NASA

Aeronautical Engineering
A Continuing Bibliography with Indexes

NASA SP-7037 (100)
September 1978

National Aeronautics and Space Administration

Aeronautical Engineering Aero
ering Aeronautical Engineering
gineering Aeronautical Engine
al Engineering Aeronautical E
autical Engineering Aeronaut
Aeronautical Engineering Aero
ring Aeronautical Engineering
gineering Aeronautical Engine
al Engineering Aeronautical E
autical Engineering Aeronauti
eronautical Engineering Aero
ing Aeronautical Engineering

NASA SP-7037 (100)
Aeronautical Engineering
A Continuing Bibliography with Indexes

Pages 369–413
September 1978

ACCESSION NUMBER RANGES

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

STAR (N-10000 Series)	N78-24042—N78-26046
IAA (A-10000 Series)	A78-36170—A78-39782

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

NASA SP–7037(100)

AERONAUTICAL ENGINEERING

A Continuing Bibliography

Supplement 100

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 August 1978 in

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

NASA Scientific and Technical Information Branch 1978
National Aeronautics and Space Administration
Washington, DC

This Supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, at the price code E02 ($4 75 domestic, $9 50 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 Since that time, monthly supplements have been issued.

This supplement to *Aeronautical Engineering -- A Continuing Bibliography* (NASA SP-7037) lists 295 reports, journal articles, and other documents originally announced in August 1978 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 (A78-10000 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 $6 00 per document up to a maximum of 20 pages, the charge for each additional page is $0 25 Microfiche[1] of documents announced in *IAA* are available at the rate of $2 50 per microfiche on demand, and at the rate of $1 10 per microfiche for standing orders for all *IAA* microfiche The price for the *IAA* microfiche by category is available at the rate of $1 25 per microfiche plus a $1 00 service charge per category per issue Microfiche of all the current AIAA Meeting Papers are available on a standing order basis at the rate of $1 35 per microfiche

Minimum air-mail postage to foreign countries is $1 00 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 (N78-10000 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 followed by the letters HC or MF in the *STAR* citation Price codes are given in the tables on page vii of the current issue of *STAR*

Microfiche is available regardless of age for those accessions followed by a # symbol

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 Unit

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 $3 00 price, for those documents identified by a # symbol)

(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 NASA Public Document Rooms Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents 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

Avail ERDA Depository Libraries Organizations in U.S. cities and abroad that maintain collections of Energy Research and Development Administration reports, usually in microfiche form, are listed in *Nuclear Science Abstracts* Services available from the ERDA and its depositories are described in a booklet, *Science Information Available from the Energy Research and Development Administration* (TID-4550), which may be obtained without charge from the ERDA 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 ZLDI Sold by the Zentralstelle fur Luftfahrtdokumentation und -Information, Munich, 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 Office Sold by Commissioner of Patents, U.S. Patent 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

SUBSCRIPTION AVAILABILITY

This publication is available on subscription from the National Technical Information Service (NTIS) The annual subscription rate for the monthly supplements is $45 00 domestic, $75 00 foreign All questions relating to the subscriptions should be referred to NTIS, Attn Subscriptions, 5285 Port Royal Road, Springfield Virginia 22161

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics
and Astronautics
Technical Information Service
750 Third Ave
New York, N Y 10017

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

Commissioner of Patents
U S Patent Office
Washington, D C 20231

Energy Research and Development
Administration
Technical Information Center
P O Box 62
Oak Ridge, Tennessee 37830

ESA-Space Documentation Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

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

Zentralstelle fur Luftfahrtdoku-
mentation und -Information
8 Munchen 86
Postfach 880
Federal Republic of Germany

TABLE OF CONTENTS

TYPICAL CITATION AND ABSTRACT FROM *STAR*

NASA SPONSORED DOCUMENT

AVAILABLE ON MICROFICHE

NASA ACCESSION NUMBER

TITLE

AUTHORS

CONTRACT OR GRANT

REPORT NUMBERS

CORPORATE SOURCE

PUBLICATION DATE

AVAILABILITY SOURCE

COSATI CODE

N78-10020*# Boeing Vertol Co Philadelphia Pa
WIND TUNNEL INVESTIGATION OF ROTOR LIFT AND PROPULSIVE FORCE AT HIGH SPEED DATA ANALYSIS
Frank McHugh Ross Clark and Mary Soloman Oct 1977
211 p 3 Vol
(Contract NAS1-14317)
(NASA-CR-145217-App-1 D210-11135-1) Avail NTIS
HC A10/MF A01 CSCL 01A

The basic test data obtained during the lift-propulsive force limit wind tunnel test conducted on a scale model CH-47b rotor are analyzed Included are the rotor control positions blade loads and six components of rotor force and moment corrected for hub tares Performance and blade loads are presented as the rotor lift limit is approached at fixed levels of rotor propulsive force coefficients and rotor tip speeds Performance and blade load trends are documented for fixed levels of rotor lift coefficient as propulsive force is increased to the maximum obtainable by the model rotor Test data is also included that defines the effect of stall proximity on rotor control power The basic test data plots are presented in volumes 2 and 3 Author

TYPICAL CITATION AND ABSTRACT FROM *IAA*

NASA SPONSORED

AVAILABLE ON MICROFICHE

AIAA ACCESSION NUMBER

TITLE

TITLE OF PERIODICAL

AUTHORS

AUTHOR'S AFFILIATION

PUBLICATION DATE

A78-13071 * # Toward a new V/STOL generation L Roberts and S B Anderson (NASA, Ames Research Center, Moffett Field, Calif) *Astronautics and Aeronautics*, vol 15, Nov 1977, p 22-27

While many V/STOL problems are now better understood and technology has progressed to the point where higher thrust/weight ratios and greater stability augmentation are achievable, a number of still existing insufficiencies provide a sobering reminder that learning in ground testing and simulation, and careful methodical planning, are a prerequisite for any research and development program The present paper is centered on the major technical problems for the Navy Type multimission V/STOL aircraft The aircraft's configurations with and without forward lift fan are discussed, along with the propulsion systems, testing techniques, controls, displays, flight dynamics, and ground/flow field interactions V P

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 100)

SEPTEMBER 1978

IAA ENTRIES

A78-36203 # Characteristics of flow past fuselages and wing-fuselage systems of gliders (Zjawiska oplywu kadlubow szybowcow i ukladow skrzydlo-kadlub) J Ostrowski, M Litwinczyk, and L Turkowski *Archiwum Budowy Maszyn,* vol 25, no 1, 1978, p 91-104 In Polish

Flow visualization tests were conducted on gliders, and the velocity fields in the diffusor regions with positive pressure gradient on the fuselage and wing-fuselage transition were measured Secondary flow effects, influencing the rate of separation, were shown The influence of geometry of the wing-fuselage system on flow separation was studied Different types of separation on the wing near the fuselage are shown in photographs Principles for proper design of fuselage and wing-fuselage transition zone ensuring minimal effect of secondary flows on separation are announced P T H

A78-36204 # Discussion of results of studies on the design of laminar airfoils for stunt gliders (Omowienie wynikow badan zwiazanych z konstruowaniem profilow laminarnych dla szybowcow wyczynowych) J Ostrowski, S Skrzynski, and M Litwinczyk *Archiwum Budowy Maszyn,* vol 25, no 1, 1978, p 105-120 5 refs In Polish

The main results of several studies dealing with phenomena influencing the properties of laminar airfoils are examined Deflection of the flow in the boundary layer and local separations of the laminar layer (laminar bubbles) were investigated on several airfoils These phenomena are classified and their influence on the airfoil characteristics is evaluated The choice of pressure distribution leading to best lift-to-drag ratio is studied P T H

A78-36205 # Hot-wire velocity measurements in thin boundary layers (Pomiary termoanemometryczne w cienkich warstwach przyscziennych) S Skrzynski and M Litwinczyk *Archiwum Budowy Maszyn,* vol 25, no 1, 1978, p 137-145 5 refs In Polish

Hot wire techniques for measurements in the thin boundary layer on a laminar airfoil are studied Errors in analog measurement of the velocity profile in the boundary layer due to linearization, the rectifying effect of the hot wire anemometer, the effect of the wall on the hot wire probe, and the change in the heat transfer law in the presence of a velocity gradient are analyzed A special copper plating process for the probes is described P T H

A78-36210 # Calculation of airfoil drag (Obliczenia oporu profilow lotniczych) Z Nowak *Archiwum Budowy Maszyn,* vol 25, no 1, 1978, p 213-222 10 refs In Polish

A numerical method based on classical boundary layer theory is proposed for calculating the drag coefficient of airfoils at small angle of attack, Reynolds number of several million, and low subsonic speeds The polar function of the airfoil, that is, the drag coefficient as a function of lift coefficient and Reynolds number, is calculated A point on the polar function curve is determined in two steps (1) for a given value of the lift coefficient, the pressure distribution along the airfoil contour in the flow of an ideal fluid without separation is determined, and (2) for a given Reynolds number, the preceding results are used to calculate momentum losses in the boundary layer P T H

A78-36216 # Remarks on design of supersonic wind tunnels (Uwagi o projektowaniu naddzwiekowych tuneli aerodynamicznych) Z Dzygadlo, J Kaczmarczyk, and A Tarnogrodzki *Archiwum Budowy Maszyn,* vol 25, no 1, 1978, p 285-294 9 refs In Polish

A brief survey of various design solutions for supersonic wind tunnels is presented A method of determining the main aerodynamic parameters of a high-pressure continuously acting tunnel is given Remarks on the design of individual parts and auxiliary installations are made P T H

A78-36279 Aircraft propulsion from the back room /Sixty-sixth Wilbur and Orville Wright Memorial Lecture/ W Hawthorne (Cambridge University, Cambridge, England) *Aeronautical Journal,* vol 82, Mar 1978, p 93-108 25 refs

A brief review is presented of the early history of jet engines and gas turbines along with a historical review of work done at the RAE Turbine Division Particular attention is given to gas dynamics, axial compressor research and fuel economy B J

A78-36280 The certification of light aircraft D Stinton (Civil Aviation Authority, Airworthiness Div, Redhill, Surrey, England) *Aeronautical Journal,* vol 82, Mar 1978, p 109-116

Consideration is given to various aspects of the airworthiness certification of light aircraft according to British Civil Airworthiness Requirements Airworthiness design is discussed along with the tasks of flight testing It is maintained that adequate test flying should be the standard by which to judge the reliability of light aircraft B J

A78-36323 # Study on problems of terminal site location Y Nagao and I Wakai (Kyoto University, Kyoto, Japan) *Kyoto University, Faculty of Engineering, Memoirs,* vol 39, Oct 1977, p 548-565 16 refs

The location of a large terminal facility, e g , an airport, harbor, or truck depot, is considered with reference to the environmental factors which affect it, and its effect, in turn, upon the environment Two cases of land use are presented, single purpose use, and mixed use Linear programming is applied to the problems associated with mixed use, while 0-1 mixed integer programming is applied to single purpose use Also considered is the role of the government, both in establishing environmental standards, and in the regulation of commerce Attention is given to airport planning, which is discussed in terms of the Japanese Act for Prevention of Negative Effects upon Areas Surrounding Airports, passed in 1967 · D M W

A78-36366 # Application of the integral-transformation method to three-dimensional unsteady problems of the theory of cascades (Primenenie metoda integral'nykh preobrazovanii k trekhmernym nestatsionarnym zadacham teorii reshetok) G S Lipovoi (Akademiia Nauk Ukrainskoi SSR, Institut Matematiki, Kiev, Ukrainian SSR) In Analytical, numerical and analog methods in problems of heat conductivity Kiev, Izdatel'stvo Naukova Dumka, 1977, p 173-183 7 refs In Russian

The Fourier transformation and the factorization method are used to solve the problem of determining pressure differences on elements of a three-dimensional cascade oscillating harmonically in a subsonic gas flow The problem is posed for rectangular plates and for plates whose edges are directed to the flow at angles not equal to 90 deg The method can be extended easily to the case of an immobile multirow cascade with equal spacing, oscillating with equal phase shift and with phase shift in every row B J

A78-36380 Experimental evaluation of an array technique for zenith to horizon coverage W G Mavroides and R. J Mailloux (USAF, Bedford, Mass) *IEEE Transactions on Antennas and Propagation,* vol AP 26, May 1978, p 403-406 11 refs

An experimental study of a new array concept with application to providing low cost efficient antennas with hemispherical coverage for aircraft to satellite communication links is described The combined array-surface wave antenna consists of 64 waveguide elements scanned conventionally except at endfire At endfire the array is shorted to become a corrugated surface-wave antenna and excited by an eight-element feed to provide a directional beam near the horizon The array is rotated to give hemispherical coverage (Author)

A78-36431 Integrally stiffened laminate construction E E House (Lockheed-Georgia Co , Marietta, Ga) *(Society for the Advancement of Material and Process Engineering, National Technical Conference, 9th, Atlanta, Ga , Oct 4-6, 1977) SAMPE Journal,* vol 14, May-June 1978, p 17 20

Integral stiffening is defined as the occurring of conventional stiffener shapes, e g , Js, Zs, hats, channels, etc , with the facing plies Attention is given to graphite-epoxy and fiberglass stiffening as it pertains to wing-to-fuselage C-5A fairings Comparisons are made between composite material and honeycomb stiffening It is found that the former saves weight without jeopardizing safety or performance It is noted that composite material stiffening was able to reduce life cycle costs by requiring fewer and less costly repairs than honeycombs, requiring only visual inspection (as opposed to X-ray and ultrasonic), and simply by lasting longer Tooling and manufacturing procedures are also reviewed D M W

A78-36446 The design of future cockpits for high performance fighter aircraft G Roe (British Aerospace, Future Projects Dept , Kingston-upon-Thames, Surrey, England) *Aeronautical Journal,* vol 82, Apr 1978, p 159-166 8 refs

Means of increasing a pilot's g-tolerance through increasing the recline angle of the seat are discussed, and the corresponding modifications required in cockpit displays and ejector design are considered In particular, an articulated seat providing the additional recline angle to give a tolerance increase of about 2-g magnitude over present levels is proposed Optimum locations for flight, sensor and systems data displays are determined on the basis of information requirements for the pilot during takeoff, climb, cruise and other maneuvers A head-up display for flight information and a head-level display for sensor data are suggested J M B

A78-36447 The German-Dutch low speed wind tunnel DNW M Seidel and F Jaarsma (Stichting Duits-Nederlandse Windtunnel, Noordoostpolder, Netherlands) *Aeronautical Journal,* vol 82, Apr 1978, p 167-173

A jointly financed German-Dutch wind tunnel is under development to provide aeronautical testing facilities in the speed range 62-145 m/sec The flow characteristics of the 6- to 9 5-m cross section wind tunnel include relative deviation of stationary and dynamic pressure across the tunnel section of + or - 0 3%, a local deviation of flow direction of + or - 0 1 deg, turbulence of 0 1-0 2%, and local temperature fluctuations of + or - 1C Among the applications of the facility are studies to improve low-speed characteristics of aircraft, and investigations of engine/airframe interference, aircraft noise, helicopter rotor dynamics, flutter characteristics and the performance of full-scale aircraft components J M B

A78-36453 System requirements for transition from enroute to approach guidance D H Meyer (Rockwell International Corp , Cedar Rapids, Iowa) *Navigation,* vol 24, Winter 1977-1978, p 312-328 12 refs

The airborne system operational/functional requirements (from navigation using enroute aids to navigation using approach guidance) are examined for the transitional phase of an aircraft flight In this paper the automated navigation system (based nominally on enroute aids) and the ILS/MLS system capabilities are described, and the complementary nature of each is treated To achieve the full potential benefits of proposed landing system operations, it is suggested that on-board enroute navigation systems will be an important aid to exploit fully the resulting operational capabilities Proposed microwave landing system capabilities suggest new operational procedures for predefined maneuvers in the terminal area such as close-in captures and complex approach paths These operational procedures, although only partially available at this time, can be expanded upon based on the operational advantages of the system Equipment configurations are presented to demonstrate the system requirements (Author)

A78-36454 Jeppesen charting for area navigation J E Terpstra (Jeppesen-Sanderson, Denver, Colo) *(Institute of Navigation, National Aerospace Meeting, Denver, Colo , Apr 14, 1977) Navigation,* vol 24, Winter 1977-1978, p 338 344

Area navigation (RNAV) provides freedom for establishing courses This type of system allows the airplane to proceed via navigational guidance to almost any geographical position without having to overfly a radio navaid This capability requires ingenuity for charting since many routes flown by RNAV-equipped aircraft do not fly on published courses, but prefer to go present position direct to their destination (Author)

A78-36455 Concerning the logical comparison of ATC separation standard assessment models A L Haines (Mitre Corp , Metrek Div , McLean, Va) *Navigation,* vol 24, Winter 1977-1978, p 345-351 6 refs

There exist many models for the determination or assessment of safe separation standards between aircraft flying under an air traffic control (ATC) system Most models fall within the general categories of collision risk or collision avoidance This paper presents a framework for the qualitative comparison of the logical structure of these several models Thus the merits and appropriateness of the several models may be more critically evaluated, and better definition of model applicability made (Author)

A78-36483 # Preliminary experience with the use of the Yak-40 aircraft in studies of cloud physics and artificial modifications (Predvaritel'nyi opyt ispol'zovaniia samoleta Iak-40 v issledovaniiakh po fizike oblakov i aktivnym vozdeistviiam) F Ia Voit, E E Kornienko, L A Mirmovich, and A I Furman In Artificial modification of clouds and fogs Moscow, Gidrometeoizdat, 1977, p 96-101 In Russian

A78-36494 # **Reliability of aviation techniques and flight safety (Bezotkaznost' aviatsionnoi tekhniki i bezopasnost' poletov)** P A Solomonov Moscow, Izdatel'stvo Transport, 1977 272 p 114 refs In Russian

Basic quantitative flight safety indicators and their determination are discussed Methods of evaluating the effects of failure involving components of the crew-aircraft-groundbase-flight conditions are analyzed, and on-board and ground-based technical safety procedures are considered with attention directed to the use of objective monitoring procedures Methods of investigating aviation accidents and component failures are described M L

A78-36498 **Design for flying** D B Thurston New York, McGraw-Hill Book Co , 1978 284 p 56 refs $14 95

Design criteria for civil aviation aircraft are reviewed, with emphasis on FAA handling requirements for flight profiles from takeoff to landing Practical information on changing the speed or climb range of a propeller, equipping an aircraft for IFR flight, and installing position avionics antennas is also presented Among the topics included in the manual are crosswind handling, the advantages of tricycle gear design, the angle-of-attack indicator for approach maneuvers, center-of-gravity determinations, performance comparisons for advanced aircraft designs, powerplant noise reduction, seaplane design, protective coatings for aluminum and steel structural components, and steps required to obtain FAA certification for an aircraft design J M B

A78-36596 * **ALC/50/ values for some polymeric materials** C J Hilado, H J Cumming, J E Schneider (San Francisco, University, San Francisco, Calif), D A Kourtides, and J A Parker (NASA, Ames Research Center, Moffett Field, Calif) *Journal of Combustion Toxicology,* vol 5, Feb 1978, p 5-10 5 refs Grant No NsG-2039

Apparent lethal concentrations for 50 per cent of the test animals within a 30-min exposure period (ALC/50/) were determined for seventeen samples of polymeric materials, using the screening test method The materials evaluated included resin-glass composites, film composites, and miscellaneous resins ALC(50) values, based on weight of original sample charged, ranged from 24 to 110 mg/l Modified phenolic resins seemed to exhibit less toxicity than the baseline epoxy resins Among the film composites evaluated, only flame modified polyvinyl fluoride appeared to exhibit less toxicity than the baseline polyvinyl fluoride film (Author)

A78-36621 # **Ergonomics in commercial aircraft landing (Ergonomik der Landung eines Verkehrsflugzeugs)** R Heinig (Gesellschaft fur Internationalen Flugverkehr mbH, Berlin, East Germany) *Technische-okonomische Information der zivilen Luftfahrt,* vol 13, no 5, 1977, p 264-278 In German

Various aircraft currently in Interflug service (IL-14, -18, 62, An-24, and Tu-134) are evaluated in terms of overall performance during the landing phase, with attention to the demands different system components place on the pilot and flight personnel The man-machine interface is examined on the basis of navigational and mechanical parameters Approach speed and angles are considered with regard to minimizing pilot strain, and maximizing both pilot and aircraft reaction time D M W

A78-36622 # **The technical concepts behind the IL-62M /8/ landing gear (Die technische Konzeption der IL-62M /8/ - Fahrwerk)** G Dolgushev, N Soin, and V Volobuev (Opytno-Konstruktorskoe Biuro, Moscow, USSR) *(Grazhdanskaia Aviatsiia,* no 12, 1976) *Technisch-okonomische Information der zivilen Luftfahrt,* vol 13, no 5, 1977, p 292-296 In German (Translation)

The landing gear of the IL-62M is identical to that of the IL-62 In both aircraft there is a two-wheel nose gear together with a double tandem main gear Attention is given to the positioning of the center of gravity, noting that it falls behind the main gear in both empty and loaded configurations The wheels of the nose gear are steerable, and all wheels of the main gear are equipped with hydraulic disk brakes. The shock absorber systems of the main gear and the rear gear are considered especially well engineered The lowering and retraction, respectively, of the rear landing gear is signaled to the pilot by a bright yellow light and a buzzer D M.W

A78-36706 * **Structural and assembly concepts for large erectable space systems** E Katz (Rockwell International Corp , Space Div , Downey, Calif), E T Kruszewski, and E C Naumann (NASA, Langley Research Center, Structures and Dynamics Div., Hampton, Va) In The industrialization of space, Proceedings of the Twenty-third Annual Meeting, San Francisco, Calif , October 18-20, 1977 Part 1 San Diego, Calif , American Astronautical Society, Univelt, Inc , 1978, p 101-113 (AAS 77-205)

This paper presents a summary of studies performed by the Space Division of Rockwell under contract to the Langley Research Center of the NASA The studies specifically addressed requirements and concepts for erectable structures ranging in size from 100 to 300 meters - using the Shuttle Orbiter as the operation/assembly base This paper discusses various types of structural configurations and building block elements and the criteria which influence their designs. A brief review is given concerning the subject of flight control An assembly concept is presented - showing how the Orbiter may be equipped and operated to build large area structures Estimates are also given for cargo bay stowage and mission timelines (Author)

A78-36721 **Maritime satellite communications - Where we are and where we're going** D W Lipke (COMSAT General Corp , Washington, D C) In The industrialization of space, Proceedings of the Twenty-third Annual Meeting, San Francisco, Calif , October 18-20, 1977 Part 1 San Diego, Calif , American Astronautical Society, Univelt, Inc , 1978, p 485-490 (AAS 77-257)

The need for high quality, reliable, real-time maritime communications has been recognized for some time Satellites now offer the opportunity to overcome the long delays and unpredictable quality commonly experienced with HF and MF transmissions The use of satellites for commercial maritime communications had its origin in 1973 when it was determined that both Navy and commercial maritime requirements could be met with a single satellite system The ensuing program, known as Marisat, now fulfills both requirements The status of the Marisat program and the European maritime satellite program (Marots) is reviewed, together with the status of international efforts in the development of a maritime satellite communications system (Author)

A78-36941 **Case of damage involving aircraft and helicopter components of light metal (Schadensfalle an Flugzeug- und Hubschrauberteilen aus Leichtmetall)** G Lange *Metall,* vol 32, May 1978, p 435-439. In German

In most investigations regarding the cause of damage in the case of aircraft it has to be determined whether a certain component has failed because of fatigue or as a consequence of a forced rupture The two types of fracture can be distinguished on the basis of macroscopic and microscopic criteria Macro and microfractography techniques are currently considered as equivalent complementary methods. It appears advisable that a macroscopic fracture analysis precedes an investigation with the scanning microscope The macroscopic criteria are in many cases sufficient to determine unambiguously the type of fracture An investigation with the scanning microscope becomes vital if for some reason macroscopic fracture characteristics are not available or are not sufficient for an adequate fracture analysis In many cases the scanning microscope can also provide information in addition to that required for a determination of the type of fracture It can give indications regarding the origin of cracks or the existence of structural defects. The application of the available investigative techniques is illustrated with the aid of a number of specific cases involving various aircraft and helicopter components. G R

A78-36947 Compressible flow about helicopter rotors B C A Johansson (Forsvarsdepartementet Flygtekniska Forsoksanstalten, Bromma, Sweden) *Vertica,* vol 2, no 1, 1978, p 1-9 5 refs

A lifting-line theory for a helicopter rotor in vertical climb, hover or slow descent, and a disk approximation for the induced velocity field of a helicopter rotor in forward flight are presented The method of matched asymptotic expansions serves to treat the problem of the vertically moving rotor, series solutions are developed in terms of the ratio of a typical blade chord to the rotor diameter and the ratio of the climb velocity to the tip velocity of the rotor A disk of continuous thrust and in-plane force distributions provide the rotor approximations for the case of forward flight Both methods assume a compressible fluid J M B

A78-36948 A theoretical study of the effect of blade ice accretion on the power-off landing capability of a Wessex helicopter C Young (Royal Aircraft Establishment, Farnborough, Hants, England) *(European Rotorcraft and Powered Lift Aircraft Forum, 3rd, Aix-en-Provence, France, Sept. 7-9, 1977) Vertica,* vol 2, no 1, 1978, p 11-25

The effect of rotor blade icing on helicopter performance is investigated, calculations are presented to indicate the maximum torque rise which can be tolerated in forward flight before the helicopter autorotational performance is seriously degraded Various decreases in the lift curve slope, together with increases in the drag of the blade section, are employed to simulate the effects of blade ice The excess torque at engine failure provides a measure of the ability of the helicopter to make a successful power-off landing with iced blades J M B

A78-36949 Flight experiments on aerodynamic features affecting helicopter blade design P Brotherhood and M J Riley (Royal Aircraft Establishment, Farnborough, Hants, England) *(European Rotorcraft and Powered Lift Aircraft Forum, 3rd, Aix-en-Provence, France, Sept 7-9, 1977) Vertica,* vol 2, no 1, 1978, p 27-42 5 refs

From a continuing program of flight research, several features of blade aerodynamics which are associated with rotor performance limits are discussed By systematically roughening sections of the leading edge, those parts of the blade which are most sensitive to a reduction in the local value of maximum life coefficient have been identified The results have been used to examine the feasibility of using reflex cambered sections with nose-up pitching moments but attendant reduced value of maximum lift coefficient, in the inboard regions of the blade In this way, the nose-down moments of highly cambered sections used to advantage nearer the tip may be balanced and control loads reduced From detailed surface pressure measurements near the blade tip, the features of the chordwise pressure distribution attributable to unsteady aerodynamics are studied during retreating blade stall, and three dimensional effects assessed The spanwise and chordwise progression of the 'dynamic stall front' is discussed Finally, recent tests to examine the detailed distribution of local incidence and stall are described (Author)

A78-36950 IDS - An advanced hingeless rotor system W Jonda and H Frommlet (Messerschmitt-Bolkow-Blohm GmbH, Munich, West Germany) *(European Rotorcraft and Powered Lift Aircraft Forum, 3rd, Aix-en-Provence, France, Sept 7-9, 1977) Vertica,* vol 2, no 1, 1978, p 61-72 Research supported by the Bundesministerium der Verteidigung

The integrated dynamic system (IDS), a hingeless helicopter rotor design, consists of flexible fiberglass blades with a single bearing for blade pitching motion, the bearing is supported on the stiff titanium rotor hub The IDS construction permits high control and trimming moments, together with a considerable reduction in moving parts At present, an economical production scheme for the IDS is under development Modular integration of subsystems, high degrees of maintainability and reliability, and lower weight and life cycle costs are being sought J M B

A78-36980 Color displays for airborne weather radar R H Aires and G A Lucchi (RCA, Avionics Systems Div, Van Nuys, Calif) *RCA Engineer,* vol 23, Feb -Mar 1978, p 54 60

