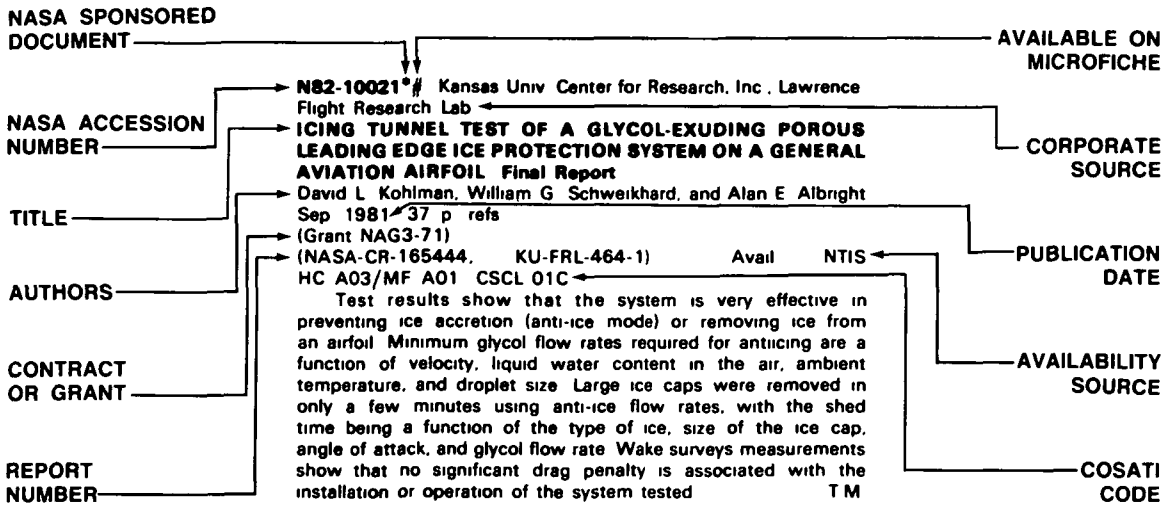
Price Code	North American Price	Foreign Price
E01	$ 6 50	$ 13 50
E02	7 50	15 50
E03	9 50	19 50
E04	11 50	23 50
E05	13 50	27 50
E06	15 50	31 50
E07	17 50	35 50
E08	19 50	39 50
E09	21 50	43 50
E10	23 50	47 50
E11	25 50	51 50
E12	28 50	57 50
E13	31 50	63 50
E14	34 50	69 50
E15	37 50	75 50
E16	40 50	81 50
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

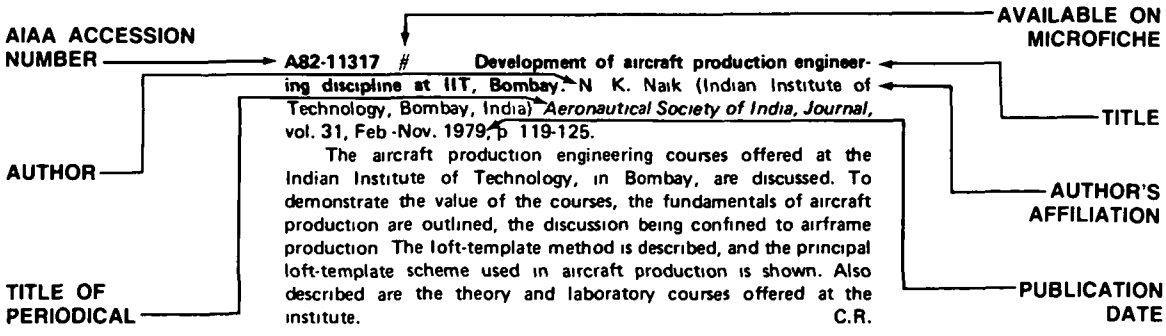
N01	30 00	45 00

TABLE OF CONTENTS

TYPICAL CITATION AND ABSTRACT FROM *STAR*



TYPICAL CITATION AND ABSTRACT FROM *IAA*



AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 155)

DECEMBER 1982

IAA ENTRIES

A82-41686 # The analysis of the thermal-mechanical stress conditions in axisymmetric rotating hot components of /aircraft/ gas turbines (Zur Analyse des thermisch-mechanischen Spannungszustandes in rotationssymmetrischen drehenden Heissteilen von /Flug-/ Gasturbinen). D Keppeler München, Technische Universität, Fakultät für Maschinenwesen, Dr -Ing Dissertation, 1980 183 p 85 refs In German

The essential equations for computations concerning axial turbine disks are presented, taking into account steady and unsteady heat transfer, linear-elastic calculations, elastoplastic calculations, and thermal, aerodynamic, and mechanical boundary conditions Two different numerical methods are described One is used to obtain numerical values regarding the aerodynamic-thermal boundary conditions at the hub and on the surfaces The second procedure considered is the method of finite elements This method provides a good approximation regarding the solution of the considered problems even in the case of axial turbine disks of complex shape The suitability of the developed programs for the solution of the considered problems is demonstrated with the aid of comprehensive computational examples The elastoplastic calculation discussed represents a first important step towards the computation of the operational life of hot gas turbine components which are subjected to great thermal-mechanical stresses G R

A82-41687 # A restrained model helicopter, which is able to fly, for investigations regarding human multiparameter control behavior (Ein flugfähig eingespannter Modellhubschrauber für Untersuchungen zum menschlichen Mehrgrössenreglerverhalten). W H Oesterlin Darmstadt, Technische Hochschule, Fachbereich Regelungs- und Datentechnik, Dr -Ing Dissertation, 1980 259 p 77 refs In German Research supported by the Deutsche Forschungsgemeinschaften

The control of a Remotely Piloted Vehicle (RPV) with six degrees of freedom of motion represents for the human operator a very difficult problem The present investigation is concerned with this problem The conducted studies involve the control of the hovering flight of a remotely piloted model helicopter A 'model helicopter trainer' was employed in place of a model engaged in free flight By means of a special mechanism, the helicopter is connected to a carriage which is mounted on two rails The constructional design involved permits helicopter hovering flight operations The conduction of investigations regarding the control behavior of man requires that the dynamic behavior of the controlled system is known A model for the operational characteristics of the helicopter in hovering flight was, therefore, developed The model provided the basis for the development of a dynamic multiparameter control model for two experienced pilots G R

A82-41700 Characteristics of a Paris-New York flight on board the Concorde (Réalisation d'un vol Paris-New York sur Concorde). F Vicens (Compagnie Nationale Air France, Paris, France) *Navigation* (Paris), vol 30, July 1982, p 310-328 In French

A summary of crew operating procedures in-flight on board the Concorde during a trip from Paris to New York is presented Details of checklist sequences are reviewed, including adjustment of the center of gravity through fuel pumping, noise suppression steps, climb through the transonic regime, and use of afterburners for supersonic cruise The inertial navigation system is activated once cruise speed is reached at Mach 2 and over 50,000 ft altitude, and maintains control for the Atlantic crossing The landing phase is guided either by a VOR/DME designated Hyannis-Long Island, or by means of a VOR situated 119 nmi along a 142 deg radial vector from New York Using the second beacon is noted to allow approximately six more miles in a supersonic regime M S K

A82-41725 Oxidation-resistant materials for hot-gas turbines and jet engines. I (Über oxidationsbeständige Werkstoffe fur Heissgasturbinen und Strahltriebwerks. I). K Hauffe *Metall*, vol 36, Aug 1982, p 882-888 In German

High-alloy chromium and chromium-nickel steels are very suitable for a use as construction material in gas turbines operating at high temperatures and in jet engines Nickel-chromium alloys containing aluminum are superior to cobalt-chromium alloys with respect to corrosion resistance It is pointed out that the presence of halides and sulfur compounds in the combustion gases makes it necessary to utilize special approaches in order to keep the corrosion of expensive alloys, even at high temperatures, within acceptable limits These approaches involve the development of oxidation-resistant materials which can provide a protective coating for the basic alloy Possibilities are discussed for improving the inherent corrosion resistance of pure nickel with the aid of suitable alloying ingredients G R

A82-41795 Simulated ILS using a laser tracker. L H Morinaga (Douglas Aircraft Co , Long Beach, CA) In International Instrumentation Symposium, 27th, Indianapolis, IN, April 27-30, 1981, Proceedings Part 1 Research Triangle Park, NC, Instrument Society of America, 1981, p 347-355

The Simulated ILS (Instrument Landing System) was developed to test and evaluate an aircraft's Autopilot modes, particularly autoland and ground rollout This system utilizes a laser tracker to obtain continuous space position data of the test aircraft A minicomputer software program determines the aircraft position relative to the test runway Aircraft deviation from the center of a simulated ILS beam is calculated on the ground, telemetered to the test aircraft, and input to the airborne flight guidance system Since beam simulation is accomplished in software, almost any type of desired simulation is possible By the simulation of numerous actual airport ILS beams at a single test site, significant cost savings in flight time and fuel are realized This system is currently in use on a major commercial aircraft flight-test program (Author)

A82-41796 Analysis of flight data in the frequency domain. W R Wells (Wright State University, Dayton, OH) and S S Banda (Dayton, University, Dayton, OH) In International Instrumentation Symposium, 27th, Indianapolis, IN, April 27-30, 1981, Proceedings Part 1 Research Triangle Park, NC, Instrument Society of America, 1981, p 357-365 9 refs

This paper describes the methods commonly used to process flight data in the frequency domain for application to aircraft parameter estimation Estimates of stability and control derivatives were obtained by the use of maximum likelihood estimation methods in the frequency domain The case used for illustration purposes is flight data from a single engine general aviation airplane The airplane equations of motion included unsteady aerodynamics The airplane responses were generated by using rudder and aileron deflections Measured data is converted by a Fast Fourier Transform algorithm into the frequency domain An interpolation technique such as 'zero packing' is demonstrated for the purpose of increasing the frequency sampling rate for the estimation algorithm It was shown that the use of zero packing technique will improve the estimates of stability and control derivatives (Author)

A82-41846 * Programmable controller system for wind tunnel diversion vanes. R F King (NASA, Ames Research Center, Moffett Field, CA) In International Instrumentation Symposium, 28th, Las Vegas, NV, May 3-6, 1982, Proceedings Part 1 Research Triangle Park, NC, Instrument Society of America, 1982, p 457-463

A programmable controller (PC) system automatic sequence control, which acts as a supervisory controller for the servos, selects the proper drives, and automatically sequences the vanes, was developed for use in a subsonic wind tunnel Tunnel modifications include a new second test section (80 ft x 100 ft with a maximum air speed capability of 110 knots) and an increase in maximum velocity flow from 200 knots to 300 knots A completely automatic sequence control is necessary in order to allow intricate motion of the 14 triangularly arranged vanes which can be as large as 70 ft high x 35 ft wide and which require precise acceleration and deceleration control Rate servos on each drive aid in this control, and servo cost was minimized by using four silicon controlled rectifier controllers to control the 20 dc drives The PC has a programming capacity which facilitated the implementation of extensive logic design A series of diagrams sequencing the vanes and a block diagram of the system are included R K R

A82-41854 * A miniature electro-optical air flow sensor. D D Kershner (NASA, Langley Research Center, Cockpit Systems Branch, Hampton, VA) In International Instrumentation Symposium, 28th, Las Vegas, NV, May 3-6,

1982, Proceedings Part 2 Research Triangle Park, NC, Instrument Society of America, 1982, p 645-652

Miniature sensors are needed for rapid and uncomplicated installation on light aircraft engaged in stability research programs One particularly difficult sensor to miniaturize to the required degree has been a flow angle and velocity sensor for measuring the local flow ahead of a wing However, by using an electrooptical technique it was possible to overcome the encountered difficulties and to design a sensor satisfying the requirements The developed sensor for measuring angle-of-attack, yaw, and airspeed was shown to be suitable for rapid instrumentation of research aircraft because of its small size The size reduction was accomplished by a design feature which eliminates the need for slip rings and wiring within the movable components of the sensor G R

A82-41868 * A floating-point/multiple-precision processor for airborne applications. R Yee (NASA, Ames Research Center, Moffett Field, CA) In International Instrumentation Symposium, 28th, Las Vegas, NV, May 3-6, 1982, Proceedings Part 2 Research Triangle Park, NC, Instrument Society of America, 1982, p 857-864
(Previously announced in STAR as N82-26289)

A82-41869 Integrated sensor system for flight test instrumentation. L D Plews (USAF Flight Test Center, Edwards AFB, CA) In International Instrumentation Symposium, 28th, Las Vegas, NV, May 3-6, 1982, Proceedings Part 2 Research Triangle Park, NC, Instrument Society of America, 1982, p 865-873

The motivation for the integrated sensor system (ISS) was to take advantage of advances in strapdown inertial navigation systems and microcomputer technology to improve flight test efficiency at lower cost by providing a standard interface with the data acquisition system, aircraft sensors, and onboard flight-/navigation computers The ISS will generate flight test data in a form which can be used to document the aerodynamic properties of the test aircraft Flight tests applications are related to performance testing, stability and control testing, and pre and poststall flying qualities testing Attention is given to data accuracy, sensors for performance and flying qualities testing, a system definition, the ISS computer, the ISS interface, the inertial measurement unit, the air data system, and aspects of implementation G R

A82-41881 # Requirements and possible design choices for improving the operation of aircraft in the terminal control area (Requisiti e possibili scelte di progetto per migliorare la operatività degli aeromobili in area di controllo terminale). F Bossa *Ingegneria*, May-June 1982, p 130-136 6 refs In Italian

Ways to optimize operations in the terminal control area are discussed with particular reference to the Terminal Configured Vehicle Program Attention is given to criteria for the design of aircraft that are compatible with the terminal control area Questions of aircraft noise and airport congestion are examined B J

A82-41888 Hover jam - US Army studies EW helicopter. D Boyle *Interavia*, vol 37, Aug 1982, p 760-762

An airborne radar jamming system (ARJS) has been conceived to provide tactical jamming and operational flexibility necessary to suppress enemy radars (e g , surveillance, anti-mortar, and anti-artillery radars) to protect attack helicopters and close air support aircraft The ARJS electronic system is similar to EA-6B and EF-111 systems, but is lighter and simpler Three frequency bands would have to be covered by the ARJS, reducing power and cooling requirements, as opposed to eight covered by the EF-111 system, but within these three bands, more radar frequencies would have to be covered The ALQ-99 tactical jamming system is fundamental to the ARJS, and developments include mechanically steerable antennas in the pods Other developments are underway such as the use of phased lens arrays, and an increased need for battlefield support jamming is foreseen R K R

A82-41914 Acoustic emission inspection of aircraft engine turbine blades for intergranular corrosion. W D Feist (Motoren- und Turbinen-Union München GmbH, Munich, West Germany) *NDT International*, vol 15, Aug 1982, p 197-200

The depth of the intergranular corrosion on turbine blades is of decisive significance with regard to their suitability for continued use An acoustic emission method is introduced that is suitable for examination of blades during regular engine overhaul and which permits a statement on the depth of the corrosion to be made (Author)

A82-41951 Long-range radio NAVAID signal reliability. W B Ruhnow (Rockwell International Corp , Cedar Rapids, IA) *Navigation*, vol 29, Summer 1982, p 152-159

The results of a continuing study of Loran-C, VLF communication and Omega long range radio navigation signal reliability are updated MTBF and mean time to repair statistics are given for the ground stations of the three systems, and trends in failure statistics from late 1973 to 1981 are presented in yearly and half-year intervals The trends show that while the Loran-C signal reliability has improved significantly in recent years, VLF communication stations show random fluctuations which degrade performance in certain years and Omega signal integrity has remained constant since 1973 The 1981 probability of completing a stated mission of given duration is calculated for each transmitter type in zero- or two-station redundancy situations The redundant signal coverage calculations show that airborne equipment should be structured to take advantage of redundant signals which have good geometry O C

A82-42035 1980 Conference on Propeller Propulsion, Dayton, OH, April 22-24, 1980, Proceedings. Conference sponsored by AIAA, AHS, SAE, and University of Dayton. Edited by B Lindenbaum, D L Quam, W T Grady (Dayton, University, Dayton, OH), J R Hunter (Boeing Co , Seattle, WA), E J Leach (United Technologies Corp , Hamilton Standard Div , Windsor Locks, CT), and J J Lusczek, Jr (USAF, Washington, DC) New York, American Institute of Aeronautics and Astronautics, 1982 157 p $25

Following a report on conference results, and a series of reports on the deliberations of panels on aircraft design and manufacture, propulsion system performance, propulsion hardware design and manufacture, and noise and vibration, the topics presented at this conference on the development status of propeller and propeller fan aircraft propulsion systems include Navy, Air Force and Commercial user views of propeller propulsion, the application of this technology to general aviation aircraft, and NASA research on low to high speed propeller systems Also considered are the aerodynamic and structural analyses of propeller fan systems, the mechanical drive requirements of turboshaft gas turbine engines, the prospective fuel efficiency gains of state-of-the-art propeller propulsion systems, and the aerodynamic compatibility of propellers and the wing and fuselage flows with which they interact O C

A82-42055 † Models for controlling reliability in aviation (Modeli upravleniia nadezhnost'iu aviatsionnoi tekhniki). V P Molomin Moscow, Izdatel'stvo Mashinostroenie, 1981 200 p 91 refs In Russian

Ways of formalizing and optimizing the control of reliability are considered, with an allowance made for the maintainability and useful life of parts and units that are serviced in processes that involve several stages (the extent of control differing in each stage) The mathematical models required to provide the basis for the operational control actions that are optimum in relation to reliability control are elaborated C R

A82-42059 † Repair and maintenance of buildings in civil aviation (Ekspluatatsiia i remont zdanii grazhdanskoi aviatsii). A M Malyshkov and Iu Ia Berlin Moscow, Izdatel'stvo Transport, 1981 224 p 28 refs In Russian

Basic information is presented in this handbook on the repair and maintenance of civil-aviation buildings, with particular reference to the situation in the Soviet Union A classification of such buildings is presented, and their structural and equipment requirements are considered Regulations concerning the planning, financing, and organization of repair operations are examined B J

A82-42063 † Structural strength of materials and parts of gas turbine engines (Konstruktsionnaia prochnost' materialov i detalei gazoturbinnykh dvigatelei). I A Birger, B F Balashov, R A Dul'nev, T P Zakharova, L A Kozlov, A N Petukhov, and R N Sizova Moscow, Izdatel'stvo Mashinostroenie, 1981 224 p 90 refs In Russian

Aspects of the study of the fatigue strength, thermal fatigue, and long-term strength of the materials and parts of gas turbine engines are reviewed Particular consideration is given to fatigue-test methods, low-cycle fatigue under isothermal and nonisothermal loading, and determinate and statistical models of fracture B J

A82-42066 † A history of aerostatics and aviation in Russia - In the period up to 1914 /2nd revised and enlarged edition/ (Istoriia vozdukhoplavaniia i aviatsii v Rossii - Period do 1914 g /2nd revised and enlarged edition/). P D Duz' Moscow, Izdatel'stvo Mashinostroenie, 1981 272 p 52 refs In Russian

A history of the planning and building of piloted balloons, dirigibles, and airplanes in Russia, focusing on the period 1861-1914, is presented based on an extensive use of archival and published documentation Following a survey of the designing and testing of piloted balloons up to 1861, the development of theoretical aerodynamics in Russia is examined, including the work of Tsiolkovskii and Zhukovskii The pioneer efforts in the construction of airplanes in Russia are treated in detail, including the first airplanes designed and built by Sikorsky N B

A82-42067 † Aircraft radio communications equipment: Design and use (Samoletnoe radiooborudovanie sviazi: Ustroistvo i ekspluatatsiia). A P Shved, Iu V Efremenkov, and F F Tiagun Moscow, Izdatel'stvo Transport, 1981 264 p In Russian

Descriptions are given of the Mikron and Landysh radio sets, the SPU-7 interphone, the SGS-25 loudspeaker system, and the Arfa-MB, MS-61, and Mars-BM tape recorders Attention is also given to the operation of the equipment and to prospects for the development of shortwave and ultrashort-wave radio sets
C R

A82-42176 Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings. Symposium sponsored by IEEE, AIAA, ASME, et al New York, Institute of Electrical and Electronics Engineers, 1982 548 p Members, $30 , nonmembers, $40

Topics considered include reliability and the rare event, life-cycle costing, screening, new developments in analysis, software reliability, equipment readiness, new developments in mathematics and modeling, R&M data systems, new developments in testability, manufacturing reliability, and reliability testing Case histories are presented on mechanical reliability, energy, consumer and industrial projects, maintainability, transportation, and military and aerospace Aspects of reliability in the Space Shuttle program are discussed B J

A82-42178 Repair-discard concepts in design. J K Seger (Lockheed-California Co , Burbank, CA) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings
New York, Institute of Electrical and Electronics Engineers, 1982, p 21-24
The repair-discard and expanded repair-level analysis methodology is being developed at Lockheed, and initial experience shows that this methodology is a practical means for determining LRU (line replaceable unit) and SRU (shop replaceable unit) maintenance policy This methodology provides a structured approach for proposing design changes and for assessing the impact of economic and operational factors when the objective is to achieve mission and readiness requirements at a minimum life cycle cost The methodology complements the logistic support analysis process of MIL-STD 1388 B J

A82-42181 # R/M/LCC effects of commercial off-the-shelf equipment. P R MacDiarmid, A D Pettinato (USAF, Rome Air Development Center, Griffiss AFB, NY), and B G Johnson (Rockwell International Corp , Cedar Rapids, IA) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings New York, Institute of Electrical and Electronics Engineers, 1982, p 40-46 8 refs
This paper addresses the effects of using commercial off-the-shelf equipment in military environments Comparisons are made of military vs commercial reliability approaches and an analytical approach for choosing the most appropriate acquisition strategy is presented Life cycle cost comparisons are made of commercial off-the-shelf equipment vs similar militarized equipment in military environments Examples are presented of assessing risks under varying applications and choosing the best acquisition strategy (Author)

A82-42206 # F-16 Centralized Data System /CDS/ G M Arnold (USAF, Aeronautical Systems Div , Wright-Patterson AFB, OH) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings New York Institute of Electrical and Electronics Engineers, 1982, p 326-328
This paper describes a data system developed for the F-16 System Program Office (SPO) This Centralized Data System (CDS) contains F-16 maintenance, operational, and configuration data which is used for engineering and management information Existing data sources within the Air Force are used and special queries and transmission procedures were developed The existing data sources utilized included various base level tapes These tapes contain operational and maintenance information and are updated on a daily basis Mitron tape transmitters are then used to transfer the data from the base locations to the contractor's centralized computers The contractors facility uses two Honeywell 852s and a Honeywell 820 to process and store the information (Author)

A82-42208 Economic analysis for data base management. F M Hall (Evaluation Research Corp , Arlington, VA) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings
New York, Institute of Electrical and Electronics Engineers, 1982, p 343-352 11 refs
The purpose of this paper is to establish those factors which must be evaluated and properly structured to institute a cost effective field data collection system to support a system readiness improvement program Factors outlined in this paper represent decision points to tailor a data collection system which effectively contributes to a readiness improvement program at a level which is equal to the cost of the data system Cost-effectiveness is determined through a detailed evaluation and comparison of (1) the cost of obtaining information, and (2) the value and benefits of information obtained In order to relate some practical experience in the use of field data for operational readiness improvement, a brief review is provided on Department of Defense experience with large-scale field data collection systems The proposed analysis procedure does not assume that a dedicated readiness data collection system is required for any program The functions of data collection and analysis are evaluated for return on investment in the same manner as other systems effectiveness engineering elements within a program If a cost-benefit analysis of a proposed data collection system indicates a low rate of return, resources should be reallocated to other functions, such as reliability design analysis, parts and material control, production readiness planning, or testing (Author)

A82-42210 Fault isolation BITE for increased productivity. C R Stander (Boeing Commercial Airplane Co , Seattle, WA) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings New York, Institute of Electrical and Electronics Engineers, 1982, p 365-369
The paper discusses the potential effect of fault isolation on productivity, the development of BITE (built-in test equipment) on the 757/767 aircraft, and a new analytical method for verifying the level of system fault isolation efficiency It is noted that the 757/767 BITE is designed for the mechanic, not the engineer It eliminates such problems as the inability to deal with intermittent faults, and is expected to lead to improved aircraft productivity through improved schedule reliability and decreased maintenance cost B J

A82-42211 # Analysis of built-in-test accuracy. D Gleason (USAF, Rome Air Development Center, Griffiss AFB, NY) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings New York, Institute of Electrical and Electronics Engineers, 1982, p 370-372
Built-in-test (BIT) accuracy is a combined measure of fault detection capability and false alarm occurrences This paper provides a Markovian analysis of BIT accuracy The results of the analysis are used to develop tradeoff techniques for achieving optimal BIT accuracy levels (Author)

A82-42216 R & M characteristics of a Microwave Landing System. W R Belcher (Amalgamated Wireless (Australasia), Ltd , North Ryde, New South Wales, Australia) and R E Kuehn (Kuehn and Co , North Ryde, New South Wales, Australia) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings New York, Institute of Electrical and Electronics Engineers, 1982, p 404-407 10 refs
The function, performance and hardware implementation of the Time Reference Scanning Beam (TRSB) Interscan Microwave Landing System (MLS) are briefly discussed Reliability and Maintainability (R and M) design goals for MLS are established Selected aspects of R and M design support to monitor and optimize implementation are discussed, and the R and M status of an Interscan prototype system assessed (Author)

A82-42217 Computer Monitored Inspection Program /CMIP/, a key to increased aircraft and personnel productivity. H D Hall (Lockheed-Georgia Co , Marietta, GA) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings New York, Institute of Electrical and Electronics Engineers, 1982, p 408-416
A computer program has been developed which permits maintenance managers to maintain aircraft scheduled inspection programs in a dynamic and cost-effective configuration This program, which is called CMIP (Computer Monitored Inspection Program), was specifically designed to increase the aircraft's and the maintenance manager's productivity by assisting the maintenance manager in evaluating the effectiveness of scheduled maintenance programs The CMIP gives the maintenance manager the ability to keep inspection programs dynamic and cost-effective while simultaneously maintaining inherent design levels of safety and reliability (Author)

A82-42229 F/A-18 Hornet reliability challenge - Status report. M P Ricketts (McDonnell Aircraft Co , St Louis, MO) In Annual Reliability and Maintainability Symposium, Los Angeles, CA, January 26-28, 1982, Proceedings New York, Institute of Electrical and Electronics Engineers, 1982, p 491-496
A development status report is given for the F/A-18 Hornet Reliability Program, in which an attempt is made to give reliability criteria the same design emphasis as weight, performance and cost Among the established reliability assurance techniques applied are periodic status assessments for each subsystem manager, failure mode and affects analyses, an approved parts list, selective use of Sneak Circuit Analysis, and a closed loop evaluation and reporting system which reports and tracks all equipment failures The F/A-18's 3 7-hour mean flight time between failures (MFTBF) requirement was tested in 50 Reliability Demonstration flights, and an 8 4-hour MFTBF was demonstrated The F/A-18 incorporates such high inherent reliability design components as solid state avionics, improved avionics cooling, a fixed-geometry engine air inlet, simpler hydraulics, and the highly simplified F404 engine O C

A82-42462 † Mathematical models of rotor strength and optimization in computer-aided design (Matematicheskie modeli prochnosti i optimizatsii rotorov pri avtomatizirovannom proektirovanii). I V Dem'ianushko, V V

Zhestovskii, and V Ia Bratchik *Problemy Prochnosti*, Aug 1982, p 90-93 9 refs In Russian

The efficiency of various schemes and methods for analyzing plates, shells, and three-dimensional structures is examined in order to select appropriate mathematical models for incorporation into a computer-based system for designing aircraft engine rotors It is shown that at the stage of preliminary design studies, the analysis of rotor components can be carried out in the approximation of axisymmetric plates and shells Rotor design modules are developed which can be used within the automated design system or autonomously V L

A82-42474 # The Power Pair Locus - A preliminary design aid to select power ratings for multi-engined helicopters. A L Neuburger (Pratt and Whitney Aircraft of Canada, Ltd , Longueuil, Quebec, Canada) *Canadian Aeronautics and Space Journal*, vol 28, Mar 1982, p 56-64

Multi-engine passenger carrying helicopters require an engine emergency rating whose magnitude affects the economics of the vehicle The Power Pair Locus is introduced as an optimization tool suitable for initial vehicle/engine design iterations It represents pairs of takeoff and emergency power and it is based on a creep wear criterion for the critical turbine blade such that engine qualification requirements are satisfied Modification of these requirements has been explored and a 10% reduction in engine size appears feasible if only 1/4% of the endurance test time is spent at the emergency rating instead of the 4% which is currently required For cooled blades, increased cooling tends to reduce the engine's emergency to takeoff power ratio (Author)

A82-42504 Use of aircraft-derived data to assist in ATC tracking systems. I - Accuracy and theoretical considerations. H W Thomas and C C Lefas (Manchester, Victoria University, Manchester, England) *IEE Proceedings, Part F - Communications, Radar and Signal Processing*, vol 129, pt F, no 4, Aug 1982, p 281-288 9 refs Research supported by EUROCONTROL

The possible uses of currently available aircraft-derived data in assisting in radar tracking are investigated theoretically to establish the accuracies required for such data to improve the performance at present obtained from radar position measurements For straight-line tracking, it is found that velocity measurements can be obtained by resolving TAS and heading in two axes Such velocity measurements, however, are biased by the wind to such an extent that they are not directly useful Even though the straight-line filter may be augmented in order to estimate the wind speed online, and accuracies obtained are not significantly better than those obtained by filtering SSR data only For maneuvering aircraft, the results obtained suggest that maneuver tracking is possible using either roll-angle or heading measurements It is noted that use of 'higher-order' measurements such as velocity and acceleration provide considerable benefit during turns and that their incorporation into the tracking algorithm is straightforward C R

A82-42531 # Adaptation and first cryogenic operation of T2 ONERA/CERT wind tunnel. R Michel and A Mignosi (ONERA, Centre d'Etudes et de Recherches de Toulouse, Toulouse, France) *La Recherche Aérospatiale* (English Edition) no 2, 1982, p 75-85 5 refs

A description is given of the transformation of the ONERA/CERT induction-driven transonic wind tunnel into a blowdown, cryogenic wind tunnel which employs high pressure air as a driving gas and nitrogen as a coolant An analysis of results from the first series of low temperature tests shows that the combination of induction and cryogenics yields steady and well defined low temperature flows at transonic Mach numbers, with temperatures as low as 100 K and Reynolds numbers from 3 million to over 30 million Attention is given to the design details of the liquid nitrogen supply and injection systems, as well as the performance levels achieved O C

A82-42533 # An optimum design of fuselage structure. H -L Ding, W -P Chen, X -X Sun, and W Fang *Acta Mechanica Solida Sinica*, May 1982, p 157-164, 6 refs In Chinese, with abstract in English

The application of the improved fully stressed design method to fuselage structure design is presented The conventional stress and minimum gage constraints as well as the component buckling constraints are studied For the latter, the oscillation in stress ratio redesign can be effectively damped by means of the 'under-relaxation' factor derived in this paper In addition to the commonly used bars, panels and beams, some dummy and scalar elements are used to avoid the 'ill-condition' or an idealized model of the complex fuselage structure The presented computer program includes adjustments to the converged design and a final structural analysis in order to improve reliability In a sample application of the fuselage structure, the design is basically converged after only five iterations The converged design is satisfactory and is about eleven percent lighter than the initial one C D

A82-42544 Aircraft R&D in Europe - A perspective view. J C Wimpenny (British Aerospace Public, Ltd , Co , Aircraft Group, Kingston-upon-Thames, Surrey, England) *(European Pioneer's Day Conference, Toulouse, France, May 6, 7, 1982) Aeronautical Journal*, vol 86, Aug -Sept 1982, p 243-251