The basic characteristics of the PriMUS-400 ColoRadar weather radar system are described Rainfall rates in four different ranges are indicated by four different colors on the display A block diagram of the complete system, including antenna, receiver transmitter, and digital indicator, is provided The transmitter has a variable pulse width and the receiver has a very good noise figure Three comparators determine the four levels corresponding to rainfall of four intensity ranges Range and azimuth are collected in polar coordinate format, but displayed in Cartesian format The resolution of the display is four times better than previously available digital storage type indicators P T H

A78-37108 A computer-based system for processing dynamic data R E Harper and F M Reichenbach (United Technologies Corp, Pratt and Whitney Aircraft Group, East Hartford, Conn) *ISA Transactions,* vol 17, no 1, 1978, p 57-64

Large numbers of dynamic strain measurements are necessary during aircraft gas turbine development to insure product durability A new computer based system for the digital processing of dynamic strain data has just entered service at Pratt & Whitney Aircraft This system features automated handling of calibration and labeling information, and interactive operator communications Special purpose digital devices are used to increase the throughput rate, to perform FFTs and to provide a high quality hard copy readout Expansion to handle other dynamic data, including vibration and pressure, is planned (Author)

A78-37114 Aero engines climb towards better fuel efficiency M Hewish *New Scientist,* vol 78, May 11, 1978, p 380, 381

The low-by-pass-ratio turbofans of the early 1960s had specific fuel consumptions about 15 percent lower than the previous straight turbojets The introduction of high-bypass turbofans in the early 1970s led to a further 20 percent reduction Studies financed by NASA have the objective to reduce fuel consumption by another 12 percent Gains to be made are related to improved components performance, revised maintenance procedures to reduce deterioration in use, reduced sensitivity to factors which cause performance to fall while the engine is in service, and a modified operating cycle, mainly involving changes in bypass ratio, overall pressure ratio, and turbine inlet temperatures The integrated fan duct, which provides structural strength and damps out fan noise, contributes to performance gains by more efficient mixing of the fan flow and hot gas stream from the engine core G R

A78-37124 A three-dimensional finite-difference solution of the external response of an aircraft to a complex transient EM environment I - The method and its implementation II - Comparison of predictions and measurements K S Kunz and K -M Lee (Mission Research Corp, Albuquerque, N Mex) *IEEE Transactions on Electromagnetic Compatibility,* vol EMC-20, May 1978, p 328-341 14 refs Contract No F29601 76 C-0064

Experimental charge and current measurements have been performed on an aircraft exposed to the transient electromagnetic field of an electromagnetic pulse simulator These data allow a test of the predictive capabilities of the three-dimensional finite difference method for realistic aircraft simulator test problems The workings of the method and its required inputs and sensitivity to variations in the

A78-37154 # SST flight planning and navigation - The first year's experience T C R Guest (British Airways, London, England) *Journal of Navigation,* vol 31, May 1978, p 250-255, Discussion, p 255-258

The triple inertial navigation system (INS) on board the Concorde has proved a valuable aid in insuring accurate and reliable track-keeping on the complex routes operated by the aircraft The Concorde INS includes a Distance Measuring Equipment (DME) update and a card-reader facility for the insertion of waypoint and DME information Problems in the London-Bahrain route, as well as the London-Washington route, are discussed The use of the false waypoint technique to move the aircraft track and provide better sonic boom protection for a given area is considered The approach to Heathrow Airport with the INS also receives attention J M B

A78-37155 # **Fully-automated, pilot-monitored air traffic control** R L Ford (Royal Signals and Radar Establishment, Malvern, Worcs , England) *Journal of Navigation,* vol 31, May 1978, p 259 267

An analysis of trends in Air Traffic Management indicates that fully automated pilot-monitored ATC may be the system which will prevail in the future The advent of airborne collision-avoidance systems and the economic difficulties in maintaining ever larger contingents of air traffic controllers to meet increases in traffic are among the factors which suggest the likelihood of a transfer of strategic and tactical control of air traffic to the flight deck The fully automated pilot-monitored ATC system would involve development of on-board electron traffic situation displays and a radical redesigning of flight-deck instrumentation to integrate the ATC, navigation and aircraft management systems J M B

A78-37183 **Computer-aided holographic vibration analysis for vectorial displacements of bladed disks** K A Stetson and I R Harrison (United Technologies Instrumentation Laboratory, East Hartford, Conn) *Applied Optics,* vol 17, June 1, 1978, p 1733-1738

Photographs of hologram reconstructions which display vibration modes of bladed disks are digitized and numerically processed to determine translations and rotations of blade segments at radial locations Because the blades are assumed not to move in the radial direction, only two holograms, each with a different sensitivity vector, are required of each vibration mode In addition, a photograph of fringes projected onto the bladed disk is used to determine blade surface contours and compensate for their effect on the holographic fringes (Author)

A78-37246 **New model VOR/DME** E Chaki, M Yamagishi, and T Dejima (Tokyo Shibaura Electric Co , Ltd , Toyo, Japan) *Toshiba Review,* Mar -Apr 1978, p 10-12

A completely solid-state VOR/DME unit has been developed for R-NAV operation Attention is given to the design characteristics of both the VOR unit and the DME unit Major performance data are presented for the two units B J

A78-37297 **Analysis of spray combustion in a research gas turbine combustor** P B Patil, M Sichel, and J A Nicholls (Michigan, University, Ann Arbor, Mich) *Combustion Science and Technology,* vol 18, no 1-2, 1978, p 21-31 9 refs U S Environmental Protection Agency Grant No R-802925-02-2

This paper deals with the analysis of liquid fuel spray combustion in an idealized gas turbine combustor The flow, which is assumed to be one dimensional, is divided into two regions (1) the heat up region and (2) the combustion region Appropriate non-dimensional equations have been solved for each region and the solutions matched at the common boundary Analytical expressions have been developed for the burning velocity eigenvalue as well as for the solution in the combustion region The effects of the properties of the fuel and the air as well as effects of the conditions prevalent within the combustor on the solution are discussed Typical results for JP-4 fuel are presented The research gas turbine combustor designed and built at The University of Michigan comes very close to satisfying the assumptions made in this analysis (Author)

A78-37341 **Modern RF system design for aircraft** R A Stampfl (U S Naval Material Command, Naval Air Development Center, Warminster, Pa) *Archiv fur Elektronik und Ubertragungstechnik,* vol 32, May-June 1978, p 247-250

A description is presented of a new system approach, called Tactical Information Exchange System (TIES), which is currently being developed to satisfy RF system design requirements for aircraft Basic developments which make TIES possible are related to the advent of inexpensive surface acoustic wave filters of superior properties, the availability of microprocessors of small size, and the low cost and the great variety of high speed LSI logic The complexity of the avionics design problem for military aircraft is illustrated with the aid of a table which provides a summary of the kind of function which must be performed The advantages of TIES are shown by comparing it with the conventional avionics design approach The state of development of the new system approach is discussed Currently, a demonstration system with all the required modules is being built G R

A78-37406 # **Cross-flow characteristics on a cylindrical body at incidence in subsonic flow** M L Robinson (Weapons Research Establishment, Adelaide, Australia) *Institution of Engineers, Australian Hydraulics and Fluid Mechanics Conference, 6th, Adelaide, Australia, Dec 5-9, 1977, Paper* 4 p 5 refs

The flow over a cylindrical body at incidence is examined with special reference to the behavior and role of the attachment line boundary layer Results of previous work on the flow on the leading edges of swept wings are used to establish conditions governing cross-flow behavior on an inclined cylinder Flow observations and measurements of forces and moments on a cylindrical body have confirmed the theoretical prediction that, over a range of Reynolds number encountered in wind tunnel testing, an initially turbulent cross-flow reverts to a predominantly laminar flow at a critical incidence angle Both Reynolds number and conditions on the nose such as roughness greatly influence the critical incidence angle (Author)

A78-37408 # **The computation of the unsteady aerodynamics of bodies near a ground surface** G H S Pike (Sydney, University, Sydney, Australia) *Institution of Engineers, Australian Hydraulics and Fluid Mechanics Conference, 6th, Adelaide, Australia, Dec 5-9, 1977, Paper* 4 p

As a design aid for ground-effect wing aircraft, a technique for computing the steady or unsteady aerodynamic properties of bodies moving above a ground surface has been developed The computational technique, based on nonlinear aerodynamics rather than the 'small perturbation' method of standard aerodynamic stability theory, is compared to lifting surface theory and experimental data For steady calculations, the nonlinear aerodynamics approach proves superior to lifting surface theory, though for the unsteady case lifting surface theory appears more accurate J M B

A78-37409 # **The next approximation after boundary layer theory** A R Oliver (Tasmania, University, Hobart, Australia) *Institution of Engineers, Australian Hydraulics and Fluid Mechanics Conference, 6th, Adelaide, Australia, Dec 5-9, 1977, Paper* 4 p 10 refs Research supported by the Australian Research Grants Committee

A rapid stable solution method for the Navier-Stokes equations in terms of vorticity is developed as a design aid for dealing with unsteady flow effects associated with machine blades The solution technique is intended to provide an intermediate approximation between thin boundary layer theory and the full Navier-Stokes equations, if used close to the trailing edge of the blade, the solution method may reduce the length over which the full equations need to be applied The case of laminar flow with zero pressure gradient in two dimensions is treated J M B

A78-37411 # Boundary layer blowing tests on a radial diffuser in low and subsonic Mach range J S de Krasinski (Calgary, University, Calgary, Alberta, Canada) and M Mehra *Institution of Engineers, Australian Hydraulics and Fluid Mechanics Conference, 6th, Adelaide, Australia, Dec 5-9, 1977, Paper* 5 p 9 refs Research supported by the National Research Council of Canada

Radial diffusers in incompressible flow are shown to exhibit acceptable maximum efficiencies if blowing of the boundary layer at the origin of the entry bells is instituted Increasing the ratio of the jet velocity at the slot to the entry velocity results in higher stability for the diffusers, the overall efficiency of the diffusers may approach 70% for specified slot area and entry area geometries Cones of varying angles may be adopted to reduce the initial Mach number to unity at the throat, and thus make the radial diffuser design suited to supersonic diffusion The quiet operation of the radial diffusers is also noted J M B

A78-37413 # The turbulent flow through a sudden enlargement at subsonic speeds S Kangovi (National Aeronautical Laboratory, Bangalore, India) and R H Page (Rutgers University, New Brunswick, N J) *Institution of Engineers, Australian Hydraulics and Fluid Mechanics Conference, 6th, Adelaide, Australia, Dec 5-9, 1977, Paper* 4 p 10 refs

The flow through a sudden enlargement was experimentally investigated in the Mach number range of 0 1 to 0 95 Results include variation of base pressure and recovery pressure with reference Mach number The upstream influence distance and the locations of reattachment and secondary separation points are also reported (Author)

A78-37417 # The mean velocity field of unsteady subsonic air jets W H Harch and K Bremhorst (Queensland, University, St Lucia, Australia) *Institution of Engineers, Australian Hydraulics and Fluid Mechanics Conference, 6th, Adelaide, Australia, Dec 5-9, 1977, Paper* 4 p 17 refs

Mean streamwise velocity data and calculated entrainment rates are presented for a fully pulsed subsonic jet and for a steady subsonic jet with a fully pulsed subsonic coaxial core, both the jets exhaust into stationary air The same functional relationships used to characterize the mean velocity fields of steady jets are found to apply to the case of the systematically perturbed jets The perturbed jets appear to establish developed flow regimes more rapidly than steady jets Thus the perturbed jets exhibit faster growth of the jet half width and a slower decay of the jet centerline velocity, resulting in increased entrainment of the surrounding air J M B

A78-37423 # Minimisation of relaxation drag E Becker (Darmstadt, Technische Hochschule, Darmstadt, West Germany) and W Ellermeier *Institution of Engineers, Australian Hydraulics and Fluid Mechanics Conference, 6th, Adelaide, Australia, Dec 5-9, 1977, Paper* 5 p 6 refs

An analytical expression is derived in order to minimize relaxation drag It is noted that thermodynamic relaxation processes caused by a body moving through a fluid induce the production of entropy and the subsequent drag force on the body The correlation between entropy production and drag is derived for a slender two-dimensional profile moving with a constant velocity The drag force is represented by a functional of the velocity potential for cases of near-equilibrium and near-frozen flow The result for the nonequilibrium flow may be used to determine a profile which has the minimum relaxation drag for a given area and lift coefficient S C S

A78-37477 Evaluation of airborne radar Doppler processors G A Andrews (U S Navy, Naval Research Laboratory, Washington, D C) In EASCON-77, Electronics and Aerospace Systems Convention, Arlington, Va , September 26-28, 1977, Record New York, Institute of Electrical and Electronics Engineers, Inc , 1977, p 4-5A to 4-5H. 10 refs

Detection of moving targets from moving platforms is investigated in terms of the effects of platform motion and antenna pattern Using motion-compensation techniques, the performance of an MTI canceler is evaluated in terms of cascaded combinations of this canceler with additional Doppler processing The cascaded processors investigated are fast Fourier transform (FFT) filters and optimized Doppler filters Comparisons are made to determine the best configurations for particular conditions (Author)

A78-37485 The effect of correlated missed detections, correlated false alarms and interclutter visibility on the performance of an automated radar tracking system R. M O'Donnell (MIT, Lexington, Mass) In EASCON-77, Electronics and Aerospace Systems Convention, Arlington, Va , September 26-28, 1977, Record New York, Institute of Electrical and Electronics Engineers, Inc , 1977, p 10-2A to 10-2I 6 refs USAF-sponsored research

In the specification of radar detection and false alarm performance required to permit good automatic tracker performance, little regard has been given in the past to the need for radar signal processing and thresholding which will ensure that both the false alarms and missed detections fed to the tracker are uncorrelated The physical phenomena and radar design features which can cause either correlated false alarms or missed detections are rain and ground clutter, angel clutter, blind speeds, missed detections, blind phase problems and poor low velocity Doppler filter response The effect of interclutter visibility has been found to be significant in enhancing the detection of aircraft flying tangentially through ground clutter Extensive experimental results are presented illustrating these phenomena and their effects on tracking performance (Author)

A78-37486 Dealing with false targets in the Air Traffic Control Radar Beacon System J E Freedman (ARINC Research Corp , Annapolis, Md) In EASCON-77, Electronics and Aerospace Systems Convention, Arlington, Va , September 26-28, 1977, Record New York, Institute of Electrical and Electronics Engineers, Inc , 1977, p 10-3A to 10-3J 15 refs

The generation of false beacon targets in the Air Traffic Control Radar Beacon System (ATCRBS) has long been a problem and a limiting factor to its performance This paper begins by examining the origins and characteristics of false targets and surveys present preventive and eliminative remedies in terms of their principles of operation and their practical limitations It is shown that, while improvements have been made and more can be expected, no one remedy will solve all false target problems The discussion then turns to consideration of software filters as a potentially valuable new tool for eliminating whatever false targets still remain due to the technical, economic, and political limitations of the preventive remedies The paper describes as an example one candidate filter - a simple algorithm based on detection of duplicate code reports - and examines its potential effectiveness Conclusions are then drawn regarding the potential role for software filters and their relation to the other false target remedies (Author)

A78-37490 CRT update. J E Wurtz (Litton Industries, Electron Tube Div , San Carlos, Calif) In EASCON-77, Electronics and Aerospace Systems Convention, Arlington, Va , September 26-28, 1977, Record New York, Institute of Electrical and Electronics Engineers, Inc , 1977, p 12-2A to 12-2F 16 refs

Innovation in phosphor mixes and advanced tube design have contributed to the continuing wide application of CRTs for TV monitors, oscilloscopes, air traffic control and cockpit displays, as well as for nondirect projection and scanning The advanced gun design adopted for the stringent shock and vibration conditions of airborne displays is discussed, and advanced green-line emitters for CRT airborne displays are mentioned Use of CRTs to record the output of radars, infrared scanners, scanning electron microscopes and medical scanners is also considered, filter optic coupling makes the CRT especially suitable for film recording A CRT-based device for superimposing information onto the scene perceived by aircraft pilots from the cockpit is described J M B

A78-37501 Modern millimeter wave instrumentation radar development and research methodology. J A Scheer, J L Eaves, and N C Currie (Georgia Institute of Technology, Atlanta, Ga) In EASCON 77, Electronics and Aerospace Systems Convention, Arlington, Va , September 26-28, 1977, Record New York, Institute of Electrical and Electronics Engineers, Inc , 1977, p 16-6A to 16-6H 11 refs

A millimeter-wave radar is described, and its various modes of operation are related to the research associated with signal processing techniques The new system is based on a K-sub-a band radar characterized as state-of-the-art, solid-state, self-contained, portable, coherent, frequency-agile, dual-polarized, and polarization-agile Preliminary hard target and clutter data and analyses are presented and related to the determination of appropriate processing algorithms for target discrimination M L

A78-37525 Results of the NASA/MARAD L-band satellite navigation experiment B P Gibbs (EG&G/Washington Analytical Services Center, Inc , Riverdale, Md) In EASCON 77, Electronics and Aerospace Systems Convention, Arlington, Va , September 26-28, 1977, Supplement New York, Institute of Electrical and Electronics Engineers, Inc , 1977, p 25-30 9 refs

During the period from October 1974 to May 1975, the National Aeronautics and Space Administration (NASA) and the Maritime Administration (MARAD) conducted two, independent mobile-vehicle position experiments using the Application Technology Satellites (ATS) 5 and 6 NASA used an FAA aircraft as the mobile platform while MARAD used two commercial ships This paper summarizes the results of these experiments The data was analyzed to determine the operational accuracy, the dominant error sources and the potential accuracy of the system Overall, both experiments demonstrated accuracies of 2 to 30 nautical miles using the 'real time' data The dominant error source was found to be satellite ephemeris error Using refined ephemerides (either from trilateration or a two-week prediction from normal ATS-6 tracking), both systems demonstrated accuracies of 2 to 4 nautical miles Random measurement errors generally resulted in less than one nautical mile position error (Author)

A78-37530 # Prediction of the ground effect - Side-line noise from aircraft J E Piercy, T F W Embleton, and R J. Donato (National Research Council, Ottawa, Canada) *Acoustical Society of America, Meeting, 93rd, State College, Pa , June 6-10, 1977, Paper* 8 p 5 refs

Distance and angle functions are used to calculate the attenuation due to grass alongside airport runways for JT8-D powered aircraft Attention is given to the aircraft's angle of elevation It is noted that a large (5-20 dB) attenuation is reported for very small angles (less than 3 deg), due to Lloyd's mirror cancellation, while much smaller (less than 3 dB) attenuation is observed for larger angles, due to ground absorption The attenuation in the latter case depends much more on distance than on angle Measurements of the SAE are contrasted with those of the CSIR (Committee of Scientific and Industrial Research) of the Republic of South Africa D M W

A78-37532 # Azimuthal decomposition of the power spectral density of jet noise K Yamamoto and R E A Arndt (Pennsylvania State University, University Park, Pa) *Acoustical Society of America, Meeting, 93rd, State College, Pa , June 6-10, 1977, Paper.* 20 p

The reported results have been obtained in a research program which was conducted to increase the fundamental understanding of the jet noise generation mechanism which is essential to the development of further advanced techniques of noise reduction The experiments included measurements of the coherence function of the circumferentially cross correlated signals of jet noise The coherence functions plotted versus frequency for various azimuthal separation angles are shown in a graph With an increase of the azimuthal separation angle, the coherency decreases In the high frequency range the coherency falls off drastically There is a strong azimuthal coherency over a rather broad range of frequency The coherence data were sampled at 13 arbitrarily selected frequencies and expanded in terms of a Fourier-series with respect to the azimuthal angle The results of the Fourier decomposition for two different jets are presented Michalke's spectral theory was used for the prediction of the single-azimuthal-frequency component of jet noise G R

A78-37536 # An economic and technical perspective of the turboprop engine in Ag-aviation D C Emmerson (Pratt and Whitney Aircraft of Canada, Ltd , Longueuil, Quebec, Canada) *(Canadian Aeronautics and Space Institute, Annual General Meeting, Quebec, Canada, May 18, 1977) Canadian Aeronautics and Space Journal,* vol 24, Mar -Apr 1978, p 73-82

The development of turboprop technology for agricultural aircraft is reviewed Some of the more important technical considerations, cost factors, and productivity questions involved in applying turbines to agricultural aviation are examined Experience with current turboprop aircraft for agriculture with regard to reliability, time between overhauls, disk life, noise, purchase price, fuel costs, maintenance costs, insurance, payload capacity, and flight performance is discussed P T H

A78-37537 # Wind tunnel tests of a slotted flapped wing section D J Marsden (Alberta, University, Edmonton, Canada) *(Canadian Symposium on Recreational and New Generation Light Aircraft, 2nd, Toronto, Canada, Sept 1976) Canadian Aeronautics and Space Journal,* vol 24, Mar -Apr 1978, p 83-91 8 refs Research supported by the National Research Council of Canada and University of Alberta

The slotted flapped wing section that was the subject of wind tunnel tests allows a high wing loading to be used for fast cruising flight and yet retains good climb performance with the flap extended for circling flight Flow visualization revealed clearly the transition from laminar to turbulent flow Laminar separation followed by reattachment to form a laminar separation bubble was a common mechanism for transition The position of transition for angle of attack from -4 to 14 deg was plotted for retracted and extended flap, and a sharp stall point was determined. Lift and drag characteristics were obtained, and the effect of leading edge roughness, such as may result from collecting insects on the leading edge, was determined The extension of the flight regime due to the flap is revealed The useable lift coefficient range of the section is nearly doubled by the slotted flap P T H

A78-37538 # Rolls-Royce RB401 turbofan - A new business jet engine for the 1980's P E Peck (Rolls Royce, Ltd , Aero Div , Bristol, England) *Canadian Aeronautics and Space Journal,* vol 24, Mar -Apr 1978, p 92-97

The new RB401 engine delivers 5400 lb of thrust and is aimed at business jet aircraft for the 1980s It has a bypass ratio of 4 2 1, and in retrofit applications it will increase aircraft range up to 50% with accompanying improvements in climb and cruise performance It employs conventional straight flow with axial compressors and turbines at an overall pressure ratio of 16 4 1 The selected design point provides an optimum solution in the tradeoff between fuel consumption and powerplant installed thrust and weight The thermodynamic cycle permits the design of a two-stage low-pressure turbine with the same constant mean radius as the high-pressure turbine and with direct drive to the fan The fan is a low-hub-tip ratio design giving a mean pressure ratio of 1 72 at cruise conditions and passing 182 lb/sec at takeoff The high-pressure compressor incorporates a constant-diameter casing and blading produced in groups The gas generator features a supersonic nozzle and a single-stage turbine, resulting in 100 C reduction in gas temperature on the rotor blades P T H

A78-37539 # **Expansion potential for the local service air carrier** I Macleod (North Canada Air, Ltd , Prince Albert, Saskatchewan, Canada) *(Canadian Aeronautics and Space Institute, Annual General Meeting, Toronto, Canada, May 1976) Canadian Aeronautics and Space Journal,* vol 24, Mar -Apr 1978, p 98-104

The paper discusses the possibilities for the expansion of local air service in Northern and Western Canada The prospects for increased mining and tourism in Northern Saskatchewan may call for extension of the local air carrier service To keep up with competition from surfaces modes of transportation, existing local air services carriers on established routes will have to concentrate on frequency and scheduling of service, fast and reliable baggage handling, and scheduling interfacing In the process of route development, the local carrier should be allowed greater scope with limited competition on regional and mainline routes Route transfers should be encouraged Cooperation between local, regional and mainline carriers will be needed A limited and conditional subsidy policy is suggested P T H

A78-37603 # **Electronic aircraft collision avoidance system (Radiotekhnicheskie sistemy preduprezhdeniia stolknovenii samoletov)** S I Bychkov, G A Pakholkov, and V N Iakovlev Moscow, Izdatel'stvo Sovetskoe Radio, 1977 272 p 60 refs In Russian

The principles of operation and design of airborne electronic collision avoidance systems for aircraft are set forth The physical basis for the problem of avoiding collisions in midair is studied, and methods of designing and using components and systems for determining the mutual position of two objects and the parameters of their motion are studied Special attention is given to interacting systems based on interrogation and response, synchronous systems, and systems using the signal format and equipment of secondary air traffic control radar P T H

A78-37613 # **Uniqueness 'in the large' of the solution to the direct problem of the Laval nozzle (O edinstvennosti 'v tselom' resheniia priamoi zadachi sopla Lavaliia)** E G Shifrin *Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki,* vol 18, Mar Apr 1978, p 509-512 5 refs In Russian

Uniqueness 'in the large' is established for two classes of solutions to the direct problem of the Laval nozzle in the transonic approximation of the equations of motion on the assumption that no shocks are present First it is proved that for a nozzle of infinite length, if the flow acceleration is nonnegative the solution, if any, is unique Then it is proved that there do not exist two different solutions that are elliptic on the same domain and degenerating on a rectilinear segment of the boundary P T H

A78-37683 * # **On the use of relative velocity exponents for jet engine exhaust noise** J R Stone (NASA, Lewis Research Center, Cleveland, Ohio) *Acoustical Society of America, Meeting, 95th, Providence, R I , May 16-19, 1978, Paper* 16 p 14 refs

The effect of flight on jet engine exhaust noise has often been presented in terms of a relative velocity exponent, n, as a function of radiation angle The value of n is given by the OASPL reduction due to relative velocity divided by 10 times the logarithm of the ratio of relative jet velocity to absolute jet velocity It is shown in this paper that the exponent n is positive for pure subsonic jet mixing noise and varies, in a systematic manner, as a function of flight conditions and jet velocity On the basis of calculations from simple empirical models for jet mixing noise, shock noise and internally-generated noise, it is shown that when other sources are present, the resulting range of n is increased over the range for jet mixing noise, and in some cases negative values of n are obtained (Author)

A78-37712 **The role of meteorology in helicopter icing problems** P Ryder (Meteorological Office, Bracknell, Berks , England) *Meteorological Magazine,* vol 107, May 1978, p 140-147 9 refs

An analysis of helicopter icing is presented The role of the meteorologist in preventing accidents resulting from icing is examined with reference to policy decisions on the need for widescale use of helicopters It is concluded that the discipline of meteorology is more suited for planning and performing basic research concerning icing rather than in devising some simple means of predicting icing hazards The responsibility of a meteorologist as an adjunct to a policy decision is considered M L

A78-37732 * # **Notes on the transonic indicial method** D Nixon (NASA, Ames Research Center, Moffett Field, Calif) *AIAA Journal,* vol 16, June 1978, p 613-616

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

A78-37733 # **Nonlinear formulation for low-frequency transonic flow** W C Chin (Boeing Commercial Airplane Co , Seattle Wash) *AIAA Journal,* vol 16, June 1978, p 616-618

Two-dimensional unsteady transonic flow past a thin airfoil performing small-amplitude harmonic oscillations is studied in an analysis which takes into account the 'back-interaction' arising from the nonlinear harmonic interplay The back-interaction phenomenon may have important effects on mean shock jumps and location in low-frequency problems, though the effect is probably less significant for the high-frequency case The nonlinear analysis demon-

A78-37743 * # **Pressure pulsations on a flat plate normal to an underexpanded supersonic jet** L H Back and V Sarohia (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif) *AIAA Journal,* vol 16, June 1978, p 634-636 Contract No NAS7-100

An experiment was devised to study the interaction between an underexpanded supersonic gas jet and a flat plate, with the plate located in a region in which the interaction produces shock wave and flow fluctuations Nitrogen gas at ambient stagnation temperature flowed through a convergent nozzle with exit diameter of 2 03 cm and impinged on a square metal plate normal to the jet Results revealed local peak pressure fluctuations on the plate at nozzle pressure ratios of about 2 and 4 5, with the latter case producing fluctuations of the same order as the mean pressure on the plate, the frequency of the oscillations was as large as 20 kHz For choked jet flow at ambient pressure higher than atmospheric, the pressure fluctuations would increase accordingly, and adjacent solid structures would therefore be subjected to proportionately higher normal stresses B J

A78-37744 * # **Round jet in a cross flow - Influence of injection angle on vortex properties** D Krausche, R L Fearn (Florida, University, Gainesville, Fla), and R P Weston (NASA, Langley Research Center, Low Speed Aerodynamics Branch, Hampton, Va) *AIAA Journal,* vol 16, June 1978, p 636, 637 Grant No NGL-10-005-127

A model is developed to infer the properties of a pair of diffuse contrarotating vortices for perpendicular jet injection into the cross flow Attention is given to pressure distribution on the surface where the jet exhausts, especially in terms of V/STOL applications A V/STOL wind tunnel experiment is described, whereby a round jet of air (10 16 cm dia) was discharged through a horizontal flat plate into the cross flow of the wind tunnel test section at angles of 45, 60, 75, and 90 deg Results indicate that the effective vortex strength for both velocity ratios is highest near the jet orifice, and decreases as the vortices are swept downstream, at which point the effective vortex spacing increases In addition, the core radius of the vortex exhibits properties similar to those of the effective vortex spacing D M W

A78-37772 **Review of flashback reported in prevaporizing/premixing combustors** S L Plee and A M Mellor (Purdue University, West Lafayette, Ind) *Combustion and Flame,* vol 32, June 1978, p 193 203 42 refs Grant No AF-AFOSR-76 2936

Upstream flame propagation into the fuel preparation tanks of prevaporizing/premixing combustors is discussed, this type of combustor is under consideration for aircraft, ramjet and automotive propulsion systems Classical flashback, autoignition, flame propagation through reversed flow fields, and preignition of the fuel/air mixture in separated flow regions of the mixing tube are the phenomena examined A literature review suggests that the latter three mechanisms, rather than classical flashback, are present in noncatalytic combustion systems burning liquid jet fuels and propane This finding is important for development of engine burners capable of simultaneously reducing both oxides of nitrogen and carbon monoxide J M B

A78-37775 # **Flow past nonconical wings with separation** S V Ramakrishnan and N R Subramanian (National Aeronautical Laboratory, Bangalore, India) *Journal of Aircraft,* vol 15, June 1978, p 383, 384 5 refs

The Brown and Michael (1954) method is extended to evaluate the effect of flow separation on wings of nonconical planform It is assumed that the spiral vortex sheets that separate from the leading edges can be replaced by two isolated vortices at the cores of the vortex sheets. The boundary conditions on the wing are such that (1) the normal velocity is zero, (2) the velocity is finite at the leading edge, and (3) the conditions in the field are that the disturbances vanish at infinity and the fluid pressure is continuous The vortex strength increases in the downstream direction, and the increase in vorticity is achieved in this model by a feeding sheet of vorticity in order to satisfy Kelvin's theorem Although this approximation method yields higher values for the lift coefficient than those obtained from experiments on delta wings, it gives a first approximation for evaluating the vortex lift S D

A78-37860 **Investigating the efficiency of gas turbines in off-design operation** G G Ol'khovskii and N I Ol'khovskaia (Vsesoiuznyi Nauchno-Issledovatel'skii Teplotekhnicheskii Institut, Moscow, USSR) *(Teploenergetika,* vol 24, no 9, 1977, p. 25-29.) *Thermal Engineering,* vol 24, no 9, 1978, p 16-19 8 refs Translation.