Research and development in European civil air transport is considered It is suggested that industry growth depends primarily on fare reduction, resulting in an increased actual passenger per km figure A high rate of product improvement implies a reasonable growth rate, but a low rate may reduce the amount of competition If an excessive rise in fuel prices occurs, R&D will still have to be high in order to reduce direct operating cost (DOC) penalties A high or low improvement rate for DOC can influence whether future developments are primarily reorders or new types A steady R&D is essential in order to ensure high DOC reductions, and R&D effectiveness requires precise definition and management R&D growth must be accompanied by improved profitability of manufacturers and operators Air traffic management (ATM) can be a major improvement as it provides a 6% potential DOC reduction, and further investigation of ATM is needed R K R

A82-42545 A supersonic V/STOL fighter design project. J P Fielding (Cranfield Institute of Technology, Cranfield, Beds , England) *Aeronautical Journal*, vol 86, Aug -Sept 1982, p 252-258

Students of the College of Aeronautics of the Cranfield Institute of Technology have designed a V/STOL aircraft, using carbon fiber reinforced plastic construction wherever possible This material offers weight savings of 15% for wing type components, 16% for fuselage, and 10% for undercarriage, and a mass breakdown of the aircraft is given The design offers improved lift characteristics for short take-off and combat as it employs a close-coupled canard arrangement As engine intakes are on top of the rear fuselage, radar cross-section is reduced, area distribution is increased, and inlet duct volume is reduced Wind-tunnel test of a similar configuration show promising efficiency results for such intakes Other design considerations presented pertain to wing, fuselage, and powerplant and vertical take-off system design Particular attention during construction was given to achieving a reduced vulnerability by performing extensive penetration calculations It is suggested that further development of the powerplant and remote augmented lift system, and investigation of high temperature materials and insulation be done R K R

A82-42546 The application of geometric programming to the structural design of aircraft wings. M B Snell and P Bartholomew (Royal Aircraft Establishment, Dept of Materials and Studies, Farnborough, Hants , England) *Aeronautical Journal*, vol 86, Aug -Sept 1982, p 259-268 6 refs

The technique of geometric programming is applied to the design of optimum aircraft wings in the multi-spar monolithic skin configuration Both flat and corrugated web systems are considered and design examples are given based on contemporary wing data The present report is confined to the consideration of minimum weight design of metallic structure and the constraints are those which arise naturally from consideration of allowable stress, buckling and in some instances geometric limitations on the layout Most of the problems solved give rise to closed form solutions while more complex problems are readily solved by computer program (Author)

A82-42547 Turbulence modelling - Report of a Working Party. A B Haines (Aircraft Research Association, Ltd , Bedford, England) *Aeronautical Journal*, vol 86, Aug -Sept 1982, p 269-277 21 refs

A review of turbulence modelling for aeronautical applications is presented, and recommendations for future progress in the field are suggested External flow viscous turbulence models are based on boundary-layer development calculations matched with an inviscid-flow solution Boundary layer calculations derived from the Bradshaw finite difference method require the use of a Reynolds-stress (RS) turbulence model Internal flow models have lower Reynolds numbers than external, thus, the viscous layers are thicker Turbulence models for various engine parts such as compressors (basic integral methods), combustion chambers (k-epsilon model), and jets and propulsion installation (k-epsilon model, but with better methods to account for the fluxes of heat and water) are presented Short-term priority tasks include speeding up computer programs, applying methods to configurations of more complex geometry, and incorporating viscous effects into inviscid methods R K R

A82-42552 Modern compressible flow with historical perspective. J D Anderson, Jr , (Maryland, University, College Park, MD) New York, McGraw-Hill Book Co , 1982 479 p 80 refs $33

The fundamentals of classical compressible flow are reviewed along with modern computational fluid dynamics and high-temperature flows Topics discussed include integral forms of the conservation equations for inviscid flows, one-dimensional flow, oblique shock and expansion waves, quasi-one-dimensional flow, differential conservation equations for inviscid flows, and unsteady wave motion Other topics are the velocity potential equation, linearized flow, conical flow, numerical techniques for steady supersonic flow, properties of high-temperature gases, and basic examples of high-temperature flows V L

A82-42565 Optimisation in multivariable design. G F Bryant In Design of modern control systems (A82-42558 21-63) Stevenage, Herts , England and New York, Peter Peregrinus, Ltd , 1982, p 159-176 8 refs

Three new basic algorithms for achieving diagonal dominance are described (1) the choice of optimal permutation of input or output variables of the plant, (2)

the optimal choice of scaling factors, and (3) the determination of a real precompensator to optimize the dominance measure of the compensated plant A linear jet-engine model is considered as a design example B J

A82-42572 The sporty game. J Newhouse Research supported by the Marshall Fund New York, Alfred A Knopf, 1982 250 p 70 refs $15

An episodic history of the airliner business in the era of widebody airplanes is presented Competition in the development and marketing of big airplanes is focused on, with each of the major companies being discussed in detail, and the development of international competition emphasized The relationship of governments to the individual companies is explored, and aspects such as comfort, safety, and aircraft size are evaluated as factors in the competition Future prospects of the American airplane industry are assessed C D

A82-42574 Automation of flight operational control in the German Democratic Republic (Automatisierung der Flugleitung in der DDR). W Raschke (Interflug Gesellschaft für Internationalen Flugverkehr mbH, Berlin, East Germany) *Technisch-ökonomische Information der zivilen Luftfahrt*, vol 18, no 2, 1982, p 63-80 In German

A description is given of the procedures and the equipment of the subsystem flight operational control of the automated transportation process control system of Interflug Attention is given to radar data processing and radar data display complexes of Berlin-Schönefeld (Gamma-1) In connection with the employment of modern technological and technical solutions, this system represents a significant step from a manual flight control system to an automated flight control system The factors which make the automation of flight operational control procedures necessary are examined They are found to be largely related to a very significant increase in the number of flights which have to be considered Operational experience regarding the Gamma-1 is also discussed, and plans for additional automation projects are outlined G R

A82-42670 Design and analysis of advanced composite structures. R N Hadcock (Grumman Aerospace Corp , Bethpage, NY) In Handbook of composites (A82-42651 21-24) New York, Van Nostrand Reinhold Co , 1982, p 533-556 9 refs

The iterative final design process in the case of advanced composite structures is generally so complex that it can only be readily accomplished by utilizing a computer However, the process can be greatly simplified for preliminary design The present investigation is concerned with a simplified design approach which is quite adequate for preliminary design The preliminary design of composite structures begins with tradeoffs of the impact of using different types of construction and materials on the weight and cost of either a part or on the total structure associated with an aircraft or space vehicle Parametric trade studies are discussed, taking into account fuselage weight savings, weight savings for rudders and flaps, weight reductions over metal airframes, and advanced design composite aircraft configurations Attention is given to multidirectional laminate structural behavior, laminate strength under uniaxial loading, and the preliminary analysis and design of composite panels G R

A82-42675 Aerospace applications of composites. G Lubin and S J Dastin (Grumman Aerospace Corp , Bethpage, NY) In Handbook of composites New York, Van Nostrand Reinhold Co , 1982, p 722-743 16 refs

It is estimated that within 10 years composites will comprise up to 40 percent of all aircraft structures This is due to the fact that high performance composites are the only existing materials meeting the requirements for light weight, high strength, high stiffness and good fatigue resistance characteristic of aerospace applications For example, a graphite composite has a tensile strength of 3 6 x 10 to the sixth in compared with 0 8 x 10 to the sixth for aluminum, and a fatigue endurance of 80 percent of its static strength, compared with 35 percent for aluminum Additional advantages over commonly used metals include superior surface finish, dimensional stability, material uniformity and freedom of aerodynamic design and contouring Current applications to spacecraft include rocket nozzles, filament wound tanks and grid-stiffened composite panels Applications for aircraft currently include wing skins and stabilizers, with static engine components envisioned A B

A82-42722 † Optimal stream surfaces in supersonic three-dimensional flows (Ob optimal'nykh poverkhnostiakh toka v sverkhzvukovykh prostranstvennykh techeniiakh). M P Levin *Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki*, vol 22, July-Aug 1982, p 1003-1008 9 refs In Russian

A numerical solution is obtained for the optimal contouring of the supersonic part of a three-dimensional nozzle in the case when the adjoint problem for the Lagrange multipliers has an analytical solution Attention is given to the cases of smooth stream surfaces and to cases when the optimality conditions are formulated on the characteristic control surface The contouring problem is reduced to the solution of a three-dimensional nonlinear system of hyperbolic equations B J

A82-42750 Europe's best seller - Second-generation Airbus emerges. *Air International*, vol 23, Sept 1982, p 111-115, 116, 118, 147, 148

The Airbus A310 is discussed, revealing extensions and modifications of the current design Intended as a smaller capacity short/medium range transport, it has wide-body twin aisle cabins accomodating between 220-262 passengers, depending on cabin configuration The basic model employs two turbofan engines with 22,680kgp each, and has an operating range that varies from 1,250-2,600 naut miles Another model having a range of 3,750 naut miles and accomodating 218 passengers is likely to be introduced Changes made in the wing design represent an extension of ideas about supercritical airfoils and peaky sections employed in the A300 wing The main improvement is that the shock wave has been pushed back along the chord of the wing, delaying the compressibility drag rise and increasing rear loading, giving a substantial increase in the lift carried by the wing While the span and the sweepback remain unchanged, the aspect ratio was increased from 7 73 to 8 8 As a result of improved wing efficiency, engine efficiency and lower aircraft weight, the A310 is 21 percent more fuel efficient than its predecessor Airbus claims that the A310 will carry more passengers and cargo at lower costs than the Boeing 767, but sales figures to date show 311 767's ordered vs 183 A310's ordered Flight testing, begun in April 1982, is expected to lead to certification in Europe in March 1983 A B

A82-42791 # Passive aircraft location. J L Leva (Mitre Corp , Bedford, MA) *Astronautics and Aeronautics*, vol 20, Sept 1982, p 52, 53

Results of a study of systems equations and fabrication of a test passive ground-based aircraft detection system are presented Discrimination abilities of the system are noted to include accuracy in a noisy environment, sorting out aircraft emissions, and time-difference-of-arrival signal processing A civilian Mark X signal transponder was employed as the test emitter, while sensors were spread on the ground with a 10-25 n mi separation Measurements were made of pulse time of arrival, amplitude, and frequency, and fed to the sorting algorithms Synchronization was established between the sensors using rubidium frequency standards It was shown that the passive system could measure the signal time of arrival, frequency, and the direction of arrival, even if the aircraft were approaching in a line M S K

A82-42792 * # Bonding procedure for Teflon seals. S R Barringer, T E Ezell, Jr , A B Stacey, Jr , and D B Wright, Jr (NASA, Langley Research Center, Hampton, VA) *Astronautics and Aeronautics*, vol 20, Sept 1982, p 53

Material and bonding procedures designed for use as seals at the National Transonic Facility at the NASA Langley Research Center are presented Teflon TFE was chosen for its ability to withstand pressures of up to 130 psi and temperatures ranging from -320 to 150 F, in addition to tolerances of 0 074 in and having a movement allowance of 0 75 in during transient cycles Since some of the seals are 14 in in diameter, Teflon sheets had to be sliced and bonded together after machining to size, resulting in seals with circular, oval, straight, and rectangular cross sections Step-by-step preparation procedures are provided, and it is noted that the scarf joints performed as predicted during tests M S K

A82-42808 # An experimental examination of compressor blade flutter (Etude expérimentale du flottement d'aubes de compresseurs). E Szechenyi (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(Société Française des Mécaniciens, Réunion sur Alimentation des Turbomachines - Difficultés et Remèdes, Paris, France, May 4, 5, 1982) ONERA, TP* no 1982-31, 1982 11 p In French

Experimental methods and results of ONERA trials to determine ways to eliminate feed-induced flutter of axial compressor blades are described A general equation for the flutter induced on a blade is defined, showing that two cases of instability exist, conditions when the aeroelastic force cancels the stiffness of the blades, and when the total damping is negative and amplitude of vibration increases to the rupture point Operation of a wind tunnel with rectilinear blades at vibration frequencies between 0-500 Hz are reviewed, noting that flows between Mach 0 5 to Mach 1 0 have been examined Hydraulic actuators initiate the vibratory movement of the pressurized air flow, and pressure measurements recorded the magnitude and characteristics of the turbulence It has been demonstrated that in sub- and transonic regimes the angle of attack and stable vibration frequencies are dominant factors governing the onset of vibration When no instabilities are present, conditions of an unstable feed flow are noted to be responsible for the appearance of flutter M S K

A82-42809 # Aeroelastic equilibrium of a helicopter rotor in the presence of nonlinear aerodynamic forces (Equilibre aéroélastique d'un rotor d'hélicoptère en presence de forces aérodynamiques non linéaires). J -J Costes (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(NATO, AGARD, Meeting on Prediction of Aerodynamic Loads on Rotorcraft, London, England, May 17-19, 1982) ONERA, TP*, no 1982-33, 1982 22 p 13 refs In French

A computer code for the aeroelastic coupling of a helicopter rotor, holding into account stall conditions around the retreating blade, is presented Quasi-linear forms are developed for nonlinear lift functions, and the aerodynamics are based on the acceleration potential in a compressible fluid Consideration is given to all

wakes and the blades are modeled in terms of a lifting line 1/4 from the front of the blade Modifications of the linear theory of aeroelastic coupling is guided by two-dimensional results on stalled profiles The complete nonlinear system is transformed by means of the introduction of quasi-steady constraints in order to estimate power increases necessary to overcome losses due to flow separation M S K

A82-42810 # Corrections for wall effects in ONERA industrial wind tunnels (Améliorations des calculs des effets de parois dans les souffleries industrielles de l'ONERA). X Vaucheret (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(NATO, AGARD, Meeting on Prediction of Aerodynamic Loads on Rotorcraft, London, England, May 17-19, 1982) ONERA, TP* no 1982-34, 1982 13 p 11 refs In French

Analytical methods for allowing for the effects of the walls on flows in transonic wind tunnels operated by ONERA are presented The discussion is limited to the case of three-dimensional models in cylindrical wind channels Attention is given to the numerical description of the model and the sting mount, to the use of a method of characteristics for the verification of the numerical models of the model-sting configurations and the models of wall porosity, and to correction coefficients for particular wind tunnel channels A volumetric representation of ellipsoidal fuselages is discussed, including using a number of doublets equal to twice the thickness of the fuselage Further consideration is given to the calculation of lift, wall porosity, nonzero lift characteristics, and corrections of the Mach number M S K

A82-42811 # An examination of helicopter blade profiles and tips (Etudes de profils et d'extrémités de pale d'hélicoptère). J J Thibert and J J Philippe (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(NATO, AGARD, Meeting on Prediction of Aerodynamic Loads on Rotorcraft, London, England, May 17-19, 1982) ONERA, TP* no 1982-35, 1982 15 p 28 refs In French

The results of long-term ONERA research into profiles and tips of composite material helicopter blades are summarized Consideration is given to the use of symmetric NACA profiles on older helicopter designs and to the development of new profiles with numerically modeled internal and external sections Trials with the OA2XX profile blades on scale model helicopters in the Modane wind tunnel have shown a nominal power augmentation of 9 percent Flight tests with OA209 blades have, in comparison with the NACA 0012 blades, displayed isopower increases of 2 percent, an enlarged flight envelope such as 10 percent maximum speed or power increases, and more economic rotor performance at high speeds Two dimensional modeling of the interior of the rotor has been shown to give way to three-dimensional modeling near the tip in order to maintain accuracy Iso-Mach lines have been calculated from azimuths of 60 and 120 deg and with bending of 30 deg Further studies to evaluate parabolically flexed tip configurations are indicated M S K

A82-42813 # The use of adaptive walls in plane flows (Utilisation de parois adaptables pour les essais en courant plan). J P Archambaud (ONERA, Centre d'Etudes et de Recherches de Toulouse, Toulouse, France) and J P Chevallier (ONERA, Division d'Aérodynamique Expérimentale, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(NATO, AGARD, Meeting on Wall Interference in Wind Tunnels, London, England, May 19, 20, 1982) ONERA, TP* no 1982-38, 1982 15 p 38 refs In French

Computational methods which take into account the effects induced in plane flows by the presence of adaptive walls in a wind tunnel are presented, along with test results from the ONERA T2 transonic wind tunnel Modeling of the wall effects through the method of signatures is analytically described, with consideration given to the length of the adapted regions, fairings with up- and down-stream regions, residual effects, and reference conditions Operation of the walls to induce varying flow conditions is outlined, and iterative procedures for quantifying the flow under the initial, changing, and new conditions are presented The numerical techniques are shown to include factors such as the diminution of the flow in proportion to the distance from the adaptive wall sections, movement of the walls in 2 mm steps to examine camber, and fast convergence of the solution of adaptation to acceleration represented by a single gust M S K

A82-42817 # Boundary layer transducers /DCL/ developed for the study of the flow over helicopter rotor blades. C Armand, P Combet, and J -P Drevet (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(Institute of Electrical and Electronics Engineers, Congress on Instrumentation in Aerospace Simulation Facilities, 9th, University of Dayton, Dayton, OH, Sept 20-Oct 2, 1981) ONERA, TP* no 1981-93, 1981 9 p 5 refs

The development of thermistors as a suitable replacement for hot-film transducers for boundary layer experiments in the ONERA Modane test center is described, and comparisons are made between performances of the thermistor and hot-film devices The operation of both apparatus is described in terms of the power fluctuations necessary to maintain a constant temperature in an electrically heated element subject to ambient fluctuating flow Operating parameters for boundary layer transducers are defined Fabrication of a 0 2 sq mm, 10 microns thick, 200 ohms resistance (low temperature) and 250 ohms (high temperature), 11 mA heating element semiconductor thermistor for boundary layer studies is noted, including characteristics which form a Wheatstone bridge The measurement voltage has been transmitted over 100 m without loss, and frequencies of pressure fluctuations have been detected up to 15 kHz Wind tunnel tests with both types of transducers implanted on rotary wings have revealed conditions which are not quantifiable using models for fixed wing flowfields M S K

A82-42849 Taking the drag out of bombs. C Epstein (NATO, Brussels, Belgium) *Flight International,* vol 122, Aug 21, 1982, p 418-420

Conformal carriage of weapons and stores offers significant advantages over external multiple ejector rack carriage, expanding the flight envelope of the F-4 (with twelve 500 pound bombs) from Mach 1 1 to 1 8, reducing overall drag 60% and extending mission radius nearly 50% Conformal mounting of fuel tanks (fast packs) on the F-15C provides more than 230 n mi further low altitude dash, 100 n mi further radius at Mach 2, and from one and one-half to three hours extra on-station time at a 500 n mi radius Radar cross-section and maneuverability are also improved The General Dynamics F-16XL features semi-conformal weapons carriage, and comparable improvements of performance are expected A B

A82-42865 # In-flight acoustic emission monitoring. I G Scott (Department of Defence, Aeronautical Research Laboratories, Melbourne, Australia) In Symposium on Nondestructive Evaluation, 13th, San Antonio, TX, April 21-23, 1981, Proceedings San Antonio, TX, Southwest Research Institute, 1982, p 210-219 8 refs

The feasibility of the in-flight acoustic emission (AE) monitoring of fatigue cracks has been assessed by a flight test program employing a Royal Australian Air Force Macchi jet trainer aircraft It is found that despite the hostile environment in which the equipment is operating, AE signals originating from a known spar fatigue crack have upon analysis yielded suggestive data on the relation between AE, flight regimes and crack growth parameters Magnetic rubber replica inspection, EPROM flight data recording and flight profile data breakdowns have been employed in this research project O C

A82-42887 # Laser pointing in a turbulent atmosphere. A L Pavel (USAF, Weapons Laboratory, Kirtland AFB, NM) In Aero-optical phenomena New York, American Institute of Aeronautics and Astronautics, 1982, p 401-411 10 refs

The sources of jitter encountered in optical pointing from an airborne platform are surveyed Aircraft always operate in some level of atmospheric turbulence and this turbulence induces motion which must be compensated for by an optical pointing system Levels of atmospheric gust turbulence are related to the corresponding airframe jitter This level of jitter will determine the capability required by the pointing system Once the beam leaves the aircraft the final pointing accuracy becomes a function of atmospheric turbulence, which influences the index of refraction of the air through which the light must pass Levels of atmospheric temperature turbulence are used to predict system jitter that could be expected The combined effects of atmospheric gust and temperature turbulence constitute the budget of beam jitter that must be factored into laser pointing experiments (Author)

A82-42893 † Antiwear properties of additives based on higher fatty acids (Protivoiznosnye svoistva prisadok na osnove vysshikh zhirnykh kislot). O P Lykov, T P Vishniakova, V V Sashevskii, and L S Zaitseva (Moskovskii Institut Neftekhimicheskoi i Gazovoi Promyshlennosti, Moscow, USSR) *Khimiia i Tekhnologiia Topliv i Masel,* no 8, 1982, p 16, 17 5 refs In Russian

The antiwear characteristics of additives based on higher fatty acids isolated from C17-C20 fractions and residues of synthetic fatty acids production have been investigated experimentally using the additives with hydrofined jet fuel T-7 Of the additives investigated, isomonocarboxylic and unsaturated acids of C17-C20 fractions are found to have the highest antiwear characteristics when used in amounts of 0 002-0 007 mass % V L

A82-42894 † Determination of antioxidant content in aviation oils using thin-layer chromatography (Opredelenie soderzhaniia antiokislitel'nykh prisadok v aviatsionnykh maslakh metodom TSKh). P A Mikheichev, A V Vilenkin, and I M Novikova (GOSNIIErat GA, USSR) *Khimiia i Tekhnologiia Topliv i Masel,* no 8, 1982, p 35-37 6 refs In Russian

A method based on thin-layer gas chromatography is proposed for determining the amounts of antioxidants in fresh and used aviation oils The accuracy of the method has been verified by determining the content (which was known to be 0 35% by mass) of dibutyl-n-cresol additive in oil Analysis of the measurements has shown that the method is accurate to within 6 0%, which is sufficient for oil quality control purposes V L

A82-42895 † Antioxidants for synthetic oils (Antiokislitel'nye prisadki k sinteticheskim maslam). Kh N Kulieva and V S Smolenkova (Akademiia Nauk Azerbaidzhanskoi SSR, Baku, Azerbaidzhan SSR) *Khimiia i Tekhnologiia Topliv i Masel,* no 8, 1982, p 40-42 21 refs In Russian

Recent advances in the synthesis of antioxidants for synthetic lubrication oils

used in modern jet engines are briefly reviewed In particular, consideration is given to nitrogen-containing antioxidants (e g , succinimide-type compounds, aromatic amines, and Schiff's-bases), metal-containing antioxidants (e g , complex compounds of group I or group VIII metals), and mixtures of two or three different antioxidants characterized by a synergic effect V L

A82-42950 * # Transient phenomena of shock-induced turbulent separation for a spikebody and stalling airfoil at transonic and supersonic speeds. K K Yoshikawa (NASA, Ames Research Center, Moffett Field, CA) *American Institute of Aeronautics and Astronautics, Atmospheric Flight Mechanics Conference, 9th, San Diego, CA, Aug 9-11, 1982, Paper 82-1362* 19 p 17 refs

The time-dependent, compressible, Reynolds-averaged, full Navier-Stokes equations are applied to solve an axisymmetric flow around a forward-facing stepbody (spikebody) at supersonic speeds and a stalling airfoil at transonic speeds Important transient and unsteady phenomena, not yet well understood, are examined, and significant new findings of the present solution to the phenomena are discussed The phenomena described in detail are as follows The evolution of the shock wave pressure built up by the impact of the pressure waves, one from the trailing edge, the separation of the flow as influenced by the shock wave, the location of the reversed flow, the separation point, and the reattachment point, and the transient (or unsteady) phenomena of the flow pulsation, oscillation, and stalling of the body and airfoil wake flow The numerical results show that the transient flow instability is caused by a supersonic jet induced in the separation bubble by the shock-bifurcation (lambda shock) mechanism between the separation shock and the reflected shock Pulsation and stall phenomena are caused by a sudden increase in the leading-edge pressure due to the jet and the separation bubble interacting along the stagnation point flow (Author)

A82-43091 Apache to provide night/bad weather capability. R R Ropelewski *Aviation Week and Space Technology,* vol 117, Sept 13, 1982, p 42, 43, 45 (4 ff)

Test flights of the Hughes AH-64 Apache advanced attack helicopter, due for delivery to the Army in early 1984, displayed its capability for night and adverse weather antitank/operations The aircraft's two 1,690 shp T700-GE-701 engines exceeded the Army's high/hot rate of climb requirements and provided a maximum 1,700-1,800 fpm rate of climb Low altitude nap-of-the-earth flying is facilitated by the precision and quick response of the handling, as well as by the high instantaneous turn rate Doppler navigation system, day/night vision systems, laser ranging/ designating/tracking and digital fire control computer are integrated to minimize the need for communications between the two cockpits, and to reduce the pilot workload The AH-64 is armed with Hellfire missiles, and standard 2 75-inch rockets A B

A82-43092 New nozzle design aimed at F-15, F-16 aircraft. *Aviation Week and Space Technology,* vol 117, Sept 13, 1982, p 67, 71, 73

The two-dimensional convergent/divergent nozzle consists of two convergent-/divergent flaps which vary thrust and exit area as well as control vectoring and reversing Vectoring on the order of + or - 30 degrees is possible Designed for short takeoff and landing, and for high Mach maneuvering, landing distances on dry runways are reduced from 3,000 to 1,000 feet, and from 10,000 to 1,200 feet on icy runways The rectangular nozzle has lower cost and weight than circular nozzles with the same capacity Ground demonstration tests produced a maximum 8,000 pound perpendicular thrust component and 6,200 pounds of reverse thrust The nozzle could be employed in an F-15 or F-16, and several external contours for it are being considered A B

A82-43111 # Construction and testing of an Omega navigation system for the balloon-borne X-ray experiment (Aufbau und Test eines Omega-Navigationssystems für das Ballon-Röntgenexperiment). E Götz Tübingen, Universität, Astronomisches Institut, Diplomarbeit, 1981 109 p 26 refs In German

Various systems are compared for their suitability for determining balloon position The Omega navigation system is discussed, with emphasis on the propagation characteristics of VLF waves, which strongly influence the positional accuracy of the system A concept for a Tübingen navigation system is presented that is suitable for position determination in the X-ray experiment A software algorithm that permits the application of hyperbolic coordinates to geographic position is described along with a real-time program that would evaluate the data from the Omega receiver during balloon flight and convert them to geographical position using the algorithm This calculation procedure is confirmed by a test and its attainable accuracy is found The receiver electronics and its functional principle is discussed, as is the mode of data transfer to the computer C D

A82-43184 The external balance system of the German- Dutch windtunnel DNW and its strain gage load cells. C C Groothoff (Nationaal Lucht- en Ruimtevaartlaboratorium, Emmeloord, Netherlands), D Theiss, and P Giesecke (Carl Schenck AG, Darmstadt, West Germany) In Symposium on Force, Pressure, Displacement and Flow Sensors, Technische Hogeschool Twente, Enschede, Netherlands, May 13, 14, 1982, Proceedings (A82-43176 21-35) Enschede, Netherlands, Technische Hogeschool Twente, 1981, p 99-113

The external six component balance system of the German-Dutch Windtunnel DNW is described Although designed for a multitude of testing circumstances, the requirements on aircraft model testing were dominant The applied aerodynamic loads (e g 65,000 N lift) and the dimensions of the models and wind tunnel size resulted in a large and heavy instrument The balance is of the platform type, enabling a simple and stiff construction The requirements regarding the allowable errors - order of magnitude 0 1% f s for forces, 0 2% f s for moments - posed high demands on the design of the balance and calibration equipment, but check loads showed that the requirements were met (Author)

A82-43249 Meteorological aspects of North Atlantic flight tracks - The development of programs for minimum-time tracks. L Bennett (Civil Aviation Authority, London, England) *Journal of Navigation,* vol 35, Sept 1982, p 499-501

The phase of a flight planning operation in which airline personnel calculate minimum time tracks for the purpose of advising oceanic control centers of their needs is described, before defining the Organised Track System Results are based on 12- and 24-hour forecasts for a 250-mb level, and aircraft with a *nominal constant speed of Mach 0 82* The graphical method customarily employed is that of finding the minimum time track, which involves drawing the envelopes of a large number of circles This, however, is unsuitable for computer implementation The problem may alternatively be defined in terms of a network, using an algorithm to obtain the shortest paths O C

A82-43250 Meteorological aspects of North Atlantic flight tracks - Some interim results of the study. R Monk (Civil Aviation Authority, London, England) *Journal of Navigation,* vol 35, Sept 1982, p 502-513, Discussion p 513-516

A comparison is presented of minimum time North Atlantic flight tracks calculated for the weather conditions forecast and those analyzed after each of the flights between 12 city pairs The differences show that the effect of forecast error is small, averaging 1 5 min of flying time for both 12- and 24-hour forecasts, and being 4 min or less in about 90% of the flights studied The remaining 10% range from 4 min to a maximum of 21 min for a 24-hour forecast and 16 min for a 12-hour one O C

A82-43261 * # Statistical analysis of piloted simulation of real time trajectory optimization algorithms. D B Price (NASA, Langley Research Center, Hampton, VA) *IEEE, AIAA, AIChE, ASME, ISA, and SME, American Control Conference, Arlington, VA, June 13-16, 1982, Paper* 3 p

A simulation of time-optimal intercept algorithms for on-board computation of control commands is described The effects of three different display modes and two different computation modes on the pilots' ability to intercept a moving target in minimum time were tested Both computation modes employed singular perturbation theory to help simplify the two-point boundary value problem associated with trajectory optimization Target intercept time was affected by both the display and computation modes chosen, but the display mode chosen was the only significant influence on the miss distance A B

A82-43264 * # Current perspectives on emergency spin-recovery systems. R D Whipple (NASA, Langley Research Center, Hampton, VA) *Society of Flight Test Engineers, Symposium on Flight Testing Technology - A State of the Art Review, New York, NY, Sept 19-22, 1982, Paper* 13 p 23 refs

The requirements generated by the loss-of-control problems of contemporary and future aircraft are discussed in connection with the development of rocket and parachute technology for spin-recovery systems used in current aircraft Recovery rockets must be designed to provide the thrust (not impulse) levels required by the specific application, because insufficient thrust will not effect a recovery regardless of its duration The need for long firing times and a restart capability make liquid rocket systems preferable Alternatives to the current tail-mounted method of implementing parachute systems include nose chutes, wing-tip parachutes, dual-bridle and rigid towline systems Comparative test results for these and the conventional system are given along with the latest dynamic model test technique for spin-recovery rockets A B

A82-43275 757 systems key to route flexibility. R R Ropelewski *Aviation Week and Space Technology,* vol 117, Aug 30, 1982, p 36-38, 43, 45, 46

The Boeing 757 is a single-aisle narrow body commercial transport accommodating 186 passengers, with twin engines which each produce 37,000 pounds thrust, a maximum takeoff weight of 220,000 pounds, and a maximum range of 2,650 nautical miles The operating procedures and cockpit layout of the 757 are almost identical to those of the 767, which will permit flight crews to obtain a common rating for both, and can reduce maintenance and support costs for airlines operating both aircraft The avionics aboard include an integrated flight management computer, autopilot/flight director, thrust management system and color cathode ray tube displays The maiden flight was on February 19, 1982, and

certification is expected in December 1982 for commercial service the following year A B

A82-43278 † Proposed multipurpose flying radio-physical laboratory using an IL-18 aircraft (Perspektivnaia mnogotselevaia radiofizicheskaia letaiushchaia laboratoriia na baze samoleta tipa IL-18). V S Abliazov, N A Armand, A N Beliunov, V M Berezanskii, L F Borodin, V L Bulatnikov, A N Vystavkin, A A Kalinkevich, A A Kirilin, and A P Kulakov *(Vsesoiuznaia Konferentsiia po Problemam Issledovaniia Prirodnykh Resursov Zemli i Mirovogo Okeana Aviatsionno-Kosmicheskimi Sredstvami, Moscow, USSR, Nov 1980) Geodeziia i Aerofotos'emka*, no 2, 1982, p 11-18 In Russian