Parameters useful in characterizing the efficiency of gas turbines have been studied on the basis of information accumulated while refining the starting and operating performance of multistage gas turbines Among the parameters discussed are the expansion ratio, the characteristic ratio (on which individual turbine-stage efficiency is strongly dependent), available heat drop, and internal efficiency In addition, the internal capacity of the turbines is obtained from the capacity balance (allowance being made for the capacity of the starting motor) A number of the parameters are monitored for multistage gas turbines from cold start to operational gas temperature J M B

A78-37873 # **Aircraft radar systems (Radiolokatsionnye sistemy letatel'nykh apparatov)** P S Davydov, V P Zhavoronkov, G V Kashcheev, V V Krinitsyn, V S Uvarov, and I N Khresin (Moskovskii Institut Inzhenerov Grazhdanskoi Aviatsii, Moscow, USSR) Moscow, Izdatel'stvo Transport, 1977 352 p 96 refs In Russian

The book deals with various aspects of designing onboard radar systems, calculating and selecting the principal system parameters on the basis of statistical approaches, and assessing system performance The major topics covered include radar transmitters and antennas, onboard receiver systems, radar displays, automatic radar data processing, Doppler velocity and sideslip meters, radar altimeters, radar adjustment and checking techniques, and the automatic monitoring and documentation of radar parameters V P

A78-37885 # **Aircraft auxiliary power units (Vspomogatel'nye silovye ustanovki samoletov)** N I Pavlovskii Moscow, Izdatel'stvo Transport, 1977 240 p In Russian

The design, operation, and maintenance features of the TA-6A and TA-8 auxiliary power units, which serve to start up the turbojet engines of the Il 62, Tu-134A and Tu-154 aircraft, are described Descriptions are provided of all the main subsystems of these engines, such as the fuel system, lubrication system, air supply, ignition system, generator, and measuring systems Attention is given to procedures for preparing the engines for operation, starting the engines, regulating the servicing done on the engines, engine installation and removal, and parts replacement P T H

A78-37887 # Factorization methods in hydroaeromechanics (Metod faktorizatsii v zadachakh gidroaeromekhaniki) G S Lipovoi Kiev, Izdatel'stvo Naukova Dumka, 1977 120 p 78 refs In Russian

The theory of complex variables is applied in a discussion of factorization methods used in the investigation of nonsteady-state problems in hydromechanics and aeromechanics Topics include the periodic movement of an infinite or finite wing span along a solid surface, the aperiodic movement of a profile along a solid surface, the aperiodic movement of finite wing spans along a screen, the periodic fluctuations of thin spatial cascades or of multiseries cascades in subsonic gas flows, and the movement of a thin finite wing span under the free surface of a liquid of infinite or finite depth M L

A78-37979 Laser velocimeter for wind tunnel measurements A Boutier, G Fertin, and J Lefevre (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *IEEE Transactions on Aerospace and Electronic Systems,* vol AES-14, May 1978, p 441-455 32 refs (ONERA, TP No 1977-63)

Laser velocimetry principles are briefly recalled, the optical and mechanical elements making up a velocimeter are described Their purpose is to create two laser beams of equal intensity which are focused and crossed in a probe volume where a fringe pattern is formed, the light scattered by submicron particles passing through the volume is collected by an optics rigidly connected to the emitting optics and focused on a photomultiplier Among the various signal processing techniques, counters are now widely used, in connection with minicomputers The different means used to determine the velocity sign and to measure simultaneously two components of the velocity are described, the simultaneous measurement of the three velocity components is more a matter of technology and cost than a theoretical problem The modular operational velocimeter developed at ONERA is described, as examples of application, some typical results obtained in different aerodynamic flows are reported (Author)

A78-37987 Evaluation of geometric performance of global positioning system C T Leondes and K Yonezawa (California, University, Los Angeles, Calif) *IEEE Transactions on Aerospace and Electronic Systems,* vol AES-14, May 1978, p 533-539 7 refs

The global positioning system (GPS) is a satellite-based radio navigation system to provide extremely accurate three-dimensional position fixes and system time to users anywhere on the earth at any time regardless of weather conditions The most significant performance parameter of the GPS is the degree of navigation accuracy which is strongly coupled to the choice of orbit configuration The 3 x 8 orbit configuration has been considered as an operational GPS which consists of 24 satellites deployed in circular 63 deg inclined, subsynchronous 12-h orbits In this paper, the geometric performance of several orbit configurations, including a 3 x 8 orbit configuration, is analyzed numerically by altering orbit period and elevation mask, respectively It is shown that (1) there are a few orbit configurations which are comparable to or better than the baseline 3 x 8 orbit configuration, and (2) for higher elevation mask, the geometric performance can be improved effectively by increasing orbit period to some extent (Author)

A78-38083 Halogenated solvent-induced corrosion in hydraulic systems L C Lipp (Hughes Aircraft Co , Culver City, Calif) *American Society of Lubrication Engineers, Annual Meeting, 33rd, Dearborn, Mich , Apr 17-20, 1978, Preprint 78-AM-4A-2* 8 p 10 refs

Halogenated solvents and water contaminants in MIL-H-5606 hydraulic fluid were found to induce corrosion in systems used to drive radar antennas in the F-14 airplane. The predominant corrosion product found was identified as beta-iron oxide hydroxide The formation of this unusual iron oxide requires the presence of chlorine or fluorine, water and sufficiently high temperature to provide energy of activation Analyses of F-14 radar hydraulic systems revealed excessive amounts of trichlorotrifluoroethane, 1,1,1 trichloroethane and water Investigation of component manufacturing, assembly and cleaning procedures identified the sources of these contaminants Hot spots in the operating system provided reaction temperature Process controls limiting halogenated solvents in operating systems and procedures to remove excessive solvent and water contaminants were successfully incorporated to control corrosion (Author)

A78-38095 Circumferential seals for use as oil seals P C Stein (Stein Seal Co , Philadelphia, Pa) *American Society of Lubrication Engineers, Annual Meeting, 33rd, Dearborn, Mich , Apr 17-20, 1978, Preprint 78-AM-3D-2* 7 p

Segmented circumferential rubbing seals have been widely used, especially as main shaft seals for aircraft turbine engines, for well over two decades They have operated satisfactorily at high performance levels when sealing air and products of combustion In the presence of substantial amounts of oil, however, particularly with low pressure differentials, they are subject to high oil leakage, due primarily to 'surf-boarding' effects Incorporation of 'negative-lift' pockets in the bore of the segments effectively prevents the surf-boarding and makes the segmented ring into a convenient and efficient seal for many applications involving both oil rich gaseous environments and those involving solid oil The paper outlines theoretical considerations, shows their application to a number of seal structures and presents results of laboratory testing under a variety of conditions to define regions of applicability (Author)

A78-38122 Stress intensity factors, for collinear cracks in a stiffened sheet D P Rooke (Royal Aircraft Establishment, Farnborough, Hants , England) and D J Cartwright (Southampton, University, Southampton, England) *International Journal of Fracture,* vol 14, Apr 1978, p R61-R64 Research supported by the Ministry of Defence (Procurement Executive)

An analytical technique is described for determining the stress intensity factors of large airframe structural elements with stiffeners riveted to them In such configurations, cracks are initiated at the rivets and grow at right angles to the main stress direction which is parallel to the stiffeners This results in an array of collinear cracks S C S

A78-38246 # Titanium and titanium alloys in aircraft maintenance and repair I (Titan und Titanlegierungen bei der Instandhaltung und Instandsetzung von Flugzeugen I) L Ahnert (VEB Kombinat Spezialtechnik, Dresden, East Germany) *Technisch-okonomische Information der zivilen Luftfahrt,* vol 14, no 1, 1978, p 41-49 8 refs In German

Increasing aircraft speeds and engine efficiency (usually involving higher engine temperatures) has led to the widespread use of titanium in aircraft structures Titanium is noted to combine structural stability with lightweight (specific gravity = 4 5 g/cu cm) and temperature resistance to over 500 C It is noted that the Tu-144 aircraft incorporates approximately 2500 elements of titanium or its alloys Tables are presented listing various physical properties for Ti-alloys containing Al, Mn, Mo, V, Zr, Cr, and Sn, with attention to thermal stability and creep resistance D M W

A78-38247 # **On the compensation of radio direction finders (Zur Kompensation von Funkkompassen)** P Korrell (Gesellschaft fur internationalen Flugverkehr mbH, Berlin, East Germany) *Technisch-okonomische Information der zivilen Luftfahrt,* vol 14, no 1, 1978, p 50-59 In German

The relationship between local ground conditions and field disturbances in the radio spectrum near the ground is considered with reference to improving the direction finding ability of the standard radio navigation antenna of the ICAO Design and operating characteristics of the antenna are reviewed, and equations are given for the optimum positioning of the antenna coils Emphasis is placed on antenna wave propagation in various airport environments, e g , tower, runway, taxiway, highway access, etc Finally, a comparison between the modeling of positioning errors and their measurement is presented D M W

A78-38248 **Calculation of transonic flow through a turbine cascade by the time-step method (Berechnung der transsonischen Stromung durch ebene Turbinengitter nach dem Zeit-Schritt-Verfahren)** F Lehthaus *VDI-Forschungsheft,* no 586, 1978, p 5-24 33 refs In German Research supported by the Bundesministerium fur Wirtschaft

On the basis of conservation laws in integral form for mass, momentum and energy, a procedure for calculating the steady inviscid two-dimensional transonic flow in a turbine cascade by the time-dependent finite element method is developed Results of computer calculations of pressure distributions on the profile contour and of the cascade characteristics are given for two cascades of strongly different geometry Calculations are compared with extensive experimental results obtained from using both a planar array and a rotating array Good agreement is achieved between theory and experiment wherever the assumption of attached flow is reproduced in the experiments The agreement between calculated and experimental homogeneous Mach number and homogeneous outflow angle was good, while the agreement in the total pressure losses was qualitatively close P T H

A78-38475 # **Aerodynamics of the annular wing (Aerodinamika prstenastog krila)** S Pivko *Srpska Akademija Nauka i Umetnosti, Posebna Izdanja,* no 499, *Odeljenje Tekhnichkikh Nauka,* no 12, 1977 103 p 20 refs In Serbian

The aerodynamic properties of three types of annular airfoils are studied theoretically (1) cylindrical annular airfoil with symmetrical sections at zero incidence, (2) annular airfoil with thin cambered sections at zero incidence, and (3) thin cylindrical ring with axis at angle of attack The cylindrical annular airfoil with symmetric sections is replaced according to the method of singularities by a system of source and sink rings over the mean surface, and the annular foil with thin cambered sections is replaced by a distribution of bound vortex rings on a cylinder The thin cylindrical wing is replaced by a bound vortex ring of variable strength and by a system of trailing vortices escaping from the trailing edge of the ring sections Results of graphical integration are compared with some wind tunnel data P T H

A78-38521 * # **High-flying Mini-Sniffer RPV - Mars bound** R D Reed (NASA, Flight Research Center, Edwards, Calif) *Astronautics and Aeronautics,* vol 16, June 1978, p 26-39

The Mini Sniffer is a small unmanned survey aircraft developed by NASA to conduct turbulence and atmospheric pollution measurements from ground level to an altitude of 90,000 ft Carrying a 25-lb air sampling apparatus, the Mini-Sniffer typically cruises for one hour at 70,000 ft before being remotely piloted back to earth A hydrazine monopropellant engine powers the craft, while a PCM telemetering system and a radar transponder provide control functions Development of a high-performance low-Reynolds-number airfoil could make the research craft suitable for a low-altitude terrain-following mission on Mars J M B

A78-38522 # **Grumman's radio-controlled experimental air force** B Frisch *Astronautics and Aeronautics,* vol 16, June 1978, p 40, 41

Construction of V/STOL and forward-swept-wing experimental aircraft models is discussed The models may provide a good indication of the static stability and control characteristics of aircraft, though they are not generally useful in studying the stall regime and the V/STOL hovering case Spin testing through use of the foam/balsa/epoxy models is also possible J M B

A78-38524 # **A rising sun in aircraft** A E Fuhs (U S Naval Postgraduate School, Monterey, Calif) *Astronautics and Aeronautics,* vol 16, June 1978, p 52-59 5 refs

A survey of the Japanese aircraft industry indicates that in the short term the Japanese will probably sign license agreements to build the F-15 and P-3C, in the longer term (1990-2000), joint commercial aircraft development programs with other nations may place Japan in the fifth rank among world aerospace producers The YS-11, a 64-passenger aircraft first marketed by the Japanese in 1965, resulted in a loss of $100 million for the manufacturer, despite sales in 13 nations Limited domestic demand for small commercial transports and general aviation aircraft has also contributed to a low level of confidence in the national aerospace industry A quiet STOL craft and a fanjet for short-range domestic flights are principal current development projects of the Japanese national aerospace program J M B

A78-38575 **Subisokinetic sampling errors for aircraft turbine engine smoke probes** J A Martone (USAF, Armament Development and Test Center, Tyndall AFB, Fla) *Air Pollution Control Association, Journal,* vol 28, June 1978, p 607-609 11 refs

Estimates are made of subisokinetic sampling errors for aircraft turbine engine smoke probes The aerosol sampling data reported by Martone et al (1977) are discussed The study collected samples of submicrometer particles suspended in unheated near-sonic and supersonic free jets Subisokinetic sampling errors were found for free jet velocities of Mach 0 6, 0 8, 1 26, and 1 27 An expression was derived for the ratio of the sampled aerosol concentration to true freestream aerosol concentration These data are used to assess the validity of applying Zenker's (1975) results to the prediction of subisokinetic sampling errors in compressible flows When applied to turbine engine exhausts, it is found that a smoke probe may produce a 15-30% subisokinetic sampling error at a take off engine power setting S C S

A78-38641 **Experimental investigation of gasdynamic processes at sudden start-up of a supersonic nozzle** L G Gvozdeva and Iu V Zhilin *(PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki,* July-Aug 1977, p 66-74) *Journal of Applied Mechanics and Technical Physics,* vol 18, no 4, Jan 20, 1978, p 484-491 15 refs Translation

A78-38696 # Remarks on the noise emitted by the jet of a gas turbine engine (Remarques sur le bruit émis par le jet d'un turboréacteur) R Legendre *La Recherche Aérospatiale,* Mar -Apr 1978, p 53-58 7 refs In French

Without regard for entropy noise, three distinct noise sources are analyzed turbulence, nonhomogeneity of temperature or entropy, and combustion An equation is obtained in which the state variables are eliminated as far as possible The form of the equation satisfied by the acoustic agitation potential is obtained so that the three sources mentioned above can be identified P T H

A78-38698 # Viscous-inviscid coupling - A numerical method and applications to two-dimensional transonic and supersonic flows (Couplage visqueux-non visqueux - Methode numérique et applications aux écoulements bidimensionnels transsoniques et supersoniques) J -C Le Balleur (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *La Recherche Aérospatiale,* Mar -Apr 1978, p 65-76 22 refs In French

An automatic iterative method is proposed for solving two-dimensional problems of strong interaction between a perfect fluid and boundary layers It can be integrated into numerical methods for solving perfect fluid flows by relaxation The usual direct iteration is stabilized by means of a local underrelaxation coefficient A new semi-inverse iteration permits extending a direct perfect-fluid calculation to regions of separation These regions can be multiple and develop on their own In supersonic regime, a well-posed problem is solved that involves a downstream boundary condition even when the flow does not obey a simple wave law The method is applied to a supersonic compression ramp and symmetric profiles in transonic flow P T H

A78-38726 # Local method in rarefied gas aerodynamics R G Barantsev (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) *Rozprawy Inzynierskie,* vol 26, no 1, 1978, p 3-9 10 refs

An approximate method for calculating aerodynamic characteristics of bodies in hypersonic rarefied gas flow is set forth It is based on assuming that the momentum flux at the body surface is to be determined by the local incidence angle irrespective of the body form This approximation contains a number of empirical coefficients depending on regime parameters As a result the problem is split into two parts first, calculating form functions independent of the flow regime and, second, finding regime coefficients independent of the body form Treatment with experimental data has shown the local approach to be sufficiently exact for all Knudsen numbers An extension of the method to finite Mach numbers is also proposed Some advisable trends towards the further development of the local theory are discussed (Author)

A78-38746 The F-4E Austere HUD/Gunsight project E T Meschko (USAF, Washington D C) *(Society of Experimental Test Pilots, Annual Mini-Symposium, 8th, San Diego, Calif , Mar 25-27, 1977) Society of Experimental Test Pilots, Technical Review,* vol 14, no 1, 1978, p 25-30

The initial phase of the F 4E Austere HUD/Gunsight project consisted of a feasibility study aimed at determining whether a suitable HUD could be installed in the F-4 under the constraints of austerity, i e , low cost and maximum use of existing or planned avionics The second phase was verification of the gunsights, using inputs from onboard avionics The results of the two phases are discussed in the present paper Fourteen pilots flew the system during a period of three months They evaluated three air-to air modes and two air-to-ground modes, using the hotline gunsight and the DALCOS gunsight Both sights proved to be useably accurate, each having its particular advantages, the DALCOS was superior in long range tracking while the hotline was superior in the high aspect angle snapshoot situation The feasibility of an improved composite sight is examined V P

A78-38747 F-5E/F spin avoidance testing R G Thomas (Northrop Corp , Los Angeles, Calif) *(Society of Experimental Test Pilots, European Symposium, 9th, Zurich and Lucerne, Switzerland, Apr 27-30, 1977) Society of Experimental Test Pilots, Technical Review,* vol 14, no 1, 1978, p 36-46

The spin avoidance tests described were carried out to determine any possible unidentified characteristics of the F-5E/F that would result in departures leading to a spin or unrecoverable flight conditions The primary effort was directed toward placing the aircraft into control forced poststall gyrations of increasing duration and relying on the pilot's judgement to apply recovery control (based on the aircraft feel) to prevent spin entry A 24-ft ring slot parachute was installed on the tail as a provision for recovery whenever aerodynamic control failed The test phases included tactical maneuvers and stalls performed with normal control inputs, aborted tactical maneuvers and stalls performed with brief aggravated control inputs (lasting less than 1 sec) and also with sustained aggravated control inputs (up to 3 sec) and grossly aggravated control inputs (up to 15 sec, but excluding deliberate spin attempts) The test results are diagrammed, tabulated, and discussed V P

A78-38748 Jaguar and Tornado avionic development testing J J Cockburn (British Aircraft Corp , Ltd , Military Aircraft Div , Weybridge, Surrey, England) *(Society of Experimental Test Pilots, European Symposium, 9th, Zurich and Lucerne, Switzerland, Apr 27-30, 1977) Society of Experimental Test Pilots, Technical Review,* vol 14, no 1, 1978, p 47-53

The avionic systems of the single-seat Jaguar and two-seat Tornado aircraft are discussed, and the testing of the various stages is described Attention is given to avionic development, integration of the system, function and accuracy measurement in navigation and weapon aiming, pilot workload, and safety aspects of terrain following The aircraft are shown to have great similarities in the pilot-oriented display and actions, but to differ sharply in total sophistication The various displays, particularly HUD's, are examined, along with the solutions reached for each aircraft V P

A78-38749 Planning and procedures for aircraft demonstrations - V/STOL aircraft D M S Simpson (Hawker Siddeley Aviation, Ltd , Kingston-upon-Thames, Surrey, England) *(Society of Experimental Test Pilots, European Symposium, 9th, Zurich and Lucerne, Switzerland, Apr 27-30, 1977) Society of Experimental Test Pilots, Technical Review,* vol 14, no 1, 1978, p 54-57

Some aspects of demonstrating the Hawker jet V/STOL aircraft are discussed It is shown that careful performance planning, based on accurate temperature and pressure information is absolutely essential for any demonstration environment Performance margins depend on loads to be carried and on the environment Thus, a pad landing in the trees will require more margin than a straightforward approach and landing on an open space Short term limits and water injection in the engine must be carefully calculated and monitored In preparation for a demonstration, a pilot will spend much time in surveying, analyzing, and considering the possibilities of the exercise not quite going as planned Attention must be given to such aspects as approaches to and exits from the site, escape routes if difficulties should arise, the surface of the landing area and its surroundings, emergency and rescue services, communications arrangements, and the correct positioning and safety of the spectators V P

A78-38750 Helicopter flight demonstration L Forzani (Aeronautica Militare, Rome, Italy) *(Society of Experimental Test Pilots, European Symposium, 9th, Zurich and Lucerne, Switzerland, Apr 27-30, 1977) Society of Experimental Test Pilots, Technical Review,* vol 14, no 1, 1978, p 58-62

Flight demonstrations can be generally divided into two categories flights with only the crew on board for a display before spectators who are not particularly interested in the technical details of the machine, and commercial demonstration flights with possible customers (pilots, technicians) on board, in which the demonstration pilot is frequently the co-pilot The professional and personal qualities required from a test pilot to act as a commercial pilot are examined It is shown that to successfully plan and carry out a demonstration flight it is necessary to carefully follow the sequence of the following five phases assessment of the guest and his requirements, briefing on all the possible points relative to the aspects of the aircraft, carrying out the demonstration flight in a way to please the customer (on the basis of his previous assessment), debriefing, aimed at answering questions and clarifying doubts, and documentation V P

A78-38766 * Photochemistry and dynamics of the ozone layer R G Prinn, F N Alyea, and D M Cunnold (MIT, Cambridge, Mass) In *Annual review of earth and planetary sciences Volume 6* Palo Alto, Calif , Annual Reviews, Inc , 1978, p 43-74 91 refs Grant No NsG-2010

The paper presents a broad review of the photochemical and dynamic theories of the ozone layer The two theories are combined into the MIT three dimensional dynamic-chemical quasi-geostrophic model with 26 levels in the vertical spaced in logarithmic pressure coordinates between the ground and 72-km altitude The chemical scheme incorporates the important odd nitrogen, odd hydrogen, and odd oxygen chemistry, but is simplified in the sense that it requires specification of the distributions of NO2, OH and HO2 The prognostic equations are the vorticity equation, the perturbation thermodynamic equation, and the global mean and perturbation continuity equations for ozone, diagnostic equations include the hydrostatic equation, the balance condition, and the mass continuity equation The model is applied to the investigation of the impact of supersonic aircraft on the ozone layer B J

A78-38773 Soviet landing aid draws FAA scrutiny P J Klass *Aviation Week and Space Technology,* vol 108, June 12, 1978, p 42, 43, 45, 47

A laser landing system, Glissada, developed by the Soviet Union and supposedly providing visual guidance onto the runway from distances of up to 18 km at night, but in unspecified weather conditions is discussed Fog is penetrated with the concentric laser beams, whereby the outer ring is propagated in the IR spectrum, and burns a channel for the visible inner ring Attention is given to the possibility of eye damage to the pilot, and it is noted that to reduce laser power to levels dictated by safety rules, the beams would not become visible until 1 2 sec before the pilot would see existing high intensity runway lights The FAA is studying the system and its claims D M W

A78-38782 Reduction of transient gas turbine test data using a hybrid computer D M Rudnitski and B D MacIsaac (National Research Council, Ottawa, Canada) In Summer Computer Simulation Conference, Chicago, Ill , July 18-20, 1977, Proceedings Montvale, N J , AFIPS Press, 1977, p 205-210

The reported investigation had the objective to develop the procedures and the software needed to solve a specific data acquisition problem in the area of gas turbine dynamic testing The obtained results were to be employed to develop design techniques for software and hardware that could modernize the engine test facilities at the National Research Council of Canada A data reduction software package was developed on a hybrid computer to solve the specific problems of rapid turn-around of results in transient testing of gas turbines This software package proved to be a highly flexible, easy to use package which reduced turn-around time from 2 days to approximately 15 minutes The software packages are Fortran based and easily transferable to another computer G R

A78-38783 Hybrid computer models as an aid in design of gas turbine control systems for helicopters. R Langton, R M Evans (Aviation Electric, Ltd , Montreal, Canada), and B D MacIsaac (National Research Council, Ottawa, Canada) In Summer Computer Simulation Conference, Chicago, Ill , July 18-20, 1977, Proceedings Montvale, N J , AFIPS Press, 1977, p 219-227 8 refs

A description is presented of the progress achieved in a program which has the primary aim to develop for control design applications detailed computer models of helicopter propulsion systems A twin engine system is considered The primary motivation for the twin engine helicopter is to provide improved operational safety plus the capability of continued operation following a single engine failure It is necessary to include considerable detail in the engine model to ensure representative power response over the complete load range and flight envelope It was found that the cost of using a digital computer for such a complex model would have been prohibitive A hybrid computer system was, therefore, selected Attention is given to the systems model, aspects of computer model specification, model validation, the 'real time' problem, model use in the design process, and questions of project control G R

A78-38788 Time delay measurements for flight simulators R B Ewart (USAF, Aeronautical Systems Div , Wright-Patterson AFB, Ohio) In Summer Computer Simulation Conference, Chicago, Ill , July 18-20, 1977, Proceedings Montvale, N J , AFIPS Press, 1977, p 727-730

A new method of measuring flight simulator cue time delays has been developed Proper time phasing of simulated cues is a serious problem inherent to the design of modern flight simulators An accurate method of measuring these time delays is required in order to validate simulator performance A video tape recorder can be used to simultaneously record pilot cues from flight and visual systems, along with any desired analog signal information By analyzing each field of video information during playback, an accurate time history of any simulated maneuver can be obtained This method permits correlation of various pilot cues and is adaptable to both simulator and aircraft (Author)

A78-38789 * Simulation replay - Implementation and flight simulation applications D F Crane (NASA, Ames Research Center, Moffett Field, Calif) In Summer Computer Simulation Conference, Chicago, Ill , July 18-20, 1977, Proceedings Montvale, N J , AFIPS Press, 1977, p 731-734

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

A78-38798 **The impact of flight simulators on U S airlines** D C Killian (American Airlines, Inc, New York, N Y) In Summer Computer Simulation Conference, Chicago, Ill, July 18-20, 1977, Proceedings Montvale, N J, AFIPS Press, 1977, p 887-892

The use of flight simulators by U S airlines to conduct flight training and proficiency checks is discussed A survey indicates that 16 U S airlines own a total of 70 flight simulators, only two of which are operated without motion All flight crew proficiency checks are at present conducted in visual flight simulators Training for captains, second officers and flight engineers upgrading their ratings or transitioning to B-747, B-727, B-707 or DC-10 qualification is also conducted to a varying degree on flight simulators It is estimated that use of the simulators for training and proficiency checks saved 204 million gallons of jet fuel during 1976 J M B

A78-38802 **Problems of the theory of strength related to *aircraft construction and civil engineering, Structural Mechanics* Meeting, Ottobrunn, West Germany, June 1, 2, 1977, Lectures and Discussion Contributions (Probleme der Festigkeitsforschung im Flugzeugbau und Bauingenieurwesen, Strukturmechaniktagung, Ottobrunn, West Germany, June 1, 2, 1977, Vortrage und Diskussionsbeitrage)** Edited by M Esslinger and B Geier (Deutsche Forschungs- und Versuchsanstal fur Luft- und Raumfahrt, Institut fur Strukturmechanik, Braunschweig, West Germany) Braunschweig, Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, 1977 333 p In German $18 50

The papers in this collection examine the use of new materials in aircraft construction, in particular, fiber-reinforced plastics and composites, and present analyses of strength problems for aircraft and civil engineering structures Topics covered include sailplanes of carbon-fiber construction, theoretical studies of crash behavior of cell structures, Wohler curves obtained by nonlinear regression analysis, finite element analysis of linear-eleastic wing behavior, CFRP primary structure for aircraft fighter taileron, buckling analysis of fiber wound cylinders, and research philosophy P T H

A78-38803 # **New technologies for aircraft structures (Welche neuen Technologien gibt es fur Flugzeugstrukturen)** O Heise (Messerschmitt-Bolkow-Blohm GmbH, Munich, West Germany) In Problems of the theory of strength related to aircraft construction and civil engineering, Structural Mechanics Meeting, Ottobrunn, West Germany, June 1, 2, 1977, Lectures and Discussion Contributions Braunschweig, Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, 1977, p 5-24 In German

An overview of some promising new technologies for aircraft structures is given Attention is given to new materials, new applications of conventional materials, new joining techniques, and new methods of nondestructive structural component testing P T H

A78-38804 # **Sailplanes of carbon-fiber construction (Segelflugzeuge in Kohlefaserkonstruktionen)** J Klenner (Akaflieg, Braunschweig, West Germany) In Problems of the theory of strength related to aircraft construction and civil engineering, Structural Mechanics Meeting, Ottobrunn, West Germany, June 1, 2, 1977, Lectures and Discussion Contributions Braunschweig, Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, 1977, p 25-37 In German

The paper gives a brief overview of the development of sailplane structural designs After a brief mention of early wood and metal construction, attention is focused on the possibilities opened up by construction based on carbon-fiber-reinforced plastics Brief descriptions of some of the significant sailplanes that emerged with this new technology are given P T H

A78-38805 # **Theoretical investigation on the crash behavior of cell structures (Theoretische Untersuchungen zum Crash-Verhalten von Zellenstrukturen)** F Och (Messerschmitt-Bolkow-Blohm GmbH, Ottobrunn, West Germany) In Problems of the theory of strength related to aircraft construction and civil engineering, Structural Mechanics Meeting, Ottobrunn, West Germany, June 1, 2, 1977, Lectures and Discussion Contributions Braunschweig, Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, 1977, p 38-46 In German

After a review of some FAR regulations on acceptable inertial loads on passengers during light crashes and some proposed impact conditions during emergency landing, some desirable structural properties during crashes are mentioned, and some general requirements for a suitable computational procedure for estimating crash behavior of cell structures are examined An analysis method based on an n-mass model of a structure requires considerably more input and computational effor than conventional structural analyses because of the load rates and nonlinear behavior involved P T H

A78-38807 # **Use of structural analysis programs for calculating states of stress in helicopter rotor elements (Einsatz von Strukturrechenprogrammen zur Berechnung von Spannungszustanden in Hubschrauber-Rotorbauteilen)** H Auer and R Worndle (Messerschmitt-Bolkow-Blohm GmbH, Ottobrunn, West Germany) In Problems of the theory of strength related to aircraft construction and civil engineering, Structural Mechanics Meeting, Ottobrunn, West Germany, June 1, 2, 1977, Lectures and Discussion Contributions Braunschweig, Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, 1977, p 57-68 In German

Two examples of using the finite element method for static calculation of complex structural elements under small deformations and linear behavior are worked out The NASTRAN programming system was used with an isoparametric quadrangular element with eight nodes The first calculation concerned the rotor mast flange of the BO 105 helicopter, for which the stresses had to be reduced to a small region of the element by suitable design, and a nonjointed rotor head, where the stress distribution in the whole element had to be computed Computerized graphic displays were a significant tool in the calculations P T H

A78-38808 # **Application of modern methods in civil aircraft construction (Einsatz moderner Bauweisen im zivilen Flugzeugbau)** D Schulz (Messerschmitt Bolkow-Blohm GmbH, Hamburg, West Germany) In Problems of the theory of strength related to aircraft construction and civil engineering, Structural Mechanics Meeting, Ottobrunn, West Germany, June 1, 2, 1977, Lectures and Discussion Contributions Braunschweig, Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, 1977, p 69-89 In German

The paper takes a look at some of the methods of construction and materials that may be expected to find application in the beginning of the 1980s for a new generation of transport aircraft The European Airbus will feature increased use of sandwich and bonded structures, and the role of hot-treated aluminum alloys will be increased The possible areas where fiber-reinforced plastics will find advantageous use are identified P T H

A78-38810 # Heavily loaded carbon-fiber-reinforced-plastic primary structure with the Tornado taileron as an example (Hochbelastete KFK-Primarstruktur am Beispiel des Tornado Taileron) W Hartmann (Messerschmitt-Bolkow-Blohm GmbH, Ottobrunn, West Germany) In Problems of the theory of strength related to aircraft construction and civil engineering, Structural Mechanics Meeting, Ottobrunn, West Germany, June 1, 2, 1977, Lectures and Discussion Contributions Braunschweig, Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, 1977, p 102-112 In German

The paper describes an economical carbon-fiber-reinforced-plastic (CFRP) design for the taileron of the Tornado fighter aircraft The taileron is a sandwich structure consisting of an aluminum honeycomb core bonded between two CFRP sheets The bearings are taken up by the internal structure, which consists of titanium root rib and CFRP spar rib construction Secondary structural parts are in the usual metal construction The design of all these parts and the construction methods used to ensure proper distribution of loads are described P T H

A78-38811 # Material selection for the Tornado taileron (Werkstoffauswahl fur das Tornado Taileron) K O Sippel (Messerschmitt-Bolkow-Blohm GmbH, Munich, West Germany) In Problems of the theory of strength related to aircraft construction and civil engineering, Structural Mechanics Meeting, Ottobrunn, West Germany, June 1, 2, 1977, Lectures and Discussion Contributions Braunschweig, Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, 1977, p 113-123 In German

The paper describes the material selection process and the determination of design values for the CFRP stabilizer and elevator assembly for the Tornado fighter aircraft The discussion covers selection of CFRP prepregs, the wet lamination system, the bonding system, and the tensile tests, pressure tests, tests for interlaminar shear strength, fatigue tests, and aging properties The main results of all these tests are summarized P T H

A78-38844 A high-power switching network for a dual-mode antenna V J Albanese and D Kerbs (Grumman Aerospace Corp , Bethpage, N Y) *IEEE Transactions on Microwave Theory and Techniques,* vol MTT-26, May 1978, p 348-354 6 refs

A novel hybrid switching network is described in which high levels of RF power (2-3 kW) are controlled and switched over an octave bandwidth in low L band by the use of a relatively low-power level switch matrix used in conjunction with a pair of 8 34-dB (nominal) directional couplers and a phasing network An alternate design to compactly achieve the same results is also described The device is for use with a switchable (dual-mode) airborne transmitting antenna Theoretically predicted performance parameters are graphically presented, along with correlated measured data (Author)

A78-38892 Loss prediction in axial compressors - A bibliographic study (La prediction des pertes dans les compresseurs axiaux - Une etude bibliographique) G K Serovy (Iowa, University, Iowa City, Iowa) and P Bry (ONERA, Châtillon sous-Bagneux, Hauts-de-Seine, France) *Entropie,* vol 14, Mar -Apr 1978, p 21-28 55 refs In French

The paper reports on procedures for determining losses in axial-flow compressor systems noting both blade section flow turning angles and total pressure losses The development of component models is outlined with reference to profile losses, losses introduced by shocks, secondary losses, and losses caused by blade nonadaptation Factors influencing the accuracy of loss estimates are identified, including the choice of optimal loss coefficients and the definition of a uniform flow equivalent to a real heterogeneous flow S C S

A78-38900 Problem-solving with selective plating H E Chandler *Metal Progress,* vol 113, June 1978, p 39-42

Selective electroplating has been employed as an alternative to vacuum plating in the repair of damaged cadmium coatings on aircraft landing gear Selective plating is a method of depositing metal from a concentrated electrolyte solution held in an absorbent material covering a portable anode The electroplating circuit is completed by a cathode lead attached to the workpiece The selective electroplating process has also been used to repair damaged chromium platings In general the technique is more rapid and less costly than other metal plating repair methods J M B

A78-38907 # Influence of the type of corrosion of the aircraft skin on limiting value of the damage (Vliianie vida korrozii obshivki samoleta na predel'nuiu velichinu povrezhdeniia) A E Sultanov and A I Radchenko (Kievskii Institut Inzhenerov Grazhdanskoi Aviatsii, Kiev, Ukrainian SSR) *Fiziko-Khimicheskaia Mekhanika Materialov,* vol 14, Mar -Apr 1978, p 92-96 5 refs In Russian

Fatigue tests were carried out with 270 specimens of 2-mm sheet prepared of D16ATV aluminum alloy The specimens were artificially corroded in a 3% solution of sodium chloride It was found that in the case of uniform corrosion, failure occurred by tough fracture For extensive pitting, the specimens failed by brittle fracture, while in the case of sparse pitting, fracture was of a mixed type The fatigue life at identical cyclic loads differed appreciably for each type of corrosion V P

A78-38978 # Investigations of the transonic flow around oscillating airfoils H Tijdeman Delft, Technische Hogeschool, Doctor in de technische Wettenschappen Dissertation, 1978 151 p 188 refs

Exploratory wind-tunnel experiments in high-subsonic and transonic flow on a conventional airfoil with oscillating flap and a supercritical airfoil oscillating in pitch are described In the analysis of the experimental results, emphasis is placed upon the typical aspects of transonic flow, namely the interaction between the steady and unsteady flow fields, the periodical motion of the shock waves and their contribution to the overall unsteady airloads Special attention is paid to the behavior of the supercritical airfoil in its 'shock free' design condition Moreover, it is discussed to what extent linearization of the unsteady transonic flow problem is allowed if the unsteady field is considered as a small perturbation superimposed upon a given mean steady-flow field Finally, the current status of unsteady transonic flow theory is reviewed and the present test data are used to evaluate some of the recently developed calculation methods (Author)

A78-38997 # The new system for processing and presenting radar data in the Air Traffic Control Center of Barcelona (El nuevo sistema de proceso y presentacion de datos radar en el ACC-Barcelona) P Tena Lopez *IAA/Ingenieria Aeronáutica y Astronáutica,* vol 30, Apr 1978, p 3-7 In Spanish

In connection with the objective to provide a route control service utilizing radar in the area of the ATC Center of Barcelona, it was decided in October 1976, to undertake an emergency program with the aim to install a data processing and display system for the radar data The system was to become operational on June 1, 1977 The implementation of this program is discussed A cost-efficiency analysis was conducted to obtain a basis for the suitable selection of the equipment and the approaches to be used for the new system Attention is given to aspects of personnel selection, questions regarding radar operation and flight plans, and a schematic diagram showing system organization and operation The system has the capacity to consider 500 aircraft in flight and 270 radar tracks G R

A78-39042 # Unsteady heat transfer from a cylinder with radial injection (Nestatsionarnaia teplootdacha ot tsilindra so vdu-vom) Iu I Babenko (Gosudarstvennyi Institut Prikladnoi Khimii, Leningrad, USSR) *Inzhenerno-Fizicheskii Zhurnal,* vol 34, May 1978, p 923-927 In Russian

A78-39082 The determination of margins of safety for critical aircraft systems G M Smith (Aeroplane and Armament Experimental Establishment, Boscombe Down, Wilts, England) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28-30, 1977 New York, Institute of Electrical and Electronics Engineers, Inc, 1977, p 65 68

Complex electronic equipment introduced into the flight and engine control systems of aircraft is of vital operational importance and the effects of interference can present a potential hazard for the safety of flight A margin of safety, similar to that quantified for armaments, must, therefore, be established for such equipment In this case, the margin is between the levels of interference present and those required to produce degradation, or upset of the equipment performance Two forms of interference effects must be considered In one case an equipment output is obtained when none is intended Alternatively, a failure to respond to an intended signal may be observed Existing equipment qualification tests do not provide the information required for a determination of the available safety margins The development of suitable test methods is discussed An understanding of the mechanism of the generation of aircraft internal fields and the coupling of these fields to the cables will ultimately be required and is likely to be obtained from work being carried out on electromagnetic pulses G R

A78-39084 Filtering techniques in avionic transmitters A Grabowiecki, A J Kazmierski, and K Kunachowicz (Instytut Lotnictwa, Warsaw, Poland) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28-30, 1977 New York, Institute of Electrical and Electronics Engineers, Inc, 1977, p 73-76 11 refs

The principal electromagnetic compatibility transmitter parameters are considered The typical transmitter signal spectrum contains not only the principal frequency signal, its harmonics and master oscillator frequency, but also spurious emissions In designing filters to suppress transients intensive use is made of a combination of passive elements and some nonlinear limiting devices from special zener diodes to resistors having a very high degree of nonlinearity Attention is given to the practical design of broadband, low pass, matching ladder networks It is pointed out that no significant intermodulation effects due to transients and noise will be observed when dc supply filters will be protected by suitable shunt-type suppressors G R

A78-39085 Diary of an international team co-ordinating system electromagnetic compatibility of an avionic sub-system R B Rowley, R H Smith (Easams Ltd Camberley, Surrey, England), and J C Kleine (ESG-Elektronik-System-Gesellschaft mbH, Munich, West Germany) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28-30, 1977 New York, Institute of Electrical and Electronics Engineers, Inc, 1977, p 77-82

Electromagnetic compatibility (EMC) testing of the avionics subsystem of a combat aircraft has been conducted by an international group of engineers The avionics subsystem of the aircraft is extremely complex, most units are subject to 14 EMC tests, while communications equipment undergoes an additional set of five tests Problems in interpreting EM susceptibility standards are given particular attention The effects of test chamber characteristics on radiated test results are also discussed J M B

A78-39086 Susceptibility testing of airborne equipment - The way ahead N J Carter and J M Thomson (Royal Aircraft Establishment, Farnborough, Hants, England) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28 30, 1977 (A78-39076 16-32) New York, Institute of Electrical and Electronics Engineers, Inc, 1977, p 83-88

The development of realistic susceptibility standards to ensure that aircraft systems function adequately in EM environments is discussed Particular attention is given to the problems of fuselage attenuation, the generation of high EM fields for susceptibility tests, and the repeatability of test results Evidence is presented to show that even for metal-sheathed aircraft, nonuniform shielding may occur, shielding failures in the HF band (2 to 30 MHz) may be particularly damaging, since this is the operational band of a number of powerful transmitters Parallel plates operating at 80 MHz may provide a simple means for generating high field strengths for susceptibility tests In addition, it is found that the location of monitoring aerials in standard susceptibility trials may affect the repeatability of the results J M B

A78-39087 EMC control of the tornado aircraft D Ramsbottom (British Aircraft Corp, Warton, England) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28-30, 1977 New York, Institute of Electrical and Electronics Engineers, Inc, 1977, p 89-94

Electromagnetic compatibility (EMC) testing of the RF transmitters and receivers, electronic equipment and electromechanical equipment of an advanced European combat aircraft is described In addition to standard EMC testing adopted from U S military specifications, signal line conducted susceptibility criteria, audio frequency magnetic tests, and imported and exported spike tests were applied to the aircraft systems The establishment of single-point earthing through use of low audio frequencies, together with local earthing and multiple earthing for RF equipment, is discussed Bonding requirements, lightning strike protection and frequency control also receive consideration J M B

A78-39088 An approach to EMP testing of complete strike aircraft K S Rodger (Aeroplane and Armament Experimental Establishment, Boscombe Down, Wilts, England) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28-30, 1977 New York, Institute of Electrical and Electronics Engineers, Inc, 1977, p 95 98 13 refs

Development of a nuclear EM pulse (NEMP) testing procedure for a strike aircraft is discussed Difficulties arise in NEMP testing because of the low symmetry of aircraft with complex equipment, and because of allowances needed for the proximity of the simulator Models for treating NEMP response of simple cavities, coupled cavities with wires, and wires behind screens without cavities are reviewed Since transient NEMP causes many components to fail by energy overload, it may be possible to stipulate protection requirements with some ease J M B

A78-39101 Assessment procedure application utilizing UHF transistor RF pulse susceptibility data J J Whalen (New York, State University, Buffalo, N Y) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28-30, 1977 New York, Institute of Electrical and Electronics Engineers, Inc, 1977, p 317-322 11 refs

A procedure is demonstrated for determining the distance from a high-power UHF transmitter at which the UHF transistor in a receiver RF amplifier may be damaged by intense EM radiation incident on the receiver antenna The procedure can be applied to RF pulse susceptibility data for UHF transistors In an example, an L-band radar with a transmitter power of 1 MW is found to be a potential source of damage to a UHF transistor 110 meters away Application of the damage assessment procedure to an EM compatibility study of a ground control approach radar and an aircraft equipped with a UHF receiver is mentioned J M B

A78-39105 * **Aircraft measurement of radio frequency noise at 121 5 MHz, 243MHz and 406MHz** R E Taylor (NASA, Goddard Space Flight Center, Greenbelt, Md) and J S Hill (RCA Service Co , Inc , Springfield, Va) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28-30, 1977 New York, Institute of Electrical and Electronics Engineers, Inc , 1977, p 353-356 5 refs

An airborne survey measurement of terrestrial radio-frequency noise over U S metropolitan areas has been made at 121 5, 243 and 406 MHz with horizontal polarization monopole antennas Flights were at 25,000 feet altitude during the period from December 30, 1976 to January 8, 1977 Radio noise measurements, expressed in equivalent antenna-noise temperature, indicate a steady-background noise temperature of 572,000 K, at 121 5 MHz, during daylight over New York City This data is helpful in compiling radio-noise temperature maps, in turn useful for designing satellite-aided, emergency-distress search and rescue communication systems (Author)

A78-39109 **EMP induced currents on a simplified missile theory and experiment** K S Rodger (Aeroplane and Armament Experimental Establishment, Boscombe Down, Wilts , England) In Electromagnetic compatibility, Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28 30, 1977 New York, Institute of Electrical and Electronics Engineers, Inc , 1977, p 377-382 5 refs

To improve understanding of the EM pulse hazard to aircraft and airborne systems, experimental and theoretical investigations of the currents induced by a nuclear EM pulse in a simply modeled airborne missile have been conducted The model includes a two-wire transmission line external to the cylindrical missile but terminating in two internal resistors Frequency-domain expressions for the currents induced in the loads are transformed by analytical means into the time domain The analytical evaluations are in adequate agreement with the experimental data, except for the first nanosec of the EM pulse J M B

A78-39135 * **On the optimization of discrete structures with aeroelastic constraints** S C McIntosh, Jr (Nielsen Engineering and Research, Inc , Mountain View, Calif) and H Ashley (Stanford University, Stanford, Calif) *Computers and Structures,* vol 8, May 1978, p 411-419 22 refs Contract No F49620-77 C-0055, Grant No NGL-05-020 243

The paper deals with the problem of dynamic structural optimization where constraints relating to flutter of a wing (or other dynamic aeroelastic performance) are imposed along with conditions of a more conventional nature such as those relating to stress under load, deflection, minimum dimensions of structural elements, etc The discussion is limited to a flutter problem for a linear system with a finite number of degrees of freedom and a single constraint involving aeroelastic stability, and the structure motion is assumed to be a simple harmonic time function Three search schemes are applied to the minimum-weight redesign of a particular wing the first scheme relies on the method of feasible directions, while the other two are derived from necessary conditions for a local optimum so that they can be referred to as optimality-criteria schemes The results suggest that a heuristic redesign algorithm involving an optimality criterion may be best suited for treating multiple constraints with large numbers of design variables S D

A78-39182 # **Optimal digital simulation of aircraft via random search techniques** G O Beale (Babcock and Wilcox Co , Lynchburg, Va) and G Cook (Virginia, University, Charlottesville, Va) *Journal of Guidance and Control,* vol 1, July-Aug 1978, p 237-241 11 refs

This paper discusses a technique for the development of a discrete time integration operator to be used in the simulation process The integration operator can be optimized for a particular system subjected to a set of specified inputs The class of systems being investigated are those which can be represented by a set of state equations A discrete time integration operator with certain free parameters is hypothesized An adaptive random search optimization technique is used to find the optimum values for these parameters Examples are presented to show the effectiveness of this technique (Author)

A78-39183 # **Testing of the YC-14 flight control system software** D L Martin and D Gangsaas (Boeing Co , Seattle, Wash) *(American Institute of Aeronautics and Astronautics, Guidance and Control Conference, Hollywood, Fla , Aug 8-10, 1977, Paper 77-1077) Journal of Guidance and Control,* vol 1, July-Aug 1978, p 242 247

The YC-14 tactical transport aircraft uses three channels of digital flight control electronics (FCE) to provide fail-operational, fail-safe augmentation of the basic flight control characteristics This paper discusses the system-level testing performed to verify the software prior to first flight and then prior to flights using modified versions of the software Testing is performed in two phases the FCE are connected to a simulation of the aircraft systems with no aircraft dynamics (open loop), and the FCE are connected to a simulation of the aircraft systems and the aircraft dynamics with simulated sensor inputs (closed loop) A semiautomatic testing facility used for data management and control of the tests is described (Author)

A78-39186 # **Optimal flare in presence of wind shears** B G Kuncw (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio) *Journal of Guidance and Control,* vol 1, July-Aug 1978, p 284-286 6 refs

A control law for the flare of an aircraft on automatic approach in the presence of wind shear is derived to minimize longitudinal dispersion and sink rate deviation at touchdown The flare is determined on the basis of linear optimal control theory and a model of the pilot's performance in handling pitch rate, airspeed and elevator position Range from the ideal (no-wind) touchdown point, as determined by a microwave landing system, also figures in the optimal flare control A digital computer test run of the optimal flare control law for a C-135 aircraft shows significant reductions in longitudinal touchdown and sink rate dispersions as compared to results obtained with a conventional autopilot J M B

A78-39188 # **Study of magnetic noise in the Ka-26 helicopter (Izuchenie magnitnykh pomekh vertoleta Ka-26)** A E Vatsuro and V S Tsirel' *Geofizicheskaia Apparatura,* no 62, 1977, p 68-78 5 refs In Russian

A method of measuring the magnetic noise produced by the Ka-26 helicopter is described, and some measurement results are given and discussed On the basis of ground and in-flight studies, the optimal location for attaching the sensitive element of the proton aeromagnetometer was selected, and the magnitude and stability of the magnetic noise were determined Significant decrease in the course deviation was obtained through use of a rigid component compensator P T H

A78-39189 # Prospects for using new flight vehicles in aerophysical studies (Perspektivy ispol'zovaniia novykh letatel'nykh apparatov na aerogeofizicheskikh rabotakh) G D Krivolapov and V Ia Fridland *Geofizicheskaia Apparatura,* no 62, 1977, p 78-83 In Russian

The flight characteristics and technical specifications of potential aircraft for use in aerophysical studies are examined and compared with those of the currently used An-2 airplane and Mi-4 helicopter Two airplanes considered are the An-28, a two-turboprop aircraft with convertible undercarriage (floats or skis), and the L-410, also powered by two turboprop engines, and designed for servicing local airlines These planes are discussed in terms of length of flight with payload of 1000 kg, range of photographing velocities and altitudes, static ceiling, and climb rate The An 28 is already available in a version for geological photographic surveying Two helicopters briefly examined are the Ka-25 with gas turbine engines, especially suited for research over water, and the Mi-2 and Mi-8 helicopters

P T H

A78-39393 # British Airways Tri-Star - Present and future T Ford *Aircraft Engineering,* vol 50, May 1978, p 23, 24, 26, 27

Both TriStar 1 and the longer range TriStar-500 aircraft are considered together in terms of check-out, maintenance, and overhaul requirements Attention is given to a breakdown of the aircraft into area zones for periodic evaluation It is noted that since the TriStars in service with British Airways are often maintained at airfields outside Britain, e g , Paris, Bahrein, integration and uniformity of maintenance procedures are essential Finally, the TriStar RB 211 engine is examined in terms of life cycle, down time, and reliability, i e , number of in-flight shut downs and unscheduled engine removals

D M W

A78-39395 # Lighter-than-air concepts and recent developments E F Strother (Florida Institute of Technology, Melbourne, Fla) *AIAA Student Journal,* vol 16, Summer 1978, p 10-16

Lighter than air (LTA) vehicles are considered in terms of two broad categories fully buoyant and partially buoyant Included in the first category are rigid, pressure nonrigid, and pressure rigid hulls Among partially buoyant LTAs are hybrid vehicles, e g , Aerocrane and Helistat, which use rotors as well as gas for lift, and lifting body hull designs Attention is given both to the historical development of the airship, beginning with Graf Zeppelin, and to the energy and ecological advantages of LTAs in current applications A two phase NASA design program leading to the production of an 100 ton payload LTA is outlined, stressing flight stability, safety, maneuverability, and reliability as a means of passenger and freight transport in otherwise inaccessible regions, especially in the third world

D M W

A78-39396 # Airships - The next generation and beyond F Morse (Boston University, Boston, Mass) *AIAA Student Journal,* vol 16, Summer 1978, p 20-25

Developments currently in the design stage for LTA (lighter than air) vehicles are reviewed with reference to a 12 million cu ft rigid airship The ship would be inflated with helium, have a skin of aluminized Kevlar fabric, a gross lift of 800,000 lbs (equal to that of a Boeing 747), and be used for both short and long range passenger and freight applications A set of 18 Tedlar lined helium cells would be equipped with automatic pressure valves for lift control and maneuvering Propellers would be located in the slipstream for optimized L/D ratio Attention is given to LH2 and nuclear fuel as propulsion material Also discussed are the possibilities of substituting Be for Al in the rigid structure, thus greatly increasing payload, and of an ion drive using the boundary layer surrounding the hull in flight

D M W

A78-39540 # Deformation curve of rotary airfoil blades M Nenadovich *Académie Serbe des Sciences et des Arts, Bulletin, Classe des Sciences Techniques,* vol 58, no 12, 1977, p 57-61