The paper describes an airborne laboratory for performing radio-physical experiments relating to the remote sensing of earth resources and the monitoring of the environment in the microwave, infrared, and visual ranges Consideration is given to the onboard automated data acquisition system, the radiometer system, and an algorithm for processing and classifying the radiometer data A picture showing the arrangement of remote-sensing equipment and processing systems on the aircraft is presented along with block diagrams of the data-acquisition and radiometer systems B J

A82-43311 A laser-interferometer method for determining the forces on a freely-flying model in a shock-tunnel. L Bernstein and G T Stott (Queen Mary College, London, England) *Aeronautical Quarterly*, vol 33, Aug 1982, p 237-257 19 refs

An interferometric method is developed for following the trajectory of a weakly restrained model in a shock tunnel where the force levels are of order 10N for flow duration of about 1 ms The system consists of two simple Michelson interferometers and a single He-Ne laser that provides two measurement and reference beams for following the motion of two points on the model Interference fringes are produced at the detectors as the model moves, and the resulting frequency-modulated wave-trains are recorded The data are analyzed by curve fitting to a parabola in order to find the accelerations of the measurement points, and the forces on the model are calculated based on the model's internal characteristics A lift and pitching moment for a ridge-delta of aspect-ratio 1 is obtained by suitably aligning the beams In addition, results of tests on two models of the same geometric size but with different inertias are presented N B

A82-43326 # The testing of new technologies with the aid of the Alpha Jet aircraft (Erprobung neuer Technologien am Alpha Jet). M Natter (Dornier GmbH, Friedrichshafen, West Germany) *Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium über angewandte Flugwissenschaften bei der Entwicklung des Alpha Jet, Darmstadt, West Germany, Sept 24, 1981, Paper* 31 p In German

The Alpha Jet aircraft as weapon system of the 1980s and 1990s represents the most modern, operationally utilizable status of technology The origin of the currently employed technologies goes back to the late 1960s The present investigation is concerned with recent developments regarding the technologies which determine bomber aircraft design, taking into account the advantages that the new technologies will provide for future bomber aircraft Technological changes of the 1970s are related to electronics and cybernetics, fluid mechanics and flight physics, and materials and methods of construction The development, manufacture, and long-term testing of carbon-fiber reinforced plastics is considered, giving attention to the landing flap, rudder, elevator unit, and the wings of the Alpha Jet The development and flight testing of a transonic wing is discussed, and a description is presented of the development and testing of a direct side force control system G R

A82-43327 # Applied flight mechanics in the design and in flight tests (Angewandte Flugmechanik bei der Auslegung und Flugerprobung). H Wünnenberg (Dornier GmbH, Friedrichshafen, West Germany) *Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium über angewandte Flugwissenschaften bei der Entwicklung des Alpha Jet, Darmstadt, West Germany, Sept 24, 1981, Paper* 22 p 5 refs In German

It is pointed out that flight mechanics played an important part in connection with the design and the development of the Alpha Jet aircraft The main criteria involved in a selection of the optimal configuration were related to a satisfaction of the requirements of flight mechanics The German aerospace company engaged in the Alpha Jet project has already proposed seven alternative configurations for a jet trainer in connection with a prestudy Factors used in comparing these configurations were related to flight mechanics, system costs, safety, structure, problems of construction, equipment, and employment possibilities as a light weapons system The degree with which the flight-mechanics requirements were satisfied was determined on the basis of 17 criteria Attention is also given to the procedures used in the development phase of the aircraft and the test phase G R

A82-43328 # Processes and procedural approaches in the aerodynamic design of the Alpha Jet aircraft (Verfahren und Vorgehensweise bei der aerodynamischen Auslegung des Alpha-Jet). D Welte (Dornier GmbH, Friedrichshafen, West Germany) Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium über angewandte Flugwissenschaften bei der Entwicklung des Alpha Jet, Darmstadt, West Germany, Sept 24, 1981, Paper 18 p In German

The military aircraft Alpha Jet, which has been developed jointly by a French and a German aerospace company, is to be used as a training aircraft for novices and advanced students, and also as a combat aircraft to provide support to troops fighting on the ground A description is presented of the approaches used to develop a design which will ensure the aerodynamic characteristics required by the aircraft to perform its missions Attention is given to aspects of wing design, aids for obtaining satisfactory lift characteristics, engine inlets, jet effects, and a wind tunnel program G R

A82-43330 # Aerodynamic computational procedures for subsonic and transonic aircraft (Aerodynamische Berechnungsverfahren für Unterschall- und Transschallflugzeuge). W Schmidt (Dornier GmbH, Friedrichshafen, West Germany) *Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium über angewandte Flugwissenschaften bei der Entwicklung des Alpha Jet, Darmstadt, West Germany, Sept 24, 1981, Paper* 25 p 22 refs In German

The improvement of the flight characteristics of modern aircraft has been accompanied by a considerable increase in the aircraft development costs Current procedures in connection with the aerodynamic design are still characterized by wind-tunnel studies The use of modern aerodynamic computational processes will make it possible to restrict cost-intensive wind tunnel tests in the future to tests related to the verification of configuration characteristics and the determination of maneuverability properties The development of the Alpha Jet aircraft is used as an example to show the advances which have been made regarding the development of aerodynamic computational procedures since the period from 1969 to 1973 Attention is given to the aerodynamic sizing program, the predesign of the wing-fuselage combination, profile design for sonic and transonic conditions, the design of flap systems, the design of engine inlets, and the aerodynamic design of the tail assembly G R

A82-43331 # Processes and procedural approaches used in the dimensioning of the supporting structure and the demonstration of the airworthiness (Verfahren und Vorgehensweise bei der Dimensionierung der Tragstruktur und beim Nachweis der Lufttüchtigkeit). E Hässler (Dornier GmbH, Friedrichshafen, West Germany) *Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium uber angewandte Flugwissenschaften bei der Entwicklung des Alpha Jet, Darmstadt, West Germany, Sept 24, 1981, Paper* 26 p In German

The airworthyness of an aircraft is related to the ability of the airframe of the aircraft to tolerate the stresses occurring in flight operations in a satisfactory manner On the other hand, a strength of the airframe exceeding the requirements to a large degree is also undesirable in connection with a corresponding unnecessary increase in the weight of the aircraft The present investigation is concerned with the approaches used to obtain an airframe with optimum design characteristics, taking into account the procedures employed in connection with the design of the Alpha Jet aircraft Attention is given to details regarding the airworthyness requirements in the case of the Alpha Jet, the optimal dimensioning of the airframe, questions of load mechanics, the structural calculations, and approaches for ensuring appropriate quality G R

A82-43332 # A survey regarding the German-French development program Alpha Jet (Überblick über das deutsch-französische Entwicklungsprogramm Alpha Jet). P Kania (Dornier GmbH, Friedrichshafen, West Germany) *Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium über angewandte Flugwissenschaften bei der Entwicklung des Alpha Jet, Darmstadt, West Germany, Sept 24, 1981, Paper* 27 p In German

The project Alpha Jet has its origin in the late 1960s, when in Germany and in France a need for a new jet trainer for the air force was recognized Initial contacts between German and French aerospace companies in 1968 led to plans for the development of the Alpha Jet aircraft in a joint project by French and German companies In response to the need of the 'Luftwaffe' for a combat aircraft providing close-air support, the development objectives for the Alpha Jet were extended to cover also requirements concerning an employment of the aircraft for combat missions In September 1975, Belgium became the third partner in the Alpha Jet project The last of four prototypes of the Alpha Jet performed its first flight on October 11, 1974 Attention is given to details concerning the implementation of the Alpha Jet program, organizational questions, aspects of the program schedule, financial considerations, and an outlook regarding future developments involving the Alpha Jet G R

A82-43333 # Simulation in connection with the development of the Alpha Jet aircraft (Simulation bei der Entwicklung des Alpha Jet). H Friedrich (Dornier GmbH, Friedrichshafen, West Germany) *Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium über angewandte Flugwissenschaften bei der Entwicklung des Alpha Jet, Darmstadt, West Germany, Sept 24, 1981 Paper* 37 p In German

A survey is provided of simulation studies conducted by a German aerospace company as an aid in the development of the Alpha Jet military aircraft The first

simulations were unmanned simulations, involving six degrees-of-freedom calculations The simulation, including preprogrammed control input data or simulated pilot behavior, was performed by a digital computer At a later time, a cockpit mock-up was provided with control elements and instruments, and the resulting installation was connected with a digital computer In this connection, an operational simulator was developed This simulator is used for air/ground mission applications Investigations involving manned simulations are also discussed Manned simulations were almost exclusively performed in connection with the adaptation of the aircraft to modified and new missions The simulator is principally employed for mission simulations and the study of new control concepts G R

A82-43394 Sensitivity analysis and optimization of aeroelastic stability. A P Seiranian *International Journal of Solids and Structures*, vol 18, no 9, 1982, p 791-807 42 refs

An analysis of the sensitivity characteristics of aeroelastic stability with respect to changes of distributed and discrete parameters is presented using variational analysis The optimization problem of aeroelastic stability of a slender wing in incompressible flow is formulated and the solution demonstrates that this problem possesses at least two extrema, but that one of them is only a local maximum Sensitivity analysis of flutter systems is developed by deriving the gradients of flutter and divergence critical speeds, and obtaining the necessary optimality conditions The solution technique is then described and numerical results are presented The optimality conditions for the distribution of nonstructural mass along the wing span are established and the bang-bang optimal distributions are obtained N B

A82-43400 # Methodology in flight tests (Methodik bei der Flugerprobung). U von Meier (Dornier GmbH, Friedrichshafen, West Germany) *Deutsche Gesellschaft fur Luft- und Raumfahrt, Symposium uber angewandte Flugwissenschaften bei der Entwicklung des Alpha Jet, Darmstadt, West Germany, Sept 24, 1981, Paper* 19 p In German

Cost considerations in connection with the conduction of flight tests make it necessary to conduct performance and property measurements, individual system tests, and flutter studies during the same flight Flight tests conducted with the Alpha Jet aircraft provide a good example for efficient bilateral flight testing procedures Four prototypes were used in the flight tests Attention is given to the assignment of the various test problems to the Alpha Jet prototypes, the flight program for the test flights, aspects of performance evaluation, the excitation of structural vibration and the evaluation of the vibrations for the flutter analysis, and a survey concerning the testing of the weapons of the aircraft G R

A82-43402 Mode scatterer design for fan noise suppression in two-dimensional ducts. M S Tsai (Boeing Commercial Airplane Co , Seattle, WA) *Journal of Sound and Vibration*, vol 83, Aug 22, 1982, p 501-512 11 refs

The favorable scattering associated with the transfer of the lower order modal energies to the higher ones can be induced only when (1) the lower frequency waves propagate in the inlet duct or in the no mean flow conditions, and (2) the first lining which the incident waves from the fan face meet is a nearly reactive one The phases of the incident waves from the noise source will affect the performance of the scatterer, but not the selection of the optimized scatterer For a given baseline lining, the reactance and the length of the scatterer are the coupling factors in the determination of an optimized scatterer (Author)

A82-43425 Northrop ECM - From B-1B to F-5E. D Richardson *Flight International*, vol 122, Sept 4, 1982, p 683, 684, 693

Several electronic countermeasures systems are described The B-1 RFS/ECM jamming transmitter system has been extended to cover Band 8, as well as 6 and 7, in-phase power stacking allows the output of individual jamming sources to be combined, and phased array antennas are employed The ALQ-171 (V) conformal countermeasures system, designed for the F-5, has a minimal effect on aircraft performance, reducing the maximum Mach number less than 4 percent at 36,000 feet Continuous-power amplitude-modulation noise, a constant-power AM pulse repeater, and a continuous wave repeater are employed singly or in combination, and are effective against multiple threats Future developments include the Modularised Infrared Transmitting Set consisting of an infrared transmitter and electronic control unit which provides 180 degree countermeasures coverage A B

A82-43468 A field guide for scanner and photographic missions. D L Hawley (EG & G, Inc , Multispectral Remote Sensing Dept , Las Vegas, NV) In American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers

Falls Church, VA, American Society of Photogrammetry, 1981, p 513-530 6 refs

The guide comprises separate sections for planning, executing, and evaluating a multispectral scanner and/or photographic mission The planning section addresses mission objectives, mission requirements, navigation, flight briefing, weather, communications, field/aircraft equipment, and logistics The mission requirements deal with general flight parameters of sunrise, sunset, equation of time, solar altitude, solar azimuth, duration of daylight, duration of civil twilight, duration of astronomical twilight, flight line headings, flight altitude, flight line coverage, flight line interval, and number of flight lines Among the scanner parameters discussed are the velocity/height ratio, scanner speed, and tape speed Navigation techniques are described, together with aircraft considerations C R

A82-43469 Loran-C navigation as an aid to aerial photographic operations. C W Dull (U S Department of Agriculture, Forest Service, Doraville, GA) and W H Clerke (U S Department of Agriculture, Forest Service, Atlanta, GA) In American Society of Photogrammetry and American Congress on Surveying and Mapping, Fall Technical Meeting, San Francisco, CA, September 9-11, 1981 and Honolulu, HI, September 14-16, 1981, ASP Technical Papers

Falls Church, VA, American Society of Photogrammetry, 1981, p 531-541 13 refs

The navigational accuracy obtained during a wide variety of operational aerial photographic missions utilizing a Loran-C TDL-424 navigator is evaluated The navigational displays, steering, and data outputs are discussed, and the parallel track steering and preprogrammed flight pattern are shown The navigational accuracy evaluation includes a parallel flightline evaluation for three missions, a comparison of an aerial photographic mission with and without Loran-C, evaluation of return flight accuracy for a predescribed flightline, and overflights of predetermined exposure stations C D

A82-43571 # Implicit model-following technique - Application to the design of longitudinal stability augmentation systems. V Mocanu (National Institute for Scientific and Technical Research, Bucharest, Rumania) *Revue Roumaine des Sciences Techniques, Série de Mécanique Appliquée*, vol 26, Nov -Dec 1981, p 845-853 13 refs

Implicit model-following and static decoupling techniques are applied to the design of a control and stability augmentation system for a control-configured, relaxed static stability version of the F-4 aircraft Implicit model-following allows the computation of the optimal feedback law which minimizes differences between aircraft and model dynamics for the cases of distinct flying qualities The static decoupling technique is used for the computation of a feedforward matrix which decouples the steady state system outputs O C

A82-43577 Technology for tomorrow's business aircraft. M Grangier *Interavia*, vol 37, Sept 1982, p 875, 876

Improvements of business aircraft by the end of the decade are forecast, which pertain to their structure, aerodynamics, propulsion and avionics The increased use of composite materials in place of metal should reduce the empty weight of aircraft about 20 percent, but problems with testing and residual strength after damage must be resolved Aerodynamic changes may include the use of new wing shapes, canard foreplanes, and wings with relative thicknesses of more than 15 percent at the root, aspect ratios over 10, and a sweep of 35 percent or more It is hoped that engine power output will be increased 30 percent over current units by increasing the bypass ratio or by modifying the fan blade shape Improved energy efficiency is to be expected from all of these changes A B

A82-43578 Piston engines for general aviation - Is the revolution really under way. M Grangier *Interavia*, vol 37, Sept 1982, p 898-900

The search for higher efficiency, lower fuel consumption engines for general aviation is prompting the consideration of alternative fuels and engine designs The Thunder engine, based on a McLaren/Chevrolet 8 cylinder automobile engine, is being developed to produce 700 HP at 4,400 rpm with fuel consumption of 0 40 pounds/HP/ hour and to run on a variety of fuels Liquified petroleum gas is an attractive alternative fuel because its cost is 40-60 percent less than aviation gasoline with less pollution and engine carbon deposits, conversion of conventional engines is relatively simple, and it does not alter the flying characteristics of an aircraft Alcohol is a possible fuel, but it gives lower engine performance than gas and could call for altitude restrictions Diesel power is being considered through a 2 stroke 4 cylinder star configuration diesel for NASA Finally, weight and cooling present problems to be overcome, as well as the high pressure fuel injection system necessary A B

A82-43579 The cruise missile era dawns. J P Geddes *Interavia*, vol 37, Sept 1982, p 919-923

In December 1982, 192 cruise missiles will be deployed on 16 B-52's, and will be the first out of over 4,000 In addition to the ALCM, the Tomahawk SLCM will be produced in several versions for surface launch, submarine launch and ground launch, the last of which will become operational in mid-1984 All these versions employ common propulsion and internal guidance systems with Terrain Contour Matching, and have a cruise speed of 550 mi/h and a range of 1550 nmi A fifth version, the Medium Range Air-to-Surface Missile, will become operational in late-1986 The size of the anticipated production is made possible by the missile's low cost (about $1 million), and is made necessary by its vulnerability, considering

exposure to enemy counter-measures for some three hours before reaching target Nuclear arming requires 24 flight events, and occurs only in the target area Future developments center on enabling small engines to run at 3000 C for more power and range A B

A82-43583 What has hypersonics research led to - Some examples of progress and spin off /17th Handley Page Memorial Lecture/. J L Stollery (Cranfield Institute of Technology, Cranfield, Beds , England) *Aerospace* (UK), vol 9, Sept 1982, p 14, 15, 21-26 23 refs

Hypersonic flight poses considerable problems due to the high kinetic heating, the great power required, and the difficulties in maintaining structural integrity Temperatures over 1000 K are encountered, and installed thrust must equal *maximum takeoff weight The retractable spike on the Trident Missile was one* of the first applications of a technique which prevents the boundary layer from becoming a bow shockwave, and reduces kinetic heating Because no wind tunnel duplicates all the aspects of hypersonic flight, the flights of the Space Shuttle provided the opportunity to evaluate theoretical predictions of the aerodynamic conditions at speeds from Mach 27 to 0 9 Spin-offs from hypersonic research include the intermittent shock tube and the gasdynamic laser as well as developments for power cells and magnetohydrodynamics A proposed laser powered hypersonic aircraft is also discussed A B

A82-43588 *Aeronautical research and development in Europe* - Perspectives (La recherche et le développement aéronautiques en Europe - Perspectives). J C Wimpenny (British Aerospace Public, Ltd , Co , Aircraft Group, Kingston-upon-Thames, Surrey, England) *(Journée des Pionniers Européens, 7th, Toulouse, France, May 6, 1982) L'Aéronautique et l'Astronautique,* no 94, 1982, p 3-15 In French

Processes of design-to-cost, construction, and use of aircraft up to the year 2000 are discussed, with attention given to the purposes, directions, and constraints on research and development Factors influencing the commercial R&D activities are identified as competition and increases in the market, which should expand at least over the extent of the period covered The demand for new services is driven by attempts to capture markets outside the country of origin, faster flights between locations, and the cost of operations Raises in fuel costs create new markets for manufacturers to satisfy demands of commercial customers for greater flight economy Collaborative efforts by different European companies in R&D activities are reviewed, along with specific program goals to lower manufacturing costs and extend the lifetime of the aircraft M S K

A82-43589 Parietal jets. I (Les jets pariétaux. I). L Rosenthal (Centre de Documentation de l'Armement, Paris, France) *L'Aéronautique et l'Astronautique,* no 94, 1982, p 17-30 25 refs In French

Analytical models are explored for the characteristics of jet flow over a wall in order to describe the performance features of parietal jets in varying applications Attention is given to physically modeling the characteristics of the Coanda and Young effects, particularly in the case of a jet exhaust directed over an inclined flat plate Experimental studies with free stream velocities equal to zero are reviewed, and numerical models for conditions where the freestream velocity is not equal to zero are noted to require either an integral or a finite difference method for solution of the separation point Applications of the parietal jets in helicopter blades, STOL aircraft, engines, thrust reversers, and fluidics are mentioned M S K

A82-43603 † Survey and design of airfields (Izyskaniia i proektirovanie aerodromov). G I Glushkov, V F Babkov, L I Goretskii, and A S Smirnov Moscow, Izdatel'stvo Transport, 1981 616 p 15 refs In Russian

The fundamentals of airfield and airport design are reviewed with reference to the current requirements and standards, including those of ICAO and State Standard of the USSR, and results of the latest research in this area Topics discussed include airport layout, calculation of the airfield size, vertical planning of the airfield, drainage systems, design of airfield pavements, design of unpaved airfields, heliports, airfields for VTOL aircraft, and, finally, surveying and project development V L

A82-43659 NASA studies business aircraft avionics. B M Elson *Aviation Week and Space Technology,* vol 116, Apr 26, 1982, p 119, 121, 125 (4 ff)

NASA is evaluating an approach to digital avionics using as a testbed a two-engine Cessna 402B equipped with a demonstration advanced avionics system (DAAS) DAAS functions include autopilot/flight directing, navigation/flight planning, flight warning, and weight and balance computations, and examples of system capabilities are air traffic control Mode S message processing, built-in testing, and ground simulation Built around eight bus-connected microprocessors, DAAS uses digital implementations of the algorithms used for defining the analog autopilot, and incorporates some KFC 300 features Selector switch, bug selection, and wind velocity are also considered Cost constraints impose the storage of 10 navigation aids and 10 waypoints, and the use of a small CRT, but some research is being done in flat panel technology and also the use of low-cost inertial sensors should compensate for these problems R K R

A82-43660 # Theoretical and experimental investigation of some nonlinear characteristics of electrohydraulic servovalves (Theoretische und experimentelle Untersuchung einiger nichtlinearer Eigenschaften elektrohydraulischer Servoventile). M Rizk Stuttgart, Universität, Fakultät für Luft- und Raumfahrttechnik, Dr -Ing Dissertation, 1981 119 p 29 refs In German

Electrohydraulic control methods are used in a number of applications, including those related to positioning operations performed in connection with the control of aircraft These control methods are based on the employment of *electrohydraulic servovalves The characteristics of the servovalves have an* essential effect on the system behavior However, the information available concerning the nonlinearities with respect to these characteristics is in many respects insufficient The present investigation is concerned with a theoretical and experimental study of all possible nonlinear characteristics of electrohydraulic servovalves, with the exception of hysteresis An open loop control system was built for the conduction of the experiments The effect of the bypass choke valve on the pressure sensitivity of the first hydraulic stage is calculated, while aspects of hydraulic stiffness in the second stage are experimentally studied Attention is given to the effect of magnetic and hydraulic saturation on valve characteristics, the effect of manufacturing tolerances, and the effect of the supply pressure G R

A82-43724 # An examination of the dynamics of rotary machines (Contribution à l'étude dynamique des machines tournantes). R Henry Lyon I, Université, Docteur d'Etat ès-Sciences Thesis, 1981 167 p 74 refs In French

Numerical models are developed and tested experimentally for accuracy in modeling static and dynamic behaviors of disk-blade systems in conditions of equal or unequal rigidity of the disks and blades The static and dynamic analyses of thin blades in rotation are carried out through a finite element method, with the choice of elements, boundary values, and matrices being discussed Attention is given to the calculation of frequencies and modes of repetitive circular systems, with mention made of potential and kinetic energy analyses of substructures using reduced matrices A computer program, DISCO, is introduced and applied to a disk-blade lattice and an annular plate The frequencies and modes of an industrial centrifugal compressor wheel are calculated and compared to data, and an accuracy of 5 percent is demonstrated to be possible at cost effective levels of computation M S K

A82-43742 A fatigue crack growth theory based on strain energy density factor. R Badaliance (McDonnell Aircraft Co , St Louis, MO) In Absorbed specific energy and/or strain energy density criterion, Proceedings of the International Symposium, Budapest, Hungary, September 17-19, 1980 The Hague, Martinus Nijhoff Publishers, 1982, p 329-345 7 refs

The strain energy density at the crack tip is used to characterize the fatigue crack growth behaviro of metallic materials Having postulated that the rate of crack propagation is a function of the range of the strain energy density, this range is used to correlate subcritical growth data of certain aluminums, titaniums, and steels A parameter which incorporates yield stress, true ultimate stress, and stress ratio is devised to account for stress ratio effects A single crack growth curve for each material is developed by numerical procedures, and these constant amplitude curves are then used in conjunction with cycle-by-cycle integration schemes to predict spectrum fatigue lives of center cracks and elliptic surface flaws in plates subjected to fighter aircraft landing gear stress history The results show good agreement with data from experimental tests N B

A82-43753 # An implicit finite-volume method for solving the Euler equations. A Lerat (Ecole Nationale Supérieure d'Arts et Métiers, Paris VI, Université, Paris, France), J Sidès, and V Daru (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(Conférence Internationale sur les Méthodes Numériques en Dynamique des Fluides, 8th, Aachen, West Germany, June 28-July 2, 1982) ONERA, TP* no 1982-59, 1982 8 p 10 refs

Although the explicit methods which have been developed for the solution of steady or unsteady transonic flow Euler equations allow the prediction of supercritical flows around airfoils without restriction on shock wave strength and motion, they are computing time-intensive due to the limitation on the time step required for numerical stability This limitation is removed through the application *of the present, second-order and noniterative implicit method for the solution of* Euler equations An important feature of the present method is that the implicit terms are of the order of the truncation error, allowing simpler and easier treatment of boundary conditions The method is expressed in the finite volume formulation and applied to both steady and unsteady transonic flows The computing time reduction achieved while obtaining accurate results is noted O C

A82-43755 # Laser Doppler anemometry applied to the study of the airflow in the wake of an helicopter rotor. B Sellier and J Pigere (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(International Symposium on Applications of Laser-Doppler Anemometry to Fluid Mechanics, Lisbon, Portugal, July 5-7, 1982) ONERA, TP* no 1982-61, 1982 12 p 6 refs

The equipment, instrumentation and results of a laser Doppler anemometry

study of helicopter rotor wake airflow are described Azimuthal and radial distributions of vertical induced velocities and tip vortex paths are determined for the cases of hovering and forward flight Attention is given to the arrangement of the laser velocimeter system and the data acquisition system, which can operate in both a 'wake' and a 'histogram' mode The former simultaneously obtains the two induced velocities and the angular position of the blade, while in the latter, velocities are measured for one given azimuthal blade location O C

A82-43756 # Preliminary experiments on a centrifugal research compressor using a laser -2- focus velocimeter. J Labbe, G Janssens, and P Avram (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(International Symposium on Applications of Laser-Doppler Anemometry to Fluid Mechanics, Lisbon, Portugal, July 5-7, 1982) ONERA, TP* no 1982-62, 1982 10 p 5 refs

Laser velocimetry methods suitable for the measurement of turbomachine flow velocities must take into account the periodicity of rotation and minimize secondary effects caused by laser light reflection from shroud, hub and impeller surfaces These difficulties are greatest in centrifugal compressors due to shape of the casing, blade geometry, and the complexity of flow geometry near the blade tips A two-focus laser velocimeter is described whose mean values, measured outside the centrifugal compressor impeller studied, are in accordance with those determined in the same test section by classical pressure probe methods O C

A82-43757 # Application of laser velocimetry to large industrial wind-tunnels. A Boutier and M Canu (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(International Symposium on Applications of Laser-Doppler Anemometry to Fluid Mechanics, Lisbon, Portugal, July 5-7, 1982) ONERA, TP* no 1982-63, 1982 11 p Research supported by the Direction des Recherches, Etudes et Techniques

Laser velocimetry has been recently applied in two large industrial transonic wind-tunnels at Modane In S3 Modane, a blow-down facility, a velocity map has been obtained around a model, with a two-dimensional laser velocimeter using forward scattered light and two XYZ benches, one on each side of the test section the whole velocimeter was monitored by a mini computer during the runs At S2 Modane, preliminary experiments have shown that a laser velocimeter can be operated in a pressurized chamber and can provide good results, if some precautions indicated in the paper are taken (Author)

A82-43792 Recent results in main beam nulling. R N Adams, W G Brodsky, L L Horowitz, and K D Senne (MIT, Lexington, MA) In ICC '81, International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record Volume 1 New York, Institute of Electrical and Electronics Engineers, Inc , 1981, p 10 5 1-10 5 5 USAF-sponsored research

The use of an adaptive, multibeam antenna, which nulls main-beam interferers while tracking and receiving the friendly signal, can significantly reduce the size of the link outage region which results when interferers pass through the main beam of a receiving antenna aboard an aircraft A multibeam adaptive antenna system which responds to these technical requirements has been designed and partially fabricated Details of the system design are reviewed, as are preliminary results of laboratory and antenna test range experiments (Author)

A82-43821 The aviation route forecast /ARF/ program - An interactive system for pilot self-briefing. E M Gross, T Laufer (NOAA, National Weather Service, Silver Spring, MD), and T R Mitchell (Mitre Corp , Bedford, MA), and F J Steckbeck (FAA, Washington, DC) In ICC '81, International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record Volume 2 New York, Institute of Electrical and Electronics Engineers, Inc , 1981, p 32 1 1-32 1 9 19 refs

A more effective procedure of making weather information available to the user would lead to a significant improvement in weather services A description is presented of the evolution of the Pilot Self-Briefing program and the Aviation Route Forecast (ARF) development effort These two program efforts have been integrated so that users can directly acquire weather information tailored by the computer to their specific interests As presently constituted, the ARF concept is oriented toward aviation, but the basic hardware, software, and algorithms could be adapted to other forecasting applications Attention is given to the background regarding the pilot self-briefing development, the ARF concept and development, the ARF output processing rationale, the ARF output organization, pilot self-briefing data reduction due to ARF, past ARF testing, future ARF testing, and the need for forecaster analysis support systems G R

A82-43840 Electronic warfare system measure of effectiveness. A B Glenn (Mitre Corp , McLean, VA) In ICC '81, International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record Volume 2 New York, Institute of Electrical and Electronics Engineers, Inc , 1981, p 36 6 1-36 6 5

A methodology is proposed to determine the measure of effectiveness (MOE) of systems used in electronic warfare (EW) This MOE will use a combination of both qualitative and quantitative measures which are based on the EW system's test data, the threat environment, and the necessary mathematical analysis The MOE which is quantitative gives a more accurate indication of the EW effectiveness than the commonly used qualitative measures of high-medium-low A simple example is given to illustrate how the MOE of an anti-jam (AJ) Ground Control Intercept (GCI) communications system can be determined for a specific hypothetical scenario (Author)

A82-43870 Combined amplitude-phase modulation for a VHF communication link. G Benelli, G Borghi, V Cappellini, E Del Re, and S Gueli (Firenze, Università, Florence, Italy) In ICC '81, International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record Volume 3 New York, Institute of Electrical and Electronics Engineers, Inc , 1981, p 56 6 1-56 6 6 8 refs

In this work a combined amplitude-phase modulation communication system is considered Amplitude modulation is used to transmit a voice signal, phase modulation is used for data transmission Such a scheme was studied as a possible realization of a data channel between aircraft and ground stations The performance of the combined modulation system is evaluated through computer simulation in the two cases AM-PSK and AM-MSK (Author)

A82-43893 A new class of routing protocols for a proposed computer network linking tactical radar sites. C Warner (U S Naval Ocean Systems Center, San Diego, CA) and J Spragins (Clemson University, Clemson, SC) In ICC '81, International Conference on Communications, Denver, CO, June 14-18, 1981, Conference Record Volume 4 New York, Institute of Electrical and Electronics Engineers, Inc , 1981, p 73 6 1-73 6 10 6 refs

An advanced forward area tactical radar network, which has been studied for the Air Force Electronic Systems Division, can be viewed as a novel form of computer network, sharing many of the problems of more standard computer networks but with other unique problems resulting from the specialized nature of the application This network will link together a number of short range tactical radars, each with associated data processing equipment, spaced at nominal distances of approximately 30 miles, and enable each radar site to have a complete file of tracks for all targets seen by any radar in the network In addition, the communication network is expected to be used for transmission of a variety of other types of command and control messages As part of the design of this network, a new class of distributed and adaptive routing protocols has been developed The results of simulation studies of these routing algorithms are presented (Author)