An integral differential equation is presented for the deflection curve of a rotary airfoil blade for any external load The equation can be solved analytically by an operator method For conventional blade designs, the equation is readily reducible to an easily soluble simple differential equation, the bending moment produced by aerodynamical loads of the rotary airfoil blades is approximated by second-order polynomials, and the differential equation is solved by computer techniques

M L

A78-39579 # Prediction of the aerodynamic characteristics of an aircraft on the basis of the comparison of results for a calibration model in various large transonic wind tunnels (Prévision des caractéristiques aérodynamiques d'un avion d'après la comparaison des résultats sur une maquette étalon dans diverses grandes souffleries transsoniques) P Poisson-Quinton and X Vaucheret (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(NATO, AGARD, Réunion sur les Méthodes de Prévision des Performances des Avions, Paris, France, Oct 11-13, 1977) ONERA, TP* no 1978-22, 1978 18 p 19 refs In French

The main transonic wind tunnels in the U S , Canada, Great Britain, the Netherlands and France were used to study the aerodynamic characteristics of a calibration model representing a transport aircraft The accuracy of the wind-tunnel measurements in predicting aerodynamic characteristics over a range of Mach and Reynolds numbers was the focus of the tests Drag level, lift/drag ratio, longitudinal stability, pitch-up onset, spanwise pressure distributions, shock wave locations, and boundary layer transition and separation locations were among the aerodynamic properties investigated A Reynolds number above about 2 million appeared to ensure accurate results for the predictions

J M B

A78-39580 # Combustion in gas turbine engines - A review of ONERA recent works M Barrere (ONERA, Châtillon sous-Bagneux, Hauts-de-Seine, France) *(Combustion Institute, General Conference, West Lafayette, Ind , Apr 3-5, 1978) ONERA, TP* no 1978 25, 1978 28 p 12 refs

Results obtained at ONERA in the field of combustion in turbomachines (main combustor and reheat combustor) are summarized in a three part study The first part concerns the recirculation zone, with experiments without combustion in order to investigate the basic aerodynamic phenomena, and with combustion in a stirred reactor in order to acquire data on chemical kinetics Theoretical models of this zone are also mentioned The second part is devoted to the turbulent propagation of the flame, the structure of which (pressure, velocity, composition) is given for various upstream conditions of equivalence ratio and velocity The results obtained are compared to a theoretical model taking into account the chemical production in a turbulent medium The third part concerns the heat transfer at the wall in a region of active combustion The experimental results obtained are compared to a two dimensional model which accounts reasonably well for the flow field, but yields a somewhat different flux distribution at the wall (Author)

A78-39582 # Cobalt-base alloys produced by powder metallurgy for compressor and turbine disks (Alliages à base de cobalt élaborés par métallurgie des poudres pour disques de compresseurs et turbines) M Marty and A Walder (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(Symposium Européen de Métallurgie des Poudres, 5th, Stockholm, Sweden, June 4-8, 1978) ONERA, TP* no 1978-7, 1978 7 p In French

Cobalt-base alloys containing high concentrations of chromium carbides have been produced by powder metallurgy for application to compressor and turbine disks Micrographic structural studies of the CoCrC alloy, as well as a survey of the role of aging temperature on the hardness of the alloy, are reported Low-cycle fatigue resistance investigations of the alloy are also discussed The powder metallurgy production technique results in cobalt-base alloys with a high degree of ductility, though problems remain in obtaining optimal carbide dispersions

J M B

A78-39596 **Fatigue crack propagation of titanium alloys under dwell-time conditions** P J Bania (Avco Corp , Avco Lycoming Stratford Div , Stratford, Conn) and D Eylon (Cincinnati, University, Cincinnati, Ohio) *Metallurgical Transactions A - Physical Metallurgy and Materials Science,* vol 9A, June 1978, p 847-855 13 refs USAF-supported research

An experimental study was carried out to assess the fatigue crack growth (FCG) behavior of titanium alloys with a variety of compositions, microstructures, textures, and interstitial contents with a view toward gaining insight into the most important parameters which may contribute to the dwell-time effect at peak load under fatigue cycling with a 5-min dwelling time A near-alpha alloy (Ti-11) and an alpha + beta alloy (Ti-6Al-4V) are examined Three specimen forms of Ti-6Al-4V are considered a cross-rolled 50 mm thick plate, a highly textured 7 mm thick standard-grade plate, and a highly textured 7 mm thick low-interstitial plate No adverse effect on the FCG rate is detected for fatigue cycling with a 5-min dwell at peak load Similar fracture surface patterns, e g , ductile vs cleavage-like features, are observed for the dwell and nondwell test specimens Reduced FCG rate in Ti-6Al-4V is attributed solely to an increase in crack-path tortuosity, probably due to a crack tip blunting mechanism operating during the dwell period of the load cycle S D

A78-39632 **Flight-testing of a continuous laser remote sensing system (Flugerprobung eines kontinuierlichen Laser-Fernmess-Systems)** W Wiesemann (Battelle Institut, Frankfurt am Main, West Germany) In Laser 77 opto electronics, Proceedings of the Conference, Munich, West Germany, June 20 24, 1977 Guildford, Surrey, England, IPC Science and Technology Press, Ltd , 1977, p 756 762 In German

Flight testing of a lidar system developed for airborne remote sensing of trace gases is described The flight test involved a CO2 laser, the signal-to-noise ratio of the system and the effects of various reflective surfaces (streets, forests, bodies of water) on the quality of the laser signal were assessed Quantitative measurement of the specific absorption properties of atmospheric pollutants through use of the airborne lidar is also discussed J M B

A78-39674 **A relative motion analysis of horizontal collision avoidance** J W Andrews (MIT, Lexington, Mass) *SAFE Journal,* vol 8, Summer 1978, p 20-23 U S Department of Transportation Contract No FA77 WAI 432, Contract No F19628-78 C-0002

In the design of automated collision avoidance systems, it is difficult to devise resolution strategies which are valid for the wide range of aircraft speeds and collision geometries which may be encountered in normal flight This is especially true with regard to collision avoidance in the horizontal plane A technique for the analysis of horizontal relative motion between aircraft is discussed and the results are applied to the collision avoidance problem The aircraft pair are described in terms of a dynamic system for which the actual motion is decomposed into pure nonturning (rectilinear) motion and pure turning motion By expressing the projected miss distance as a fraction of range, a set of miss distance contours may be constructed which allow determination of the effect of heading changes upon the ultimate closest approach Inspection of these contours allows identification of geometries in which specific resolution strategies are appropriate The heading change required to achieve a given miss distance is readily determined (Author)

A78-39772 # **On lift of delta wings with leading-edge vortices at low speeds** M Hayashida, M Sato, and K Matsuoka (Osaka Prefecture, University, Sakai, Japan) *Osaka Prefecture, University, Bulletin, Series A - Engineering and Natural Sciences,* vol 26, no 2, 1977, p 37-51 19 refs

A vortex model of the delta wing is considered Analysis is performed in a Trefftz plane at an infinite distance behind the wing In calculating the velocity potential due to the vortices leaving the wing the work performed by the pressure or the energy spent on rolling up is neglected Lift and induced drag coefficients and the maximum lift coefficient are computed for cases with and without leading edge separation P T H

Page Intentionally Left Blank

STAR ENTRIES

N78-24042# Defense Systems Management School Fort Belvoir Va
THREE DEGREE INTERMEDIATE LEVEL MAINTENANCE OF NAVY AERONAUTICAL MATERIALS
Robert Edward Bates Jr 9 Nov 1977 79 p refs
(AD-A052389) Avail NTIS HC A05/MF A01 CSCL 01/5

This report discusses the development implementation and impact of the concept of three degree maintenance relative to the traditional maintenance policy of three levels of maintenance for Navy aeronautical materials An additional management tool specifically designed to supplement efforts directed towards improving the maintenance support posture of aeronautical materials at the intermediate level of maintenance results from the development of three degree maintenance concept A formal methodology is provided to supplement management capability on an individual equipment/component basis to (1) classify maintenance functions within levels and by activity (2) assign maintenance responsibility to a specific level and activity (3) assign maintenance tasks consistent with complexity, depth, scope and range of work to be performed and (4) ensure optimum use of limited resources Author (GRA)

N78-24043*# Rockwell International Corp Los Angeles Calif
AERODYNAMIC PRELIMINARY ANALYSIS SYSTEM PART 2 USER'S MANUAL AND PROGRAM DESCRIPTION
P Divan, K Dunn and J Kojima Apr 1978 192 p
(Contract NAS1-14686)
(NASA-CR-145300) Avail NTIS HC A09/MF A01 CSCL 01A

A comprehensive aerodynamic analysis program based on linearized potential theory is described The solution treats thickness and attitude problems at subsonic and supersonic speeds Three dimensional configurations with or without jet flaps having multiple nonplanar surfaces of arbitrary planform and open or closed slender bodies or noncircular contour are analyzed Longitudinal and lateral-directional static and rotary derivative solutions are generated The analysis is implemented on a time sharing system in conjunction with an input tablet digitizer and an interactive graphics input/output display and editing terminal to maximize its responsiveness to the preliminary analysis problem Nominal case computation time of 45 CPU seconds on the CDC 175 for a 200 panel simulation indicates the program provides an efficient analysis for systematically performing various aerodynamic configuration tradeoff and evaluation studies Author

N78-24046*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
POWERED-LIFT AERODYNAMICS AND ACOUSTICS
Washington 1976 502 p refs Conf held at Hampton Va., 24-26 May 1976
(NASA SP-406) Avail NTIS HC A22/MF A01 CSCL 01A

Powered lift technology is reviewed Topics covered include (1) high lift aerodynamics (2) high speed and cruise aerodynamics (3) acoustics (4) propulsion aerodynamics and acoustics (5) aerodynamic and acoustic loads and (6) full-scale and flight research

N78-24047*# Joint Inst for Acoustics and Flight Sciences Hampton, Va
OVERVIEW OF POWERED-LIFT TECHNOLOGY
John P Campbell *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 1-27 refs

Avail NTIS HC A22/MF A01 CSCL 01A

The concept and application of powered lift and the effects of some fundamental design variables are discussed A brief chronology of significant developments in the field is also presented and the direction of research efforts in recent years is indicated All powered lift concepts are included but emphasis is on the two externally blown schemes which involve blowing either above or below the wing and which are utilized in the YC-14 and YC-15 aircraft Aerodynamics and vehicle design are emphasized The areas of acoustics propulsion and loads are briefly considered Author

N78-24048*# National Aeronautics and Space Administration Langley Research Center Langley Station, Va
UPPER-SURFACE-BLOWING FLOW-TURNING PERFORMANCE
William C Sleeman, Jr and Arthur E Phelps III (Army Air Mobility R and D Lab Hampton, Va) *In its* Powered-Lift Aerodyn and Acoustics 1976 p 29-43 refs

Avail NTIS HC A22/MF A01 CSCL 01A

Jet exhaust flow-turning characteristics were determined for systematic variations in upper-surface blowing exhaust nozzles and trailing-edge flap configuration variables from experimental wind-off (static) flow studies For conditions with parallel flow exhausting from the nozzle jet height (as indicated by nozzle exit height) and flap radius were found to be the most important parameters relating to flow turning Nonparallel flow from the nozzle, as obtained from an internal roof angle and/or side spread angle had a large favorable effect on flow turning Comparisons made between static turning results and wind tunnel aerodynamic studies of identical configurations indicated that static flow-turning results can be indicative of wind-on powered lift performance for both good and poor nozzle-flap combinations but for marginal designs can lead to overly optimistic assessment of powered lift potential Author

N78-24049*# National Aeronautics and Space Administration Langley Research Center, Langley Station Va
RESULTS OF STATIC TESTS OF A 1/4 SCALE MODEL OF THE BOEING YC-14 POWERED-LIFT SYSTEM
James L Hassell Jr *In its* Powered-Lift Aerodyn and Acoustics 1976 p 45-62 refs
Avail NTIS HC A22/MF A01 CSCL 01A

One quarter scale static ground tests of the Boeing YC-14 powered lift system were conducted for correlation with full scale test results The 1/4 scale model utilized a JT-15D turbofan engine to represent the CF6-50D engine employed on the YC-14 advanced medium STOL transport prototype aircraft The tests included evaluation of static turning performance, static surface pressure and temperature distributions, fluctuating loads and accelerations of portions of the wing flaps and fuselage Results are presented for the landing flap configuration over an appropriate range of fan pressure ratio as affected by several variables including ground height and vortex generator modifications Static turning angles of the order of 60 deg were obtained The highest surface pressures and temperatures were concentrated over the upper surface of the flaps in the region immediately aft of the upper surface blown nozzle Author

N78-24050*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
SUMMARY OF LOW-SPEED AERODYNAMIC CHARACTERISTICS OF UPPER-SURFACE-BLOWN JET-FLAP CONFIGURATIONS
Arthur E Phelps, III (Army Air Mobility R and D Lab Hampton Va) Joseph L Johnson Jr and Richard J Margason *In its* Powered-Lift Aerodyn and Acoustics 1976 p 63-87 refs

Avail NTIS HC A22/MF A01 CSCL 01A

The results of recent wind tunnel investigations to provide fundamental information on the upper surface blown (USB) jet flap concept demonstrated that the USB concept provides good high-lift performance It is shown that the low speed performance is dependent upon the jet turning angle and turning efficiency and on the use of proper leading and trailing edge treatment to prevent premature flow separation The best means of achieving good turning performance in any particular USB application must be determined from overall operational considerations in which

high speed performance structures and noise as well as low speed performance are evaluated The large diving moments generated at high lift coefficients can be trimmed satisfactorily with a large, conventional horizontal tail, a high tail position is best from longitudinal stability considerations Large rolling and yawing moments are introduced with the loss of an engine but these moments can be trimmed satisfactorily through the use of asymmetrical boundary layer control and through the use of spoiler and rudder deflection as needed Author

N78-24051*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
APPLICATION OF POWERED-LIFT CONCEPTS FOR IMPROVED CRUISE EFFICIENCY OF LONG-RANGE AIRCRAFT
Paul L Coe Jr and Paul G Fournier *In its* Powered-Lift Aerodyn and Acoustics 1976 p 89-101 refs

Avail NTIS HC A22/MF A01 CSCL 01A
Results of studies conducted to explore the use of powered lift concepts for improved low speed performance of long range subsonic and supersonic cruise vehicles are summarized It is indicated that powered lift can provide significant improvements in low speed performance as well as substantial increases in cruise efficiency and range for both subsonic and supersonic cruise configurations Author

N78-24052*# National Aeronautics and Space Administration Langley Research Center, Langley Station, Va
COMPARISON OF AERODYNAMIC THEORY AND EXPERIMENT FOR JET-FLAP WINGS
Thomas G Gainer Long P Yip and Raymond P Vogler *In its* Powered-Lift Aerodyn and Acoustics 1976 p 103-118 refs

Avail NTIS HC A22/MF A01 CSCL 01A
Aerodynamic theory predictions made for a jet flapped wing were compared with experimental data obtained in a fairly extensive series of tests in the Langley V/STOL tunnel The tests were made on a straight rectangular wing and investigated two types of jet flap concepts a pure jet flap with high jet deflection and a wing with blowing at the knee of a plain trailing edge flap The tests investigated full and partial span blowing for wing aspect ratios of 8 0 and 5 5 and momentum coefficients from 0 to about 4 The total lift drag and pitching moment coefficients predicted by the theory were in excellent agreement with experimental values for the pure jet flap even with the high jet deflection The pressure coefficients on the wing and hence the circulation lift coefficients were underpredicted however, because of the linearizing assumptions of the lanar theory The lift drag and pitching moment coefficients as well as pressure coefficients were underpredicted for the wing with blowing over the flap because of the failure of the theory to account for the interaction effect of the high velocity jet passing over the flap Author

N78-24053*# Army Air Mobility Research and Development Lab Hampton, Va
EXTERNALLY BLOWN FLAP IMPINGEMENT PARAMETERS
Danny R Hoad *In* NASA Langley Res Center Powered Lift Aerodyn and Acoustics 1976 p 119-134 refs

Avail NTIS HC A22/MF A01 CSCL 01A
The performance of two externally blown flap (EBF) wind tunnel models was compared with an engine exhaust flap impingement correlation parameter One model was a four engine EBF triple slotted flap transport Isolated engine wake surveys were conducted to define the wake properties of five separate engine configurations for which performance data were available The other model was a two engine EBF transport for which the engine wake properties were estimated The correlation parameter was a function of engine exhaust dynamic pressure at the flap location area of engine exhaust flap impingement total exhaust area at the flap location, and engine thrust The distribution of dynamic pressure for the first model was measured however the distribution for the second model was assumed to be uniform Author

N78-24054*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
SOME MEASUREMENTS OF AN EBF POWERED-LIFT WAKE
William G Johnson Jr *In its* Powered-Lift Aerodyn and Acoustics 1976 p 135-143 refs
Avail NTIS HC A22/MF A01 CSCL 01A
Results from a wind tunnel investigation in which velocity vector measurements were obtained in the near wake of an externally blown flap powered lift configuration were analyzed These measurements were used to develop spanwise distributions for the momentum strength and location of the engine exhaust stream tube with the results used as input parameters to one jet flap analytical method It is shown that a comparison of the momentum coefficients obtained from forward speed wake surveys with the predicted values from static force data results in a good correlation which verifies the use of the flap thrust recovery factor as a means of predicting the momentum strength at the flap trailing edge Also when wake survey distributions of momentum strength and direction are used as input parameters to one analytical jet flap method the results show reasonable agreement between the experimental data and analytical results Author

N78-24055*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
AERODYNAMIC CHARACTERISTICS IN GROUND PROXIMITY
James L Thomas James L Hassell Jr and Luat T Nguyen *In its* Powered-Lift Aerodyn and Acoustics 1976 p 145-158 refs
Avail NTIS HC A22/MF A01 CSCL 01A
Results from recent investigations in the Langley V/STOL tunnel of an externally blown flap and an upper surface blown flap configuration in ground proximity are presented Comparisons of longitudinal aerodynamic characteristics indicate that in ground proximity, drag is reduced for both configurations, but changes in lift are configuration dependent Steady state analyses of the landing approach indicate an increase in flight path angle for both configurations in ground proximity because of the drag reduction Dynamic analyses with a fixed-base simulator indicate that the resultant flight path during landing approach is dependent on the initial flight path angle and the control technique used Author

N78-24056*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
DISTRIBUTED UPPER-SURFACE BLOWING CONCEPT
Paul G Fournier and Paul L Coe, Jr *In its* Powered-Lift Aerodyn and Acoustics 1976 p 159-164 refs

Avail NTIS HC A22/MF A01 CSCL 01A
A low speed investigation was conducted in the Langley V/STOL tunnel to determine the powered lift aerodynamic performance of a distributed upper surface blown propulsive lift transport model The model used blowing slots across the span of the wing to produce a thin jet efflux near the leading edge and at the knee of the trailing edge flap (internally blown jet flap) Results indicate that these concepts have both good propulsive related lift and low drag due to lift characteristics because of uniform spanwise propulsive thrust The leading edge blowing concept provides low speed lift characteristics which are competitive with the flap-hinge-line blowing concept and does not require additional leading edge treatment for prevention of abrupt stall Author

N78-24057*# Lockheed-Georgia Co Marietta
CRUISE AERODYNAMICS OF USB NACELLE/WING GEOMETRIC VARIATIONS
John A Braden, John P Hancock, and Kenneth P Burdges *In* Nasa Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 165-181

(Contract NAS1-13871)
Avail NTIS HC A22/MF A01 CSCL 01A

Experimental results are presented on aerodynamic effects of geometric variations in upper surface blown nacelle configurations at high speed cruise conditions Test data include both force and pressure measurements on two and three dimensional models powered by upper surface blowing nacelles of varying geometries Experimental results are provided on variations in nozzle aspect ratio nozzle boattail angle and multiple nacelle installations The nacelles are ranked according to aerodynamic drag penalties as well as overall installed drag penalties Sample effects and correlations are shown for data obtained with the pressure model Author

N78-24058*# National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio
EFFECTS OF NOZZLE DESIGN AND POWER ON CRUISE DRAG FOR UPPER-SURFACE-BLOWING AIRCRAFT
Edward T Meleason *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 183-196 refs

Avail NTIS HC A22/MF A01 CSCL 01A

A high speed wind tunnel investigation was conducted on a series of upper surface blowing nozzles with D-shaped exits installed on a representative short haul aircraft model Both two and four engine configurations were investigated Powered engine simulators were used to properly represent nacelle flows Large differences in cruise drag penalties associated with the various nozzle designs were seen Some geometric parameters influencing nozzle cruise drag are identified Author

N78-24059*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
THEORETICAL PREDICTIONS OF JET INTERACTION EFFECTS FOR USB AND OWB CONFIGURATIONS
C Edward Lan (Kansas Univ) and James F Campbell *In its* Powered-Lift Aerodyn and Acoustics 1976 p 197-211 refs

(Grant NsG-1139)
Avail NTIS HC A22/MF A01 CSCL 01A

A wing jet interaction theory is presented for predicting the aerodynamic characteristics of upper surface blowing and over wing blowing configurations For the latter configurations a new jet entrainment theory is developed Comparison of predicted results with some available data showed good agreement Some applications of the theory are also presented Author

N78-24060*# Lockheed-Georgia Co Marietta
USB FLOW CHARACTERISTICS RELATED TO NOISE GENERATION
W H Brown and N N Reddy *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 213-226 refs

Avail NTIS HC A22/MF A01 CSCL 01A

The effects of nozzle and flap geometry on upper surface blown flow field characteristics related to noise generation were examined experimentally using static models Flow attachment and spreading characteristics were observed using flow visualization techniques Velocity and turbulence profiles in the trailing edge wake were measured using hot-wire anemometry and the effects of the geometric variables on peak velocity and turbulence intensity were determined It is shown that peak trailing edge velocity is a function of the ratio of flow length to modified hydraulic diameter Author

N78-24061*# Lockheed-Georgia Co Marietta
CHARACTERISTICS OF USB NOISE
J S Gibson and N Searle *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 227-239

(Contract NAS1-13870)
Avail NTIS HC A22/MF A01 CSCL 01A

An extensive series of noise measurements for a variety of geometric and operational parameters was made on models of upper surface blowing (USB) powered lift systems The data obtained were analyzed and the effects and trends of parametric variation defined The behavior and nature of USB noise and the design of USB systems with low noise characteristics is examined Author

N78-24062*# Lockheed-Georgia Co Marietta
ANALYTICAL DEVELOPMENTS FOR DEFINITION AND PREDICTION OF USB NOISE
N N Reddy and C K W Tam *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 241-262 refs

(Contract NAS1-13870)
Avail NTIS HC A22/MF A01 CSCL 01A

A systematic acoustic data base and associated flow data are used in identifying the noise generating mechanisms of upper surface blown flap configurations of short takeoff and landing aircraft Theory is developed for the radiated sound field of the highly sheared flow of the trailing edge wake An empirical method is also developed using extensive experimental data and physical reasonings to predict the noise levels Author

N78-24063*# National Aeronautics and Space Administration Lewis Research Center, Cleveland Ohio
ANALYTICAL MODELING OF UNDER-THE-WING EXTERNALLY BLOWN FLAP POWERED-LIFT NOISE
Daniel J McKinzie Jr *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 263-282 refs

Avail NTIS HC A22/MF A01 CSCL 01A

The sound field produced by the interaction of a subsonic jet with a large-scale model of the under the wing externally blown flap in an approach attitude was analyzed The analysis was performed to obtain a better understanding of the dominant noise sources and the mechanisms governing the peak sound pressure level frequencies of the broadband spectra An analytical expression is derived which incorporates two available theories and experimental data, the expression predicts the sound field along a circular arc of approximately 120 deg measured from the upstream jet axis in the fly-over plane The analysis compares favorably with test results obtained from two large-scale models one using cold air from a conical nozzle and the other using hot gas from a TF-34 turbofan engine having a conical exhaust nozzle with a 12 lobe internal forced mixer The frequency at which the peak sound pressure level occurs appears to be governed by a phenomenon which produces periodic formation and shedding of large-scale turbulence structures from the nozzle lip Author

N78-24064*# Bolt Beranek and Newman Inc Cambridge Mass
USB NOISE REDUCTION BY NOZZLE AND FLAP MODIFICATIONS
Richard E Hayden *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 283-305 refs

Avail NTIS HC A22/MF A01 CSCL 01A

The development of concepts for reducing upper surface blown flap noise at the source through flap modifications and special nozzles is reviewed In particular recent results obtained on the aerodynamic and acoustic performance of flaps with porous surfaces near the trailing edge and multi-slotted nozzles are reviewed Considerable reduction (6-10 db) of the characteristic low frequency peak is shown The aerodynamic performance is compared with conventional systems and prospects for future improvements are discussed Author

N78-24065*# Bolt Beranek and Newman Inc Cambridge Mass
EBF NOISE REDUCTION THROUGH NOZZLE/FLAP POSITIONING
Y Kadman and K L Chandiramani *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 307-324

refs Sponsored by NASA
Avail NTIS HC A22/MF A01 CSCL 01A

Results are presented of an experimental and analytical study of the dependence of externally blown flap (EBF) noise on the relative position and shape of engine exhaust nozzle Tests, conducted on a 1/15 scale model of a triple-slotted EBF system indicate that a significant reduction (of up to 10 to 15 db for no forward speed case and of up to 5 to 10 db for forward speed case) is possible in the low frequency (around 63 Hz) region of the noise spectrum of the full scale device for small nozzle/flap separation distances The overall acoustic performance measured in PNdb does not exhibit significant reductions The analysis of the EBF noise is carried out for two limiting airfoil in a free jet The analytical results also suggest that low frequency noise can be reduced by placing the nozzle close to the flow turning elements Author

N78-24066*# National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio
OVERVIEW OF THE QCSEE PROGRAM
Carl C Ciepluch *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 325-333 refs

Avail NTIS HC A22/MF A01 CSCL 01A

Externally blown flap and upper surface blown flap powered lift concepts were investigated in the Quiet Clean Short-Haul Experimental Engine Program and briefly discussed along with propulsion system requirements Noise limits, emission standards, thrust requirements and thrust-to-weight ratios are among the factors considered J M S

N78-24067*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
ACOUSTIC DESIGN OF THE QCSEE PROPULSION SYSTEMS
Irvin J Loeffler Edward B Smith (GE Co Fairfield Conn) and Harry D Sowers (GE Co Fairfield, Conn) *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 335-356 refs
Avail NTIS HC A22/MF A01 CSCL 01A

Acoustic design features and techniques employed in the Quiet Clean Short-Haul Experimental Engine (QCSEE) Program are described The role of jet/flap noise in selecting the engine fan pressure ratio for powered lift propulsion systems is discussed The QCSEE acoustic design features include a hybrid inlet (near-sonic throat velocity with acoustic treatment) low fan and core pressure ratios low fan tip speeds gear-driven fans high and low frequency stacked core noise treatment multiple-thickness treatment, bulk absorber treatment, and treatment on the stator vanes The QCSEE designs represent and anticipated acoustic technology improvement of 12 to 16 PNdb relative to the noise levels of the low-noise engines used on current wide-body commercial jet transport aircraft Author

N78-24068*# General Electric Co Philadelphia, Pa
INLET/NACELLE/EXHAUST SYSTEM INTEGRATION FOR THE QCSEE PROPULSION SYSTEMS
John T Kutney *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 357-367

Avail NTIS HC A22/MF A01 CSCL 01A

The key features of the integrated propulsion systems developed for short haul aircraft are discussed including the high Mach number fixed geometry near sonic inlet the variable area nozzles thrust reversing systems and aircraft accessory location The roles and interplay of each element are considered and comparisons are made with conventional state-of-the-art technology Author

N78-24069*# National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio
INLET TECHNOLOGY FOR POWERED-LIFT AIRCRAFT
Roger W Luidens *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 369-385 refs

Avail NTIS HC A22/MF A01 CSCL 01A

The concepts analytical tools and experimental data available for designing inlets for powered lift aircraft are discussed It is shown that inlets can be designed to meet noise distortion and cruise drag requirements at the flight and engine operating conditions of a powered lift aircraft The penalty in pressure recovery for achieving the required noise suppression was 0 3 percent Author

N78-24070*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
REVERSE-THRUST TECHNOLOGY FOR VARIABLE-PITCH FAN PROPULSION SYSTEMS
David A Sagerser John W Schaefer and Donald A Dietrich *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 387-402 refs

Avail NTIS HC A22/MF A01 CSCL 01A

Tests conducted to develop the technology necessary to meet the unique reverse-thrust performance requirements of a variable pitch fan propulsion system are discussed The losses and distortion associated with the air entering the fan and core compressor from the rear of the engine, the direction of fan blade pitch rotation for best reverse-thrust aeroacoustic performance and engine response and operating characteristics during forward- to reverse-thrust transients are among the factors studied The test results of several scale fan models as well as a full-size variable pitch fan engine are summarized Results show the following a flared exhaust nozzle makes a good reverse-thrust inlet acceptable core inlet duct recovery and distortion levels in reverse flow were demonstrated adequate thrust levels were achieved forward- to reverse-thrust response time achieved was better than the goal thrust and noise levels strongly favor reverse through feather pitch and finally, flight-type inlets make the establishment of reverse flow more difficult Author

N78-24071*# General Electric Co, Philadelphia Pa
ACOUSTICS AND AERODYNAMICS OF OVER-THE-WING THRUST REVERSERS
Dale L Stimpert and Robert C Ammer *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 403-414 refs
Avail NTIS HC A22/MF A01 CSCL 01A

As part of the Quiet Clean Short-Haul Experimental Engine Program model tests were conducted to determine the effects of thrust reverser geometric parameters on noise and reverse thrust The acoustic tests used a 1/6 scale model thrust reverser while the aerodynamic performance tests used a 1/12 scale model reverser Parameters which were varied in both tests include blocker spacing, blocker height, lip angle and lip length The impact of these parameters on peak sideline noise and reverse thrust performance is discussed Author

N78-24072*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
MEASURED AND CALCULATED STEADY AERODYNAMIC LOADS ON A LARGE-SCALE UPPER-SURFACE BLOWN MODEL
Boyd Perry III and Michael R Mendenhall (Nielsen Engineering and Res Inc Mountain View Calif) *In its* Powered-Lift Aerodyn and Acoustics 1976 p 415-428 refs

Avail NTIS HC A22/MF A01 CSCL 01A

Static aerodynamic loads measurements from wind tunnel tests of a full-scale upper surface blown jet flap configuration are presented The measured loads are compared with calculations using a method for predicting longitudinal aerodynamic characteristics of upper surface blown jet flap configurations Author

N78-24073*# National Aeronautics and Space Administration Langley Research Center, Langley Station Va
ACOUSTIC-LOADS RESEARCH FOR POWERED-LIFT CONFIGURATIONS
James A Schoenster Conrad M Willis James C Schroeder, and John S Mixson *In its* Powered-Lift Aerodyn and Acoustics 1976 p 429-443 refs
Avail NTIS HC A22/MF A01 CSCL 01A

Data presented from large-scale model tests with jet engines having thrusts of 9 kN (2000 lb) and 36 kN (8000 lb) include acoustic loads for an externally blown wing and flap induced by a TF34 jet engine, an upper surface blown (USB) aircraft model

in a wind tunnel and two USB models in static tests Comparisons of these results with results from acoustic loads studies on configurations of other sizes are made and the implications of these results on interior noise and acoustic fatigue are discussed Author

N78-24074*# Virginia Univ Charlottesville
INVESTIGATIONS OF SCALING LAWS FOR JET IMPINGEMENT
J B Morton J K Haviland G D Catalano and W W Herling *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 445-463 refs

Avail NTIS HC A22/MF A01 CSCL 01A
The statistical properties of tangential flows over surfaces were investigated by two techniques In one, a laser-Doppler velocimeter was used in a smoke-laden jet to measure one-point statistical properties, including mean velocities, turbulent intensities intermittencies autocorrelations and power spectral densities In the other technique, free stream and surface pressure probes connected to 1/8 inch microphones were used to obtain single point rms and 1/3 octave pressures as well as two point cross correlations the latter being converted to auto spectra, amplitude ratios phase lags and coherences The results of these studies support the vortex model of jets give some insights into the effects of surface impingement, and confirm that jet diameter and velocity are the scaling parameters for circular jets while Reynolds number is relatively unimportant Author

N78-24076*# Boeing Co, Seattle Wash
USB ENVIRONMENT MEASUREMENTS BASED ON FULL-SCALE STATIC ENGINE GROUND TESTS
M B Sussman D L Harkonen, and J B Reed *In* NASA Langley Res Center Powered-Lift Aerodyn and Acoustics 1976 p 479-496 refs
Avail NTIS HC A22/MF A01 CSCL 01A
Flow turning parameters static pressures surface temperatures, surface fluctuating pressures and acceleration levels were measured in the environment of a full-scale upper surface blowing (USB) propulsive lift test configuration The test components included a flightworthy CF6-50D engine nacelle and USB flap assembly utilized in conjunction with ground verification testing of the USAF YC-14 Advanced Medium STOL Transport propulsion system Results based on a preliminary analysis of the data, generally show reasonable agreement with predicted levels based on model data However, additional detailed analysis is required to confirm the preliminary evaluation to help delineate certain discrepancies with model data, and to establish a basis for future flight test comparisons Author

N78-24077*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
TABULATED PRESSURE MEASUREMENTS OF A NASA SUPERCRITICAL-WING RESEARCH AIRPLANE MODEL WITH AND WITHOUT FUSELAGE AREA-RULE ADDITIONS AT MACH 0 25 TO 1 00
Charles D Harris and Dennis W Bartlett Dec 1972 263 p refs
(NASA-TM-X-2634 L-8443) Avail NTIS HC A12/MF A01 CSCL 01A
Basic pressure measurements were made on a 0 087-scale model of a supercritical wing research airplane in the Langley 8 foot transonic pressure tunnel at Mach numbers from 0 25 to 1 00 to determine the effects on the local aerodynamic loads over the wing and rear fuselage of area-rule additions to the sides of the fuselage In addition pressure measurements over the surface of the area-rule additions themselves were obtained at angles of sideslip of approximately - 5 deg 0 deg and 5 deg to aid in the structural design of the additions Except for representative figures, results are presented in tabular form without analysis Author

N78-24078*# National Aeronautics and Space Administration Langley Research Center, Langley Station, Va
WIND-TUNNEL INVESTIGATION OF BASIC AERODYNAMIC CHARACTERISTICS OF A SUPERCRITICAL-WING RESEARCH AIRPLANE CONFIGURATION
Dennis W Bartlett and Richard J Re Washington Feb 1972 109 p refs
(NASA-TM-X-2470 L-7979) Avail NTIS HC A06/MF A01 CSCL 01A
Transonic pressure tunnel and transonic tunnel tests were performed to determine the aerodynamic characteristics of a 0 087 scale model of a supercritical wing research airplane configuration at Mach numbers from 0 25 to 1 30 The investigation included tests to determine the basic longitudinal aerodynamic characteristics the lateral-directional aerodynamic characteristics for sideslip angles of 0 deg and + or - 2 5 deg and the effects of Reynolds number and aeroelasticity Author

N78-24079*# National Aeronautics and Space Administration Langley Research Center Langley Station, Va
WIND-TUNNEL MEASUREMENTS OF AERODYNAMIC LOAD DISTRIBUTION ON AN NASA SUPERCRITICAL-WING RESEARCH AIRPLANE CONFIGURATION
Charles D Harris Washington Feb 1972 226 p refs
(NASA-TM-X-2469 L-7982) Avail NTIS HC A11/MF A01 CSCL 01A
Wind tunnel tests have been conducted on a research airplane model with an NASA supercritical wing to define the general character of the flow over the wing and to aid in structural design of the full scale airplane Pressure measurements were made at Mach numbers from 0 25 to 1 30 for sideslip angles from -2 50 deg to 2 50 deg over a moderate range of angles of attack and dynamic pressures Except for representative figures, the results are presented in tabular form without detailed analysis Author

N78-24080*# National Aeronautics and Space Administration Langley Research Center Langley Station, Va
AERODYNAMIC CHARACTERISTICS OF AN NASA SUPERCRITICAL-WING RESEARCH AIRPLANE MODEL WITH AND WITHOUT FUSELAGE AREA-RULE ADDITIONS AT MACH 0 25 TO 1 00
Dennis W Bartlett and Charles D Harris Washington Dec 1972 133 p refs
(NASA-TM-X-2633 L-8422) Avail NTIS HC A07/MF A01 CSCL 01A
Transonic pressure tunnel tests at Mach numbers from 0 25 to 1 00 were performed to determine the effects of area-rule additions to the sides of the fuselage on the aerodynamic characteristics of a 0 087 scale model of an NASA supercritical-wing research airplane Presented are the longitudinal aerodynamic force and moment characteristics for horizontal-tail deflection angles of -2 5 deg and -5 deg with the side fuselage area-rule additions on and off the model The effects of the side fuselage area-rule additions on selected wing and fuselage pressure distributions at near-cruise conditions are also presented Author

N78-24084*# National Aeronautics and Space Administration, Washington, D C
INVESTIGATIONS OF THE INFLUENCE OF THE PROFILE THICKNESS OF THE COMPRESSIBLE PLANE FLOW THROUGH COMPRESSOR CASCADES
Jurgen Bahr Apr 1978 31 p refs Transl into ENGLISH from Forsch Ingenieurw (West-Germany) v 30 no 1 1964 p 14-25 Transl by SCITRAN Santa Barbara, Calif
(Contract NASw-2791)
(NASA-TM-75277) Avail NTIS HC A03/MF A01 CSCL 01A
Flow-through cascade of an aircraft turbine compressor is studied experimentally over wide range of Reynolds numbers and subsonic Mach numbers it was found that deterioration of flow properties due to decreasing Reynolds numbers is less noticeable on thin profiles than on thick ones, however thick profiles are advantageous in compressors designed for efficient partial load behavior because thick profiles have a relatively large range of usable inlet flow angles Author

N78-24085*# National Aeronautics and Space Administration Washington, D C
METHODS AND RESULTS OF BOUNDARY LAYER MEASUREMENTS ON A GLIDER
Wilhelm Van Nes May 1978 12 p refs Transl into ENGLISH of the annual book Bericht ueber Messmethoden und Messergebenisse bei Flugmessungen in der Grenzschicht" West Germany, Der Wissenschaftlichen Gesellschaft fuer Luftfahrt E V 1961 p 255-259 Translation was announced as A63-21852 Transl by Kanner (Leo) Associates, Redwood City Calif Original doc prep by Leichtbau and Flugtechnik GmbH Duisburg West Germany
(Contract NASw-2790)
(NASA-TM-75294) Avail NTIS HC A02/MF A01 CSCL 01A

Boundary layer measurements were carried out on a glider under natural conditions Two effects are investigated the effect of inconstancy of the development of static pressure within the boundary layer and the effect of the negative pressure difference in a sublaminar boundary layer The results obtained by means of an ion probe in parallel connection confirm those results obtained by means of a pressure probe Additional effects which have occurred during these measurements are briefly dealt with Author

N78-24089# ARO Inc, Arnold Air Force Station, Tenn
SIMPLIFIED INPUT FOR CERTAIN AERODYNAMIC NOSE CONFIGURATIONS TO THE GRUMMAN QUICK-GEOMETRY SYSTEM A KWIKNOSE USER'S MANUAL Final Report, Jan - Sep 1977
Frederick Schope AEDC Feb 1978 96 p refs
(ARO Proj V33A-A8A)
(AD-A051425, AEDC-TR-77-89) Avail NTIS HC A05/MF A01 CSCL 20/4

This report is a users manual for a FORTRAN computer program KWIKNOSE which for certain axisymmetric and nonaxisymmetric nose configurations provides simplified geometric input to the Grumman QUICK-geometry system, which in turn provides geometric information to various numerical flow codes For a wide variety in choice of input parameters, KWIKNOSE sets up the QUICK input for an arbitrary sequence of conical and ogival sections In this process KWIKNOSE performs the tedious computations necessary to locate the intersection points of successive arcs and to insert optional fillets or rounds over nontangent intersections In addition, the code is capable of inserting arbitrary multiple slicing planes into the top, bottom, and side of the vehicle Slicing plane intersections may be filleted or rounded Thus for a minimum of input and manual calculation by the user KWIKNOSE is tailored to modeling the geometry of a sliced multiconic vehicle capped with an asymmetrically ablated nose This manual provides check cases for the various geometry options, a description of input and output and a listing of the source deck Author (GRA)

N78-24090# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
NONLINEAR THEORY OF A BEARING SURFACE OF ARBITRARY EXTENT
A N Panchenkov 12 Oct 1977 17 p refs Transl into ENGLISH from Gidrodinamika Bolshikh Skorostey (USSR) no 3, 1967 p 21-30
(AD-A051385, FTD-ID(RS)T-1567-77) Avail NTIS HC A02/MF A01 CSCL 01/3

Difficulties encountered in the nonlinear problem of a wing of small extent in liquid and gas are primarily related to the complexity of the phenomena arising in a fluid when the motion of a wing of small extent moves with a large angle of attack The formation of strong turbulent eddies at the leading and lateral edges, the large stream angle of taper and the formation of a turbulent region behind the wing all result in the hydromechanical characteristics of the wing being nonlinear with respect to the angle of attack, so that the nonlinearity with its attendant increase in the lift of the wing, is substantial even at small angles of attack A mathematical analysis was conducted to obtain theoretical results from the nonlinear theory Author

N78-24094# Auburn Univ Ala Engineering Experiment Station
AN AERODYNAMIC ANALYSIS OF DEFORMED WINGS IN SUBSONIC AND SUPERSONIC FLOW Final Report, Jan - Dec 1977
John E Burkhalter and James W Purvis Mar 1978 76 p refs
(Grant DAAG29-77-G-0067)
(AD A052449 ARO 14802 1-A-E) Avail NTIS HC A05/MF A01 CSCL 20/4

The research effort for the past year involved the development of theoretical prediction methods for the aerodynamic loading on a wing with a full span elevon The methods are based on lifting surface Kernel function formulations in both subsonic and supersonic potential flow The unique idea in both cases is the closed form-finite summation manner in which the Kernel function integral is solved This method of solution avoides Mangler- and Cauchy type singularity problems encountered in classical numerical integration approaches and leads to stable rapidly convergent solutions In subsonic flow an existing Kernel function method for planar wings was modified by adding and assumed pressure loading function to account for the presence of the elevon The assumed pressure loading distribution led to exact closed form solutions for section and total coefficients on the wing however for the case of the deflected elevon some numerical integration procedures were required Results of these computations agree very well with experimental data In the supersonic Mach number regime a lifting Kernel function method similar to the subsonic approach was developed for the planar wing case but with appropriate Mach cone regions of integration taken into account Various assumed pressure loading functions all weighted by exact theoretical results were required for different wing shapes Numerical results produced stable (nonoscillatory) solutions which agreed well with experimental data even for very low aspect ratio triangular wings Author (GRA)

N78-24096# Texas A&M Univ College Station
THE DEVELOPMENT AND APPLICATION OF A SIMPLE METHOD FOR DETERMINING UNSTEADY AIRLOADS IN SUBSONIC COMPRESSIBLE FLOW Final Technical Report, 1 Jun 1974 - 31 Dec 1977
Balusu M Rao Vijayvardhan Elchuri Paul R Schatzle and Larry J McQuien Feb 1978 100 p refs
(Grants DAHC04-74-G-0184 DAAG29-76-G-0241)
(AD-A052417 ARO-11695 2-E) Avail NTIS HC A05/MF A01 CSCL 20/4

A numerical lifting surface method based on velocity potential formulation is applied for predicting aerodynamic loads in steady and unsteady flows for fixed as well as rotary wings The theory and the numerical procedures are validated by comparing with other analytical and experimental results The techniques developed resulted in very efficient computational schemes GRA

N78-24098# Boeing Commercial Airplane Co Seattle Wash
APPLICATION OF LAMINAR FLOW CONTROL TO LARGE SUBSONIC MILITARY TRANSPORT AIRPLANES Final Technical Report, Mar 1976 - Feb 1977
Robert M Kulfan and John D Vachal Jul 1977 150 p refs
(Contract F33615-76-C-3035 AF Proj 1476)
(AD-A052422 D6-45148 AFFDL-TR-77-65) Avail NTIS HC A07/MF A01 CSCL 01/3

A preliminary design study has been made to investigate the impact of the application of laminar flow control on the performance weight fuel consumption and economics of a large transport airplane designed to carry a heavy payload (350 000 lb) for a long range (10 000 nmi) The study was conducted in three phases In the first phase conceptual design investigations were conducted to identify the features of an LFC airplane optimized to accomplish the mission objectives A reference turbulent airplane also was developed in this phase Design and analysis studies were made to develop the final LFC configuration This configuration was sized to determine the

gross weight engine size wing area and fuel requirements necessary to achieve the design mission Various performance trade and sensitivity studies were conducted for the turbulent and LFC airplanes in the third phase Life-cycle and operating cost evaluations were also made A valid assessment of an LFC airplane must be preceded by an extensive design development and flight test program Consequently this study focused on identifying the relative benefits from applying LFC and on the sensitivities of these relative benefits to the current major LFC uncertainty items GRA

N78-24099# Princeton Univ N J Dept of Aerospace and Mechanical Sciences
EXPERIMENTAL INVESTIGATION OF AERODYNAMIC CHARACTERISTICS OF A TRACKED RAM AIR CUSHION VEHICLE Interim Report, Sep 1973 - Dec 1976
H C Curtiss Jr and W F Putnam Jan 1978 112 p refs (Contract DOT-TSC-682)
(PB-277674 DOT-TSC-OST-77-35 AMS-TR-1318 DOT-TSC-OST-78 1) Avail NTIS HC A06/MF A01 CSCL 01A

The results of an experimental and theoretical investigation of the longitudinal aerodynamic characteristics of a tracked ram air cushion vehicle are presented Experiments were conducted both in a wind tunnel with a model and section of guideway and with the same model propelled along a 300 foot guideway Experimental results are presented for the dependence of the lift drag and pitching moment of the model on model height above the guideway and winglet gap providing basic data necessary for the analysis of longitudinal stability and ride qualities of the concept The stability derivatives determined from the moving model experiments agreed well with the wind tunnel results A theory is presented which shows good agreement with the experimental results for the stability derivatives Author

N78-24102# Civil Aeronautics Board Washington D C
AIRPORT ACTIVITY STATISTICS OF CERTIFICATED ROUTE AIR CARRIERS Semiannual Report
30 Jun 1977 310 p Prepared jointly with Federal Aviation Administration Washington D C
(AD-A052728) Avail NTIS HC A14/MF A01 CSCL 01/5

This report furnishes airport activity of the Certificated Route Air Carriers Included in the data are passenger enplanements tons of enplaned freight express and mail Both scheduled and non-scheduled service and domestic and international operations are included These data are shown by airport and carrier Departures by airport, carrier and type of operation and type of aircraft are also included GRA

N78-24105# Lincoln Lab Mass Inst of Tech Lexington
VERIFICATION OF DABS SENSOR SURVEILLANCE PERFORMANCE (ATCRBS MODE) AT TYPICAL ASR SITES THROUGHOUT CONUS
W I Wells 20 Dec 1977 51 p refs
(Contract DOT-FA72WAI-261 F19628 78-C-0002 FAA Proj 034-241-012)
(AD-A051128 FAA-RD-77-113) Avail NTIS HC A04/MF A01 CSCL 17/7

A transportable measurement facility (TMF) incorporating antenna r-f and reply processing elements of a discrete address beacon system (DABS) sensor was sited at and in the vicinity of several FAA terminal ASR s throughout the United States Data collected at these sites were thoroughly analyzed to verify the design of the DABS sensor and to establish the need for design refinements Data pertaining to DABS and ATCRBS mode range and azimuth accuracy and to the total ATCRBS m de reply processing performance are presented Both range and azimuth accuracies for the DABS sensor are shown to be a factor of four or five better than those provided by existing ARTS (BI-4) interrogators and that the average blip/scan ratio is 98% or better dropping only a few percentage points in crossing track situations Author

N78-24107# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
BASES OF RADIO DIRECTION FINDING, PART 1
I S Kukes and M Ye Stank 22 Dec 1977 523 p Transl into ENGLISH of the book Osnovy Radiopelengatsii Moscow Sovetskoye Radio press 1964 p 1-516
(AD-A051951 FTD-ID(RS)T-2232-77-Pt-1) Avail NTIS HC A22/MF A01 CSCL 17/3

Radio direction finders are widely used in air and marine transport for the solution of navigational problems (position finding of movable object flight toward airport ships in distress and so forth) they are applied also for other target/purposes (research on the questions of radiowave propagation observation of space vehicles and so forth) Known direction-finding methods are continuously being improved increasingly more difficult methods are being developed and progress is made toward increasing the accuracy and sensitivity as new direction-finding methods improved theory the frequency band and the field of application of direction finders are increased All the enumerated questions are illuminated in periodic technical literature however until now have not been systematized In this book are presented the general theory of direction finding procedures of calculation of direction finders and their cell/elements and the errors of direction finding for their elimination GRA

N78-24111# Rome Univ (Italy) School of Aerospace Engineering
USE OF SIMULATION TECHNIQUES IN THE PROBLEM OF AIR TRAFFIC CONTROL [L'USO DELLE TECNICHE DI SIMULAZIONE NEL PROBLEMA DEL CONTROLLO DEL TRAFFICO AEREO]
C Bottiglieri and A DiCola Oct 1976 60 p refs In ITALIAN ENGLISH summary Presented at the 24th Intern Conf on Commun Geneva 11-13 Oct 1976
(Quad-Calc-Elett-21) Avail NTIS HC A04/MF A01

The air-traffic control involves a series of necessarily interconnected problems whose solution needs a charged system to work out the information and to plan the decisions with coordination The use of simulation techniques with which the system is divided into simple parts and a sensibility of system is defined as regards some traffic configurations and flow of information A scheme of the construction of the pertinent model and its testing with computer is suggested This scheme also can be adopted for an ample class of other traffic system (motor, railway systems) it is reported on an application to a traffic system of simple structure Author (ESA)

N78-24112 Case Western Reserve Univ Cleveland, Ohio
AIRCRAFT SIZE AND AIR TRANSPORT COSTS Ph D Thesis
David John Nicol 1977 302 p
Avail Univ Microfilms Order No 78-00554

A model of aircraft-related costs was developed which permits consideration of each major cost component in order to determine whether unit operating costs are lower for larger aircraft Utilization of capacity is included as a decision variable and can assume values between zero and some maximum practical limit Economies of scale with respect to aircraft size were found to exist for jet aircraft but they are not inevitable nor a persistent phenomenon For smaller aircraft operating on long flights the potential for cost decreases can be considerable As larger aircraft are considered however this potential steadily diminishes in importance to the extent that little potential for further reductions in unit cost appears to be available beyond the size corresponding to the largest aircraft in current commercial use Dissert Abstr

N78-24113# McDonnell-Douglas Corp St Louis, Mo
AV-8B COMPOSITE WING GOVERNMENT/INDUSTRY BRIEFING
13 Apr 1978 164 p Prepared in cooperation with Naval Air Systems Command Washington, D C
Avail NTIS HC A08/MF A01

Outlined in this document is the overall review of aircraft and wing configurations for various types of aircraft The document presents the engineering design and specifications dealing with structure, composite materials, loads wind pressure wing skin, etc The assemblage, quality control and fabrication of wing structures are reviewed G Y

N78-24116*# National Aeronautics and Space Administration, Washington D C
DRAG REDUCTION FOR GLIDERS
F X Wortmann May 1978 16 p refs Transl into ENGLISH from Aero-Revue Original language document announced as A66-15200 and A66-15198 Transl by Scientific Translation Service, Santa Barbara, Calif
(Contract NASw-2791)
(NASA-TM-75293) Avail NTIS HC A02/MF A01 CSCL 01C

The article discusses the causes of drag in gliders The importance of maintaining laminar flow is emphasized The problems of surface (or lack of) smoothness are outlined Author

N78-24117*# Systems Technology Inc, Mountain View Calif
STUDY OF A SAFETY MARGIN SYSTEM FOR POWERED-LIFT STOL AIRCRAFT Final Report, Dec 1976 - Jan 1978
Robert K Heffley and Wayne F Jewell May 1978 160 p refs
(Contract NAS2-9418)
(NASA-CR-152139, STI-1095-1) Avail NTIS HC A08/MF A01 CSCL 01C

A study was conducted to explore the feasibility of a safety margin system for powered-lift aircraft which require a backside piloting technique The objective of the safety margin system was to present multiple safety margin criteria as a single variable which could be tracked manually or automatically and which could be monitored for the purpose of deriving safety margin status The study involved a pilot-in-the-loop analysis of several safety margin system concepts and a simulation experiment to evaluate those concepts which showed promise of providing a good solution A system was ultimately configured which offered reasonable compromises in controllability, status information content and the ability to regulate the safety margin at some expense of the allowable low speed flight path envelope Author

N78-24118# Kaman Aerospace Corp, Bloomfield, Conn
ADVANCED DEVELOPMENT OF A HELICOPTER ROTOR ISOLATION SYSTEM FOR IMPROVED RELIABILITY VOLUME 1 SUMMARY REPORT Final Report, Jun. 1972 - Feb. 1976
Robert Jones and Joseph H McGarvey Dec 1977 70 p refs
(Contract DAAJ02-72-C-0082, DA Proj 1F1-63204-DB-38)
(AD-A051318, R-1396-1-Vol-1 USAAMRDL-TR-77-23A) Avail NTIS HC A04/MF A01 CSCL 01/3

This report includes the results of the analytical and experimental phases of a helicopter rotor isolation reliability and maintainability (R and M) program on a UH-1 helicopter, which was modified through the addition of a Dynamic Antiresonant Vibration Isolator (DAVI) The final flight test phase demonstrated that the DAVI-modified vehicle had substantially lower vibration levels than the standard vehicle Vertically the two-per-rev vibration level was reduced to less than one-fifth that of the standard vehicle through the transition speed range and less than one-half at high speeds An R and M analysis indicated the Army could realize an annual cost savings of approximately $12,000 000 if 1000 Army UH-1Hs were equipped with DAVI isolation systems This savings is predicated on the following assumptions (1) vibration-induced failures will be reduced in proportion to the vibration reduction afforded by the DAVI isolation system, and (2) the UH-1Hs are utilized at the rate of 20 flight-hours per month GRA

N78-24119# Kaman Aerospace Corp, Bloomfield, Conn
ADVANCED DEVELOPMENT OF A HELICOPTER ROTOR ISOLATION SYSTEM FOR IMPROVED RELIABILITY. VOLUME 2 DETAILED REPORT Final Report, Jun 1972 - Feb 1976
Robert Jones Dec 1977 256 p refs
(Contract DAAJ02-72-C-0082 DA Proj 1F1-63204-DB-38)
(AD-A051319, R-1396-2-Vol-2 USAAMRDL-TR-77-23B) Avail NTIS HC A12/MF A01 CSCL 01/3

For abstract see N78-24118

N78-24120# Naval Air Development Center Warminster Pa Aircraft and Crew Systems Technology Directorate
EVALUATION OF A LIP-SEAL HYDRAULIC FITTING FOR THE F-14 AIRCRAFT Final Report
D O Bagwell 15 Dec 1977 10 p
(AD-A051159 NADC-77292-60) Avail NTIS HC A02/MF A01 CSCL 11/1

A new type of lip-seal fitting was evaluated for possible use on the F-14 aircraft This fitting would be used interchangeably with the Resistoflex Dynatube which is now being exclusively used Impulse, proof burst, repeat assembly and flexure testing was completed on representative samples Three samples of sizes 6 mm 9 mm, 13 mm and 25 mm were tested in accordance with MIL-F-18280 and Grumman Aerospace Company specification SP-G-017A They successfully passed all tests Compatibility with the Resistoflex Dynatube connector is established and it is recommended that this fitting be used interchangeably with the Dynatube fitting Author (GRA)