A82-44091 # Generation of boundary-conforming grids around wing-body configurations using transfinite interpolation. L E Eriksson (Flygtekniska Forsoksanstalten, Bromma, Sweden) *AIAA Journal,* vol 20, Oct 1982, p 1313-1320

A computational procedure for generating three-dimensional nonorthogonal surface-fitted mesh systems around wing-fuselage configurations is presented The method is based on the concept of transfinite interpolation, which has been extended to handle very general mapping function specifications at the boundaries, thereby making it possible to generate single-block mappings with geometry data specified only at the outer boundaries of the computational domain Since it is a direct algebraic mapping technique, the method is very inexpensive in terms of computer cost Different types of possible mappings are compared with respect to resolution and economy of nodal points A procedure for a novel type of mapping, designated type O-O, is described and several plots of generated grids demonstrate the capabilities of the method The singular lines inherent in every three-dimensional mesh for this type of surface geometry are also discussed (Author)

A82-44092 # Damped Euler-equation method to compute transonic flow around wing-body combinations. A Rizzi (Flygtekniska Forsoksanstalten, Bromma, Sweden) *AIAA Journal,* vol 20, Oct 1982, p 1321-1328 22 refs Research sponsored by the Forsvarets Materielverk

Inviscid transonic flows containing either strong shock waves or complex vortex structure call for the Euler equations as a realistic model Presented here is a computational procedure for solving the Euler equations for transonic flow around a wing and fuselage upon an O-O mesh generated by transfinite interpolation An explicit time-marching finite-volume procedure solves the flow equations and features a nonreflecting far field boundary condition, an internal mechanism for temporal damping, and use of the local time step, all of which improve the convergence of the computation Converged after several hundred iterations, results computed on the CYBER 203 vector processor are compared with experimental data and potential-flow computations The Euler-equation model is found to predict the existence of a tip vortex created by inviscid flow separation in the downstream region of the tip of the M6 wing where the radius of curvature approaches zero (Author)

A82-44100 A method to determine runway capacity. M Jelaska and T Jovanovic (ZG-Prometni Institut, Ljubljana, Yugoslavia) *Airport Forum,* vol 11, Aug 1982, p 42-46

Two approaches to the calculation of runway capacity are presented, and are compared by application to a specific situation The analytic model provides point-by-point estimates of the capacity for given percentages of landings out of the total number of operations, but the relationship between capacity, input flow and average delays per aircraft cannot be determined The simulation model, employing the Monte Carlo method, takes into consideration the input flows into the system, so average aircraft delays can be estimated and the relationship of the capacity to the values of the parameters can be determined This makes the simulation model more suitable for the analysis of airport operation A block diagram of the simulation model is included A B

A82-44218 # New approaches to fighter design. *Dornier-Post* (English Edition), no 3, 1982, p 4-6

The principles of the development of a cost-effective weapons system which could replace the Luftwaffe F-4 Phantom tactical combat aircraft are summarized The first principle which Dornier has proposed is maximum fleet effectiveness, and the approach to this goal includes such considerations as determining the effects of aircraft, weapons, and equipment requirements on costs, evaluating the effects of requirements on combat effectiveness, and identifying cost-effective substitute performances A second principle is that new technologies be developed which are based on cost-effectiveness criteria, rather than performance criteria Criteria include the use of cost-effective carbon fiber materials, and plastic-formed and diffusion-bonded titanium components The tailless all-wing aircraft is considered as an example of the integration of new technologies for new weapons systems capabilities Operational analysis reveals that the dry thrust concept can match tactical fighters' combat performance, and, in some missions, offers a superiority of 50% R K R

A82-44219 # New technologies for future fighters. *Dornier-Post* (English Edition), no 3, 1982, p 7-10

Recent activities underway at Dornier in the fields of aerodynamics and flight mechanics are presented The Alpha Jet is being used to test a transonic wing (TST), which, compared to the standard wing, has an 18% thicker profile, advanced wing/fuselage blending, and maneuver flaps comprised of leading-edge slats and trailing-edge flaps Tests have shown an improvement in drag-rise and buffeting limits, and the thicker wing permits carrying additional fuel without external tanks The maximum lift coefficient has been increased by approximately 20%, allowing higher stationary and unstationary load factors, thus improved maneuverability In addition, direct side force control (DSFC) tests, aimed at accelerating aircraft alignment, have shown that the system is good in all three axes, the drag control mode is effective with decelerations of up to 0 75 g in horizontal flight, and well-controlled steep dives at constant speed are possible A combination of the TST and DSFC programs will be tested on a modified Alpha Jet R K R

A82-44220 # Perspectives for the use of remotely piloted vehicles in military technology. W Klaar *Dornier-Post* (English Edition), no 3, 1982, p 23-29

An overview of remotely piloted vehicle (RPV) technology is presented in terms of crew replacement, design possibilities, and mission tasks In air attack applications, one-way missile concepts are preferred, as they use airborne signal processing and need no remote pilot Terrain contours have been used for en-route navigation, and more precise methods are being investigated For mission planning, computer-based methods and systems must be used In addition, unmanned carrier platforms and net recovery methods are being developed at Dornier This recovery method reduces launch vehicle weight by 8-15%, and ensures well-controllable landing decelerations Applications for unmanned systems include air target simulation, aerial reconnaissance, and electronic warfare tasks R K R

A82-44221 # Image processing in tactical flight guidance. *Dornier-Post* (English Edition), no 3, 1982, p 32-38

Work performed by Dornier in the field of image processing in tactical flight guidance is presented Image-forming sensors scan the scene and store the energy potential to form a TV image, and sensors are being designed for the infrared range and the millimeter wave range To remove errors and imperfections from the image, preprocessing methods such as a two-dimensional high pass filter, a histogram for contrast spreading, and inverse filtering methods are used An object recognition process is explained which involves a comparison between stored images and recently scanned area images Pattern and feature recognition can be achieved by two approaches The first is a direct image comparison (image point brightness value), and the second consists of transforming two images into a single feature space for comparison Images which represent these processes are included R K R

A82-44222 # Automated flight data processing. K Blumenwitz *Dornier-Post* (English Edition), no 3, 1982, p 39-43

The automated flight data processing (AFA) system for use in the Alpha Jet consists of six components which are (1) a digital computer with two disk drives, (2) an electronic cabinet with central voltage cutoff, (3) a single-color screen (38 cm x 28 cm), (4) a screen copier which supplies an A4 hardcopy of the screen display, (5) a printer with keyboard, and (6) an elevated and inclining map table Stored meteorological data can be updated for a planned mission, and once they are verified, a low-level or a high-level mission, or any combination of the two, can begin Due to time savings in low- and high-level flight planning, the pilot has more time to study the planned flight path and the available flight information It is mentioned that the AFA has been designed such that it is adaptable to the requirements of other flying weapons systems R K R

A82-44223 # Interactive graphics design with CODEM. L Thieme *Dornier-Post* (English Edition), no 3, 1982, p 49-52

The Computer-Graphics Augmented Design and Manufacturing System (CODEM) is user-optimized and can be connected to other program systems CODEM offers a time savings in making precise drawings, resulting in a cost savings and a shorter project cycle time Aspects to consider when the system is introduced include user participation during preparations, computer configuration planning which avoids lengthy response times, and well planned file organization and data security In addition, it is found that a six-hour work day for each designer is required, and such tasks as short discussions and consulting, calculations, and looking up of standard components can be performed at the display In order to ensure uninterrupted and transparent data transfer in the design, development, and production of the aircraft, link-ups with other program systems are made via the defined interfaces of CODEM R K R

A82-44224 # The design of airfoil profiles with trailing edge loading in transonic flow (Conception de profils à charge arriere en écoulement transsonique). E Lavigne *Toulouse, Conservatoire National des Arts et Métiers, Ingenieur en Aérodynamique Thesis, 1981 112 p In French Research supported by the Service Technique des Programmes Aéronautiques*

The results and techniques of a series of studies to define airfoil profiles with satisfactory characteristics in transonic flows are presented An inverse numerical model for transonic flows past an airfoil is developed, along with techniques for a two-dimensional analysis of transonic flows coupled to a boundary layer The results of trials performed in wind tunnels with perforated walls to diminish the intensity of reflected waves are presented, along with a description of the instrumentation, including 76 pressure sensors, photographic equipment, and carborundum bands to induce transition to separation Results are presented for configurations producing higher maximum lift, augmented buffeting lift, and reducing drag It is shown that increasing the trailing edge loading increases drag M S K

A82-44231 # Radionavigation for civil aviation (La radionavigation de l'aviation civile). O Carel (Direction Générale à l'Aviation Civile, Paris, France) *Société des Electriciens, des Electroniciens et des Radioélectriciens, Journée d'Etudes sur l'Electronique dans l'Aéronautique, Nice, France, Nov 26, 27, 1981, Paper 811760* 17 p In French

Radionavigation systems involving beacons either on the ground or on satellites which transmit and receive signals from general aviation aircraft for fixing location and distance are reviewed The systems are intended to allow flight in the shortest possible route, to aid in avoiding ground obstacles, to keep flight within controlled airspace and aid in avoiding air collisions, and to aid landing in safe and timely conditions In France, ground based beacons comprise 180 radiocompasses, 30 VHF goniometers, 70 VOR installations, 80 ILS stations, 30 DME units, and the ILS successor, the MLS Additionally, the Navstar global positioning system will eventually feature 18 satellites to give continuous worldwide coverage The use of frequency synthesizers to allow high volume multiple access to DME units is noted, along with widespread use of the MLS to replace ILS beacons Finally, the increasing radio noise from citizen band radios, television, and industry as a threat to VHF radionavigation systems' effectiveness is mentioned M S K

A82-44232 # The ILS in Category III operations (L'ILS dans les opérations de Catégorie III). J P Dupont (Direction Générale à l'Aviation Civile, Service Technique de la Navigation Aérienne, Paris, France) *Société des Electriciens, des Electroniciens et des Radioélectriciens, Journée d'Etudes sur l'Electronique dans l'Aéronautique, Nice, France, Nov 26,t27, 1981, Paper 811761* 19 p In French

The evolution of ground-based equipment for support of an inertial landing system (ILS) for the French national air routes is described, along with nominal functioning characteristics The approach trajectory is defined by a track represented by a three degree angle from the ground which includes the point of touchdown The ILS consists of two signals giving angular references within a limited volume The signals register on the same display grid for the pilot, while the autopilot performs functions of maintaining center of gravity and aligning the aircraft in its approach, taking into account both lateral and longitudinal motions Specific features of monitoring the radio beacons to assure accuracy are outlined, and attention is given to the certification process All weather landing is made feasible by use of the ILS, even in conditions of extremely low ceiling M S K

A82-44233 # The flight management computer (Calculateurs de gestion du vol). J Grossin (Société Nationale Industrielle Aérospatiale, Direction des Etudes, Toulouse, France) *Société des Electriciens, des Electroniciens et des Radioélectriciens, Journée d'Etudes sur l'Electronique dans l'Aéronautique, Nice, France, Nov 26, 27, 1981, Paper 811762* 23 p In French

Numerical models and their implementation into flight management computers to ensure maximum flight economies in the air transport industry are discussed The FMC system comprises a data bank, a memory-filed flight plan, built-in programs for determining the position of the aircraft and optimizing the performance, a display system for alerting the pilot to autopilot actions or recommending actions, and a series of sensors to monitor the aircraft interior, the environment, and waypoints on the flight path Optimization is shown to reside in minimizing both fuel consumption and the flight time The flight is divided into three phases in the computer ascent, cruise, and descent, with calculations proceeding through use of a singular perturbation algorithm The necessity of the computer being able to receive and process data in-flight is stressed, and the implementation of bubble chips and magnetic disks is noted M S K

A82-44234 # Electronic aircraft stabilization (Stabilisation d'un avion par l'électronique). A Chadeau (Ministère de la Defense, Service Technique des Télécommunications et des Equipements Aéronautiques, Paris, France) *Société des Electriciens, des Electroniciens et des Radioélectriciens, Journée d'Etudes sur l'Electronique dans l'Aéronautique, Nice, France, Nov 26, 27, 1981, Paper 811763* 13 p In French

The performance, components, circuitry, and degree of totality of electronic autopilots are discussed The systems are noted to alleviate the pilot work load in cruise flight and bad weather conditions as well as correcting instabilities which are beyond human capability and freeing the pilot for other tasks, such as managing armaments Electronic autopilots have been shown to be capable of maintaining trim in pitch and roll, stabilizing the flight slope, course, altitude, speed, the course as determined by fixed radio beacons, landing an aircraft, and in controlling flare A block diagram is furnished of an electrohydraulic servocontrol system, and the limits of on board computers to calculate responses to changing demands are discussed, along with safety procedures Finally, programmed features for limiting and assessing the gravity and probability of malfunctions are outlined M S K

A82-44235 # Air-air anticollision systems (Systèmes d'anticollision air-air). A Michel (Direction Générale à l'Aviation Civile, Service Technique de la Navigation Aérienne, Paris, France) *Société des Electriciens, des Electroniciens et des Radioélectriciens, Journée d'Etudes sur l'Electronique dans l'Aéronautique, Nice, France, Nov 26, 27, 1981, Paper 811764* 47 p In French

The requirements for a successful air-air on-board anticollision system for aircraft are reviewed and test results to date on prototype equipment are discussed The systems are noted to require the capability of detecting all possible collision dangers, must function at all times, offer clear avoidance paths, be compatible with air traffic control and other anticollision systems, function in controlled and uncontrolled airspace, have a low rate of false alarms, and be able to take into account multiple dangers in dense air traffic Attention is given to BCAS (beacon collision avoidance system), a system equipped with a secondary radar set to detect the presence of other aircraft, measure the separation distance and altitude, discern those aircraft which pose a threat, and calculate an avoidance path The safety maneuver can be done in coordination with the other aircraft's system if compatibility is present between the on-board systems Block diagrams are furnished of a test system of the BCAS, along with an analysis of operational procedures M S K

A82-44236 # New image generators for the next generation of civil aircraft (Nouvelles visualisations pour la prochaine génération d'avions civils). M Bernard and D Giroux (Thomson-CSF, Division Equipements Avioniques, Malakoff, Hauts-de-Seine, France) *Société des Electriciens, des Electroniciens et des Radioélectriciens, Journée d'Etudes sur l'Electronique dans l'Aéronautique, Nice, France, Nov 26, 27, 1981, Paper 811767* 21 p In French

The results of studies of problems, benefits, and applications, and design of CRT displays for private aircraft are discussed Particular attention is given to avionics for the Airbus A 310 and the A 300-600 aircraft, and the possibilities of enhancing the reliability of pilot data displays while reducing the volume necessary for cockpit instrumentation The CRTs will produce color images, and in being coupled to the central computer, will permit the pilots to call up a wide range of data on any screen with the mode of display adapted for each stage of a flight The displays will follow the flight path and provide changing parameters during takeoff and during automatic adaptation during velocity changes to maintain efficient flight under changing mass due to fuel being consumed M S K

A82-44238 # New trends and concerns in the airliner radio equipment market (Nouvelles tendances et nouvelles préoccupations sur le marché des équipements radio avions de ligne). H Medioni (Electronique Aérospatiale, Le Bourget, Seine-Saint-Denis, France) *Société des Electriciens, des Electroniciens et des Radioélectriciens, Journée d'Etudes sur l'Electronique dans l'Aéronautique, Nice, France, Nov 26, 27, 1981, Paper 811768* 10 p In French

The types of new electronics for avionics communication and navigation displays which are currently available to airlines, and problems inherent in assuring that microprocessors installed on fleet aircraft are not made obsolescent in too short a time are discussed Airline regulations in France which require the interchangeability of certain electronic equipment in order to assure, at least in this respect, the financial viability of making repairs to electronic equipment in a safe manner with a short down time are noted One requirement for equipment such as multiplexers, multiemitters/multireceivers, and locators has been in operation at 1 Mbit/sec, while monoemitters in open switch position transmit at 12 kbit/sec Problems which are expected to occur in flight-qualifying totally automated pilot systems, including landing systems, are explored M S K

A82-44239 # Satellite localization of aircraft accidents - The Sarsat program (La localisation par satellite des accidents d'avion - Le programme SARSAT). M Leveque (Centre National d'Etudes Spatiales, Direction des Programmes et de la Planification, Paris, France) *Société des Electriciens, des Electroniciens et des Radioélectriciens, Journée d'Etudes sur l'Electronique dans l'Aéronautique, Nice, France, Nov 26, 27, 1981, Paper 811765* 24 p In French

Features of the search and rescue satellite aided tracking (Sarsat) system, which will aid in locating air and seacraft in distress conditions, are outlined The first Sarsat will be launched in 1982 and a globally operating system is envisioned by 1990 The program, a joint effort by the U S and Canada beginning in 1976, was joined by the French in 1977 for coordination with the Sargos program, and by the Soviet Union for the Cospas program Doppler location by Sarsat will comprise beacons operating between 121 5-243 MHz for demonstration purposes, and then use beacons at 406 MHz in cooperation with the Sargos system Repeaters are used if a distress signal in the 121 5-243 MHz band is received by an NOAA spacecraft equipped with SAR The distress signal is stored on board and transmitted by downlink to a ground station when the satellite recrosses the continental U S or Canada M S K

A82-44244 # Pneumatic tire model for aircraft simulation. J R Kilner (Boeing Military Airplane Co , Seattle, WA) *Journal of Aircraft*, vol 19, Oct 1982, p 851-857 5 refs Research supported by the Boeing Military Airplane Co

The development of a tire model for the prediction of vertical and drag loads in response to large discrete surface obstacles shorter than the tire footprint length is presented The tire is modeled as a toroidal membrane with the objective of characterizing the enveloping properties of the tire An explicit set of equations is used to calculate the tire footprint in contact with a user specified surface profile, the tire volume, the pneumatic pressure, and the resultant vertical and drag loads at the wheel axle Tire carcass and bottoming loads are also predicted The model is designed to be computationally efficient for use with aircraft digital taxi simulations Model predictions are compared with tire test data for low-speed fixed axle excursions over short rectangular bumps and dips Excellent quantitative correlation is demonstrated (Author)

A82-44245 # Transonic flutter and response analyses of two 3-degree-of-freedom airfoils. T Y Yang (Purdue University, West Lafayette, IN) and C H Chen *Journal of Aircraft*, vol 19, Oct 1982, p 875-884 33 refs Grant No AF-AFOSR-78-3523

Time-response and flutter analyses are presented for a conventional and a supercritical airfoil which are oscillating with plunge, pitch and aileron pitch degrees-of-freedom (DOFs) in small disturbance transonic flow, using the LTRAN2-NLR transonic code to calculate aerodynamic characteristics The flutter speeds associated with the bending-torsion branch of aeroelastic parameters are plotted against Mach number for different parameter values, and the transonic dip phenomenon is demonstrated The flutter modes are studied by plotting the flutter speed, amplitude ratio, and phase difference at various Mach numbers against the mass ratio for both a 2DOF and a 3DOF case Time-response results are given for the conventional and supercritical airfoils at Mach 0 85 and 0 765, respectively O C

A82-44246 * # Higher-order flow angle corrections for three-dimensional wind tunnel wall interference. M H Rizk (Flow Research Co , Kent, WA) *Journal of Aircraft*, vol 19, Oct 1982, p 893-895 5 refs Contract No NAS1-16262

A second-order theory including camber effects in wind tunnel wall interference corrections is described Changes in the geometrical configuration of the model tested are avoided by introducing the camber correction as an equivalent angle-of-attack correction Tabular and graphic data are presented which indicate improved accuracy for second-order over first-order theory O C

A82-44291 Improving aircarrier water survival. C T Lindemann, Jr (Air Line Pilots Association International, Washington, DC) *SAFE Journal*, vol 12, Fall 1982, p 11-13

Existing deficiencies in planning, preparation and equipment for aircraft water accident survival are reviewed and recommendations made Many approved seat cushions are not adequate flotation devices for passengers, because the required level of buoyancy is lost after a few minutes of use, and because users have

about one-half of their heads immersed, speeding hypothermia Life vests designed for easy donning with improved buoyancy and hypothermia protection should be employed Slide/rafts, like those already installed in wide-body aircraft, should be developed for narrow-body aircraft, and airports should develop emergency plans for water accidents A B

A82-44293 Problems with the use of percentages in the analysis of AAES data. J E Vetter (U S Navy, Washington, DC) *SAFE Journal,* vol 12, Fall 1982, p 23-26, 28, 29

Techniques for rectifying common problems with the statistical analysis of in-service usage data for aircrew automated escape systems are outlined and illustrated The comparison of percentage data should be made with regard to the sample size and its variation Percentage points can be plotted along with a bar representing the confidence level Trend-line analysis should use the method of weighted least squares, when some points have a larger variance than others Pie charts can make a decrease in one component appear as an increase in another unless sample size is included Log-linear model analysis is recommended for the analysis of categorical data A B

A82-44467 # Mediating Mach's mechanics - Bombs away. D Spurgeon *Science Dimension,* vol 14, no 4, 1982, p 10, 12, 14

The Canadian National Aeronautical Establishment's (NAE) approach to the problems posed when cargo is carried externally at the speed of sound is presented At such speed flutter can occur, leading to the break-up of the vehicle In addition, stores released at transonic speeds may rise after a short fall as the aircraft moves ahead, and eventually collide with the tail section Wind tunnel experiments have been carried out using force-measuring devices to determine the results of simulated flying conditions These results can be scaled up to approximate real conditions, and may reduce the number of flight tests needed, while increasing the safety of actual tests By flying a loaded aircraft equipped with accelerometers in the wing tips, it is found that a precise velocity must not be exceeded in order to avoid flutter Weight, type, and suspension of the stores carried can influence this velocity Research on this problem has significant applications in the production of civilian aircraft R K R

A82-44468 XV-15 program update. T Thomason (Bell Helicopter Textron, Tilt Rotor Aircraft Dept , Fort Worth, TX) *Vertiflite,* vol 28, Sept -Oct 1982, p 12-15

After nearly 500 hours of total operating time, the operating characteristics of the Army/NASA XV-15 Tiltrotor aircraft are becoming clear Level flight at 301 knots, and descent at 345 knots have been demonstrated, as well as operation at 24,500 feet and between -0 5 and +2 7 G's, more than 100 full conversions have been made from the helicopter to the airplane mode and back In addition, the aeroelastic stability of the wing/pylon/rotor system, gust sensitivity and the effects of disk loading and tipspeed on downwash, noise and hover mode operations have been investigated, and do not limit the aircraft's capability, although further modifications are planned The Joint Services Advanced Vertical Lift Aircraft Development Program has been initiated partly as a result of the demonstration of the Tiltrotor concept A B

A82-44469 It's too logical - It'll never work /Commercial applications of the JVX/. J F Zugschwert *Vertiflite,* vol 28, Sept -Oct 1982, p 24-27

It is proposed that both military and commercial applications of V/STOL aircraft be developed by the Joint Services Advanced Vertical Lift Aircraft Fleet, the commercial models would be subject to, and suitable for wartime call-up Such cross utilization would have the benefit of spreading the R & D and acquisition costs over a larger base, and of reducing the total operational flying hour cost by permitting a return on investment from the commercial aircraft This proposal is also deemed appropriate for the Heavy Lift Helicopter and the Advancing Blade Concept aircraft A B

A82-44470 Helicopter commuters - An optimistic outlook. L K Smith *Vertiflite,* vol 28, Sept -Oct 1982, p 28-32

Current operations of helicopter airline services in the United States are reviewed along with past attempts at providing such a service Problems which plagued helicopter services in the past included the high number of maintenance hours per flight hour, high seat mile costs, percentages of on-time departures, labor-managment problems, and the need for city center heliports Technological advances have reduced maintenance time as well as reducing noise and vibration, and improving avionics and crashworthiness, it is expected that seat mile costs will also be made more competitive with those of fixed wing aircraft The recent start of helicopter shuttle operations by major airlines for their first-class and business-class passengers has reinforced the conviction that there is a need for helicopter commuter services A B

A82-44480 * # Minimum fuel horizontal flight paths in the terminal area. E Kreindler and F Neuman (NASA, Ames Research Center, Moffett Field, CA) *Journal of Guidance, Control, and Dynamics,* vol 5, Sept -Oct 1982, p 490-497 16 refs

A82-44481 # Maximum likelihood failure detection of aircraft flight control sensors. B Friedland (Singer Co , Kearfott Div , Little Falls, NJ) *Journal of Guidance, Control, and Dynamics,* vol 5, Sept -Oct 1982, p 498-503 11 refs

A recently developed maximum likelihood failure detection algorithm, based on processing the residuals from an observer designed on the assumption of no failures, is applied to the problem of detecting and correcting gyro or accelerometer failures in the vertical axis of an aircraft flight control system Design calculations are illustrated with a simplified dynamic model and the effectiveness of the failure detection method is demonstrated by simulation (Author)

A82-44482 # Minimum-time three-dimensional turn to a point of supersonic aircraft. C -F Lin (Wisconsin, University, Madison, WI) *Journal of Guidance, Control, and Dynamics,* vol 5, Sept -Oct 1982, p 512-520 13 refs

The objective of this paper is to present real-time, on-line, minimum-time three-dimensional turn to a point of supersonic aircraft The analytic aspect of the theory of optimal trajectories is emphasized This includes the general properties of optimal trajectories consisting of the integrals of motion and the characteristic features in engine and aerodynamic controls By using the integrals of motion the totality of the optimal trajectories can be obtained as a family of curves depending on a certain number of arbitrary constants The optimal control is obtained by geometrical method through the domain of maneuverability This makes explicit the switching characteristics of the optimal control, in particular when singular or chattering control is involved The optimality of singular thrust control and the optimal junction of different subarcs are analyzed The computation of the optimal trajectories is carried out using the aerodynamic and engine characteristics of a lightweight, high thrust-to-weight ratio supersonic fighter By using normalized control variables, i e , the thrust-to-weight ratio, the bank angle, and the load factor, results can be applied to any supersonic aircraft (Author)

A82-44695 # Design to life cycle cost capability of the PRICE models. M H Burmeister (RCA, Cherry Hill, NJ) *International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept 27-Oct 2, 1982, Paper 82-221* 8 p

PRICE is a family of three parametric cost predicting models, currently widely used in U S government and industrial circles A number of European organizations also use the PRICE models A case study, utilizing the PRICE Hardware and Life Cycle models, is presented here to illustrate the cost impact of maintainability considerations for Avionic equipment The study depicts a trade-off analysis to assess the economic impact of designing equipment with two different technologies for changing deployment scenarios This case study is not intended to provide a definitive answer on the level of technology to be employed in the design of avionics Rather, the purpose of this analysis is to illustrate the flexibility and utility of parametric estimating models Through the use of these parametric models, a practical method now exists to conduct multiple, rapid, design-to-life-cycle-cost trade-off analyses (Author)

A82-44699 # Consideration of an international private sector satellite search and rescue locating system. C M Case (Boeing Aerospace Co , Seattle, WA) *International Astronautical Federation, International Astronautical Congress, 33rd, Paris, France, Sept 27-Oct 2, 1982, Paper 82-236* 11 p 24 refs

This paper presents a rationale for the creation of a private sector organization to establish, finance, and operate an international satellite aided search and rescue locating system The social and political impact of such a system on the global community is examined Organizational structure, ownership, and control design issues are considered using Intelsat and Inmarsat as models Questions of financial support including source and stability of income streams are addressed Search and rescue requirements and satellite design trades are considered, and a conceptual network design is described (Author)

STAR ENTRIES

N82-30283*# National Aeronautics and Space Administration, Washington, D C
NASA AERONAUTICS
David A Anderson [1982] 30 p Original contains color illustrations
(NASA-EP-85, NAS 1 19 85) Avail NTIS MF A01, SOD HC $2 50 as 033-000-00796-5 CSCL 01B

Aeronautical research programs are discussed in relation to research methods and the status of the programs The energy efficient aircraft, STOL aircraft and general aviation aircraft are considered Aerodynamic concepts, rotary wing aircrft, aircraft safety, noise reduction, and aircraft configurations are among the topics included S L

N82-30287*# National Aeronautics and Space Administration, Washington, D C
AERODYNAMICS ON A TRANSPORT AIRCRAFT TYPE WING-BODY MODEL
V Schmitt May 1982 30 p refs Transl into ENGLISH of Aerodynamique dun ensemble voilure-fuselage du type 'avion de transport' (France), no ONERA-TP-1981-122, 1981 p 1-23 Presented at the 18th Colloq on Appl Aerodyn of AAAF, Poiteriers, France, 18-20 Nov 1981 Original document announced as A82-19738 Transl by Kanner (Leo) Associates, Redwood City, Calif
(Contract NASw-3541)
(NASA-TM-76878, NAS 1 15 76878) Avail NTIS HC A03/MF A01 CSCL 01A

The DFLR-F4 wing-body combination is studied The 1/38 model is formed by a 9 5 aspect ratio transonic wing and an Airbus A 310 fuselage The F4 wing geometrical characteristics are described and the main experimental results obtained in the S2MA wind tunnel are discussed Both wing-fuselage interferences and viscous effects, which are important on the wing due to a high rear loading, are investigated by performing 3D calculations An attempt is made to find their limitations S L

N82-30288*# Oklahoma State Univ, Stillwater Dept of Mechanical Engineering
FLOW AND ACOUSTIC PROPERTIES OF LOW REYNOLDS NUMBER UNDEREXPANDED SUPERSONIC JETS Ph.D. Thesis
Tieh-Feng Hu 1977 146 p refs
(Contracts NAG1-159, NAG1-10)
(NASA-CR-169257, NAS 1 26 169257) Avail NTIS HC A07/MF A01 CSCL 01A

Jet noise on underexpanded supersonic jets are studied with emphasis on determining the role played by large scale organized flow fluctuations in the flow and acoustic processes The experimental conditions of the study were chosen as low Reynolds number (Re = 8,000) Mach 1 4 and 2 1, and moderate Reynolds number (Re = 68,000) Mach 1 6 underexpanded supersonic jets exhausting from convergent nozzles At these chosen conditions, detailed experimental measurements were performed to improve the understanding of the flow and acoustic properties of underexpanded supersonic jets S L

N82-30289*# Systems Technology, Inc, Hawthorne, Calif
STABILITY AND CONTROL OF THE GOSSAMER HUMAN POWERED AIRCRAFT BY ANALYSIS AND FLIGHT TEST Final Report, Jan. 1980 - Dec. 1981
Henry R Jex Jan 1982 82 p refs Prepared for AeroVironment, Inc
(Contract NAS4-2705)
(NASA-CR-163119, NAS 1 26 163119, STI-TR-2109-1, AV-R-82/520) Avail NTIS HC A05/MF A01 CSCL 01A

A solar cell electric-powered aircraft was investigated in relation to performance, stability and control The performance properties, such as lift to drag, power required, propeller efficiency, and trim speed effects were studied The dynamic response properties to various control inputs to verify the computed stability and control characteristics were also investigated S L

N82-30290*# National Aeronautics and Space Administration, Washington, D C
FLOW AND PRESSURE FIELD OF A MODEL PROPELLER
Rudolf Neubauer and Klaus-Peter Anders Feb 1982 12 p refs Transl into ENGLISH of "Stromungs und Druckfeld eines Modellpropellers" West Germany, 1977 8 p Presented at the 10th Jahrestagung, West Berlin, 13-15 Sep 1977 Original language document announced as A78-24451 Transl by Scientific Translation Service, Santa Barbara, Calif Original doc prep by DFVLR, Brunswick
(Contract NASw-3542)
(NASA-TM-76690, NAS 1 15 76690) Avail NTIS HC A02/MF A01 CSCL 01A

To examine the problem of noise reduction of propeller aircraft, a disturbance free method is presented for visualization of pressure gradients and flows by means of a Schlieren configuration The flow and pressure field of a model propeller was represented using a running film Aspects of Schlieren and model technology are commented on Author

N82-30291*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
AEROPROPULSIVE CHARACTERISTICS OF MACH NUMBERS UP TO 2.2 OF AXISYMMETRIC AND NON-AXISYMMETRIC NOZZLES INSTALLED ON AN F-18 MODEL
Francis J Capone Aug 1982 80 p refs
(NASA-TP-2044, L-15208, NAS 1 60 2044) Avail NTIS HC A05/MF A01 CSCL 01A

An investigation to determine the aeropropulsive characteristics of nonaxisymmetric nozzles on an F-18 jet effects model was conducted in the Langley 16-foot transonic tunnel and the AEDC 16-foot supersonic wind tunnel The performance of a two dimensional convergent-divergent nozzle, a single expansion ramp nozzle, and a wedge nozzle was compared with that of the baseline axisymmetric nozzle Test data were obtained at static conditions and at Mach numbers from 0 60 to 2 20 at an angle of attack of 0 deg Nozzle pressure ratio was varied from jet-off to about 20 Author

N82-30293# Naval Surface Weapons Center, White Oak, Md
EFFECTS OF CANOPY GEOMETRY AND CLOTH PERMEABILITY ON THE DRAG COEFFICIENT OF A CROSS PARACHUTE IN THE FULLY OPEN AND REEFED CONDITIONS FOR A W/A RATIO OF 0.3 Final Report, FY 1981
W P Ludtke 1 Feb 1982 77 p
(AD-A115046, AD-F500030, NSWC/TR-81-441) Avail NTIS HC A05/MF A01 CSCL 01/3

This report describes a series of wind-tunnel tests on the cross-type parachute to investigate the effects of cloth permeability, number of suspension lines, and suspension line length in the fully opened and reefed conditions Forty-inch-diameter models with a canopy arm width-to-length ratio (W/L) of 0 3 were tested at various velocities from 50 fps to 293 fps in the fully inflated state Results of these tests demonstrate that the parachute geometry and cloth permeability do have an effect on the drag capability of the cross parachute Additional tests of reefed configurations for several reefing line lengths-to-canopy-diameter ratios from 0 6 to 1 6 at a constant velocity of 203 fps established the reefed characteristics of this parachute The steady state forces in the reefing line were measured by use of strain gage links Data are presented in tabular and graphical format Photographs of representative canopy shapes are included for illustration GRA

N82-30296# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany) Inst fuer *Entwurfsaerodynamik*
WIND TUNNEL INVESTIGATIONS ON THIN SUPERCRITICAL AIRFOILS IN HIGH SUBSONIC FLOW
Horst Koerner and Wolfgang Puffert-Meissner Feb 1982 63 p refs In GERMAN, ENGLISH summary Report will also be announced as translation (ESA-TT-774)
(DFVLR-FB-82-06, ESA-TT-774) Avail NTIS HC A04/MF A01, DFVLR, Cologne DM 19,30

Four thin airfoils (t/c = 0 05) were investigated experimentally The aerodynamic efficiency of three supercritical airfoils is compared with that of a conventional one The investigation was conducted in a transonic wind tunnel within a Mach number

range of 0 6 to 0 95 and at Reynolds numbers 4 million to 6 million Results show the superiority of supercritical airfoil design This is explained, referring to overall aerodynamic coefficients, limits of efficiency, and in special cases to pressure distributions Author (ESA)

N82-30297*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
AIRCRAFT ICING RESEARCH AT NASA
J J Reinmann, R J Shaw, and W A Olsen, Jr 1982 17 p refs Presented at the 1st Intern Workshop on Atmospheric Icing of Struct , Hanover, N H , 1-3 Jun 1982
(NASA-TM-82919, E-1307, NAS 1 15 82919) Avail NTIS HC A02/MF A01 CSCL 01C

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

N82-30298*# Dayton Univ , Ohio Research Inst
AERODYNAMIC PENALTIES OF HEAVY RAIN ON A LANDING AIRCRAFT Final Report
Patrick A Haines and James K Luers Jul 1982 72 p refs (Grant NsG-6026)
(NASA-CR-156885, NAS 1 26 156885, UDR-TR-82-26) Avail NTIS HC A04/MF A01 CSCL 01C

The aerodynamic penalties of very heavy rain on landing aircraft were investigated Based on severity and frequency of occurrence, the rainfall rates of 100 mm/hr, 500 mm/hr, and 2000 mm/hr were designated, respectively, as heavy, severe, and incredible The overall and local collection efficiencies of an aircraft encountering these rains were calculated The analysis was based on raindrop trajectories in potential flow about an aircraft All raindrops impinging on the aircraft are assumed to take on its speed The momentum loss from the rain impact was later used in a landing simulation program The local collection efficiency was used in estimating the aerodynamic roughness of an aircraft in heavy rain The drag increase from this roughness was calculated A number of landing simulations under a fixed stick assumption were done Serious landing shortfalls were found for either momentum or drag penalties and especially large shortfalls for the combination of both The latter shortfalls are comparable to those found for severe wind shear conditions Author

N82-30299# Royal Aircraft Establishment, Farnborough (England) Radio and Navigation Dept
FLIGHT TRIALS OF THE LITTON LTN-211 OMEGA NAVIGATION SYSTEM IN A WESSEX HELICOPTER
I D Birch Jan 1981 20 p refs
(RAE-TM-RAD-NAV-147, BR78250) Avail NTIS HC A02/MF A01

The Litton LTN-211 Omega Navigation System is currently in service in RAF transport and other aircraft Installation and flight trials of the Omega equipment in a Wessex helicopter are described Author

N82-30303*# National Aeronautics and Space Administration, Washington, D C
GROB AIRCRAFT CONSTRUCTION: THE G 110 FLIES
B Malzbender Jun 1982 15 p Transl into ENGLISH from Aerokurier (West Germany), no 3, 1982 p 262-264 Transl by Scientific Translation Service, Santa Barbara, Calif
(Contract NASw-3542)
(NASA-TM-76893, NAS 1 15 76893) Avail NTIS HC A02/MF A01 CSCL 01C

Description, specifications and test flight performance of the G 110 are provided The G 110 completely incorporates modern GfK construction techniques which heretofore have been developed and perfected for the construction of sailplanes The G 110 is a prototype of a GfK constructed motorized aircraft and shows much promise for the future of German aviation Author

N82-30304# School of Aerospace Medicine, Brooks AFB, Tex
HUMAN-FACTORS EVALUATION OF C-141 FUEL SAVINGS ADVISORY SYSTEM Final Report, Dec. 1979 - Feb. 1981
Layne P Perelli Dec 1981 33 p refs
(AF Proj 7930)
(AD-A114931, SAM-TR-81-37) Avail NTIS HC A03/MF A01 CSCL 01/3

The Air Force installed a Fuel Savings Advisory System (FSAS) in three C-141 aircraft and performed an operational test and evaluation At the request of the USAF Airlift Center, observers from the USAF School of Aerospace Medicine evaluated human-engineering, workload, and fatigue aspects of FSAS during three long-duration missions Pilot's subjective fatigue/workload reports, interviews with crewman, and human-engineering analyses indicated that the FSAS was satisfactory for use in MAC airlift operations Human-engineering solutions are provided, also suggestions for future improvement of the FSAS Author (GRA)

N82-30305# Naval Air Engineering Center, Lakehurst, N J Advanced Technology Office
APPLICATION OF WEAR DEBRIS ANALYSIS TO AIRCRAFT HYDRAULIC SYSTEMS
P V Ciekurs and S A Ropar (Rockwell International Corp , Columbus, Ohio) 10 May 1982 23 p refs
(WF41461000)
(AD-A115060, NAEC-92-158) Avail NTIS HC A02/MF A01 CSCL 13/7

This report documents an investigation into the feasibility of applying wear debris analysis methods as a maintenance tool for aircraft hydraulic systems A breadboard was designed and operated, fluid samples were analyzed and trended No relevant failures were experienced and limited conclusions reached Recommendations are made for further investigations Author (GRA)

N82-30306# Honeywell, Inc , Minneapolis, Minn Avionics Div
ASSESSMENT OF STEREOGRAPHICS FOR FIRE CONTROL AND NAVIGATION IN FIGHTER AIRCRAFT Final Report, 1 Aug. 1980 - 30 Nov. 1981
Jeffrey M Setterholm, S Joy Mountford, and Paul N Turner Wright-Patterson AFB, Ohio AFWAL Mar 1982 95 p
(Contract F33615-80-C-3602, AF Proj 2403)
(AD-A115414, AVD-TAS-3D-81-D02, AFWAL-TR-82-3008) Avail NTIS HC A05/MF A01 CSCL 14/5

Integration of dual helmet-mounted displays, a helmet-attitude tracking device, a six-degree of freedom fighter aircraft digital simulation and dynamic stereo-pair computer graphics line drawings permitted overlaying 3-D (stereo) information on a pilot's view of the world Display content for weapon delivery and 4-D navigation was investigated A second display medium using a forward projection, TV, and PLZT goggles was incorporated to aid in the training process This report documents what was learned in developing and evaluating the displays Author (GRA)

N82-30307# Air Force Inst of Tech , Wright-Patterson AFB, Ohio School of Engineering
DESIGN AND IMPLEMENTATION OF USAF AVIONICS INTEGRATION SUPPORT FACILITIES M.S. Thesis
Jon G Hanson Dec 1981 337 p refs
(AD-A115537, AFIT/GCS/EE/81D-10) Avail NTIS HC A15/MF A01 CSCL 01/3

The design and implementation of avionic software support facilities known as Avionic Integration Support Facilities (AISFs) are investigated A complete set of AISF functional requirements is presented in Data Flow Diagram format This method of presentation facilitated the hierarchical development of the functional requirements From these functional requirements an implementation model for such a facility is developed The modeling vehicle used is Softech's Structured Analysis and Design Technique (SADT) The SADT model depicts inputs, outputs, processes, controls, and the mechanisms required to implement the AISF Author (GRA)

N82-30308# Naval Postgraduate School, Monterey, Calif
A PRELIMINARY ANALYSIS OF TF34-100/400 JET ENGINE

REWORK DATA IN SUPPORT OF THE MRP SYSTEM IMPLEMENTATION AT NARF ALAMEDA M.S. Thesis
Ernest R Slaybaugh Dec 1981 83 p refs
(AD-A114452) Avail NTIS HC A05/MF A01 CSCL 15/5

The Naval Air Rework Facility (NARF) located at Naval Air Station (NAS) Alameda is in the process of implementing a Material Requirements Planning (MRP) system which will incorporate an inventory model to help manage those repair parts which are not always replaced during component rework This thesis focused on analyzing TF34-100/400 jet engine rework data as one phase of that implementation In particular, probability of replacement values were generated for the repair parts from demand data and the rework schedule during 1980, and the engine's bill of materials In addition, a parametric analysis was conducted to study the optimal relationship between the shortage and surplus costs of the proposed inventory model for the TF34 repair parts The analyses highlighted the importance of determining the actual shortage costs resulting from a work stoppage and suggested some potentially useful forms for the surplus cost parameter Author (GRA)

N82-30310# Lincoln Lab, Mass Inst of Tech, Lexington
REMOTE SENSING OF TURBINE ENGINE GASES Final Report, 1 Oct. 1980 - 30 Sep. 1981
Dennis K Killinger, Norman Menyuk, and Aram Mooradian 30 Sep 1981 81 p refs
(Contract F19628-80-C-0002, AF Proj 1900)
(AD-A115443, ESD-TR-82-014, AFESC/ESL-TR-82-016)
Avail NTIS HC A05/MF A01 CSCL 20/5

This is the FY 81 final report on the program entitled 'Remote Sensing of Turbine Engine Gases' The specific tasks which were conducted during FY 81 consisted of the following (1) the feasibility demonstration of a dual-laser differential-absorption LIDAR(DIAL) system for the remote sensing of CO, NO, and C2H4 (2) the development of a data acquisition and processing system for the dual-laser DIAL system, (3) the laser remote sensing of CO and C2H4 in the exhaust of a stationary jet aircraft, and (4) the laser remote sensing of hydrazine, monomethylhydrazine (MMH), and unsymmetrical dimethylhydrazine (UDMH) GRA

N82-30312# Naval Postgraduate School Monterey, Calif Dept of Aeronautics
THE LATERAL RESPONSE OF AN AIRSHIP TO TURBULENCE M.S Thesis
John J Wrobleski, Jr Dec 1981 151 p refs
(AD-A115197) Avail NTIS HC A08/MF A01 CSCL 20/4

A method is derived for finding the linear response and loading transfer functions for the lateral aerodynamic case of airship flight through atmospheric turbulence The functions obtained are in a form that can be applied to the various spectral analysis methods used to predict survivability currently employed by designers A numerical example using the USS AKRON (ZR-4) is presented The results show that peak motion response and loading occur when the encountered spectral component has a wavelength equal to the airship length, and that simple feedback of heading angle does not significantly decrease this peak Author (GRA)

N82-30313# Hochschule der Bundeswehr, Munich (West Germany) Fachbereich Luft-und Raumfahrttechnik
OPTIMAL PERIODIC DOLPHIN GLIDING FLIGHT [OPTIMAL PERIODISCHER DELPHIN-SEGELFLUG]
E D Dickmanns Feb 1982 48 p refs In GERMAN
Avail NTIS HC A03/MF A01

Numerically calculated time optimal flight paths through vertical wind fields are discussed for different wind field types and airplane classes For solution types 1 (prefers speed to altitude, globally optimal for small wind fields), the ratio of path oscillation wavelength to up-wind field wavelength was chosen as criterion for global optimization The most favorable control sequence as well as the most favorable periodic boundary values for the speed components are determined Calculations on examples for three wind field families and three airplane types with the best reciprocal glide numbers 29, 41, and 55, show that the unstationary type 2 ths for aerodynamically highly sophisticated airplanes with large wing load (water ballast) are more meaningful than for conventional gliders with small wing load Author (ESA)

N82-30314*# Southampton Univ (England) Dept of Aeronautics and Astronautics
CONTROL SOFTWARE FOR TWO DIMENSIONAL AIRFOIL TESTS USING A SELF-STREAMLINING FLEXIBLE WALLED TRANSONIC TEST SECTION Semiannual Progress Report for period ending Feb 1982
S W D Wolf and M J Goodyer Jul 1982 90 p refs
(Grant NsG-7172)
(NASA-CR-165941, NAS 1 26 165941) Avail NTIS HC A05/MF A01 CSCL 14B

Operation of the Transonic Self-Streamlining Wind Tunnel (TSWT) involved on-line data acquisition with automatic wall adjustment A tunnel run consisted of streamlining the walls from known starting contours in iterative steps and acquiring model data Each run performs what is described as a streamlining cycle The associated software is presented Author

N82-30315# Air Force Inst of Tech, Wright-Patterson AFB, Ohio School of Engineering
ANALYSIS AND PREPARATION OF A DIGITAL TERRAIN DATA BASE FOR FLIGHT SIMULATOR USE M.S. Thesis
Harry D Ross Nov 1981 68 p refs
(AD-A115547, AFIT/GEO/MA-81D-1) Avail NTIS HC A04/MF A01 CSCL 08/6

The Air Force needs low-level, high speed flight simulators capable of producing correlated visual, radar, and infra-red display scenes These scenes can be produced by computer generated imagery if a suitable data base is available The purpose of this thesis is to develop a digital terrain data base suitable for use in a high speed, low-level flight simulator A 164,000 square nautical mile data base was constructed from data supplied by the Defense Mapping Agency This paper discussed the construction and organization of the data base, as well as the data retrieval algorithms It was demonstrated that the data could be accessed fast enough to simulate Mach 1 flight Author (GRA)

N82-30336*# National Aeronautics and Space Administration *Lewis Research Center, Cleveland, Ohio*
HIGH TEMPERATURE COMPOSITES. STATUS AND FUTURE DIRECTIONS
Robert A Signorelli 1982 25 p refs Presented at the 4th Intern Conf on Composite Mater, Tokyo, 25-28 Oct 1982
(NASA-TM-82929, E-1280, NAS 1 15 82929) Avail NTIS HC A02/MF A01 CSCL 11D

A summary of research investigations of manufacturing methods, fabrication methods, and testing of high temperature composites for use in gas turbine engines is presented Ceramic/ceramic, ceramic/metal, and metal/metal composites are considered Directional solidification of superalloys and eutectic alloys, fiber reinforced metal and ceramic composites, ceramic fibers and whiskers, refractory coatings, metal fiber/metal composites, matrix metal selection, and the preparation of test specimens are discussed J D

N82-30337*# National Aeronautics and Space Administration, Washington, D C
COMPOSITE MATERIALS: TOMORROW FOR THE DAY AFTER TOMORROW
Pierre Condom May 1982 21 p Transl into ENGLISH from Aviation Mag Intern (France), no 817, 1-14 Jan 1982 p 34-39 Transl by SCITRAN, Santa Barbara, Calif
(Contract NASw-3542)
(NASA-TM-76709 NAS 1 15 76709) Avail NTIS HC A02/MF A01 CSCL 11D

A description is given of the history of the use of composite materials in the aerospace industry Research programs underway to obtain exact data on the behavior of composite materials over time are discussed It is concluded that metal composites have not yet replaced metals, but that that this may be a future possibility Author

N82-30340# Atlantic Research Corp, Alexandria, Va
NOTEBOOK ON ELECTROMAGNETIC PROPERTIES OF COMPOSITE MATERIALS BELOW 1 GHz Final Technical Report
D R Pflug, J A Birken, R A Wallenberg, and D T Auckland Sep 1981 154 p refs
(Contract N00019-80-C-0157)
(AD-A115132, NAVAIR-AIR-518-9) Avail NTIS HC A08/MF A01 CSCL 11/4

This report is the seventh in a series of reports on the electromagnetic properties of composites materials The report

quantitatively delineates the vast differences in electromagnetic behavior exhibited by the principle composite materials (Graphite/-epoxy & Kelvar), how to predict these different properties based on the materials intrinsic electrical properties (conductivity, permeability and permittivity) and how the airframe shape influences electromagnetic coupling The electromagnetic threats of lightning electromagnetic pulse (LEMP), nuclear Electromagnetic pulse (NEMP) Author (GRA)

N82-30356# Northeastern Univ, Boston, Mass Electronics Research Lab

CONTROL ELECTRONICS FOR AIR-BORNE QUADRUPOLE ION MASS SPECTROMETER Final Report, 15 Sep. 1978 - 14 Sep 1981

J Spencer Rochefort and Raimundas Sukys Oct 1981 310 p refs

(Contract F19628-78-C-0218, AF Proj 2310)

(AD-A115399, AFGL-TR-82-0056) Avail NTIS HC A14/MF A01 CSCL 07/4

The work concerned in this report spans the three-year period commencing 15 September 1978 and deals with the development of electronic instrumentation for rocket and balloon-borne quadrupole ion mass spectrometers, Electronic packages containing circuits to control the quadrupole filters and data processing were developed for sounding rockets launched from Red Lake, Ontario, Canada during the 26 February 1979 Solar Eclipse, from the Poker Flat Research Range, Chatanika, Alaska during 1980 and 1981 Solar Proton Event Programs and also the 1981 Auroral E Program A microprocessor-based control system was developed for a balloon-borne mass spectrometer This latter system also provides a two-way communications link for ground control of the experiment and data transmission during the flight Author (GRA)

N82-30378# Naval Air Development Center, Warminster, Pa Aircraft and Crew Systems Technology Directorate

TITANIUM SURFACE TREATMENTS FOR ADHESIVE BONDING Phase Report

S R Brown and G J Pilla 31 Mar 1982 50 p refs

(WF61542001)

(AD-A114710, NADC-82032-60) Avail NTIS HC A03/MF A01 CSCL 13/8

The aircraft industry prepares titanium surfaces for adhesive bonding using various types of abrasive, etchant, chemical and anodize treatments A study was made to determine pretreatment effects on adhesive bond durability of titanium under severe environmental conditions of temperature, humidity, and stress Replicate sets of Ti-6Al-4V titanium specimens were provided to aircraft manufacturers who prepared the sets using eleven different pretreatment processes The manufacturers also bonded the specimens with the same four adhesive systems Wedge specimens, bounded from 0 150-inch thick Ti-6Al-4V titanium were tested in a 140 F, 100% relative humidity atmosphere for a period of eight weeks Chromic acid anodize, alkaline etch, chromate-fluoride and alkaline peroxide treatments resulted in substantially lower crack growth rates than phosphate-fluoride treatments There was a slight difference in performance ranking of bonding pretreatments depending upon the adhesive system used Author (GRA)

N82-30386# Pratt and Whitney Aircraft Group West Palm Beach, Fla Government Products Div

IMPROVED PENETRANT PROCESS EVALUATION CRITERIA Final Report, 1 Aug. 1980 - 31 Jul 1981

J S Cargill and K D Smith Wright-Patterson AFB, Ohio AFWAL Oct 1981 51 p refs

(Contract F33615-80-C-5060, AF Proj 2418)

(AD-A115157, PWA-FR-15223) Avail NTIS HC A04/MF A01 CSCL 11/6

The objective of this program is to investigate the significance of the improvements and modifications suggested in 'Methods Improvement of the Fluorescent Penetrant Inspection (FPI) Process' The program is composed of three technical phases (1) specimen preparation and baseline demonstration, (2) improved methods demonstration, and (3) statistical comparison of Phase I and Phase II Author (GRA)

N82-30400*# Hughes Aircraft Co, Culver City, Calif

STUDIES OF NEW PERFLUOROETHER ELASTOMERIC SEALANTS Final Contractor Report, 1 Oct 1980 - 26 Sep. 1981

D I Basiulis and D P Salisbury Sep 1981 105 p refs

(Contract NAS2-10334)

(NASA-CR-166377, NAS 1 26 166377 Rept-76-966, FR-81) Avail NTIS HC A06/MF A01 CSCL 11A

Channel and filleting sealants were developed successfully from cyano and diamidoxime terminated perfluoro alkylene ether prepolymers The prepolymers were polymerized, formulated and tested The polymers and/or formulations therefrom were evaluated as to their physical, mechanical and chemical properties (i e, specific gravity, hardness, nonvolatile content, corrosion resistance, stress corrosion, pressure rupture resistance, low temperature flexibility, gap sealing efficiency, tensile strength and elongation, dynamic mechanical behavior, compression set, fuel resistance, thermal properties and processability) Other applications of the formulated polymers and incorporation of the basic prepolymers into other polymeric systems were investigated A cyano terminated perfluoro alkylene oxide triazine was formulated and partially evaluated The channel sealant in its present formulation has excellent pressure rupture resistance and surpasses present MIL specifications before and after fuel and heat aging S L

N82-30404# Naval Research Lab, Washington, D C

LIFE ENHANCEMENT OF NAVAL SYSTEMS THROUGH ADVANCED MATERIALS

A I Schindler and I Wolock 12 May 1982 50 p refs

(AD-A114722, NRL-4807) Avail NTIS HC A03/MF A01 CSCL 11/3

Recent progress in the development of advanced materials to extend the life of Naval systems is discussed The developments include anti-corrosion and anti-fouling paints, improved lubricants, and more durable helicopter rotor blades, as well as a variety of materials processing techniques and improved uses of materials to reduce corrosion, wear and fatigue of systems components Author (GRA)

N82-30414# Suntech, Inc, Marcus Hook, Pa

THE PREPARATION AND CHARACTERIZATION OF MIXTURES OF POLYCYCLOPENTADIENES AS SOLID RAMJET FUELS Final Report, 17 Jun. 1980 - 30 Jun 1981

A Schneider, L W Hall, Jr, and E J Janoski 15 Apr 1982 18 p refs

(Contract N00019-80-C-0277)

(AD-A115075) Avail NTIS HC A02/MF A01 CSCL 07/3

Conditions for the thermal polymerization of cyclopentadiene to tetracyclopentadienes and higher molecular weight oligomers are given for both neat and solution polymerization modes Density and volumetric heats of combustion are given for the mixtures of oligomers formed under different conditions Compatibilities of oligomers with hydroxyl terminated polybutadiene (HTPB) are given Author (GRA)

N82-30432*# Massachusetts Inst of Tech, Cambridge Flight Transportation Lab

THE INTERACTION OF RADIO FREQUENCY ELECTROMAGNETIC FIELDS WITH ATMOSPHERIC WATER DROPLETS AND APPLICATIONS TO AIRCRAFT ICE PREVENTION Thesis

Robert John Hansman, Jr Jun 1982 193 p refs

(Grants NAG1-100, NGL-22-009-640)

(NASA-CR-169246, NAS 1 26 169246, FTL-R82-5) Avail NTIS HC A09/MF A01 CSCL 20N

The feasibility of computerized simulation of the physics of advanced microwave anti-icing systems, which preheat impinging supercooled water droplets prior to impact, was investigated Theoretical and experimental work performed to create a physically realistic simulation is described The behavior of the absorption cross section for melting ice particles was measured by a resonant cavity technique and found to agree with theoretical predictions Values of the dielectric parameters of supercooled water were measured by a similar technique at lambda = 2 82 cm down to -17 C The hydrodynamic behavior of accelerated water droplets was studied photograhically in a wind tunnel Droplets were found to initially deform as oblate spheroids and to eventually become unstable and break up in Bessel function modes for large values of acceleration or droplet size This confirms the theory as to the maximum stable droplet size in the atmosphere A computer code which predicts droplet trajectories in an arbitrary flow field was written and confirmed experimentally The results were consolidated into a simulation to study the heating by

electromagnetic fields of droplets impinging onto an object such as an airfoil It was determined that there is sufficient time to heat droplets prior to impact for typical parameter values Design curves for such a system are presented J D

N82-30437# Analysis and Technology, Inc , North Stonington, Conn
UTILIZATION OF AN/APS-94 SIDE-LOOKING AIRBORNE RADAR SYSTEMS IN SEARCH AND RESCUE Interim Report, Jan. 1978 - Apr. 1982
S R Osmer, L Nash, G L Hover, and T J Mazour Apr 1982 23 p refs
(Contract DTCG39-81-C-80287)
(AD-A114484, USCG-D-14-82, CGR/DC-3/82) Avail NTIS HC A02/MF A01 CSCL 17/9

Since September 1978, side-looking airborne radar (SLAR) detection data have been gathered in conjunction with visual detection experiments conducted by the U S C G R&D Center These are part of a series of experiments designed to improve search planning guidance contained in the National Search and Rescue Manual HC-130 aircraft, equipped with either the Airborne Oil Surveillance system (AOSS) or SLAR/radar image processor (SLAR/RIP) configuration of the AN/APS-94C or D SLAR, conducted controlled searches for life rafts, small boats, and 41-to 95-foot Coast Guard vessels Through the use of a microwave tracking system and SLAR data, the positions of searchers and targets were accurately reconstructed to facilitate the verification of detections on SLAR films or video tape These data were used to evaluate the effects of environmental and controllable parameters on SLAR detection of the various target types Of the 12 parameters investigated, target size/ composition, search altitude, swell height, wind speed, and humidity/precipitation were found to have a significant influence on SLAR detection performance Sweep widths for SLAR search and recommendations for SLAR utilization in SAR missions are included In addition, recommendations for future SLAR evaluation are made Author (GRA)

N82-30462# Ohio State Univ , Columbus ElectroScience Lab
NEAR FIELD ANALYSIS OF AIRBORNE ANTENNAS Final Report
W D Burnside and N Wang Dec 1981 33 p refs
(Contract N00019-80-C-0593)
(AD-A115074 ESL-713321-4) Avail NTIS HC A03/MF A01 CSCL 09/5

The radiation pattern analysis of the prolate spheroid based on the efficient UTD and geodesic solutions developed at least partially under previous NASC contracts has been combined with the flat plate scattering analysis in order to simulate complex airborne structures This includes the junction edge scattering which results at the union between the fuselage (prolate spheroid) and flat plate This solution is being verified by comparisons with various airborne antenna configurations In addition, the geodesics for an ellipsoid have been found using a perturbation theory similar to that used for the prolate spheroid This new ellipsoid configuration will be used to represent the fuselage in future simulation analyses Author (GRA)

N82-30463# Air Force Inst of Tech , Wright-Patterson AFB, Ohio Dept of Electrical Engineering
THE EFFECT OF RADOME SCATTERING ON ECM ANTENNA PATTERNS M.S. Thesis
Robert K Schneider Dec 1981 150 p refs
(AD-A115517, AFIT/GE/EE/81D-52) Avail NTIS HC A07/MF A01 CSCL 17/9

The problem of scattering by thin cylindrical dielectric shells of large circular cross sections is approached by two methods (1) an infinite series of eigenfunctions, and (2) the method of moments Numerical results are presented for shell radii of 0 3 lambda, 3 0 lambda, and 30 lambda, the source being an electric line current near but external to the shell Computer programs are presented which implement these two solutions When the scattering structure does become large limitations on numerical results are encountered due to computer memory and speed limitations Author (GRA)

N82-30525*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
DATA ACQUISITION SYSTEM FOR NASA LARC IMPACT DYNAMICS RESEARCH FACILITY
Royce F McCormick, Jack C Spears, James W Lynch, and Frank R Batten Jun 1982 13 p
(NASA-TM-84510) Avail NTIS HC A02/MF A01 CSCL 14B

A data system is designed to permit the simultaneous recording of 90 data channels on one 28 track magnetic tape recorder using a constant bandwidth FM multiplexing technique Dynamic signals from transducers located in the test aircraft are amplified and fed to voltage controlled oscillators where they are converted to discrete FM signals The signals from each group of five VCO's are fed to a mixer/distribution amplifier where they are combined into one composite signal and recorded, using direct recording techniques on one magnetic tape recorder track Millivolt signals from the recorders reproduce heads are amplified to one volt and then electronically switched to an FM demultiplexing system where appropriate frequency discrimination and signal filtering recover the original analog information S L

N82-30547# Naval Postgraduate School, Monterey, Calif
FLOW CONTROL FOR A HIGH ENERGY LASER TURRET USING TRAPPED VORTICES M.S Thesis
James Edward Burd Dec 1981 101 p refs
(AD-A115263 NPS67-81-017) Avail NTIS HC A06/MF A01 CSCL 20/5

The Department of Defense is concerned with the viability of an airborne high energy laser system The laser is housed in a blunt turret atop a NKC-135 aircraft Turbulence generated by flow separation around the turret causes optical distortion of the laser beam Control of flow separation is needed to improve laser beam performance especially for aft-aimed turrets One technique proposed for flow control is a fairing design which will stabilize shed vortices by suction A two dimensional computer model was used to design a fairing compatible with present test equipment Experimental research of this fairing design was conducted in wind tunnel tests Although flow mapping demonstrated improved flow performance through the use of suction, total quiescent flow was never achieved A more adequate three dimensional model is needed to design a fairing that will stabilize trapped vortices GRA

N82-30556# Garrett Turbine Engine Co , Phoenix, Ariz
GAS FOIL BEARING DEVELOPMENT PROGRAM Final Report, 1 Jul 1979 - 28 Feb 1981
Francis J Suriano Wright-Patterson AFB, Ohio AFWAL Sep 1981 135 p
(Contract F33615-79-C-2037, AF Proj 3048)
(AD-A114692, Rept-31-4089, AFWAL-TR-81-2095) Avail NTIS HC A07/MF A01 CSCL 13/9

This document presents the final technical report for the nineteen-month gas foil bearing development program The 3 5-inch foil bearing design was analyzed using an elasto-hydrodynamic analysis program Bearing configurations with 10 and 8 foils were identified as having the potential to exceed the performance of the 12-foil GTCP165 APU bearing A total of six bearing configurations were tested, two ambient temperature configurations using Teflon-S coated foils with a chrome-plated journal, and four with high-temperature foil and journal coatings The high-temperature bearings used foil coatings Kaman DES, Kaman DES + au, Co-20 Ni, and TiC, all of which were run with a Kaman SCA-coated journal Program goals were met with both ambient-temperature bearing configurations and Kaman SCA versus Kaman DES and TiC high-temperature configurations GRA