N78-24122# Boeing Vertol Co, Philadelphia, Pa
HEAVY LIFT HELICOPTERS ADVANCED TECHNOLOGY COMPONENT PROGRAM HUB AND UPPER CONTROLS Final Report, Jul. 1971 - Jul 1975
Sep 1977 194 p refs
(Contract DAAJ01-71-C-0840)
(AD-A051348 USAAMRDL-TR-77-37) Avail NTIS HC A09/MF A01 CSCL 01/3

The Heavy Lift Helicopter Advanced Technology Component (ATC) development program was conducted by the Boeing Vertol Company for the U S Army from July 1971 through July 1975 As a part of this program, an advanced rotor hub and upper controls system design was developed and demonstrated to be satisfactory for application to the XCH-62 Prototype HLH The ATC hub and upper control component development/demonstration activities included the flap/lag pitch elastomeric bearing frequency selective lag damper, and shear bearing development efforts manufacturing techniques development, fretting inhibitor evaluation safe-life fail-safe, and endurance testing of major hub and upper control components whirl tower tests and integrated rotor-drive system tests GRA

N78-24124# Lockheed-California Co Burbank
FORMULAS FOR TAKEOFF PERFORMANCE P3-A, B AND C AIRPLANES Final Report
Joseph G Carrillo and William M Purdy 1 Feb 1978 26 p refs
(Contract N00014-77-C-0461)
(AD-A052354 LR-28461) Avail NTIS HC A03/MF A01 CSCL 01/2

The increase in program steps to more than 200 and larger memory storage of handheld computers appears to make practical their use in preflight planning of military missions by flight crews Such application would provide greater accuracy and enhance efficient utilization of airplane capability Contract No N00014-77-C-0461 authorized development of formulas to calculate takeoff field length requirements and pertinent airspeeds and powerplant performance to test the feasibility of this application This report contains formulas for the performance items authorized by the contract It is recommended that they be programmed for use with a handheld computer and that computer solutions be evaluated for flight planning for service missions of P-3 airplanes Author (GRA)

N78-24125# Army Armament Research and Development Command Watervliet N Y Benet Weapons Lab
VIBRATIONS OF A HELICOPTER ROTOR BLADE USING FINITE ELEMENT UNCONSTRAINED VARIATIONAL FORMULATIONS
J J Wu and C N Shen Sep 1977 30 p refs
(DA Proj 1L1-61102-AH-45)
(AD-A052670 AD-E400118 ARLCB-TR-77038) Avail NTIS HC A03/MF A01 CSCL 01/3

In the past several years a numerical method has been developed which is a generalized Rayleigh-Ritz finite element discretization using the combined concept of Lagrange multipliers and adjoint variables This approach enables one to deal with problems associated with nonconservative forces coupling effects and all types of boundary conditions in a routine fashion, and it appears promising in solving the vibration and dynamic stability problems associated with the complicated equations of a helicopter rotor blade This paper presents the first application of the general method of the vibration problem of such a rotor blade The numerical results from some demonstrative examples show that instability of flutter can occur in the range of operational rotor speed due to the coupled motion of flapping and root torsion without any aerodynamic force, if the torsional spring (or the pitch control link) is not sufficiently stiff This instability does not appear to have been reported previously GRA

N78-24126# Boeing Vertol Co Philadelphia, Pa
FINITE ELEMENT ANALYSIS FOR COMPLEX STRUCTURES, HELICOPTER TRANSMISSION HOUSING STRUCTURAL MODELING Final Report, Jul 1975 - May 1977
R W Howells and J J Sciarra Jan 1978 216 p refs
(Contract DAAJ02-75-C-0053, DA Proj 1F2-62209-AH-76)
(AD-A052759 D210-11232-1 USAAMRDL-TR-77-32) Avail NTIS HC A10/MF A01 CSCL 01/3

The objective of the Finite Element Analysis for Complex Structures program was to develop and demonstrate a comprehensive finite element analytical technique with the capability and flexibility for analyzing helicopter transmission housings made of metal and/or composite materials The work encompassed the study of thermal distortion and stress and deflection due to static and dynamic loads load path definition, dynamic response and the control of structural energy distribution The results were used to optimize strength and weight and to assess operational housing life, fail safety/safe life and reliability Some emphasis was placed on heat transfer analyses Additional objectives were to integrate this housing analysis method with existing methods to form a comprehensive transmission analysis and to validate these design tools so that they might be applied to future transmission configurations A finite element model and analytical methods were applied to analyze a CH-47C helicopter's forward rotor transmission and also to define design modifications for structural optimization GRA

N78-24127# Avions Marcel Dassault-Breguet Aviation Saint-Cloud (France)
ENERGY SAVINGS AN AIRCRAFT CONSTRUCTOR'S VIEWPOINT [LES ECONOMIES D'ENERGIE POINT DE VUE D'UN AVIONNEUR]
Philippe Amblard Paris Assoc Aeron et Astronautique de France 1977 17 p In FRENCH Presented at the 13th Intern Aeron Congr Paris, 2-3 Jun 1977
(AAAF-NT-77-24 ISBN-2-7170-0449-1) Avail NTIS HC A02/MF A01, CEDOCAR Paris FF 15 (France and EEC) FF 19 (others)

The possibility of designing aircraft with reduced fuel consumption is examined Present day techniques reviewed include engines with high dilution ratio supercritical airfoils mass reduction by using composite materials for secondary structures and economic flight control Future techniques include use of composite materials for main structural elements, and active control Some projects discussed briefly are the Boeing 7X7 Lockheed L-1011-600A, Falcon 50 and Mercure 200 ESA

N78-24128# Association Aeronautique et Astronautique de France Paris
HELICOPTERS AND ENERGY SAVINGS [LES HELICOPTERES ET LES ECONOMIES D'ENERGIE]
Georges Petit 1977 35 p In FRENCH Presented at the 13th Intern Aeron Congr Paris, 2-3 Jun 1977
(AAAF-NT-77-25 ISBN-2-7170-0450-5) Avail NTIS HC A03/MF A01, CEDOCAR, Paris FF 25 (France and EEC) FF 29 (others)

Possibilities of reducing the energy consumption of helicopters are discussed The order of magnitude of the problem i e the part helicopters play in total energy consumption was established The share of fuel consumption in comparison with total operational costs is dealt with The energy balance of the helicopters Gazelle Dauphin and Puma is presented Proposals for energy reduction are made which might lead to a 30% reduction due to engine improvements and 15% reduction resulting from aerodynamic improvements Finally a comparison with competitive aircraft, i e vertical takeoff aircraft is made ESA

N78-24129# Air France Paris
AN OPERATOR'S VIEWPOINT HOW TO REDUCE THE FUEL CONSUMPTION IN AERONAUTICAL MAINTENANCE [LE POINT DE VUE D'UN EXPLOITANT. COMMENT REDUIRE LA CONSOMMATION DE CARBURANT DANS L'ENTRETIEN AERONAUTIQUE]
P Kleitz Assoc Aeron et Astronautique de France 1977 42 p In FRENCH Presented at the 13th Intern Aeron Congr, Paris 2-3 Jun 1977
(AAAF-NT-77-26 ISBN-2-7170-0451-3) Avail NTIS HC A03/MF A01 CEDOCAR Paris FF 25 (France and EEC) FF 29 (others)

Possibilities for airline companies to reduce aircraft fuel consumption are indicated Changes that influence fuel consumption most (mass change performance change, and deterioration of engine performance) are outlined ESA

N78-24130# Societe Francaise d Equipments pour la Navigation Aerienne Velizy-Villacoublay (France)
EQUIPMENT PERMITTING FUEL SAVINGS DURING APPROACH [UN EQUIPEMENT PERMETTANT D'ECONOMISER LE CARBURANT EN APPROCHE]
J Sicre Paris Assoc Aeron et Astronautique de France 1977 13 p In FRENCH Presented at the 13th Intern Aeron Congr Paris 2-3 Jun 1977
(AAAF-NT-77-27 ISBN-2-7170-0452-1) Avail NTIS HC A02/MF A01 CEDOCAR, Paris FF 15 (France and EEC) FF 19 (others)

Possibilities for airline companies to reduce aircraft fuel consumption are indicated Changes that influence fuel consumption most (mass change performance change and deterioration of engine performance) are outlined ESA

N78-24131# Association Aeronautique et Astronautique de France Paris
SUPERSONIC TRANSPORTATION FACED WITH ENERGY SAVINGS [LE TRANSPORT SUPERSONIQUE FACE AUX ECONOMIES D'ENERGIE]
G Cormery 1977 20 p In FRENCH Presented at the 13th Intern Aeron Congr, Paris 2-3 Jun 1977
(AAAF-NT-77-28, ISBN-2-7170-0453-X) Avail NTIS HC A02/MF A01, CEDOCAR Paris FF 15 (France and EEC) FF 19 (others)

Energy savings aspects for supersonic aircraft are dealt with Topics include air transportation and energy, supersonic transportation and air transportation short and medium term technological innovation, and long term technological innovation ESA

N78-24132*# Research Triangle Inst, Research Triangle Park, N C
GENERAL AVIATION AVIONICS EQUIPMENT MAINTENANCE Final Report
C D Parker and J B Tommerdahl May 1978 71 p refs
(Contract NAS1-14939)
(NASA-CR-145342, RTI/1464/00-00F) Avail NTIS HC A04/MF A01 CSCL 01D

Maintenance of general aviation avionics equipment was investigated with emphasis on single engine and light twin engine general aviation aircraft Factors considered include the regulatory agencies, avionics manufacturers avionics repair stations, the statistical character of the general aviation community, and owners and operators The maintenance, environment, and performance, repair costs, and reliability of avionics were defined It is concluded that a significant economic stratification is reflected in the maintenance problems encountered, that careful attention to installations and use practices can have a very positive impact on maintenance problems, and that new technologies and a general growth in general aviation will impact maintenance Author

N78-24133# Institute for Defense Analyses Arlington, Va Cost Analysis Group
ON SETTING AVIONIC SUBSYSTEM UNIT PRODUCTION COST GOALS Final Report
David C Weimer Oct 1977 79 p refs
(Contract DAHC15-73-C-0200)
(AD-A051337, AD-E500020, IDA/HQ-77-19573, P-1280) Avail NTIS HC A05/MF A01 CSCL 14/1

Major avionics subsystems for candidate aircraft developed under the Design-to-Cost (DTC) acquisition concept were analyzed to gain additional insight into the critical production cost goal-setting process The candidate aircraft sample consisted of the Air Force F-16 and A-10 the Navy F-18 and the Army Advanced Attack Helicopter A total of 23 avionics subsystems assigned to the candidate aircraft were investigated It was found that only six of the 23 subsystems met Department of Defense criteria for authentic DTC programs The other subsystems were developed and acquired by airframe prime contractors on a competitive fixed-price basis with priced options for production In these programs competitive pricing replaced DTC goal-setting Based upon limited research findings it was concluded that subcontractor goal-setting was usually masked by competitive pricing practices the resulting development programs did not have the schedule, cost and design tradeoff flexibility to properly pursue the cost goal It also was concluded that the goal establishment process as observed for those 6 subsystems examined, was effective and did include appropriate important criteria for goal selection GRA

N78-24135# Naval Postgraduate School Monterey Calif
DESIGN AND CONSTRUCTION OF A FLIGHT MONITOR AND DATA RECORDER M S Thesis
Dennis Leland Kane Dec 1977 96 p refs
(AD-A052405) Avail NTIS HC A05/MF A01 CSCL 14/3

The design and preliminary testing of a microcomputer based flight monitor and data recorder utilizing magnetic bubble memory, is reported Component selection, software design and magnetic bubble storage system construction and testing are discussed Difficulties encountered both in software and bubble testing are reviewed, with results and remaining work summarized Magnetic bubble memory technology is reviewed and its potential as a reliable, dense, low cost non-volatile recording medium is noted It is proposed that the microprocessor be utilized as a flight monitoring as well as a recording device to detect and report imminent extremis situations GRA

N78-24137*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
ON THE USE OF RELATIVE VELOCITY EXPONENTS FOR JET ENGINE EXHAUST NOISE
James R Stone 1978 17 p refs Presented at 95th Meeting of Acoust Soc of Am Providence R I 16-19 May 1978
(NASA-TM-78873 E-9605) Avail NTIS HC A02/MF A01 CSCL 20A

The effect of flight on jet engine exhaust noise has often been presented in terms of a relative velocity exponent, n, as a function of radiation angle The value of n is given by the OASPL reduction due to relative velocity divided by 10 times the logarithm of the ratio of relative jet velocity to absolute jet velocity In such terms classical subsonic jet noise theory would result in a value of n being approximately 7 at 90 degree angle to the jet axis with n decreasing but remaining positive, as the inlet axis is approached and increasing as the jet axis is approached However, flight tests have shown a wide range of results including negative values of n in some cases In this paper it is shown that the exponent n is positive for pure subsonic jet mixing noise and varies in a systematic manner as a function of flight conditions and jet velocity Author

N78-24138*# National Aeronautics and Space Administration Lewis Research Center, Cleveland Ohio
DESIGN AND PRELIMINARY RESULTS OF A SEMITRANSPIRATION COOLED (LAMILLOY) LINER FOR A HIGH-PRESSURE HIGH-TEMPERATURE COMBUSTOR
Jerrold D Wear, Arthur M Trout, John M Smith and Robert E Jones 1978 13 p refs To be presented at the 14th Propulsion Conf Las Vegas Nev 25-27 Jul 1978 sponsored by AIAA and SAE
(NASA-TM-78874, E-9607) Avail NTIS HC A02/MF A01 CSCL 21E

A Lamilloy combustor liner was designed fabricated and tested in a combustor at pressures up to 8 atmospheres The liner was fabricated of a three layer Lamilloy structure and designed to replace a conventional step louver liner The liner is to be used in a combustor that provides hot gases to a turbine cooling test facility at pressures up to 40 atmospheres The Lamilloy liner was tested extensively at lower pressures and demonstrated lower metal temperatures than the conventional liner, while at the same time requiring about 40 percent less cooling air flow Tests conducted at combustor exit temperatures in excess of 2200 K have not indicated any cooling or durability problems with the Lamilloy linear Author

N78-24142*# National Aeronautics and Space Administration Washington D C
FUNDAMENTAL ASPECTS OF THE AERODYNAMICS OF TURBOJET ENGINE COMBUSTORS
M Barrere Apr 1978 35 p refs Transl into ENGLISH from Rev Fr Mecan (France) 3d and 4th Quarters 1975 p 55-68 Translation was announced as A76-39181 Transl by Kanner (Leo) Associates Redwood City Calif Original doc prep by

ONERA Paris
(Contract NASw-2790)
(NASA-TM-75287 ONERA-TP-1976) Avail NTIS HC A03/MF A01 CSCL 21E

Aerodynamic considerations in the design of high performance combustors for turbojet engines are discussed Aerodynamic problems concerning the preparation of the fuel-air mixture the recirculation zone where primary combustion occurs the secondary combustion zone and the dilution zone were examined An aerodynamic analysis of the entire primary chamber ensemble was carried out to determine the pressure drop between entry and exit The aerodynamics of afterburn chambers are discussed A model which can be used to investigate the evolution of temperature pressure and rate and efficiency of combustion the length of the chamber was developed Author

N78-24143# Naval Research Lab Washington D C
NUMERICAL PARAMETRIC STRESS ANALYSIS OF THE TF-30 TURBINE ENGINE THIRD-STAGE FAN-BLADE/DISK DOVETAIL REGION Final Report
L A Beaubien Jan 1978 36 p refs
(AD-A051299 AD-E000121 NRL-MR-3671) Avail NTIS HC A03/MF A01 CSCL 21/5

A two-dimensional finite element parametric analysis was conducted for the disk/blade dovetail region of the TF-30 turbine engine assuming purely radial (centrifugal) loading of the blade A graphical boundary matching procedure was used to determine a likely disk/blade interface force distribution This distribution produced a stress concentration factor (SCF) of 5 3 in the disk fillet relative to the average stress in the neck section of the disk In addition the SCF was found to decrease with decreasing interface friction Parametric modification of the disk fillet resulted in a maximum SCF reduction of 27%, achieved with a fillet radius of three times the present one For all studied combinations of interface force distribution coefficient of friction and fillet geometry the point of maximum tensile stress occurred farther into the fillet (away from the contact region) than the point at which cracks appear to initiate (near or just into the inboard edge of the contact area) However, different combinations of interface force and fillet geometry result in different degrees of spread of the tensile stress concentration from the fillet area into the contact area Finally the effects of some assumed interface force perturbations due to non-radial (non-centrifugal) loading are discussed Author (GRA)

N78-24144# Systems Control Inc Palo Alto Calif Aeronautical and Marine Systems Div
F100 MULTIVARIABLE CONTROL SYNTHESIS PROGRAM. VOLUME 1 DEVELOPMENT OF F100 CONTROL SYSTEM Final Report, 1 Aug 1975 - 31 Dec 1976
Ronald L DeHoff W Earl Hall, Jr, Richard J Adams and Narendra K Gupta Jun 1977 328 p refs 2 Vol
(Contract F33615-75-C-2053 AF Proj 3066)
(AD-A052420 AFAPL-TR-77-35-Vol-1) Avail NTIS HC A15/MF A01 CSCL 21/5

The objective of the F100 multivariable controls program was to demonstrate modern control design methodology applied to a state-of-the-art aircraft turbine over its entire flight envelope Linear quadratic regulator design methods were used to develop feedback gains for a series of operating points Reference schedules were used to translate pilot and ambient inputs to reference point specifications A transient controller produced smooth and rapid transitions from one operating point to another A variable structure integral trim system produced specified steady-state performance and limit accommodation in the presence of simulated degradation effects and instrument errors The resulting control logic was extensively tested on a hybrid simulation of the F100 turbofan and will be used to control an engine in an altitude test cell The details of the design procedure linear model analysis and a summary of digital and hybrid simulation tests results are presented in this report Author (GRA)

N78-24145# Systems Control Inc, Palo Alto Calif Aeronautical and Marine Systems Div
F100 MULTIVARIABLE CONTROL SYNTHESIS PROGRAM VOLUME 2 APPENDICES A THROUGH K Final Report, 1 Aug 1975 - 31 Dec 1976
Ronald L DeHoff W Earl Hall Jr, Richard J Adams and Narendra K Gupta Jun 1977 507 p refs
(Contract F33615-75-C-2053 AF Proj 3066)
(AD-A052346 AFAPL-TR-77-35-Vol-2) Avail NTIS HC A22/MF A01 CSCL 21/5

For Abstract see N78-24144

N78-24146# Aeronautical Research Labs Melbourne (Australia)
VIBRATION INVESTIGATION OF HELICOPTER ENGINE COOLING FAN
N S Swansson and G A Duke Mar 1977 22 p refs
(AD-A047081 ARL/ME-363) Avail NTIS HC A02/MF A01 CSCL 21E

An investigation into the cause of the unacceptably high incidence of fatigue failure of blades in the engine cooling fan fitted to Sioux helicopters led to a search for resonant frequencies of the fan blades Tests on a stationary fan and in a rotating rig showed resonant vibration at various fan speeds in particular, high stresses were generated by a second shaft order resonance close to the normal operating speed A modification to overcome the problem was proposed, consisting of a stainless steel shroud fitted over the blade tips Tests showed that this modification reduced stresses to a negligible level and the mechanical soundness of the scheme was confirmed by an endurance run followed by an overspeed test The modified fan was fitted to a helicopter and measurements comparing its cooling performance with a standard fan showed only small differences Author (GRA)

N78-24149# Massachusetts Inst of Tech Cambridge Gas Turbine Lab
STUDIES ON TRANSONIC TURBINE WITH FILM-COOLED BLADES Annual Report, 1 Jul 1976 - 30 Jun 1977
N Adams F Hajjar R F Topping and J F Louis Sep 1977 123 p refs
(Contract N00014-76-C-0253)
(AD-A052423 Rept-77-1) Avail NTIS HC A06/MF A01 CSCL 13/7

During the fourth year of the contract further advances were made towards the goal of gathering the heat transfer and aerodynamics flow data necessary for a good understanding of the performance of film-cooled highly-loaded transonic turbine blading Surface Mach number and heat transfer rate distributions were determined for a reference transonic airfoil over a range of exit Mach numbers for inlet incidence angle variation of + or - 15 deg An evaluation and comparison of all cascade data collected so far was then conducted Progress was also made in the investigation of the effects of unsteadiness on transonic airfoil aerodynamics and heat transfer Author (GRA)

N78-24150# Texas A&M Univ College Station Dept of Industrial Engineering
REPLACEMENT PROCESS ANALYSIS AN INTERIM REPORT ON REPLACEMENT MODELS Interim Report, 1 Oct 1977 - 1 Feb 1978
Po-Wen Hu and Laurence L George 30 Jan 1978 38 p refs
(Grant AF-AFOSR-3501-78)
(AD-A052411 AFOSR-78-0679TR) Avail NTIS HC A03/MF A01 CSCL 21/5

This report describes models for the aircraft engine replacement processes and models for the probability distribution of engine ages at failure Potential uses of these models for predicting replacement requirements are discussed Also models for the randomness of flying hours on different aircraft are proposed for the study of the effect on replacement models which assume each aircraft flies an equal share of a flying hour program The first section briefly describes the problem of computing replacement requirements for a fleet of aircraft The second section describes several models of engine lives ages at replacement

N78-24153# National Aviation Facilities Experimental Center Atlantic City N J
EVALUATION OF A 100-WATT ELEVATED HIGH-INTENSITY RUNWAY EDGE LIGHT Final Report, Jun 1975 - Jul 1977
Raymond E Johnston and E Leon Reamer Mar 1978 19 p refs
(FAA Proj 072-424-500)
(AD-A051651 FAA-NA-77-47 FAA-RD-77-176) Avail NTIS HC A02/MF A01 CSCL 01/5

The purpose of this project is to evaluate a newly designed evaluated, high intensity runway edge light using a 100 watt lamp as its light source rather than the standard 200 watt lamp to determine if the lower wattage lamp and fixture combination would be satisfactory for category 1 and category 2 low-visibility operations where a Federal Aviation Administration Specification type L-862 runway edge light fixture would be required Pilot opinion during flight tests indicates that an installed group A version of the experimental runway edge light unit is visually adequate for category 1 weather operations and should be adequate for category 2 operations Group A lights however did not meet the Office of Airport Programs Specifications for L-862 runway edge lights An improved group B version *will meet both requirements, since it satisfactorily passed the* L-862 photometric specifications Author

N78-24154# National Aviation Facilities Experimental Center Atlantic City N J
FEASIBILITY STUDY FOR SIMULATION OF AN AIRPORT TOWER CONTROL ENVIRONMENT Final Report, May 1976 - Mar 1977
Helen W Hamilton Feb 1978 84 p refs
(FAA Proj 216-102-100)
(AD-A051174 FAA-NA-77-33 FAA-RD-77-190) Avail NTIS HC A05/MF A01 CSCL 01/2

The feasibility and desirability of developing an airport tower control simulation training facility at the FAA Academy was investigated Training program needs were assessed and the state-of-the-art in simulation technology was surveyed Several large-scale airport tower and ship's bridge simulators are described and evaluated from an operational and engineering viewpoint also a number of flight simulators and image generation and projection systems are considered with regard to the applicability of the concepts to the FAA training requirements Computer generated image systems versus other imaging technologies are discussed with reference to realism requirements capability for efficient generation of instructional materials and for objective student evaluation The large number of visual-scene simulation facilities presently in use or under contract development for a wide variety of uses indicates that a tower control application is entirely feasible Author

N78-24155# Department of Transportation Washington, D C ATC Systems Div
PROJECT PLAN TOWER AUTOMATED GROUND SURVEILLANCE SYSTEM DEVELOPMENT PROGRAM Development Plan, FY 1978
M E Perie Jan 1978 18 p refs
(AD-A051621 FAA-RD-78-4) Avail NTIS HC A02/MF A01 CSCL 17/9

The tower automated ground surveillance system (TAGS) is designed to provide automation support for air traffic controllers in the tower cab and increase surface traffic handling capacity minimize delays and provide all-weather control and guidance for the airport surface traffic control (ASTC) system The TAGS system having a clear uncluttered presentation of each target and its identity will eliminate voice channel saturation and permit ground control capacity in bad visibility to equal that in good visibility TAGS will also become the baseline automation system to increase ASTC system capacity in the future air traffic control system Author

N78-24156# Institute for Defense Analyses Arlington Va Science and Technology Div
COST-EFFECTIVENESS OF FLIGHT SIMULATORS FOR MILITARY TRAINING VOLUME 1 USE AND EFFECTIVENESS OF FLIGHT SIMULATORS Final Report, Apr 1976 - Jul 1977
Jesse Orlansky and Joseph String Aug 1977 167 p refs
(Contract DAHC15-73-C-0200)
(AD-A052801 AD-E500013 IDA/HQ-77-19470 P-1275-Vol-1) Avail NTIS HC A08/MF A01 CSCL 01/1

Flight simulators cost less to operate than do aircraft estimates range from 5 to 20 percent Many studies have shown that skills learned in flight simulators can be performed successfully in aircraft i e the use of flight simulators for training purposes saves flight time The critical issue is whether the amount of flight time saved by the use of simulators is worth their cost The cost-effectiveness of flight simulators for training has been demonstrated only in a few recent studies which report that the procurement cost of simulators can be amortized in a few years Current R and D about flight simulators centers about the need for motion and wide angle visual display systems Flight simulators have achieved their greatest use by the military so far in undergraduate flight training Their greatest potential for future *savings lies in transition and continuation training which account* for the major costs of military flying Consistent methods of data collection and cost estimating not now available are needed to evaluate the cost-effectiveness of alternative flight training programs including the use of various types of simulators part-task trainers new instructional strategies and the like The report provides a preliminary cost model which identifies the data needed to develop cost estimates for use in cost-effectiveness analyses of flight training Author (GRA)

N78-24158# AiResearch Mfg Co, Phoenix Ariz
ADVANCED TECHNOLOGY SERVICING EQUIPMENT FOR ARMY AIRCRAFT Final Report
R R Mejdrich Dec 1977 192 p
(Contract DAAJ02-76-C-0042, DA Proj 1F2-62209-AH-76)
(AD-A052652, AiResearch-31-2491B USAAMRDL-TR-77-33) Avail NTIS HC A09/MF A01 CSCL 01/5

The purpose of this effort was to define an advanced Ground Power Unit (GPU) to service AAH and UTTAS helicopters The GPU was to be lightweight air-transportable, highly mobile, and use aircraft equipment wherever possible The program included the following activities Aircraft requirements verification trade-off analyses to select specific components, design and component compatability verification and preparation of specification and layout drawings defining conceptual design Author (GRA)

N78-24159# Civil and Environmental Engineering Development Office Tyndall AFB Fla Detachment 1 ADTC
NONDESTRUCTIVE PAVEMENT EVALUATION Final Report, 1 Oct 1976 - 30 Sep 1977
B M Das Oct 1977 23 p refs
(AD-A052707, CEEDO-TR-77-41) Avail NTIS HC A02/MF A01 CSCL 01/5

Research has been in progress for about 10 years to develop a compatible pavement evaluation procedure for airfields based on nondestructive tests A successful nondestructive pavement evaluation technique will reduce the time of closure of various airfield facilities needed to conduct destructive tests required for conventional pavement evaluation This study provides a comparison of the projected pavement life of several airfield features estimated by nondestructive and destructive pavement evaluation procedures For aircraft and gross loads on similar pavement sections the nondestructive evaluation procedure yields higher numbers of allowable operations as compared to that obtained by the destructive test evaluation technique at this point in the research effort Follow-on research is planned which will cause the two evaluation procedures to yield more closely compatible numbers Author (GRA)