N82-30566*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
STRUCTURES AND DYNAMICS DIVISION RESEARCH AND TECHNOLOGY PLANS, FY 1982
Kay S Bales Jun 1982 56 p
(NASA-TM-84509, NAS 1 15 84509) Avail NTIS HC A04/MF A01 CSCL 20K

Computational devices to improve efficiency for structural calculations are assessed The potential of large arrays of microprocessors operating in parallel for finite element analysis is defined, and the impact of specialized computer hardware on static, dynamic, thermal analysis in the optimization of structural analysis and design calculations is determined General aviation aircraft crashworthiness and occupant survivability is also considered Mechanics technology required for design coefficient, fault tolerant advanced composite aircraft components subject

to combined loads, impact, postbuckling effects and local discontinuities are developed S L

N82-30606# Lockheed Engineering and Management Services Co , Inc , Houston, Tex Office of Remote Sensing Technology Implementation

PHOTOINTERPRETATION KEY FOR PINE REGENERATION ANALYSIS USING HIGH-ALTITUDE COLOR INFRARED PANORAMIC PHOTOGRAPHY Final Report

B B Eav, C A Clark, R E Kinkle, and J C Prill Aug 1981 38 p refs

(Contract USDA/FS-53-3187-0-29)

(PB82-164450 LEMSCO-16379, NFAP-247) Avail NTIS HC A03/MF A01 CSCL 02F

A photointerpretation key for analysis of pine regeneration was developed during the second of the three phases of a timber inventory project The procedures used in developing the photointerpretation key are presented, and the resulting selective photointerpretation key with color illustrations (stereopairs) is presented This photointerpretation key represents a model application of high-altitude color infrared panoramic photography to timber inventory and should pave the way for more imaginative applications of optical bar technoloy to resource inventories GRA

N82-30608# Lockheed Engineering and Management Services Co , Inc , Houston, Tex Office of Remote Sensing Technology Implementation

HIGH-ALTITUDE IMAGERY USER GUIDE

Richard E Hinkle Aug 1981 127 p refs

(Contract USDA/FS-53-3187-0-29)

(PB82-158353, LEMSCO-16312, NFAP-224) Avail NTIS HC A07/MF A01 CSCL 02F

New and more efficient remote sensing methods to users in the field are presented The high altitude aircraft and associated sensor systems are discussed Applications in use, such as resource inventories, pest management, catastrophic damage assessment, resource management and planning are outlined GRA

N82-30782# Scripps Institution of Oceanography, La Jolla, Calif Visibility Lab

AIRBORNE MEASUREMENTS OF EUROPEAN SKY AND TERRAIN RADIANCES Scientific Interim Report

Richard W Johnson Aug 1981 36 p refs

(Contract F19628-78-C-0200, AF Proj 6210)

(AD-A114637, SIO-82-2, AFGL-TR-81-0275, SIR-19) Avail NTIS HC A03/MF A01 CSCL 04/1

A data set which contains nearly 500 arrays representing measurements of sky and terrain radiance values from 47 different flights is described and illustrated The measurements were made using radiometer systems mounted on a C-130 aircraft during a series of European flights associated with the NATO program OPAQUE Radiance measurements throughout the 4 pi field surrounding the aircraft were made in four spectral bands having mean wavelengths of 478, 557, 664, and 765 nm Spectral sets of measurements were made at each of several altitudes between the surface and approximately 6 km AGL Evaluation of the data illustrates good orientation and radiometric accuracies, except for stray light influences as the radiometer field of view swept near and through the solar disc Corrective procedures are outlined and their application is undergoing further refinement These data are appropriate for use in the development of operationally useful predictive models The radiance data in conjunction with their companion scattering coefficient data, are readily applicable to the determination of slant path contrast transmittances, atmospheric optical depths, aerosol directional scattering characteristics, flux divergences and their attendant determinations of turbid atmospheric single scattering albedos GRA

N82-30800# Ohio Univ , Athens Avionics Engineering Center

EVALUATION OF THE FAA/MITRE WEATHER DATA DEVICE Final Report

Delmar G Pullins Washington FAA Jan 1982 59 p refs

(Contract DTFA01-81-C-10007)

(AD-A114646, OU/AEC/EER-54-1, DOT-FAA-RD-82-14) Avail NTIS HC A04/MF A01 CSCL 04/2

A cockpit weather display unit was evaluated Twenty subject pilots were flown using prerecorded weather information, and real time weather information from the Columbus weather radar The airborne system consists of a VOR Receiver, a processor unit, a control module, and a hardcopy printer that provides the pilot with ground weather radar information in the cockpit upon demand It is found that providing the pilot with a low cost, real time radar weather information source, will be a distinct factor in reducing unnecessary radio transmissions, controller workload, and will aid the pilot in decision making The installation of such a unit in the cockpit would eliminate errors due to verbal communication of the weather picture, provide useful information, and directly attack the major problem of aviation thunderstorm avoidance E A K

N82-30804# National Oceanic and Atmospheric Administration, Norman, Okla National Severe Storms Lab

FIELD PROGRAM OPERATIONS: TURBULENCE AND GUST FRONT Final Report, Mar. 1980 - Dec 1980

J T Lee and R J Doviak Washington FAA Nov 1981 43 p

(Contract DTFA01-80-Y-10524)

(AD-A115447, DOT-FAA-RD-81-108) Avail NTIS HC A03/MF A01 CSCL 04/2

Aircraft, rawinsonde network, mesoscale surface network, low-level wind shear alert system at Will Rogers World Airport, 444 m instrumented tower and satellite observations augmented a conventional weather radar and a new, dual Doppler weather radar system to obtain concurrent data on weather hazards to aircraft Storm days and data acquired are detailed An objective was to determine the characteristics and detectability of turbulence, wind shear and other aircraft operational weather hazards using indirect (radar) probes The South Dakota School of Mines T-28 aircraft and the National Aeronautics and Space Administration's F-106 aircraft made thunderstorm penetrations during Doppler radar and lightning operations Data obtained are discussed, and the analysis of a turbulence case and two gust front cases is presented Author

N82-30806# Air Force Geophysics Lab , Hanscom AFB, Mass Meteorology Div

A SURVEY OF MELTING LAYER RESEARCH

Robert C Schaller, Ian D Cohen, Arnold A Barnes, Jr , and Lawrence C Gibbons 4 Jan 1982 105 p refs

(AF Proj 2310)

(AD-A115224, AFGL-TR-82-0007, AFGL-AFSG-438) Avail NTIS HC A06/MF A01 CSCL 01/3

This report summarizes previous melting-layer research both within and outside AFGL and provides recommendations for future research in the melting layer An extensive literature search provided a bibliography of previous research This bibliography is included as an appendix Several definitions of the top and bottom of the melting layer are presented and discussed Aggregation and breakup appear to be the chief microphysical processes that determine the particle-size spectrum of snow and ice that enter the melting layer Studies of the actual melting process and of the melting layer as seen by radar are presented Microphysical and thermodynamic characteristics are discussed Dynamic considerations are mentioned Previously gathered aircraft data are reviewed, and recommendations are made for future aircraft and radar data-gathering efforts Author (GRA)

N82-30820# National Oceanic and Atmospheric Administration, Boulder, Colo Weather Modification Program Office

EVALUATION OF A METEOROLOGICAL AIRBORNE PULSE DOPPLER RADAR

B L Trotter, R G Strauch, and C L Frush (National Center for Atmospheric Research) Jul 1981 65 p

(PB82-156860, NOAA-TM-ERL-WMPO-45, NOAA-81103011) Avail NTIS HC A04/MF A01 CSCL 04B

Doppler measurements installed in the aircraft which measure the radial velocities in light to heavy precipitation and in nonturbulent to turbulent meteorological situations was evaluated The base line noise level in the system increased whenever video returns were present The minimum detectable signal at the system output was approximately minus 100 dBm It is shown that the system can be used in an airborne environment Errors in velocity measurements will occur if the exact antenna spacial pointing angle is not known The magnitude of error in the measurement is a function of the error in the known antenna position and the ground speed of the aircraft GRA

N82-30838*# Bolt, Beranek, and Newman, Inc , Cambridge, Mass

PILOT/VEHICLE MODEL ANALYSIS OF VISUAL AND MOTION CUE REQUIREMENTS IN FLIGHT SIMULATION

R Lancraft, G Zacharias, and S Baron *In* MIT Proc of the 16th Ann Conf on Manual Control 1980 p 66-91 refs

Avail NTIS HC A99/MF A01 CSCL 14B

The optimal control model for pilot/vehicle analysis is used to investigate the closed-loop consequences of the performance limitations associated with a computer generated image (CGI) visual system and a six degree-of-freedom motion simulator (VMS) in a helicopter hover task The specific problem addressed was to determine the potential effects of CGI and VMS system characteristics on closed-loop hover performance and pilot workload, and to evaluate these effects in light of performance/workload levels we might expect to see in the actual flight situation Author

N82-30840*# Systems Technology, Inc , Mountain View, Calif
TRAINING AIRCRAFT DESIGN CONSIDERATIONS BASED ON THE SUCCESSIVE ORGANIZATION OF PERCEPTION IN MANUAL CONTROL
Robert K Heffley, Warren F Clement, and Samuel J Craig (Vought Corp , Hawthorne, Calif) *In* MIT Proc of the 16th Ann Conf on Manual Control 1980 p 119-127 refs

Avail NTIS HC A99/MF A01 CSCL 01C

Pilot skill development in the approach and landing task is very strongly tied to the aircraft closure rate and, therefore, pilot training for this task should be based on an appropriate progression closure rate This, in turn, leads to a rational and explicit determination of design point approach speeds as well as other important aerodynamic features for training aircraft One key is to recognize the significance of transitioning from a purely compensatory control loop technique to one involving a pursuit crossfeed between throttle and pitch attitude Such transitioning requires significant skill development, yet reduces pilot workload while enhancing flight path and airspeed performance The second key is to address the terminal flight path adjustment in terms of range-to-go This establishes a bridge between the visual field and the combination of manual control technique and vehicle flight dynamics A design summary plot is thus created in terms of (1) performance (flight path bandwidth), (2) critical range-to-go (for terminal path correction), and (3) closure rate Author

N82-30848# Air Force Inst of Tech , Wright-Patterson AFB, Ohio
EFFECTS OF HIGHER ORDER CONTROL SYSTEMS ON AIRCRAFT APPROACH AND LANDING LONGITUDINAL HANDLING QUALITIES
Muhammad A Pasha (Pakistan Air Force), John J DAzo, and James T Silverthorn *In* MIT Proc of the 16th Conf on Manual Control 1980 p 254-264 refs

Avail NTIS HC A99/MF A01 CSCL 01C

A study of approach and landing longitudinal flying qualities, based on data generated by Calspan using a variable stability NT-33 aircraft combined with significant control system dynamics is presented An optimum pilot lead time for pitch tracking, flight path angle tracking, and combined pitch and flight path angle tracking tasks is determined from a closed-loop simulation using integral squared error (ISE) as a performance measure Pilot gain and lead time were varied in the closed-loop simulation of the pilot and aircraft to obtain the best performance for different control system configurations The results lead to the selection of an optimum lead time using ISE as a performance criterion Using this value of optimum lead time, a correlation is then found between pilot rating and performance with changes in the control system and in the aircraft dynamics It is also shown that pilot rating is closely related to pilot workload which, in turn, is related to the amount of lead which the pilot must generate to obtain satisfactory response The results also indicate that the pilot may use pitch angle tracking for the approach task and then adds flight path angle tracking for the flare and touchdown Author

N82-30849*# Princeton Univ , N J Flight Research Lab
PILOT OPINIONS OF SAMPLING EFFECTS IN LATERAL DIRECTIONAL CONTROL
Robert F Stengel and George E Miller *In* MIT Proc of the 16th Ann Conf on Manual Control 1980 p 265-270 refs

(Contract N00014-78-C-0257)

Avail NTIS HC A99/MF A01 CSCL 01C

Flight experiments with a microprocessor control system were conducted to determine the effects of variations in sampling parameters on several pilots' opinions of lateral-directional flying qualities Princeton's Variable Response Research Aircraft, which is equipped with a microprocessor-based digital flight control system was the test vehicle Two U S Navy pilots evaluated the effects of sampling rate, quantization, and pure time delay during tracking, approach, and landing Aircraft carrier approach tasks were conducted using a Navy approach mirror Acquisition and tracking of fixed objects on the ground provided additional information related to the Navy mission Author

N82-30856*# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
EVALUATION OF A TRAJECTORY COMMAND CONCEPT FOR MANUAL CONTROL OF CARRIER APPROACHES AND LANDINGS
Walter E McNeill, G Allan Smith, Jr , and Ronald M Gerdes *In* MIT Proc of the 16th Ann Conf on Manual Control 1980 p 370-392 refs

Avail NTIS HC A99/MF A01 CSCL 01C

A trajectory control system concept for providing manual control of a conventional jet aircraft is described The total aircraft flight control system (TAFCOS) utilizes an inverse model of the aerodynamic and propulsion characteristics and employs feedforward control to provide the required acceleration command On-board digital computations which can easily be handled by a modern airborne computer are required The system was studied in a piloted simulation of the carrier approach and landing task with primarily visual flight and guidance cues The principal modes of vertical flight path control investigated were vertical velocity command and vertical acceleration command The study included manual carrier approaches with and without moderate ship motion and associated air disturbances, and tests of the effects of discrete gusts Manual control of flight path through this concept was shown to be feasible as an addition to an automatic control system and to have potential as an improved mode of control over conventional control for the carrier approach task The concept also offers several advantages, among which are design flexibility, automatic compensation for external disturbances, and prevention of abusive pilot control Author

N82-30857*# Systems Technology, Inc , Mountain View Calif
APPLICATION OF A PILOT CONTROL STRATEGY IDENTIFICATION TECHNIQUE TO A JOINT FAA/NASA GROUND BASED SIMULATION OF HEAD UP DISPLAYS FOR CTOL AIRCRAFT
Wayne F Jewell *In* MIT Proc of the 16th Ann Conf on Manual Control 1980 p 395-409 refs

(Contracts NAS2-10385, DOT-FA77WAI-725, NASA-NMI-1052 151)

Avail NTIS HC A99/MF A01 CSCL 01D

The development, evaluation and application of a technique for measuring a pilot's control strategy is described The nonintrusive pilot identification program (NIPIP) estimates the pilot's input-output describing function and combined pilot vehicle performance parameters such as crossover frequency and phase margin by using a time domain model of the pilot and a least squares identification algorithm It functions in realtime and uses a 'sliding' time window to maintain freshness in the data, thus time varying characteristics in the pilot's control strategy can be measured The application of NIPIP to a realtime ground based simulation of two competing concepts of head up displays (HUD) for use in conventional takeoff and landing aircraft Differences in the pilot's control strategy used for the two HUDs and the head down display are quantified in terms of differences in the pilots' describing functions and combined pilot vehicle measurements Conclusions based on the performance evaluation and application of NIPIP are presented and some recommendations on how NIPIP could be used in other manual control tasks are discussed J D

N82-30859*# Massachusetts Inst of Tech , Cambridge Dept of Aeronautics and Astronautics
DESIGN, SIMULATION AND EVALUATION OF ADVANCED DISPLAY CONCEPTS FOR THE F-16 CONTROL CONFIGURED VEHICLE
Robert W Klein (Grumman Aerospace Corp , Bethpage, N Y)

and Walter M Hollister *In its* Proc of the 16th Ann Conf on Manual Control 1980 p 424-438 refs

(Grant AF-AFOSR-3260-78)
Avail NTIS HC A99/MF A01 CSCL 01D

The F-16 control configured vehicle (CCV) flight test program, and current aircraft display research are reviewed and task oriented and compensatory displays to further enhance the capability of the F-16 CCV are suggested The fixed base M I T 707 simulator was modified to represent the F-16 CCV An isometric sidearm control stick and two axis CCV thumb button were installed in the cockpit The forward cockpit CRT was programmed to present an external scene (numbered runway, horizon) and the designed heads up display The cockpit interior was modified to represent a fighter and the F-16 CCV dynamics and direct lift and side force modes were programmed Compensatory displays were designed from man/machine considerations Pilots evaluated the heads up display and compensatory displays during simulated descents in the presence of several levels of filtered, zero mean wind gusts During a descent from 2500 feet to the runway, the pilots tracked a point on the runway utilizing the basic F-16, F-16 CCV, and F-16 CCV with advanced displays Substantial tracking improvements resulted utilizing the CCV modes, and the displays were found to even further enhance the tracking ability of the F-16 CCV J D

N82-30860*# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
SEPARATION MONITORING WITH FOUR TYPES OF PREDICTORS ON A COCKPIT DISPLAY OF TRAFFIC INFORMATION
Sharon Jago and Everett Palmer *In* MIT Proc of the 16th Ann Conf on Manual Control 1980 p 439-447 refs

Avail NTIS HC A99/MF A01 CSCL 01D

The concept of a cockpit display of traffic information (CDTI) includes the integration of air traffic, navigation, terrain and weather information in a single electronic display in the cockpit Investigations designed to develop a clear and concise display format for use in later full mission simulator evaluation of the CDTI concept are described The experiment required airline pilots to monitor a CDTI and make perceptual judgments concerning the future position of a single intruder aircraft in relationship to their own aircraft (ownship) The main experimental variable was the type of predictor used to display future position of each aircraft Predictors were referenced to the ground or to ownship and they either included turn rate information or did not Other variables were the aircraft's separation distance when the judgment was required and the type of encounter (straight or turning) Results indicate that under these experimental conditions fewer errors were made when the predictor included turn rate information There was little difference in overall error rate for the curved ground referenced and the ownship referenced predictors Author

N82-30953# Naval Training Equipment Center, Orlando, Fla Computer Systems Lab
COMPUTER ARCHITECTURE STUDY FOR VTXTS SIMULATORS Final Report, Mar. - Nov. 1981
Leonard D Healy, Gerald A Wyndle, and Bruce Baker (Servos and Simulation, Inc) Apr 1982 123 p refs
(AD-A115006, NAVTRAEQUIPC-IH-336) Avail NTIS HC A06/MF A01 CSCL 09/2

This report provides an evaluation of computer configurations that might be applied to VTXTS simulators Computers ranging from the large, general purpose computer ordinarily used in data processing to the microcomputer which requires 40 separate units to implement a simulator complex are considered Eleven computer configurations are evaluated with respect to availability, maintenance, expandability, risk and life cycle cost The information is summarized in a table of advantages and disadvantages of the various configurations Author (GRA)

N82-30954# Naval Training Equipment Center, Orlando, Fla Computer Systems Lab
DESIGN OF A MICROPROCESSOR-CONTROLLED LINKAGE FOR SIMULATOR APPLICATIONS Final Report, Oct. 1980 - Jun. 1981
Leonard D Healy Apr 1982 82 p
(AD-A115421, NAVTRAEQUIPC-IH-334) Avail NTIS HC A05/MF A01 CSCL 09/2

This report describes a method of linking a host computer to external devices and presents an implementation of such a system using multiple microcomputers The technique used takes advantage of the statistical properties of simulator data to reduce the amount of data transferred, thereby insuring that those variables that change are updated with minimum delay Implementation of linkage using multiple microcomputers provides a modular system easily tailored to various simulator applications Author (GRA)

N82-30962*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
ADVANCED RELIABILITY MODELING OF FAULT-TOLERANT COMPUTER-BASED SYSTEMS
Salvatore J Bavuso May 1982 33 p refs
(NASA-TM-84501, NAS 1 15 84501) Avail NTIS HC A03/MF A01 CSCL 09B

Two methodologies for the reliability assessment of fault tolerant digital computer based systems are discussed The computer-aided reliability estimation 3 (CARE 3) and gate logic software simulation (GLOSS) are assessment technologies that were developed to mitigate a serious weakness in the design and evaluation process of ultrareliable digital systems The weak link is based on the unavailability of a sufficiently powerful modeling technique for comparing the stochastic attributes of one system against others Some of the more interesting attributes are reliability, system survival, safety, and mission success

N82-31066*# Man-Acoustics and Noise, Inc Seattle, Wash
A STUDY OF GENERAL AVIATION COMMUNITY NOISE IMPACT AND ANNOYANCE Final Contractor Report, Sep 1979 - Apr. 1982
J E Mabry Apr 1982 45 p refs
(Contract NAS1-15896)
(NASA-CR-165945, NAS 1 26 165945, MAN-1045) Avail NTIS HC A03/MF A01 CSCL 20A

The method involved the selection of three airports which were dominated by aircraft weighing 12,500 lbs or under and which were also undergoing a change relative to utilization Also, there was interest in airports with different utilization levels so that effect of number of operations could be considered In addition there was a requirement to select airports with communities in the surrounding areas which were exposed to aircraft operations noise Noise annoyance response data was obtained from available sources These sources included environmental impact statements, interviews with airport managers, noise complaint information, community meetings concerned with projected changes in airport utilization and social survey data As a means of objectively assessing the noise impact due to aircraft operations, noise measurement and computer noise modeling determinations were obtained for each airport Listening quality tape recordings were also obtained Author

N82-31069*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
NOISE TRANSMISSION LOSS OF AIRCRAFT PANELS USING ACOUSTIC INTENSITY METHODS
Michael C McGary Aug 1982 37 p refs
(NASA-TP-2046, L-15306, NAS 1 60 2046) Avail NTIS HC A03/MF A01 CSCL 20A

The two-microphone, cross-spectral, acoustic intensity measurement technique was used to determine the acoustic transmission loss of three different aircraft panels The study was conducted in the transmission loss apparatus in the Langley aircraft noise reduction laboratory Author

N82-31070*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
AIRPORT/COMMUNITY NOISE
David G Stephens, comp 1982 40 p Proceedings of a Workshop held at Hampton, Va , 25-26 Feb 1982
(NASA-CP-2241, L-1545, NAS 1 55 2241) Avail NTIS HC A03/MF A01 CSCL 13B

Airport noise and community planning for noise compatibility were discussed For individual titles, see N82-31071 through N82-31074

N82-31071*# Douglas Aircraft Co , Inc Long Beach, Calif
AIRPORT NOISE
Robert E Pendley *In* NASA Langley Research Center

Airport/Community Noise 1982 p 2-12

Avail NTIS HC A03/MF A01 CSCL 13B

The problem of airport noise at several airports and air bases is detailed Community reactions to the noise, steps taken to reduce jet engine noise, and the effect of airport use restrictions and curfews on air transportation are discussed The adverse effect of changes in allowable operational noise on airport safety and altenative means for reducing noise pollution are considered Community-airport relations and public relations are discussed J D

N82-31072*# Georgia Inst of Tech , Atlanta
COMMUNITY NOISE
Clifford R Bragdon *In* NASA Langley Research Center Airport/Community Noise 1982 p 13-29

Avail NTIS HC A03/MF A01 CSCL 13B

Airport and community land use planning as they relate to airport noise reduction are discussed Legislation, community relations, and the physiological effect of airport noise are considered Noise at the Logan, Los Angeles, and Minneapolis/St Paul airports is discussed J D

N82-31073*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
SUMMARY OF AIRPORT TECHNOLOGY NEEDS
Homer G Morgan *In its* Airport/Community Noise 1982 p 30

Avail NTIS HC A03/MF A01 CSCL 13B

The need for improvement in airport noise assessment methodology is summarized and specific investigations of the relationship between noise level and individual and community response outlined J D

N82-31074*# Georgia Inst of Tech , Atlanta
SUMMARY OF COMMUNITY TECHNOLOGY NEEDS
Clifford R Bragdon *In* NASA Langley Research Center Airport/Community Noise 1982 p 31-33

Avail NTIS HC A03/MF A01 CSCL 13B

Applications of the social sciences and engineering to solution of the problem of airport noise are summarized Specific needs are outlined J D

N82-31147*# National Aeronautics and Space Administration, Washington, D C
PRESENT CHALLENGES OF RESEARCH AND TECHNOLOGY POLITICS
Andreas V Bulow May 1982 12 p Transl into ENGLISH from DFVLR-Nachr (West Germany), no 35, Mar 1982 p 3-5 Transl by Scientific Translation Service, Santa Barbara, Calif (Contract NASw-3542)
(NASA-TM-76720, NAS 1 15 76720) Avail NTIS HC A02/MF A01 CSCL 05A

Research and technology in Germany are discussed The rapid transfer of scientific knowledge and techniques from the laboratory to the manufacturing and industrial communities is indentified as a priority It is recommended that the government give maximum support to the aviation and space flight industries R J F

N82-31153*# National Aeronautics and Space Administration, Washington, D C
EXTRACTS FROM PROBLEMS OF AIR LAW, A COLLECTION OF WORKS OF THE SECTION OF AIR LAW OF THE AVIAKHIM SOCIETY OF THE USSR AND AVIAKHIM RSFSR
P I Baranov, ed , V A Zarzar, ed , Ye A Korovin, ed , V L Lakhtin, ed , and A V Sabanina, ed Jun 1982 25 p Transl into ENGLISH from the book "Voprosy Vozdushnogo Prava Sbornik Trudov Sektsii Vozdushnogo Prava Soyuza Aviakhim SSSRi Aviakhim RSFSE" Moscow, Aviakhim Press, 1927 p 89-110 Transl by Kanner (Leo) Associates, Redwood City, Calif
(Contract NASw-3541)
(NASA-TM-76913, NAS 1 15 76913) Avail NTIS HC A02/MF A01 CSCL 05D

The difficulties of developing a body of international law to govern air travel is discussed A summary of literature and agreements is presented as well as a brief history Air space over the poles and the legality of methods of claiming territory in the polar regions is discussed R J F

N82-31158*# Detroit Diesel Allison, Indianapolis, Ind
CERAMIC APPLICATIONS IN TURBINE ENGINES Semiannual Report, 1 Jan. - 30 Jun. 1980
S Michael Hudson, Michael A Janovicz, and Franklin A Rockwood Nov 1980 177 p
(Contracts DEN3-17, EC-77-A-31-1040)
(NASA-CR-165197, NAS 1 26 165197, EDR-10383) Avail NTIS HC A09/MF A01 CSCL 13F

The design and testing of gas turbine engines employing ceramic components is discussed Thermal shock and vibration test results as well as spin tests of various engine components are discussed R J F

N82-31291# Aeronautical Systems Div , Wright-Patterson AFB, Ohio
AERONAUTICAL SYSTEMS TECHNOLOGY NEEDS: ESCAPE, RESCUE AND SURVIVAL, TEST FACILITIES AND TEST EQUIPMENT AND TRAINING/SIMULATION EQUIPMENT Annual Report, CY 1982
Mark A Moon Feb 1982 88 p refs Supersedes ASD-TR-82-5001
(AD-A115435, ASD-TR-82-5001-Rev) Avail NTIS HC A05/MF A01 CSCL 01/3

This report is a part of a compilation of formalized Technology Needs (TN) covering Equipment Subsystems as identified in the Aeronautical Systems Division They are based on development/operational experience, systems studies and new concepts - all related to future system applications Their presentation is to serve a threefold purpose, i e , (1) guidance for technology program, (2) prove developmental potential, and (3) engineering data/requirements essential for technology use in systems The identified needs delineate progress desired in performance, control, design flexibility, safety and cost Author (GRA)

N82-31294*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE AND ECONOMIC CHARACTERISTICS OF AN ADVANCED BLENDED SUPERSONIC TRANSPORT CONCEPT
John K. Molloy, William D. Grantham, and Milton J. Neubauer, Jr. Sep. 1982 32 p refs
(NASA-TP-2073; L-15297; NAS 1.60:2073) Avail. NTIS HC A03/MF A01 CSCL 01B

Noise and economic characteristics were obtained for an advanced supersonic transport concept that utilized wing body blending, a double bypass variable cycle engine, superplastically formed and diffusion bonded titanium in both the primary and secondary structures, and an alternative interior arrangement that provides increased seating capacity. The configuration has a cruise Mach number of 2.62, provisions for 290 passengers, a mission range of 8.19 Mm (4423 n.mi.), and an average operating cruise lift drag ratio of 9.23. Advanced operating procedures, which have the potential to reduce airport community noise, were explored by using a simulator. Traded jet noise levels of 105.7 and 103.4 EPNdB were obtained by using standard and advanced takeoff operational procedures, respectively. A new method for predicting lateral attenuation was utilized in obtaining these jet noise levels. Author

N82-31295*# United Technologies Research Center, East Hartford, Conn.
A DOUBLET LATTICE METHOD FOR THE DETERMINATION OF ROTOR INDUCED EMPENNAGE VIBRATION AIRLOADS. ANALYSIS DESCRIPTION AND PROGRAM DOCUMENTATION
Santu T. Gangwani Jun. 1982 68 p refs
(Contract NAS1-16058)
(NASA-CR-165893; NAS 1.26:165893; UTRC81-7) Avail: NTIS HC A05/MF A01 CSCL 01A

An efficient state-of-the-art method was developed to determine the unsteady vibratory airloads produced by the interaction of the main rotor wake with a helicopter empennage. This method was incorporated into a computer program, Rotor Induced Empennage Vibration Analysis (RIEVA). The program requires the main rotor wake position and the strength of the vortices locates near the

empennage surfaces. A nonlinear lifting surface analysis is utilized to predict the aerodynamic loads on the empennage surfaces in the presence of these concentrated vortices. The analysis was formulated to include all pertinent effects such as suction of the interacting vortices and the shed vorticity behind the empennage surfaces. The analysis employs a time domain solution. The output of the program consists of chordwise and spanwise airload distributions on the empennage surfaces. The airload distributions are harmonically analyzed and formulated for input into the Coupled Rotor/Airframe Vibration Analysis. Author

N82-31296*# United Technologies Research Center, East Hartford, Conn.
A PRESCRIBED WAKE ROTOR INFLOW AND FLOW FIELD PREDICTION ANALYSIS, USER'S MANUAL AND TECHNICAL APPROACH
T. A. Egolf and A. J. Landgrebe Jun. 1982 79 p refs
(Contract NAS1-16058)
(NASA-CR-165894; NAS 1.26:165894; UTRC81-2) Avail: NTIS HC A05/MF A01 CSCL 01A

A user's manual is provided which includes the technical approach for the Prescribed Wake Rotor Inflow and Flow Field Prediction Analysis. The analysis is used to provide the rotor wake induced velocities at the rotor blades for use in blade airloads and response analyses and to provide induced velocities at arbitrary field points such as at a tail surface. This analysis calculates the distribution of rotor wake induced velocities based on a prescribed wake model. Section operating conditions are prescribed from blade motion and controls determined by a separate blade response analysis. The analysis represents each blade by a segmented lifting line, and the rotor wake by discrete segmented trailing vortex filaments. Blade loading and circulation distributions are calculated based on blade element strip theory including the local induced velocity predicted by the numerical integration of the Biot-Savart Law applied to the vortex wake model. Author

N82-31297*# Sikorsky Aircraft, Stratford, Conn.
USER'S MANUAL FOR THE AUTOMATED PANELING TECHNIQUE (APT) AND THE WING BODY AERODYNAMIC TECHNIQUE (WABAT) PROGRAMS Final Report
R. E. Studwell Jun. 1982 44 p refs
(Contract NAS1-16058)
(NASA-CR-165895; NAS 1.26:165895) Avail: NTIS HC A03/MF A01 CSCL 01A

User instructions for the Tektronix Graphics Package of the Automated Paneling Technique (APT) and the Wing and Body Aerodynamic Technique (WABAT) Programs are provided. Responses to plot package messages which the user must make to activate plot package operations and options are described. Modifications to the APT and WABAT input run streams, to affect the graphic interface, are also covered. Author

N82-31298*# United Technologies Research Center, East Hartford, Conn.
AEROELASTIC ANALYSIS FOR HELICOPTER ROTORS WITH BLADE APPENDED PENDULUM VIBRATION ABSORBERS. MATHEMATICAL DERIVATIONS AND PROGRAM USER'S MANUAL Final Report
Richard L. Bielawa Jun. 1982 109 p refs
(Contract NAS1-16058)
(NASA-CR-165896; NAS 1.26:165896; UTRC81-45) Avail: NTIS HC A06/MF A01 CSCL 01A

Mathematical development is presented for the expanded capabilities of the United Technologies Research Center (UTRC) G400 Rotor Aeroelastic Analysis. This expanded analysis, G400PA, simulates the dynamics of teetered rotors, blade pendulum vibration absorbers and the higher harmonic excitations resulting from prescribed vibratory hub motions and higher harmonic blade pitch control. Formulations are also presented for calculating the rotor impedance matrix appropriate to these higher harmonic blade excitations. This impedance matrix and the associated vibratory hub loads are intended as the rotor blade characteristics elements for use in the Simplified Coupled Rotor/Fuselage Vibration Analysis (SIMVIB). Sections are included presenting updates to the development of the original G400 theory, and material appropriate to the user of the G400PA computer program. This material includes: (1) a general description of the structuring of the G400PA FORTRAN coding, (2) a detailed description of the required input data and other useful information for successfully running the program, and (3) a detailed description of the output results. Author

N82-31299*# Sikorsky Aircraft, Stratford, Conn.
USER'S MANUAL FOR THE COUPLED ROTOR/AIRFRAME VIBRATION ANALYSIS GRAPHIC PACKAGE Final Report
R. E. Studwell Jun. 1982 27 p
(Contract NAS1-16058)
(NASA-CR-165897; NAS 1.26:165897) Avail: NTIS HC A03/MF A01 CSCL 01A

User instructions for a graphics package for coupled rotor/airframe vibration analysis are presented. Responses to plot package messages which the user must make to activate plot package operations and options are described. Installation instructions required to set up the program on the CDC system are included. The plot package overlay structure and subroutines which have to be modified for the CDC system are also described. Operating instructions for CDC applications are included. S.L

N82-31300*# Flow Research, Inc., Kent, Wash.
SINGULARITY EMBEDDING METHOD IN POTENTIAL FLOW CALCULATIONS
Wen-Huei Jou and Hung Huynh Jun. 1982 28 p refs
(NASA Order A-77471B)
(NASA-CR-166387; NAS 1.26:166387) Avail. NTIS HC A03/MF A01 CSCL 01A

The so-called H-type mesh is used in a finite-element (or finite-volume) calculation of the potential flow past an airfoil. Due to coordinate singularity at the leading edge, a special singular trial function is used for the elements neighboring the leading edge. The results using the special singular elements are compared to those using the regular elements. It is found that the unreasonable pressure distribution obtained by the latter is removed by the embedding of the singular element. Suggestions to extend the present method to transonic cases are given. Author

N82-31301*# Grumman Aerospace Corp., Bethpage, N.Y.
AXISYMMETRIC AND NON-AXISYMMETRIC EXHAUST JET INDUCED EFFECTS ON A V/STOL VEHICLE DESIGN. PART 2: ANALYSIS OF RESULTS
W. C. Schnell Jan. 1982 202 p refs
(Contract NAS2-9887)
(NASA-CR-166365; NAS 1.26:166365) Avail: NTIS HC A10/MF A01 CSCL 01A

A wind tunnel investigation, employing a 1/8 scale model in an 11 foot transonic wind tunnel (Mach 0.4-1.4), was conducted to determine the jet effects of several exhaust nozzles on the aeropropulsive performance of a V/STOL fighter design. The force and pressure data show that significant differences in aeropropulsion performance can be expected by varying the exhaust nozzle type, jet area and deflection angle on an underwing nacelle installation. At unvectored conditions, the single expansion ramp nozzles show large performance gains relative to a circular nozzle installation. Additionally, a further drag reduction is realized when the nonaxisymmetric nozzle is vectored through a 10 degree deflection angle. The combined payoff of the vectored nonaxisymmetric nozzle over the baseline circular nozzle installation is equivalent to 25 percent of zero lift drag. R.J.F.

N82-31302*# Grumman Aerospace Corp., Bethpage, N.Y.
AXISYMMETRIC AND NON-AXISYMMETRIC EXHAUST JET INDUCED EFFECTS ON A V/STOL VEHICLE DESIGN. PART 3: EXPERIMENTAL TECHNIQUE
W. C Schnell Jun. 1982 115 p refs
(Contract NAS2-9887)
(NASA-CR-166147; NAS 1.26.166147) Avail: NTIS HC A06/MF A01 CSCL 01A

The jet induced effects of several exhaust nozzle configurations (axisymmetric, and vectoring/modulating varients) on the aeropropulsive performance of a twin engine V/STOL fighter design was determined A 1/8 scale model was tested in an 11 ft. transonic tunnel at static conditions and over a range of Mach Numbers from 0.4 to 1.4. The experimental aspects of the static and wind-on programs are discussed. Jet effects test techniques in general, fow through balance calibrations and tare force corrections, ASME nozzle thrust and mass flow calibrations, test problems and solutions are emphasized. S.L.

N82-31303*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUPERCRITICAL MANEUVERING FIGHTER CONFIGURATION. WIND-TUNNEL INVESTIGATION AT MACH NUMBERS OF 0.60 TO 0.95
Michael J. Mann, Charles E. Mercer, and Richard L. Campbell Sep. 1982 69 p refs
(NASA-TM-84513; L-15399; NAS 1.15:84513) Avail: NTIS HC A04/MF A01 CSCL 01A

A wind tunnel investigation was conducted to study the application of supercritical technology to highly maneuverable combat aircraft. The configuration studied has a leading-edge sweep of 45 deg and an aspect ratio of 3.28. Two supercritical-wing shapes were tested at Mach numbers from 0.60 to 0.95 with angles of attack from -2 deg to 17 deg. On supercritical wing was designed to achieve a high level of transonic maneuver performance at a Mach number of 0.90; however, excessive flow separation developed on this wing at a Mach number of 0.85. A second supercritical wing was tested which had significantly reduced flow separation and improved drag characteristics at a Mach number of 0 85 and maintained the performance of the original wing at the higher Mach numbers Leading-edge vortex generators did not improve the performance of the second wing; however, a sharp leading-edge flap produced sizable drag reductions at Mach numbers from 0.60 to 0.90. Author

N82-31304*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
HYBRID STATE VECTOR METHODS FOR STRUCTURAL DYNAMIC AND AEROELASTIC BOUNDARY VALUE PROBLEMS
Larry Lee Lehman Washington NASA Aug. 1982 195 p refs (Grant NGL-05-020-243)
(NASA-CR-3591; NAS 1 26:3591) Avail: NTIS HC A09/MF A01 CSCL 01A

A computational technique is developed that is suitable for performing preliminary design aeroelastic and structural dynamic analyses of large aspect ratio lifting surfaces. The method proves to be quite general and can be adapted to solving various two point boundary value problems. The solution method, which is applicable to both fixed and rotating wing configurations, is based upon a formulation of the structural equilibrium equations in terms of a hybrid state vector containing generalized force and displacement variables. A mixed variational formulation is presented that conveniently yields a useful form for these state vector differential equations. Solutions to these equations are obtained by employing an integrating matrix method. The application of an integrating matrix provides a discretization of the differential equations that only requires solutions of standard linear matrix systems. It is demonstrated that matrix partitioning can be used to reduce the order of the required solutions. Results are presented for several example problems in structural dynamics and aeroelasticity to verify the technique and to demonstrate its use. These problems examine various types of loading and boundary conditions and include aeroelastic analyses of lifting surfaces constructed from anisotropic composite materials. Author

N82-31305# Arizona Univ., Tucson. Engineering Experiment Station.
SURFACE GENERATION FOR AERODYNAMIC APPLICATIONS
H. Sobieczky (DFVLR, Goettingen, West Germany) Jun. 1981 22 p refs
(Contract N00014-76-C-0182)
(AD-A116263; TFD-81-03) Avail: NTIS HC A02/MF A01 CSCL 20/4

This paper describes an analytical procedure to obtain the geometry of wing-body combinations, missiles, rotors and propellers, to be used in computational algorithms as well as for automated tool manufacturing wind tunnel models for flow-field analysis, with emphasis on parametrical shape variations needed in aerodynamic design and optimization procedures. Analytical shape definition allows for arbitrary surface coordinates generation to be combined with three dimensional (flow space) grid generators. Present version of the code (E88-A) defines the wing along sections at constant span, with smooth deviations near the wing root section, which is projected onto the body surface. The body is defined by cross-section shapes based on superelliptic arcs, connecting analytic crown lines and planform projection curves. Wing sections are defined by an analytical blending between given root and central sections for the inner part of the wing, and the same between the central and tip section for the outer part of the wing. These three basic airfoils may be given as dense data from preceding two dimensional design or as relatively few spline supports for an interpolation technique of suitably stretched ordinates in order to density airfoil data. GRA

N82-31308# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
MATERIALS AND DESIGN CRITERIA FOR KEVLAR-29 RIBBON PARACHUTES Final Report, 1 Sep. - 1 Mar. 1980
William R Pinnell Apr. 1982 267 p refs
(AF Proj. 2402)
(AD-A116357; AFWAL-TR-81-3138) Avail: NTIS HC A12/MF A01 CSCL 01/3

This report contains information and design criteria for application of Kevlar-29 (intermediate modulus para-aramid) textile materials to ribbon parachutes. Textile materials for this application are listed, their properties and limitations discussed, and methods for tensile testing presented. Twenty degree conical continuous ribbon parachute test items were designed and fabricated using Kevlar-29 textile materials entirely. The results of air drop and sled track testing at subsonic and transonic conditions are presented and design criteria based on these results are reported. The effects of reefing (two stages) on aerodynamic performance of the 15.3 ft nominal diameter parachutes is also reported. The report treats joining techniques for kevlar-29 parachute components and presents the results of tensile tests of joint samples. Design considerations and fabrication techniques related to application of Kevlar-29 materials are included. A comprehensive list of references useful to the parachute or decelerator system designer is provided. Author (GRA)

N82-31309# Sandia Labs., Albuquerque, N. Mex.
REDUCTION IN PARACHUTE DRAG DUE TO FOREBODY WAKE EFFECTS
Carl W. Peterson and Donald W. Johnson 1981 10 p refs Presented at the 7th AIAA Aerodyn. Decelerator and Balloon Technol. Conf., San Diego, Calif., 21 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE81-030124; SAND-81-0510C) Avail: NTIS HC A02/MF A01

The reduction in parachute drag due to forebody wake effects was predicted. The drag of a 20 deg conical ribbon parachute was measured at several axial stations behind an ogive cylinder forebody with and without fins. The same parachute was tested in undisturbed flow (where wake effects were negligible) so that the effects of suspension line length on parachute drag could be separated from the drag losses caused by the turbulent wake. Total head pressure surveys were made across the forebody wake and integrated across the canopy skirt area to determine the effective dynamic pressure acting on the parachute. Experimental results confirmed the validity of the underlying physical model of the parachute/wake interaction: the ratio of parachute drag behind a forebody divided by wake-free parachute drag is equal to the ratio of effective dynamic pressure acting on the parachute divided by freestream dynamic pressure. DOE

N82-31311*# Virginia Univ., Charlottesville. Dept. of Mechanical Engineering.
IDENTIFICATION OF TERMS TO DEFINE UNCONSTRAINED AIR TRANSPORTATION DEMANDS Final Report, 26 Mar. 1980 - 31 Aug. 1981
Ira D. Jacobson and A. Robert Kuhlhau Apr. 1982 60 p refs (Contract NAS1-14908)
(NASA-CR-165961; NAS 1.26:165961; UVA/528194/MAE-CE82/101) Avail: NTIS HC A04/MF A01 CSCL 01C

The factors involved in the evaluation of unconstrained air transportation systems were carefully analyzed. By definition an unconstrained system is taken to be one in which the design can employ innovative and advanced concepts no longer limited by present environmental, social, political or regulatory settings. Four principal evaluation criteria are involved: (1) service utilization, based on the operating performance characteristics as viewed by potential patrons; (2) community impacts, reflecting decisions based on the perceived impacts of the system; (3) technological feasibility, estimating what is required to reduce the system to practice; and (4) financial feasibility, predicting the ability of the concepts to attract financial support. For each of these criteria, a set of terms or descriptors was identified, which should be used in the evaluation to render it complete. It is also demonstrated that these descriptors have the following properties: (a) their interpretation may be made by different groups of evaluators; (b) their interpretations and the way they are used may depend on the stage of development of the system in which they are used; (c) in formulating the problem, all descriptors should be addressed independent of the evaluation technique selected. Author

N82-31313# Federal Aviation Administration, Washington, D.C.
SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSE TO NATIONAL TRANSPORTATION SAFETY BOARD SAFETY RECOMMENDATIONS Quarterly Report, Jul. - Sep. 1981
R. E. Livingston and C. A. Carpenter Oct. 1981 320 p refs
(AD-A115485; DOT/FAA/ASF-81/5) Avail: NTIS HC A14/MF A01 CSCL 05/4

This report contains NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions. The Table of Contents for this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as 'Closed' by the NTSB as a result of acceptable action). Accordingly, the Table of Contents may reflect a number of multiple recommendations (example: A-81-36 through 38), but background material is included only for those recommendations which remain in an 'Open' status. Background information for those recommendations which have been closed is available in FAA Headquarters files. Author (GRA)

N82-31314# Federal Aviation Administration, Washington, D.C. Office of Aviation Safety.
SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSE TO NATIONAL TRANSPORTATION SAFETY BOARD SAFETY RECOMMENDATIONS Quarterly Report, Oct. - Dec. 1981
R. E. Livingston and C. A. Carpenter Jan. 1982 412 p refs
(AD-A115486; DOT/FAA/ASF-81/6) Avail: NTIS HC A18/MF A01 CSCL 05/04

This report contains NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions. The Table of Contents for this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as 'Closed' by the NTSB as a result of acceptable action). Accordingly, the Table of Contents may reflect a number of multiple recommendations (example: A-81-88 through 91), but background material is included only for those recommendations which remain in an 'Open' status Background information for those recommendations which have been closed is available in FAA Headquarters files. Author (GRA)

N82-31315# Federal Aviation Administration, Atlantic City, N.J. Technical Center
FAA ACCEPTANCE TESTS ON THE NAVIGATION SYSTEM USING TIME GLOBAL POSITIONING SYSTEM Z SET RECEIVER Final Report, Jun. - Dec. 1979
Robert J Esposito Jul. 1982 21 p refs
(FAA Proj. 049-330-110)
(DOT/FAA/RD-82/9) Avail: NTIS HC A02/MF A01

Acceptance tests on the Navigation System Using Time and Ranging (NAVSTAR) Global Positioning System (GPS) Z-set receiver are described. The Yuma laser tracking system computed a reference trajectory against which the GPS receiver solution was compared. Data from five flights, totaling over 6 hours, are presented with the objective of assessing Z-set capabilities to meet civil aviation requirements for nonprecision approaches
Author

N82-31318# Mitre Corp., McLean, Va. Metrek Div.
OPERATIONAL AND FUNCTIONAL REQUIREMENTS FOR THE NAVIGATION SYSTEM IN TERMINAL AREAS Final Report
Satish C Mohleji Feb. 1982 63 p refs
(Contract DOTA01-82-C-10003)
(AD-A116127; MTR-82W13; FAA-RD-82-10) Avail: NTIS HC A04/MF A01 CSCL 17/7

A comprehensive set of operational requirements relating the capabilities of the navigation system and its use in the ATC environment are developed in this paper by modifying the operational requirements for MLS established by the International Civil Aviation Organization In order to establish the functional requirements, an interrelationship is established between the navigation system parameters, route geometry and ATC procedures considering system uncertainties An impact of each ATC uncertainty (navigation, surveillance, communication delays, airspeeds and winds) is first examined individually by computing the time dispersions between the planned vs. the achieved aircraft performance Then a total dispersion and control interaction is established by calculating the time variability due to speed adjustments permitted under ATC procedures, and by statistically combining the impact of the ATC uncertainties using a root sum square (RSS) approach. This technique is general enough to permit evaluation of functional requirements (accuracy, coverage and channel capacity) of any navigation system under varying ATC parameters, procedures and operational requirements GRA

N82-31319# Mitre Corp., McLean, Va. Metrek Div.
ANALYSIS OF ACTIVE BCAS ALERT RATES AND PROTECTION BASED ON ACTUAL AIRCRAFT TRACKS Final Report
Lillian B. Zarrelli Feb 1982 239 p refs
(Contract DTFA01-82-C-10003)
(AD-A116402; MTR-80W267; FAA-RD-82-33) Avail: NTIS HC A11/MF A01 CSCL 17/7

This document describes an evaluation of the performance of the Active Beacon Collision Avoidance System (Active BCAS) using the Houston data base and simulated midair collision scenarios. The Houston data was extracted from ARTS III tapes and consisted of 65 hours of operation This data was used to measure alert rates and assess desensitization techniques aimed at reducing the number of unnecessary alerts The midair data base consisted of the reconstructed flight paths of 15 actual midair collisions. Measures of protection and tradeoffs were made based on the performance of the BCAS logic in resolving these simulated collision scenarios. Author (GRA)

N82-31321*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL INVESTIGATION OF ACTIVE LOADS CONTROL FOR AIRCRAFT LANDING GEAR
John R. McGehee and Robert C Dreher Aug 1982 72 p refs

(NASA-TP-2042, L-15224, NAS 1.60:2042) Avail. NTIS HC A04/MF A01 CSCL 01C

Aircraft dynamic loads and vibrations resulting from landing impact and from runway and taxiway unevenness are recognized as significant in causing fatigue damage, dynamic stress on the airframe, crew and passenger discomfort, and reduction of the pilot's ability to control the aircraft during ground operations One potential method for improving operational characteristics of aircraft on the ground is the application of active control technology to the landing gears to reduce ground loads applied to the airframe An experimental investigation was conducted which simulated the landing dynamics of a light airplane to determine the feasibility and potential of a series hydraulic active control main landing gear. The experiments involved a passive gear and an active control gear Results of this investigation show that a series hydraulically controlled gear is feasible and that such a gear is very effective in reducing the loads transmitted by the gear to the airframe during ground operations. Author

N82-31322# Arizona Univ., Tucson. Engineering Experiment Station.

AN EFFECTIVE ALGORITHM FOR SHOCK-FREE WING DESIGN

K.-Y. Fung, A. Robert Seebass, L. J Dickson, and C. F. Pearson Jun. 1981 31 p refs Presented at the 14th AIAA Fluid and Plasma Dyn. Conf., Palo Alto, Calif., 23-25 Jun. 1981

(Contract N00014-76-C-0182)

(AD-A116265; TFD-81-06) Avail: NTIS HC A03/MF A01 CSCL 20/4

This paper reviews the fictitious gas procedure of Sobieczky for finding shockfree airfoils and wings. Results for inviscid and viscous flows for airfoils and wings are described. The method is applied to a business jet planform resulting in a wing that should have good low speed characteristics as well as an M-infinity L/D that is near the maximum achievable for the wing lift and thickness chosen for the study. GRA

N82-31323# Atmospheric Sciences Lab, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.

THE MANEUVERABLE ATMOSPHERIC PROBE (MAP), A REMOTELY PILOTED VEHICLE Final Report

Roberto Rubio, Claude L. Tate, Maynard L. Hill, Harold N. Ballard, Mike Izquierdo, and Carlos McDonald May 1982 56 p refs

(DA Proj 1L1-62111-AH-71)

(AD-A116118; ERADCOM/ASL-TR-0110) Avail: NTIS HC A04/MF A01 CSCL 01/3

This report documents, in considerable detail, the physical and aerodynamic characteristics of the 10-hp, 36.5-kg, radio-controlled MAP aircraft, as well as the novel fluidic and electrostatic vertical stabilizer systems assisting in aircraft control. The atmospheric and aerodynamic sensor configurations, including the sensor data telemetry system, are described. Three distinct flight experiments were conducted with the instrumented MAP vehicle. During the first experiment, dust particulate samples, raging in size from 0 2 micrometer to 400 micrometer, were obtained by flying the RPV-mounted samplers through low altitude dust clouds generated by ground-based 105-mm artillery shell explosions. Data from this experiment are presented. The second experiment involved characterizing typical atmospheric conditions along a laser propagation range (path). Graphs of atmospheric temperature, pressure, RH, and derived air density, all as functions of RPV altitude, present data that are representative of those obtained from the second experiment. Measurement accuracies for temperature, pressure, and RH are respectively shown to be plus or minus 1 deg C, plus or minus 2 percent of the total pressure and plus or minus 4 percent of actual RH. The third experiment was conducted with the instrumented RPV being flown near a mountain peak whose altitude is 2440 millimeter relative to mean sea level (msl). Atmospheric electric field intensity and turbulence structure measurements as functions of RPV position relative to the mountain peak make up the third set of data presented in this report. GRA

N82-31324# Army Natick Research and Development Command, Mass.

SIMULATION OF THE INTERACTION BETWEEN AIRDROP PLATFORMS AND AIRCRAFT ROLLERS

Earl C. Steeves Apr. 1982 54 p

(DA Proj 1L1-62210-D-283)

(AD-A116370; NATICK/TR-82/014) Avail: NTIS HC A04/MF A01 CSCL 01/2

All airdrop loads must be certified as not exceeding the maximum aircraft roller loads. This certification is presently accomplished by a series of tests which are numerous and complex. This report looks at the possibility of replacing this test procedure with a numerical simulation. Two simulations are examined; a straightforward deterministic structural simulation and a structural simulation that includes the imperfections in the system in a statistical manner The imperfections in the system are large enough to make the deterministic structural model inadequate, and insufficient data are available to make an accurate statistical model of the imperfections. As a result, it was not possible to develop a complete model to carry out the roller load simulation, although only the imperfection model is needed for completion of the statistical simulation. The statistical model was used to demonstrate that the use of very flexible rollers would reduce the importance of the imperfections in the system. GRA

N82-31325# Naval Air Propulsion Test Center, Trenton, N.J. Propulsion Technology and Project Engineering Dept.

A METHOD FOR DESIGNING INLET DISTORTION SCREENS FOR AIRCRAFT GAS TURBINE ENGINE TESTS USING AN INTERACTIVE COMPUTER PROGRAM Final Report

Robert E. Anderson May 1982 35 p ref

(AD-A116584; NAPC-PE-66) Avail: NTIS HC A03/MF A01 CSCL 21/5

The design of inlet distortion screens used for testing aircraft gas turbine engines can be facilitated by using an interactive computer program. This report describes a computer program which has been developed by the Naval Air Propulsion Center to aid in the screen design process. The computer program can be used to establish the initial screen design and to develop modifications after the screen is tested. Author (GRA)

N82-31326*# Analytical Mechanics Associates, Inc., Mountain View, Calif.

FUNCTIONAL DESIGN TO SUPPORT CDTI/DABS FLIGHT EXPERIMENTS Final Report

Tsuyoshi Goka Jul. 1982 170 p refs

(Contract NAS1-16802)

(NASA-CR-165947, NAS 1.26:165947) Avail: NTIS HC A08/MF A01 CSCL 01D

The objectives of this project are to: (1) provide a generalized functional design of CDTI avionics using the FAA developed DABS/ATARS ground system as the 'traffic sensor', (2) specify software modifications and/or additions to the existing DABS/ATARS ground system to support CDTI avionics, (3) assess the existing avionics of a NASA research aircraft in terms of CDTI applications, and (4) apply the generalized functional design to provide research flight experiment capability. DABS Data Link Formats are first specified for CDTI flight experiments. The set of CDTI/DABS Format specifications becomes a vehicle to coordinate the CDTI avionics and ground system designs, and hence, to develop overall system requirements The report is the first iteration of a system design and development effort to support eventual CDTI flight test experiments. Author

N82-31327# Smiths Industries, Inc., Clearwater, Fla.

FINAL ENGINEERING REPORT FOR COMPUTER, WEAPON AIMING CP-1444/A Final Report

M. D. Caramichael 1 Jun. 1982 175 p refs

(Contract N00019-77-A-0350)

(AD-A115238; SI-0519) Avail. NTIS HC A08/MF A01 CSCL 19/5

The WAC performs the following general functions: (1) Signal conditioning of the aircraft attitude sensor data for use by the

Head-Up Display (HUD) system; (2) Air-to-air lead angle computation for the HUD air-to-air gunsight; (3) Air-to-ground weapon depression and across-wind aimpoint computation for the HUD air-to-ground Continuously Computed Impact Point (CCIP) weapon release cue; and (4) Breakway warning computation for terrain and weapon fragmentation avoidance for the HUD air-to-ground CCIP mode. GRA

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

DEVELOPMENT OF A SPINNING WAVE HEAT ENGINE Final Report

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

(Grant NAG3-96)

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

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

N82-31330*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.

SINGULAR PERTURBATION TECHNIQUES FOR REAL TIME AIRCRAFT TRAJECTORY OPTIMIZATION AND CONTROL Final Report, Feb. 1978 - Dec. 1981

Anthony J. Calise and Daniel D. Moerder NASA Washington Aug. 1982 111 p refs

(Grant NsG-1496)

(NASA-CR-3597; NAS 1.26:3597) Avail: NTIS HC A06/MF A01 CSCL 01C

The usefulness of singular perturbation methods for developing real time computer algorithms to control and optimize aircraft flight trajectories is examined. A minimum time intercept problem using F-8 aerodynamic and propulsion data is used as a baseline. This provides a framework within which issues relating to problem formulation, solution methodology and real time implementation are examined Theoretical questions relating to separability of dynamics are addressed. With respect to implementation, situations leading to numerical singularities are identified, and procedures for dealing with them are outlined. Also, particular attention is given to identifying quantities that can be precomputed and stored, thus greatly reducing the on-board computational load. Numerical results are given to illustrate the minimum time algorithm, and the resulting flight paths An estimate is given for execution time and storage requirements. Author

N82-31331# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.

DESIGN OF ADVANCED DIGITAL FLIGHT CONTROL SYSTEMS VIA COMMAND GENERATOR TRACKER (CGT) SYNTHESIS METHODS, VOLUME 1 M.S. Thesis

Richard M. Floyd Dec 1981 226 p refs 2 Vol

(AD-A115510; AFIT/GE/EE/81-20-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 01/2

This study develops a computer program for interactive execution to aid in the design of Command Generator Tracker control systems employing Proportional-plus-Integral inner-loop controllers and Kalman Filters for state estimation (CGT/PI/KF controllers). Design parameters are specified in the continuous-time domain and the computer program obtains the corresponding discrete-time parameters and determines a direct digital design for sampled-data implementation. Designs are based upon the Linear system mode, Quadratic cost, and Gaussian noise process (LQG) assumptions of optimal control theory. The report discusses the theoretical background and applications of optimal model-following designs which preceded the CGT theory. A development of the CGT/PI/KF controller theory is presented, and performance evaluation tools for the controller design are discussed. Following a brief description of the computer program developed, results of applying it to example aircraft-related controller design problems are presented and discussed GRA

N82-31332# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.

DESIGN OF ADVANCED DIGITAL FLIGHT CONTROL SYSTEMS VIA COMMAND GENERATOR TRACKER (CGT) SYNTHESIS METHODS, VOLUME 2 M.S. Thesis

Richard M. Floyd Dec. 1981 246 p refs 2 Vol.

(AD-A115511; AFIT/GE/EE/81-20-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 01/2

CGTPIF is a controller design program which executes interactively. Three design paths are offered: (1) design of a Proportional-plus-Integral (PI) regulator via linear-quadratic (LQ) methodology, (2) design of a Command Generator Tracker, either open-loop (CGT) or closed-loop (CGT/PI); and (3) design of a Kalman filter (KF) These three designs are components of a final controller implemented as a Command Generator Tracker, with an inner-loop proportional-plus-integral regulator, and a Kalman filter for state estimation (CGT/PI/KF). For each design path there is a corresponding set of routines to evaluate the quality of the design achieved The program is written in FORTRAN IV and consists of about 2500 lines of source code. In addition, numerous routines are employed from a library of matrix routines described in Reference 24. Author (GRA)

N82-31333# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).

DESCRIPTION OF A SIMPLE MODEL TO DETERMINE LANDING GEAR FORCES DURING THE TAKEOFF OF AERODYNAMICALLY UNSTABLE AIRCRAFT [BESCHREIBUNG EINES EINFACHEN MODELLS ZUR ERMITTLUNG VON FAHRWERKSKRAEFTEN WAEHREND DES STARTVORGANGS EINES AERODYNAMISCHES INSTABILEN FLUGZEUGS]

M. Soelter 25 Nov. 1981 43 p refs In GERMAN

(EX-22B) Avail: NTIS HC A03/MF A01

A simple model to simulate the lateral motion during the takeoff of an aerodynamically unstable aircraft is presented. By neglecting the landing gear dynamics no additional solution of the corresponding differential equations was required. Landing gear forces were determined from the geometrical ratios of the aircraft to the ground reference line. This procedure is particularly efficient when no high frequency landing gear drive-as, e.g., during touchdown has to be taken into account. The objection free function of the control concept for an aircraft aerodynamically unstable in the lateral plane is shown. Author (ESA)

N82-31335# Goulding (Merrill K.) and Associates, Glendale, Calif.

STUDY OF THE DE-ICING PROPERTIES OF THE ASDE-3 ROTODOME Final Report, Sep. 1978 - Sep. 1980

Merrill K. Goulding Washington FAA Apr. 1982 132 p refs

(Grant DOT-TSC-15950)

(AD-A115445; DOT/FAA/RD-81/112; DOT-TSC-FAA-81-24; DTS-541) Avail. NTIS HC A07/MF A01 CSCL 01/5

A study was conducted of the thermal characteristics of the

ASDE-3 system's rotating radome (rotodome), a spheri-toroidal thin wall structure, approximately 18 feet in diameter and 6 feet in height The purpose of the study was to determine the thermal transmissivities of the various regions of the design, discover 'hot spots,' determine the need for insulation, heater exhaust deflectors and other enhancements, and to make a prediction of the ability of its heaters to prevent system outages due to ice accretion on the rotodome. An analysis made using test data to predict the ability of the rotodome to resist icing conditions was very encouraging, demonstrating that convection becomes the dominant mode of heat loss during high wind conditions. A conservative analysis was made with winds applied at full velocity across all regions of the rotodome. The results indicate that the goal of de-icing the rotodome appears achievable using 30 kW of power. Although there are hot spots about the rotodome, the de-icing function using the hot air blower system is satisfactory To reduce hot spots near the blower assembly, a deflector is recommended at the output of the blower. Author (GRA)

N82-31336# American Airlines, Inc., Ft. Worth, Tex.
WIDE-ANGLE, MULTIVIEWER, INFINITY DISPLAY SYSTEM Final Report
Ian Whyte and A. W. Zepf Jun. 1982 95 p refs
(Contract F33615-79-C-0002)
(AD-A116308; AFHRL-TR-81-27(1)) Avail: NTIS HC A05/MF A01 CSCL 05/9

This study examined the design specification for a wide angle infinity display system with minimal distortion, convergence, dipvergence, and collimation errors for use on wide body aircraft simulators. The report includes a recommended final design specification; a survey of potential fabrication technologies for projector, screen and large mirrors; an approach to fabrication of a large display system; and finally, assembly and alignment techniques of mirror segments for a large display. (Note: Dipvergence refers to vertical movement of eyes up and down as opposed to side to side.) GRA

N82-31338# *Calspan Field Services, Inc., Arnold Air Force Station,* Tenn.
CALIBRATION AND PERFORMANCE OF THE AEDC/VKF TUNNEL C, MACH NUMBER 4, AEROTHERMAL WIND TUNNEL Final Report, 15 May - 18 Dec. 1981
W. T. Strike, Jr. Jun. 1982 117 p refs
(AD-A116279; AEDC-TR-82-6) Avail: NTIS HC A06/MF A01 CSCL 14/2

The shakedown and calibrated characteristics of the new AEDC Mach Number 4 Aerothermal Wind Tunnel were experimentally identified at several test conditions. The nominal Mach number of the test core as defined by a 30-probe pitot pressure rake varied between nominally 3.95 and 4.0, depending on the test section Reynolds number and stilling chamber temperature. The overall variation in the stilling chamber pressure is nominally 15 to 180 psia, with temperatures from 250 to 1,210 F for an overall Reynolds number range of 0.2 to 8 1 million per foot and true temperature-pressure altitude simulation from 56,000 to 105,000 ft. Author (GRA)

N82-31448*# Douglas Aircraft Co., Inc., Long Beach, Calif.
KEVLAR/PMR-15 REDUCED DRAG DC-9 REVERSER STANG FAIRING
R. T. Kawai Aug. 1982 140 p refs
(Contract NAS3-21763)
(NASA-CR-165448; NAS 1.26:165448) Avail: NTIS HC A07/MF A01 CSCL 11D

A reduced drag fairing for the afterbody enclosing the thrust reverser actuators on the DC-9 has been developed with Kevlar-49/PMR-15 advanced composite material. The improved fainng reduces airplane drag 1% compared to the production baseline. Use of composites reduces weight 40% compared to an equivalent metal fairing. The Kevlar-49/PMR-15 advanced composite is an organic matrix material system that can be used at temperatures up to 500 F. Author

N82-31449*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENVIRONMENTAL AND HIGH-STRAIN RATE EFFECTS ON COMPOSITES FOR ENGINE APPLICATIONS
C. C. Chamis and G. T. Smith 1982 20 p refs Presented at the 23rd Struct. Dyn. and Mater. Conf., New Orleans, 10-12 May 1982; sponsored by AIAA, ASME, ASCE, and AHS Previously announced in IAA as A82-30118
(NASA-TM-82882; NAS 1.15:82882) Avail: NTIS HC A02/MF A01 CSCL 11D

The Lewis Research Center is conducting a series of programs intended to investigate and develop the application of composite materials to structural components for turbojet engines. A significant part of that effort is directed to establishing resistance, defect growth, and strain rate characteristics of composite materials over the wide range of environmental and load conditions found in commercial turbojet engine operations. Both analytical and experimental efforts are involved. Author

N82-31546*# Lockheed-California Co., Burbank.
ADDITIONAL EXPERIMENTS ON FLOWABILITY IMPROVEMENTS OF AVIATION FUELS AT LOW TEMPERATURES, VOLUME 2 Final Report
Francis J. Stockemer and Ronald L. Deane Aug. 1982 56 p refs
(Contract NAS3-21977)
(NASA-CR-167912; NAS 1.26:167912) Avail: NTIS HC A04/MF A01 CSCL 21D

An investigation was performed to study flow improver additives and scale-model fuel heating systems for use with aviation hydrocarbon fuel at low temperatures. Test were performed in a facility that simulated the heat transfer and temperature profiles anticipated in wing fuel tanks during flight of long-range commercial aircraft. The results are presented of experiments conducted in a test tank simulating a section of an outer wing integral fuel tank approximately full-scale in height, chilled through heat exchange panels bonded to the upper and lower horizontal surfaces. A separate system heated lubricating oil externally by a controllable electnc heater, to transfer heat to fuel pumped from the test tank through an oil-to-fuel heat exchanger, and to recirculate the heated fuel back to the test tank. B.W.

N82-31548# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF THE EFFECTS OF SMOKE SUPPRESSANT FUEL ADDITIVES ON ENGINE AND TEST CELL EXHAUST GAS OPACITIES Final Report, 1981
Donald W. Thornburg, Thomas R. Darnell, and David W. Netzer May 1982 116 p refs
(AD-A116171; NPS67-82-004) Avail: NTIS HC A06/MF A01 CSCL 21/4

Tests were conducted in a one-eighth scale turbojet test cell with a ramjet type combustor to investigate the effects of fuel additives on smoke reduction. Particle size and mass concentrations were determined at the engine and stack exhausts using three wavelength optical detector systems. Particulate samples were also collected at the engine exhaust and analyzed with a scanning electron microscope Combustor temperature and fuel additives were found to significantly affect particulate mass concentrations emitted from the engine while particle size appeared to be unaffected. No significant changes in the particulate size or mass occurred from the engine exhaust to the stack exhaust. The optical determination of exhaust mean particulate size/mass concentration with three wavelength optical detector systems appears to be reasonably accurate technique for evaluating the effects of engine and test cell operating conditions and fuel composition changes on the emitted particulates. Author (GRA)

N82-31569# Southampton Univ. (England). Inst. of Sound and Vibration Research.
[ACTIVITIES OF THE INSTITUTE OF SOUND AND VIBRATION RESEARCH] Annual Report, Mar. 1982
1982 49 p refs

Avail: NTIS HC A03/MF A01

Research in fluid dynamics, acoustics, automotive engineering, audiology, noise and vibration effects (on human beings), and structural response to noise and vibration was carried out. Aircraft noise, acoustics of flow duct systems and enclosures, acoustic modeling, sound propagation, and acoustic measurement techniques were studied. Auditory and vestibular functions and electrophysiology were investigated. Author (ESA)

N82-31637*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

REAL TIME ESTIMATION AND PREDICTION OF SHIP MOTIONS USING KALMAN FILTERING TECHNIQUES

Michael A. Triantafyllou, Marc Bodson, and Michael Athans Jul. 1982 142 p refs

(Grant NGL-22-009-124)

(NASA-CR-169284; NAS 1.26:169284, LIDS-R-1220) Avail: NTIS HC A07/MF A01 CSCL 20D

A landing scheme for landing V/STOL aircraft on rolling ships was sought using computerized simulations. The equations of motion as derived from hydrodynamics, their form and the physical mechanisms involved and the general form of the approximation are discussed. The modeling of the sea is discussed. The derivation of the state-space equations for the DD-963 destroyer is described. Kalman filter studies are presented and the influence of the various parameters is assessed. The effect of various modeling parameters on the rms error is assessed and simplifying conclusions are drawn. An upper bound for prediction time of about five seconds is established, with the exception of roll, which can be predicted up to ten seconds ahead. R.J.F.

N82-31639*# City Coll. Research Foundation, New York. Turbomachinery Lab.

EXPERIMENTAL STUDY OF TURBULENCE IN BLADE END WALL CORNER REGION

R. Raj Aug. 1982 110 p refs

(Grant NAG3-122)

(NASA-CR-169283; NAS 1.26:169283; RF-05438) Avail: NTIS HC A06/MF A01 CSCL 20D

Corner flows and wall pressure fluctuations, design and fabrication of the test model, preliminary results on boundary layer, flow visualization, turbulence intensity and spectra measurements are presented. The design consideration and fabrication report on the newly built wind tunnel to be used for subsequent continuation of the research effort is also presented. S.L.

N82-31645*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LAMINAR FLOW CONTROL, 1976 - 1982: A SELECTED ANNOTATED BIBLIOGRAPHY

Marie H. Tuttle and Dal V. Maddalon Aug. 1982 82 p

(NASA-TM-84496; L-15434; NAS 1.15:84496) Avail: NTIS HC A05/MF A01 CSCL 20D

Laminar Flow Control technology development has undergone tremendous progress in recent years as focused research efforts in materials, aerodynamics, systems, and structures have begun to pay off. A virtual explosion in the number of research papers published on this subject has occurred since interest was first stimulated by the 1976 introduction of NASA's Aircraft Energy Efficiency Laminar Flow Control Program. The purpose of this selected bibliography is to list available, unclassified laminar flow (both controlled and natural) research completed from about 1975 to mid 1982. Some earlier pertinent reports are included but listed separately in the Appendix. Reports listed herein emphasize aerodynamics and systems studies, but some structures work is also summarized. Aerodynamic work is mainly limited to the subsonic and transonic sped regimes. Because wind-tunnel flow qualities, such as free stream disturbance level, play such an important role in boundary-layer transition, much recent research has been done in this area and it is also included. Author

N82-31663*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEVELOPMENT AND UTILIZATION OF A LASER VELOCIMETER SYSTEM FOR A LARGE TRANSONIC WIND TUNNEL

Robert J. Freedman and John P. Greissing Jun. 1982 17 p refs

(NASA-TM-82886; E-1264; NAS 1.15:82886) Avail: NTIS HC A02/MF A01 CSCL 14B

The need for measurements of the velocity flow field about spinner propeller nacelle configurations at Mach numbers to 0.8 was met by a specially developed laser velocimeter system. This system, which uses an argon ion laser and 4 beam 2 color optics, was required to operate in the hostile environment associated with the operation of a large transonic wind tunnel. To overcome the conditions present in locating the sensitive optics in close proximity to the wind tunnel, an isolation system was developed. The system protects the velocimeter from the high vibrations, elevated temperatures, destructive acoustic pressures and low atmospheric pressures attendant with the operation of the wind tunnel. The system was utilized to map the flow field in front of, behind and in between the rotating blades of an advanced swept blade propeller model at a Mach number of 0.8. The data collected by the system will be used to correlate and verify computer analyses of propeller nacelle flow fields and propeller performance. R.J.F.

N82-31694# AiResearch Mfg. Co., Torrance, Calif.

ELECTROMECHANICAL ACTUATION DEVELOPMENT PROGRAM (EADP). POWER CONTROL DEVELOPMENT Final Report, Jul. 1980 -Sep. 1981

Stephen Rowe, David Bailey, and Robert Belanus Wright-Patterson AFB, Ohio AFWAL Sep. 1981 146 p

(Contract F33615-80-C-3620; AF Proj. 2403)

(AD-A116126; AMC-81-18106; AFWAL-TR-81-3106) Avail: NTIS HC A07/MF A01 CSCL 20/3

Electromechanical actuation of primary flight control surfaces has been demonstrated by the development of an integrated rotary hingeline dual-redundant actuation unit. Improved system bandwidth was demonstrated after employing improved sensors and electronic controls. Author (GRA)

N82-31705 Politecnico di Milano (Italy). Dept. di Ingegneria Aerospaziale.

EXPERIMENTAL INVESTIGATION OF AEROELASTIC INSTABILITY OF OPEN FIELD THIN PROFILES [INDAGINE SPERIMENTALE SUL'INSTABILITA AEROELASTICA DI PROFILI SOTTILI APERTI]

G. Casanco (Soc. Anonima Elettrificazione SPA), S DePonte, and P. Faggiano (Soc. Anonima Elettrificazione SPA) 1981 11 p In ITALIAN Presented at Coll. dei Tec dell'Acciaio (CTA) Giornate Ital. della Costruzione in Acciaio, Palerma, Italy, Oct. 1981

Avail: Issuing Activity

The behavior of thin wall metal profiles under oscillating aerodynamic loads was investigated in a wind tunnel. The beams were held by elastic constraint, being able to move in all directions, while the air incidence angle was varied throughout the experiments. Three types of transient response characterized by one or two critical wind velocities and either flexional or torsional vibration, which are related to the profile characteristics and the wind incidence, are described. Author (ESA)

N82-31707*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LARGE DISPLACEMENTS AND STABILITY ANALYSIS OF NONLINEAR PROPELLER STRUCTURES

Robert A. Aiello 1982 18 p refs Presented at the 10th NASTRAN User's Colloq., New Orleans, 13-14 May 1982

(NASA-TM-82850; NAS 1.15:82850) Avail: NTIS HC A02/MF A01 CSCL 20K

The use of linear rigid formats in COSMIC NASTRAN without DMAP procedures for the analysis of nonlinear propeller structures is described. Approaches for updating geometry and applying follower forces for incremental loading are demonstrated. Comparisons are made with COSMIC NASTRAN rigid formats and other independent finite element programs. Specifically, the comparisons

include results from the four approaches for updating the geometry using RIGID FORMAT 1, RIGID FORMATS 4 and 13, MARC and MSC/NASTRAN. It is shown that 'user friendly' updating approaches (without DMAPS) can be used to predict the large displacements and instability of these nonlinear structures. These user friendly approaches can be easily implemented by the user and predict conservative results. Author

N82-31714# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
STRESS INTENSITY FACTORS FOR RADIAL CRACKS AT OUTER SURFACE OF A PARTIALLY AUTOFRETTAGED CYLINDER SUBJECTED TO INTERNAL PRESSURE Final Report
S. L. Pu May 1982 50 p refs
(DA Proj. 1L1-61102-AH-60)
(AD-A116396; ARLCB-TR-82003) Avail: NTIS HC A03/MF A01 CSCL 12/1

The functional stress intensity factor approach which combines the finite element, thermal simulation and weight function methods developed for the computation of stress intensity factors for multiple radial cracks at the inner surface of a partially autofrettaged cylinder is applied in this report to external cracks. Numerical results of stress intensity factors are obtained for a cylinder with outer diameter twice the inner diameter. A slight increase into the degree of autofrettage will increase stress intensity factors of inner cracks slightly but will decrease stress intensity factors of external cracks considerably. As in the inner crack case, the cylinder with two diametrically opposed external cracks is in general the weakest configuration and for more than two cracks, the stress intensity factor decreases as the number of external cracks increase.
Author (GRA)

N82-31718# Riso National Lab., Roskilde (Denmark).
AERODYNAMIC FORCES ACTING ON THE BLADES OF STALL REGULATED PROPELLER TYPE WINDMILLS
F. Rasmussen Aug. 1981 37 p refs In DANISH
(DE82-901178; RISO-M-2316) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries; also available from Risoe Library, DK-4000, Roskilde, Denmark

Aerodynamic forces acting on the blades of stall regulated propeller type windmills are discussed The expected dynamic behavior of the loads are outlined. Great dynamic loads under stall condition and skew wind (yaw or tilt) are shown by theoretical calculations from the blade element theory for one typical design. The forces on the three blades are calculated as well as the total forces from the rotor acting on the main shaft. Blade strut forces on a 10 m diameter, three blades Riisager windmill are measured.
DOE

N82-31965*# Sikorsky Aircraft, Stratford, Conn.
COUPLED ROTOR/AIRFRAME VIBRATION ANALYSIS PROGRAM MANUAL MANUAL. VOLUME 1: USER'S AND PROGRAMMER'S INSTRUCTIONS Final Report
S. Cassarino and R. Sopher Jun. 1982 212 p refs Sponsored in part by ARMY 2 Vol.
(Contract NAS1-16058)
(NASA-CR-165891; NAS 1.26:165891) Avail: NTIS HC A10/MF A01 CSCL 09B

user instruction and software descriptions for the base program of the coupled rotor/airframe vibration analysis are provided. The functional capabilities and procedures for running the program are provided Interfaces with external programs are discussed. The procedure of synthesizing a dynamic system and the various solution methods are described. Input data and output results are presented. Detailed information is provided on the program structure. Sample test case results for five representative dynamic configurations are provided and discussed. System response are plotted to demonstrate the plots capabilities available. Instructions to install and execute SIMVIB on the CDC computer system are provided. Author

N82-31966*# Sikorsky Aircraft, Stratford, Conn.
COUPLED ROTOR/AIRFRAME VIBRATION ANALYSIS PROGRAM MANUAL. VOLUME 2: SAMPLE INPUT AND OUTPUT LISTINGS Final Report
S. Cassarino and R. Sopher Jun. 1982 263 p refs Sponsored in part by ARMY 2 Vol
(Contract NAS1-16058)
(NASA-CR-165892; NAS 1.26:165892) Avail: NTIS HC A12/MF A01 CSCL 09B

Sample input and output listings obtained with the base program (SIMVIB) of the coupled rotor/airframe vibration analysis and the external programs, G400/F389 and E927 are presented. Results for five of the base program test cases are shown. They represent different applications of the SIMVIB program to study the vibration characteristics of various dynamic configurations. Input and output listings obtained for one cycle of the G400/F389 coupled program are presented. Results from the rotor aeroelastic analysis E927 also appear. A brief description of the check cases is provided A summary of the check cases for all the external programs interacting with the SIMVIB program is illustrated. Author

N82-31967*# Illinois Univ., Urbana-Champaign. Coordinated Science Lab.
MULTILEVEL SEMANTIC ANALYSIS AND PROBLEM-SOLVING IN THE FLIGHT DOMAIN Final Report, 11 Jul. 1981 - 10 Jul. 1982
R. T. Chien, D. C. Chen, W. P.-C. Ho, and Y. C. Pan Aug. 1982 111 p refs
(Contract NCC1-52)
(NASA-CR-169282; NAS 1.26:169282; T-117) Avail: NTIS HC A06/MF A01 CSCL 09B

A computer based cockpit system which is capable of assisting the pilot in such important tasks as monitoring, diagnosis, and trend analysis was developed. The system is properly organized and is endowed with a knowledge base so that it enhances the pilot's control over the aircraft while simultaneously reducing his workload. S.L.

N82-31974# Kaman Aerospace Corp., Bloomfield, Conn.
DYNAMIC SYSTEM COUPLING (DYSCO) PROGRAM. VOLUME 1: USER'S MANUAL Final Technical Report
A. Berman Fort Eustis, Va Army Research and Technology Labs Apr 1982 40 p 2 Vol.
(Contract DAAK51-79-C-0046, DA Proj 1L1-62209-AH-76)
(AD-A115003, R-1649-Vol-1;
USAAVRADCOM-TR-81-D-42A-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

Dynamic System Coupling (DYSCO) is a computer program which allows an interactive user to couple arbitrary components and force algorithms into a model of a helicopter or other dynamic system The equations of the system may then be solved by a choice of analytical methods. The components available are rigid blade rotor, elastic fuselage, rotor control system, and other structures representable by general linear second-order differential equations. The force methods available are linear rotor loads, tabular rotor aerodynamics with optional induced velocity map, fuselage flat plate drag, and sinusoidal shaker. The solution methods available are time history, linear constant coefficient eigenanalysis, and complex frequency response. The program has the capability of being expanded in its level of complexity by the addition of other technology modules Author (GRA)

N82-31975# Kaman Aerospace Corp , Bloomfield, Conn.
DYNAMIC SYSTEM COUPLING (DYSCO) PROGRAM. VOLUME 2: THEORETICAL MANUAL Final Report
A. Berman Fort Eustis, Va. Army Research and Technology Labs. Apr. 1982 84 p 2 Vol
(Contract DAAK51-79-C-0046; DA Proj. 1L1-62209-AH-76)
(AD-A115004, R-1649-Vol-2,
USAAVRADCOM-TR-81-D-42B-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

Dynamic System Coupling (DYSCO) is a computer program which allows an interactive user to couple arbitrary components and force algorithms into a model of a helicopter or other dynamic system. The equations of the system may then be solved by a

choice of analytical methods The components available are rigid blade rotor, elastic fuselage, rotor control system, and other structures representable by general linear second-order differential equations. The force methods available are linear rotor loads, tabular rotor aerodynamics with optional induced velocity map, fuselage flat plate drag, and sinusoidal shaker. The solution methods available are time history, linear constant coefficient eigenanalysis, and complex frequency response. The program has the capability of being expanded in its level of complexity by the addition of other technology modules. Author (GRA)

N82-32080*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THE NOISE IMPACT OF PROPOSED RUNWAY ALTERNATIVES AT CRAIG AIRPORT

Richard DeLoach Jun. 1982 36 p refs
(NASA-TM-84503; NAS 1.15:84503) Avail: NTIS HC A03/MF A01 CSCL 20A

Four proposed runway expansion alternatives at Craig Airport in Jacksonville, Florida have been assessed with respect to their forecasted noise impact in the year 2005. The assessment accounts for population distributions around the airport and human subjective response to noise, as well as the distribution of noise levels in the surrounding community (footprints). The impact analysis was performed using the Airport-noise Levels and Annoyance Model (ALAMO), an airport community response model recently developed at Langley Research Center. Author

N82-32081*# California Univ., Los Angeles.

AEROSOUND FROM CORNER FLOW AND FLAP FLOW

W. C. Meecham Jul. 1982 41 p refs Prepared in cooperation with Mechanics Development Co., Pacific Palisades, Calif.
(Contract NAS2-10590)
(NASA-CR-166396; NAS 1.26:166396) Avail: NTIS HC A03/MF A01 CSCL 20A

Noise generation at the edge of a wing flap is analyzed. The phenomenon as a single vortex moving around a corner in an incompressible, potential flow is modelled. Vortex image retarding effects are proposed as an explanation for small Strouhal numbers. The model surface pressures, sound pressures (using Curle's theory), and Mach number dependencies agree with wind tunnel experiments. A double pressure peak is found in the model (credited to image action) which is qualitatively similar to measured sound correlations. Incompressible flow aerosound calculations are discussed. The effects of a series of vortices moving in the same idealized potential flow are also studied. The vortices are assumed to be statistically independent so their intensities can be added. The frequency of appearance of the vortices are determined from measurements. Diffraction effects caused by the presence of the wing near the dipole sound radiators on the flap surfaces are included. S.L.

N82-32082*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ROUGH ANALYSIS OF INSTALLATION EFFECTS ON TURBOPROP NOISE

Paul A. Durbin and John F. Groeneweg 1982 17 p refs Proposed for Presentation at the Acoust. Soc. of Am., Orlando, Fla., 8-12 Nov. 1982
(NASA-TM-82924; E-1316; NAS 1.15:82924) Avail: NTIS HC A02/MF A01 CSCL 20A

A rough analysis of noise from a propeller operated at angle of attack, and in the nonuniform flow due to a line vortex approximating a wing flow field suggests installation can significantly affect turboprop noise levels. On one side of the propeller, where the blades approach the horizontal plane from above, decreases of noise occur; while on the other side noise increases. The noise reduction is due to negative interference of steady and unsteady sources. An angle of attack, or distance between propeller and vortex, exists for which noise is a minimum. Author

N82-32083# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.

HELICOPTER NOISE DEFINITION REPORT UH-60A, S-76, A-109, 206-L Final Report

J. Steven Newman, Edward J. Rickley (DOT, Cambridge, Mass.), and David W. Ford Dec. 1981 687 p
(AD-A116363; DOT/FAA/EE-81/16) Avail: NTIS HC A99/MF A01 CSCL 20/1

This document presents noise data for the Sikorsky UH-60A Blackhawk, the Sikorsky S-76 Spirit, the Agusta A-109 and the Bell 206-L. The acoustical data are accompanied by phototheodolite tracking data, cockpit instrument panel photo data, and meteorological data acquired from radiosonde balloons. Acoustical metrics include both noise certification metrics (EPNL, PNLT, PNL) as well as community/airport noise assessment metrics (SEL, dBA). Noise data have been acquired systematically to identify variations in level with variations in helicopter airspeed and altitude. Data contained in this report provide essential information for development of helicopter noise exposure contours as well as further evaluation of ICAO helicopter noise certification standards. Accordingly, this information will be of interest to helicopter manufacturers, airport planning consultants, acoustical engineers and airport managers. This report serves as a noise definition document establishing baseline acoustical characteristics of the test helicopters. Author (GRA)

N82-32084# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.

A DESCRIPTION OF METHODOLOGIES USED IN ESTIMATION OF A A-WEIGHTED SOUND LEVELS FOR FAA ADVISORY CIRCULAR AC-36-3B

Jan 1982 114 p refs
(AD-A116543; FAA-EE-82-1; DOT/FAA/AEE-82-1) Avail: NTIS HC A06/MF A01 CSCL 20/1

This report provides a description of the assumptions, methodologies and techniques employed in arriving at estimated sound levels for many of the aircraft included in FAA Advisory Circular AC-36-3B. AC 36-3B was published to provide the public and the aviation community with comparative sound level information for aircraft currently in use. Detailed noise estimation data sheets are provided for 78 aircraft types. A table showing the difference between EPNL and dB(A) for selected jet aircraft is also provided. Author (GRA)

N82-32140# Federal Aviation Administration, Atlantic City, N.J. Technical Center.

FIBER OPTICS REMOTING OF TERMINAL RADAR AND BEACON SIGNALS Final Report, Jul. 1980 - May 1981

Robert G. Oliver May 1982 68 p refs
(FAA Proj. 021-241-860)
(AD-A116403; FAA-CT-81-71; FAA-RD-82-20) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report discusses the study phase of the terminal radar-beacon fiber optics remoting project. Fiber optics technology is discussed and applied to the remoting of airport sureveillance radar (ASR) and air traffic control beacon interrogator (ATCBI) video and control signals. The requirements of this system are outlined and an engineering model, using multiplexed and nonmultiplexed video transmissions, is specified for installation at the Federal Aviation Administration (FAA) Technical Center. Tests to be conducted on this system are briefly outlined. Cost estimates are presented as well as suggested sources of supply fort the fiber optic components. The interface to the ASR and ATCBI systems is described. It is recommended that the system be built by the technical center. A schedule for completion of the remainder of the project is presented. Author (GRA)

N82-32186*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMODYNAMIC AND TRANSPORT COMBUSTION PROPERTIES OF HYDROCARBONS WITH AIR. PART 1: PROPERTIES IN SI UNITS

Sanford Gordon Jul. 1982 397 p refs
(NASA-TP-1906; E-946; NAS 1.60:1906) Avail: NTIS HC A17/MF A01 CSCL 20M

Thermodynamic and transport combustion properties were calculated for a wide range of conditions for the reaction of hydrocarbons with air. Three hydrogen-carbon atom ratios (H/C = 1.7, 2.0, 2.1) were selected to represent the range of aircraft fuels. For each of these H/C ratios, combustion properties were calculated for the following conditions: Equivalence ratio: 0, 0.25, 0.5, 0.75, 1.0, 1.25 Water - dry air mass ratio: 0, 0.03 Pressure, kPa: 1.01325, 10.1325, 101.325, 1013.25, 5066.25 (or in atm: 0.01, 0.1, 1, 10, 50) Temperature, K: every 10 degrees from 200 to 900 K; every 50 degrees from 900 to 3000 K Temperature, R: every 20 degrees from 360 to 1600 R; very 100 degrees from 1600 to 5400 R The properties presented are composition, density, molecular weight, enthalphy, entropy, specific heat at constant pressure, volume derivatives, isentropic exponent, velocity of sound, viscosity, thermal conductivity, and Prandtl number. Property tables are based on composites that were calculated by assuming both: (1) chemical equilibrium (for both homogeneous and heterogeneous phases) and (2) constant compositions for all temperatures. Properties in SI units are presented in this report for the Kelvin temperature schedules. Author

N82-32187*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMODYNAMIC AND TRANSPORT COMBUSTION PROPERTIES OF HYDROCARBONS WITH AIR. PART 2: COMPOSITIONS CORRESPONDING TO KELVIN TEMPERATURE SCHEDULES IN PART 1
Sanford Gordon Jul. 1982 281 p refs
(NASA-TP-1907; E-947; NAS 1.60:1907) Avail: NTIS HC A13/MF A01 CSCL 20M

The equilibrium compositions that correspond to the thermodynamic and transport combustion properties for a wide range of conditions for the reaction of hydrocarbons with air are presented. Initially 55 gaseous species and 3 coin condensed species were considered in the calculations. Only 17 of these 55 gaseous species had equilibrium mole fractions greater than 0.000005 for any of the conditions studied and therefore these were the only ones retained in the final tables. J.M.S.

N82-32188*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMODYNAMIC AND TRANSPORT COMBUSTION PROPERTIES OF HYDROCARBONS WITH AIR. PART 3: PROPERTIES IN US CUSTOMARY UNITS
Sanford Gordon Jul. 1982 362 p refs
(NASA-TP-1908; E-948; NAS 1.60:1908) Avail: NTIS HC A16/MF A01 CSCL 20M

Thermodynamic and transport properties are presented for a wide range of conditions for the reaction of hydrocarbons with air. The values given are in U.S. customary units. J.M.S.

N82-32189*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMODYNAMIC AND TRANSPORT COMBUSTION PROPERTIES OF HYDROCARBONS WITH AIR. PART 4: COMPOSITIONS CORRESPONDING TO RANKINE TEMPERATURE SCHEDULES IN PART 3
Sanford Gordon Jul. 1982 281 p refs
(NASA-TP-1909; E-949; NAS 1.60:1909) Avail: NTIS HC A18/MF A01 CSCL 20M

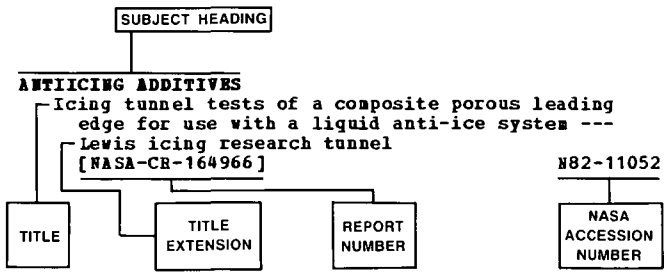
The equilibrium compositions corresponding to the thermodynamic and transport combustion properties for a wide range of conditions for the reaction of hydrocarbons with air are presented. The compositions presented correspond to Rankine temperature schedules. J.M.S.

N82-32300# Joint Publications Research Service, Arlington, Va.
AIRBUS A 310 WILL COMPETE WITH BOEING 767 FOR MARKET
Pierre Kerlouegan *In its* West Europe Rept.: Sci. and Technol., No. 99 (JPRS-80536) 9 Apr. 1982 44-47 Transl. into ENGLISH from Le Figaro (France), 17 Feb. 1982 p 9
Avail: NTIS HC A04

The European A-310 airbus is described, compared with the Boeing 767, and an analysis of its market presented. The A-310 is certified to fly with a crew of two. Projections for the larger A-320 are given. The basic configuration of the A-310 is presented. J.D.

SUBJECT INDEX

Typical Subject Index Listing



The title is used to provide a description of the subject matter When the title is insufficiently descriptive of the document content, a title extension is added, separated from the title by hyphens The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement If applicable, a report number is also included as an aid in identifying the document

A

B

C

D

E

F

G

H

J

K

L

M

N

O

P

Q

R

S

T

U

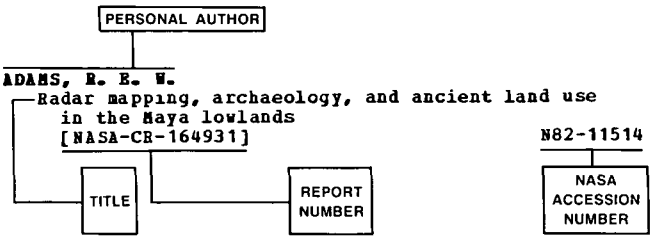
V

W

X

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The accession number is located beneath and to the right of the title, e.g., N82-11514. Under any one author's name the accession numbers are arranged in sequence with the *IAA* accession numbers appearing first.

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

V

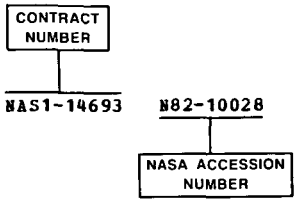
W

Y

Z

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order with the *IAA* accession numbers appearing first The accession number denotes the number by which the citation is identified in either the *IAA* or *STAR* section

1. Report No.	2 Government Accession No	3 Recipient's Catalog No.
NASA SP-7037(155)		

4. Title and Subtitle	5. Report Date
Aeronautical Engineering A Continuing Bibliography (Supplement 155)	December 1982
	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 272 reports, articles and other documents introduced into the NASA scientific and technical information system in November 1982.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Aerodynamics Aeronautical Engineering Aeronautics Bibliographies	Unclassified - Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price*
Unclassified	Unclassified	68	$5.00 HC

*For sale by the National Technical Information Service, Springfield, Virginia 22161

NASA-Langley, 1982

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.

National Aeronautics and
Space Administration

Washington, D.C.
20546

Official Busines
Penalty for Priv

THIRD-CLASS BULK RATE

Postage and Fees Paid
National Aeronautics and
Space Administration
NASA-451

U.S.MAIL

6 1 SP-7037, 821223 S90569AU 350609
NASA
SCIEN & TECH INFO FACILITY
ATTN: ACCESSIONING DEPT
P O BOX 8757 BWI ARPRT
BALTIMORE MD 21240

NASA

POSTMASTER: If Undeliverable (Section 158
Postal Manual) Do Not Return