N78-24292*# National Aeronautics and Space Administration, Washington D C
CARBON FIBER STUDY
[1977] 43 p
(NASA TM-79449) Avail NTIS HC A03/MF A01 CSCL 11D
A coordinated Federal Government action plan for dealing with the potential problems arising from the increasing use of graphite fiber reinforced composite materials in both military and civilian applications is presented The required dissemination of declassified information and an outline of government actions to minimize the social and economic consequences of proliferated composite materials applications were included Author

N78-24320# Air Force Inst of Tech Wright-Patterson AFB Ohio
AN ATOMIC FLUORESCENCE SYSTEM USING A CONTINUUM SOURCE FOR THE RAPID DETERMINATION OF WEAR METALS IN JET ENGINE LUBRICATING OILS M S Thesis - Fla Univ
Robert L Vaughn Mar 1978 65 p refs
(AD-A052721 AFIT-CI-78-53) Avail NTIS HC A04/MF A01 CSCL 07/4
A brief review is presented of atomic absorption and atomic fluorescence methods of trace wear-metal analysis of jet engine lubricating oil The theory of atomic fluorescence in flames is presented for the case of a continuum excitation source A system for atomic fluorescence measurements is described that employs an electrically-heated graphite rod and a N2O/C2H2 flame atomizer with a 300-W Eimac xenon arc as the continuum excitation source With this system, small samples (1 microliter) having complex matrices can be analyzed rapidly, conveniently and with no pretreatment Analytical calibration curves are given for Cr, Al and Mo and these metals are determined in synthetic and real jet engine lubricating oils The determinations of these elements are evaluated with respect to the accuracy and repeatability criteria of the Interservice Oil Analysis Program
Author (GRA)

N78-24344# Aluminum Co of America Alcoa Center Pa
EXPLORATORY DEVELOPMENT FOR DESIGN DATA ON STRUCTURAL ALUMINUM ALLOYS IN REPRESENTATIVE AIRCRAFT ENVIRONMENTS Final Report, 1 May 1974 - 30 Apr 1977
D J Brownhill R E Davies G E Nordmark and B M Ponchel Jul 1977 197 p refs
(Contract F33615-74-C-5089 AF Proj 7381)
(AD-A052809, AFML-TR-77-102) Avail NTIS HC A09/MF A01 CSCL 11/6
The mechanical properties fracture toughness, fatigue, fatigue-crack growth rates in three environments and corrosion characteristics of 10 lots each of 2048-T851 7050-T7351 and 7475-T7351 plate and 2219-T852 hand forgings have been evaluated Data for establishing MIL-HDBK-5 values, including modulus of elasticity and stress-strain are presented GRA

N78-24348# Army Materials and Mechanics Research Center Watertown Mass
TRIP STEELS PROMISE HIGH RELIABILITY HARDWARE Final Report
Kenneth H Abbott Feb 1978 18 p
(AD-A052765 AMMRC-MS-78-2) Avail NTIS HC A02/MF A01 CSCL 11/6
Based on a review of the properties of typical TRIP steels a discussion is presented of possible Army applications for this new material Problems related to component fabrication and specification controls are presented and a brief outline of a recommended R and D program is included Author (GRA)

N78-24369*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
IMPACT OF FUTURE FUEL PROPERTIES ON AIRCRAFT ENGINES AND FUEL SYSTEMS
R A Rudey and J S Grobman 1978 33 p refs To be presented at Lecture Ser 96 Paris Munich and London 12-20 Oct 1978 sponsored by AGARD
(NASA-TM-78866, E-9597) Avail NTIS HC A03/MF A01 CSCL 21D
This paper describes and discusses the propulsion-system problems that will most likely be encountered if the specifications of hydrocarbon-based jet fuels must undergo significant changes in the future and correspondingly the advances in technology that will be required to minimize the adverse impact of these problems Several investigations conducted are summarized Illustrations are used to describe the relative effects of selected fuel properties on the behavior of propulsion-system components and fuel systems The selected fuel properties are those that are most likely to be relaxed in future fuel specifications Illustrations are also used to describe technological advances that may be needed in the future Finally the technological areas needing the most attention are described and programs that are under way to address these needs are briefly discussed
Author

N78-24370*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
CHARACTERISTICS AND COMBUSTION OF FUTURE HYDROCARBON FUELS
R A Rudey and J S Grobman 1978 26 p Proposed for presentation at Lecture Series 96 Paris Munich London 12-20 Oct 1978 sponsored by AGARD
(NASA-TM-78865 E-9596) Avail NTIS HC A03/MF A01 CSCL 21D
As the world supply of petroleum crude oil is being depleted the supply of high-quality crude oil is also dwindling This dwindling supply is beginning to manifest itself in the form of crude oils containing higher percentages of aromatic compounds sulphur, nitrogen and trace constituents The result of this trend is described and the change in important crude oil characteristics as related to aircraft fuels, is discussed As available petroleum is further depleted the use of synthetic crude oils (those derived from coal and oil shale) may be required The principal properties of these syncrudes and the fuels that can be derived from them are described In addition to the changes in the supply of crude oil increasing competition for middle-distillate fuels may require that specifications be broadened in future fuels The impact that the resultant potential changes in fuel properties may have on combustion and thermal stability characteristics is illustrated and discussed in terms of ignition soot formation carbon deposition flame radiation, and emissions Author

N78-24380*# Jet Propulsion Lab, Calif Inst of Tech, Pasadena
PERFORMANCE EVALUATION OF A CATALYTIC PARTIAL OXIDATION HYDROGEN GENERATOR USING TURBINE ENGINE FUELS Final Report, 1 Oct 1976 - 30 Apr 1977
Richard M Clayton Oct 1977 43 p refs
(Contract MIPR-FY14557-601611)
(AD-A047355 AFAPL-TR-77-62) Avail NTIS HC A03/MF A01 CSCL 21/4
Operation of a catalytic partial oxidation reactor under simulated turbine engine idle power air state conditions, using a conventional aviation turbine fuel (JP-5) and an unconventional fuel (blend of JP-5/xylene), is shown to produce a fuel gas stream of near theoretical equilibrium composition at very fuel-rich A/F ratios in the range of 5 0-5 6 The combustibles in the fuel gas comprise about 6% H2 and 93% CO by mass and therefore the fuel gas exhibits superior lean-burning qualities relative to the fuel gas exhibits superior lean-burning qualities

relative to the fuel feed stock The concept of using the very fuel-rich partial oxidation process as a first stage of a two-stage combustion system for onboard processing of broadened specification fuels to improve their combustion characteristics is discussed For the nonoptimal reactor design used excessive catalyst bed temperatures and a propensity for solid carbon deposition in the bed were observed These phenomena are not fully understood and need further elucidation Thermal reactor schemes (without catalysts) may be more advantageously applied to aviation turbine engines but these schemes also require additional investigation to delineate design requirements

Author (GRA)

N78-24385# National Bureau of Standards Washington, D C
PROBLEMS IN WORLD-WIDE STANDARDIZATION OF THE UNITS OF HEIGHT MEASUREMENT Interim Report
Judith F Gilsinn Feb 1978 23 p refs
(Contract DOT-FA76WAI-594)
(AD-A051150 NBSIR-77-1386 FAA-EM-78-2) Avail NTIS HC A02/MF A01 CSCL 17/7

The U S commitment to a voluntary conversion to metric units raises changeover problems in the fields of air traffic control and airspace management Current practice in altitude measurement and the rules for height maintenance now in effect worldwide are discussed Four desirable features are given for an altitude measurement system, encompassing both the units of height measurement and the designation of cruising levels Three alternative bases for the design of such a system are described and related to the desirable characteristics Problems associated with each of the approaches were examined and the many factors to be considered and the many interrelationships involved were studied

Author

N78-24391* National Aeronautics and Space Administration Pasadena Office Calif
THIN CONFORMAL ANTENNA ARRAY FOR MICROWAVE POWER CONVERSIONS Patent
Richard M Dickinson, inventor (to NASA) (JPL) Issued 14 Mar 1978 8 p Sponsored by NASA
(NASA-Case-NPO-13886-1 US-Patent-4,079 268
US-Patent-Appl-SN-730045, US-Patent-Class-307-151,
US-Patent-Class-361-395, US-Patent-Class-343-700MS) Avail US Patent Office CSCL 09C

A structure of a circularly polarized thin conformal antenna array which may be mounted integrally with the skin of an aircraft employs microstrip elliptical elements and interconnecting feed lines spaced from a circuit ground plane by a thin dielectric layer The feed lines are impedance matched to the elliptical antenna elements by selecting a proper feedpoint inside the periphery of the elliptical antenna elements Diodes connected between the feed lines and the ground plane rectify the microwave power and microstrip filters (low pass) connected in series with the feed lines provide dc current to a microstrip bus Low impedance matching strips are included between the elliptical elements and the rectifying and filtering elements

Official Gazette of the U S Patent Office

N78-24418# Naval Ocean Systems Center, San Diego, Calif
PERSPECTIVE RADAR DISPLAY SYSTEM TV-LIKE PRESENTATION ON CRT PROVIDES HIGHER LATERAL POSITION AND LATERAL MOTION SENSITIVITY THAN A PPI Technical Report, Mar - Dec 1977
L G Harris 17 Jan 1978 21 p
(AD-A052342, NOSC/TR-198) Avail NTIS HC A02/MF A01 CSCL 14/2

The data rate and display format of a conventional navigation radar/PPI display are adequate for most purposes but have limitations in certain close-range applications such as precision maneuvers in low-visibility conditions At close ranges the PPI format bunches the close targets near the center of the scope where the inherent azimuth resolution is poorest Close targets may make several degrees of change in relative bearing before the change is noticeable on the PPI display Also, a small change in heading of 'own ship' is not immediately apparent on a PPI display Radar Systems Company has developed a Perspective Radar Display System which provides a perspective presentation on a cathode ray tube of the volume of space being scanned by an electromechanical scanning (nonrotating) radar antenna This type of display has higher lateral position and lateral motion sensitivity than a PPI display It has the additional capability of varying the apparent altitude of perspective This report covers a technical and operational evaluation of the Perspective Radar Display System to determine its effectiveness as an aid to piloting for precision maneuvers in low-visibility conditions, for collision avoidance intercept solution, and shadowing, and for aiding SEAL team cast and recovery operations

Author (GRA)

N78-24515* National Aeronautics and Space Administration Langley Research Center Langley Station Va
NON-DESTRUCTIVE METHOD FOR APPLYING AND REMOVING INSTRUMENTATION ON HELICOPTER ROTOR BLADES Patent
Walt C Long and Milton L Williams inventors (to NASA) Issued 4 Apr 1978 8 p Filed 19 Apr 1977 Supersedes N77-22452 (15 - 13 p 1725)
(NASA-Case-LAR-11201-1 US-Patent-4 082 001
US-Patent-Appl-SN-788705 US-Patent-Class-73-756
US-Patent-Class-73-456 US-Patent-Class-416-61
US-Patent-Class-416-144) Avail US Patent Office CSCL 14B

A nondestructive method of applying and removing instrumentation on airfoils

Official Gazette of the U S Patent Office

N78-24544* National Aeronautics and Space Administration Lyndon B Johnson Space Center Houston Tex
STATOR ROTOR TOOLS Patent
Donald D Diamond inventor (to NASA) (Serv-Air Inc Houston Tex) Issued 14 Mar 1978 6 p Filed 8 Nov 1976 Supersedes N77-13062 (15 - 04 p 0426) Sponsored by NASA
(NASA-Case-MSC-16000-1, US-Patent-4,078,290,
US-Patent-Appl-SN-739915 US-Patent-Class-29-252
US-Patent-Class-29-244, US-Patent-Class-29-23 5,
US-Patent-Class-29-156 8R) Avail US Patent Office CSCL 13I

An apparatus and method for removing and reinserting base member segments in an arcuate slot in an engine part are described Each base member separately includes blades or stators holding the engine part in place while manipulating fingers or an arm onto an interfitting abutting relationship with most of the blades A torque force is applied to the base of the blades to move a base member relative to such an arcuate slot

Official Gazette of the U S Patent Office

N78-24556# Pratt and Whitney Aircraft Group, West Palm Beach Fla Government Products Div
DEVELOPMENT OF MAINSHIFT HIGH SPEED CYLINDRICAL ROLLER BEARINGS FOR GAS TURBINE ENGINES Interim Report, 1 Oct 1975 - 1 Apr 1977
P F Brown L J Dobek F C Hsing, and J R Miner Apr 1977 121 p refs
(Contract N00140-76-C-0383)
(AD-A052351 PWA-FR-8615) Avail NTIS HC A06/MF A01 CSCL 21/5

This combined analytical and experimental program is aimed at generating a manual that will permit the design of 3 0 MDN cylindrical roller bearings The roller bearing analysis will be correlated with the results from a series of bearing tests designed to determine, by statistical methods the effect of geometrical variables on bearing performance An existing quasi-static design optimization system has been upgraded and the basic analyses for use in developing a program to predict the dynamic behavior

of roller bearing components are nearly complete A study identified a total of thirty separate bearing parameters that can influence roller skewing and skidding Two groups of 124 mm roller bearing designs were then prepared using statistical design techniques and incorporating parameters from the list of thirty Fabrication of full-scale bearing hardware was completed and testing was initiated on the first group of bearings

Author (GRA)

N78-24557# United Technologies Corp Stratford Conn Sikorsky Aircraft Div

ADVANCED OVERRUNNING CLUTCH TECHNOLOGY

Progress Report, 14 Mar - 14 Jun. 1976

Jules G Kish Dec 1977 316 p refs

(Contract DAAJ02-74-C-0028, DA Proj 1F2-62209-AH-76)

(AD-A052635 USAAMRDL-TR-77-16) Avail NTIS HC A14/MF A01 CSCL 01/3

This report documents a study to find overrunning clutch concepts suitable for use in helicopters Ten designs were selected for in-depth evaluation and from these three were selected for fabrication and testing the spring the sprag and the ramp-roller clutches These performed satisfactorily in the tests, and a design guide was compiled for them (USAAMRDL-TR-77-18)

Author (GRA)

N78-24587# Societe Nationale Industrielle Aerospatiale Suresnes (France) Lab Central

CAN FATIGUE CRACKS BE DETECTED IN AN EARLY STAGE BY ACOUSTIC EMISSION? APPLICATION TO HIGH RESISTANCE LIGHT ALLOYS USED IN AERONAUTICS

C Bathias B Brintet and G Sertour Paris Assoc Aeron et Astronautique de France 1977 11 p refs In FRENCH ENGLISH summary Presented at the 8th World Conf on Nondestructive Testing Cannes France 6-11 Sep 1976

(AAAF-NT-77-35 ISBN-2-7170-0460-2) Avail NTIS HC A02/MF A01 CEDOCAR Paris FF 15 (France and EEC) FF 19 (others)

A study carried out on different types of test pieces (shot blasted anodized notched) has shown that acoustic emission provides an accurate method for following fatigue damage up to crack initiation

ESA

N78-24755# Toronto Univ (Ontario) Inst for Aerospace Studies

THE EFFECTS OF WIND SHEAR ON AIRCRAFT FLIGHT PATH AND METHODS FOR REMOTE SENSING AND REPORTING OF WIND SHEAR AT AIRPORTS

Gaston Beaulieu Feb 1978 61 p refs

(UTIAS-TN-216 CN-ISSN-0082-5263) Avail NTIS HC A04/MF A01

Strong wind shear can cause large flight path disturbances with modern jet transport aircraft The meteorological conditions causing wind shear and aircraft response to wind shear are described in general terms to provide a basic understanding of the wind shear phenomenon The dynamic response of an aircraft/pilot system to wind shear is explained based on one hundred approaches flown with a simple flight simulator in very strong wind shear The basic philosophy of flight control displays and integrated automatic flight control systems is discussed with regard to enhanced flight path and airspeed control under extreme wind shear conditions Wind shear remote sensors now under development are briefly described with their limitations advantages and disadvantages A complete description of an airborne display for wind shear information and a proposed acoustic Doppler installation in an airport environment conclude the present investigation

Author

N78-24808*# New York Univ N Y Courant Inst of Mathematical Sciences

NUMERICAL CALCULATION OF TRANSONIC FLOW PAST A SWEPT WING BY A FINITE VOLUME METHOD

Antony Jameson Dec 1977 25 p refs Presented at the 3d IFIP Conf on Computing Methods in Appl Sci and Eng Versailles France 1973

(Grants NGR-33-016-167 NGR-33-016-201 Contracts N00014-77-C-0032 EY-76-C-02-3077)

(NASA-CR-157012) Avail NTIS HC A02/MF A01 CSCL 09B

The utility of numerical methods for predicting transonic flows over wings and bodies is well established The computer program FLO22 based on a method presented earlier has actually been widely used to calculate the aerodynamic performance of wings of transport aircraft Provided that a correction is made for the displacement effect of the viscous boundary layer this code has been found to give predictions which are accurate enough to serve as a useful design guide The main disadvantages of the scheme used in FLO22 are the use of nonconservative difference formulas which result in a failure to satisfy conservation of mass across shock waves and the difficulty of finding suitable transformations of coordinates to permit the treatment of more complex geometric configurations The method described here is an attempt to overcome these shortcomings while retaining the successful features of the previous method The basic idea is to use a discrete approximation which directly represents a balance of the mass flow through small volume elements This leads to a relatively simple treatment of the potential flow equation in conservation form

Author

N78-24897*# National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio

ACOUSTIC EVALUATION OF A NOVEL SWEPT-ROTOR FAN

James G Lucas Richard P Woodward and Michael J Mackinnon 1978 24 p refs Proposed for Presentation at 11th Fluid and Plasma Dyn Conf Seattle 10-12 Jul 1978 sponsored by AIAA

(NASA-TM-78878 E-9612 AIAA-Paper-78-1121) Avail NTIS HC A02/MF A01 CSCL 20A

Inlet noise and aerodynamic performance are presented for a high tip speed fan designed with rotor blade leading edge sweep that gives a subsonic component of inlet Mach number normal to the edge at all radii The intent of the design was to minimize the generation of rotor leading edge shock waves thereby minimizing multiple pure tone noise Sound power level and spectral comparisons are made with several high-speed fans of conventional design Results show multiple pure tone noise at levels below those of some of the other fans and this noise was initiated at a higher tip speed Aerodynamic performance of the fan did not meet design goals for this first build which applied conventional design procedures to the swept fan geometry

Author

N78-24899# DyTec Engineering, Inc Huntington Beach Calif

ATMOSPHERIC-ABSORPTION ADJUSTMENT PROCEDURE FOR AIRCRAFT FLYOVER NOISE MEASUREMENTS

Final Report, May - Sep 1977

Alan H Marsh Dec 1977 89 p refs

(W1-77-5660-1)

(AD-A051700, DyTec-R-7705, FAA-RD-77-167) Avail NTIS HC A05/MF A01 CSCL 20A

An analytical method was developed for adjusting measured aircraft noise levels for differences in atmospheric absorption between test and reference meteorological conditions along the sound propagation path The method is based on the procedure in the proposed American National Standard ANS S1 26 for calculating pure-tone sound absorption as a function of the frequency of the sound and the temperature, humidity, and

pressure of the air Measured aircraft noise levels are assumed to be 1/3-octave-band sound pressure levels A computer program was written in FORTRAN IV to carry out the calculations The operation of the computer program, the required input data, and all symbols and terms used in the program are described A program listing of source statements is provided Recommendations are given for applying the method to routine processing of aircraft noise measurements Author

N78-24900*# Boeing Commercial Airplane Co, Seattle Wash
LOW FREQUENCY CABIN NOISE REDUCTION BASED ON THE INTRINSIC STRUCTURAL TUNING CONCEPT THE THEORY AND THE EXPERIMENTAL RESULTS, PHASE 2
G SenGupta Mar 1978 104 p refs Sponsored in part by NASA
(Contract F33657-72-C-0829)
(NASA-CR-145262 D6-44283, D748-10113-3) Avail NTIS HC A06/MF A01 CSCL 20A

Low frequency cabin noise and sonically induced stresses in an aircraft fuselage may be reduced by intrinsic tuning of the various structural members such as the skin stringers, and frames and then applying damping treatments on these members The concept is also useful in identifying the key structural resonance mechanisms controlling the fuselage response to broadband random excitation and in developing suitable damping treatments for reducing the structural response in various frequency ranges The mathematical proof of the concept and the results of some

N78-24903*# Boeing Vertol Co, Philadelphia, Pa
EVALUATION OF THE ANNOYANCE DUE TO HELICOPTER ROTOR NOISE Final Report
Harry Sternfeld Jr and Linda Bukowski Doyle Washington NASA Jun 1978 74 p refs
(Contract NAS1-14192)
(NASA-CR-3001) Avail NTIS HC A03/MF A01 CSCL 20A

A program was conducted in which 25 test subjects adjusted the levels of various helicopter rotor spectra until the combination of the harmonic noise and a broadband background noise was judged equally annoying as a higher level of the same broadband noise spectrum The subjective measure of added harmonic noise was equated to the difference in the two levels of broadband noise The test participants also made subjective evaluations of the rotor noise signatures which they created The test stimuli consisted of three degrees of rotor impulsiveness, each presented at four blade passage rates Each of these 12 harmonic sounds was combined with three broadband spectra and was adjusted to match the annoyance of three different sound pressure levels of broadband noise Analysis of variance indicated that the important variables were level and impulsiveness Regression analyses indicated that inclusion of crest factor improved correlation between the subjective measures and various objective or physical measures Author

N78-24999# Defense Systems Management School Fort Belvoir Va
LIFE COST MANAGEMENT, METHODOLOGY, AND CASE STUDIES
Andrew H Berard Oct 1977 64 p refs
(AD-A052388) Avail NTIS HC A04/MF A01 CSCL 14/1

This study project examines the management policies that have initiated O and S cost control and the progress made on O and S costing methodology Costing guidelines prepared by LMI are summarized to provide the reader with an overview of the guidelines content and a preview of CAIG O and S costing methodology guidelines The RAND report on LCC analysis for aircraft turbine engines provides analysis methods that allows performance to be assessed with the present technology and determines cost and schedule risks Further commercial operational and maintenance practices are reviewed for military applicability Three case studies representative of LCC management techniques are discussed in detail showing the impact of logistics alternatives, reliability by design, and maintainability features that contribute towards reduced O and S costs and lower LCC The cases were selected from a LCC Seminar held on 29 Sept 1977 The Army s Black Hawk program, Navy s F-18 program and the Air Force s ARC-164 program are the three case studies selected Important lessons learned on all three of the case studies should serve as models for other programs to follow that are concerned with LCC procurement The results of the case studies provide positive indications that LCC management does work and can provide affordable systems Author (GRA)

N78-25048*# National Aeronautics and Space Administration Wallops Station, Wallops Island Va
PRECISION POSITIONAL DATA OF GENERAL AVIATION AIR TRAFFIC IN TERMINAL AIR SPACE
W E Melson Jr L C Parker A M Northam (Computer Sciences Corp Wallops Island Va), and R P Singh (Computer Sciences Corp Wallops Island Va) May 1978 13 p
(NASA-RP-1020) Avail NTIS HC A02/MF A01 CSCL 02A

Three dimensional radar tracks of general aviation air traffic at three uncontrolled airports are considered Contained are data which describe the position-time histories, other derived parameters and reference data for the approximately 1200 tracks All information was correlated such that the date time flight number and runway number match the pattern type aircraft type, wind visibility and cloud conditions Author

N78-25050# Arinc Research Corp Annapolis Md
LOGISTICS AND OPERATIONAL EFFECTIVENESS OF THE P-3 AIRCRAFT Final Summary Report
Mar 1978 37 p
(Contract N00019-77-C-0309)
(AD-A052239 Rept-1701-01-1-1728) Avail NTIS HC A03/MF A01 CSCL 01/3

This report summarizes a 12-month logistics, engineering, and program analysis effort performed by ARINC Research Corporation for the Naval Air Systems Command It describes the activities that provided the P-3 Project Manager with an independent and objective evaluation of factors affecting the P-3's operational availability and logistic support posture The effort consisted primarily of analysis tasks for the major P-3 modification programs integrated logistic support foreign military sales programs operational readiness programs and P-3 site transition programs Author (GRA)

N78-25051# Administrative Sciences Corp Alexandria Va
NAVAL AIRCRAFT OPERATING AND SUPPORT COST MODEL - FISCAL YEAR 1976 REVISION
Mar 1978 84 p
(Contract N00014-77-C-0180)
(AD-A053180 ASC-R-116) Avail NTIS HC A05/MF A01 CSCL 01/3

This report documents the revisions of a parametric model for estimating Naval aircraft operating and support costs developed by Administrative Sciences Corporation The model provides an estimate of average annual and life cycle O and S costs based on aircraft physical characteristics and basic program parameters using parametric cost-estimating relationships cost factors and throughputs and has been used to support numerous cost analyses prepared for CAIG review as well as other special studies such as the Naval Escort Force Mix Study and the Sea Based Air Study It is updated often in order to remain responsive to each particular analysis to reflect the changing nature of Naval aviation, and simply to remain timely This report reflects the status of the model after incorporation of all FY1976 data The bulk of the report is concerned with providing a clear concise and complete definition of each cost element and the way it is estimated by the model GRA

N78-25054*# Vought Corp Hampton Va
PANELING TECHNIQUES FOR USE WITH THE VORLAX COMPUTER PROGRAM
Glenn L Martin Apr 1978 23 p ref
(Contract NAS1-13500)
(NASA-CR-145364) Avail NTIS HC A02/MF A01 CSCL 01A

A method is presented for determining the geometric input data required by the VORLAX computer program in order to accurately model an aircraft configuration Techniques are described for modeling each of the major components of a configuration and for joining these individual components into a complete configuration The effects of trailing vortex filaments and methods of avoiding their intersection with downstream panels are also discussed The methods presented here are applicable to most conventional aircraft configurations Author

N78-25055*# National Aeronautics and Space Administration Hugh L Dryden Flight Research Center Edwards Calif
FLIGHT-MEASURED PRESSURE CHARACTERISTICS OF AFT-FACING STEPS IN HIGH REYNOLDS NUMBER FLOW AT MACH NUMBERS OF 2 20, 2 50, AND 2 80 AND COMPARISON WITH OTHER DATA
Sheryll Goecke Powers May 1978 38 p refs
(NASA-TM-72855 H-956) Avail NTIS HC A03/MF A01 CSCL 01A

The YF-12 airplane was studied to determine the pressure characteristics associated with an aft-facing step in high Reynolds number flow for nominal Mach numbers of 2 20, 2 50 and 2 80 Base pressure coefficients were obtained for three step heights The surface static pressures ahead of and behind the step were measured for the no-step condition and for each of the step heights A boundary layer rake was used to determine the local boundary layer conditions The Reynolds number based on the length of flow ahead of the step was approximately 10 to the 8th power and the ratios of momentum thickness to step height ranged from 0 2 to 1 0 Base pressure coefficients were compared with other available data at similar Mach numbers and at ratios of momentum thickness to step height near 1 0 In addition the data were compared with base pressure coefficients calculated by a semiempirical prediction method The base pressure ratios are shown to be a function of Reynolds number based on momentum thickness Profiles of the surface pressures ahead of and behind the step and the local boundary layer conditions are also presented Author

N78-25056*# Polytechnic Inst of New York Aerodynamics Labs
A FINITE-STEP METHOD FOR ESTIMATING THE SPANWISE LIFT DISTRIBUTION OF WINGS IN SYMMETRIC, YAWED, AND ROTARY FLIGHT AT LOW SPEEDS
Final Report
A R Krenkel Jun 1978 107 p refs
(Grants NsG-1107 NsG-1300)
(NASA-CR-157043 Poly-M/AE-78-17) Avail NTIS HC A06/MF A01 CSCL 01A

The finite-step method was programmed for computing the span loading and stability derivatives of trapezoidal shaped wings in symmetric, yawed and rotary flight Calculations were made for a series of different wing planforms and the results compared with several available methods for estimating these derivatives in the linear angle of attack range The agreement shown was generally good except in a few cases An attempt was made to estimate the nonlinear variation of lift with angle of attack in the high alpha range by introducing the measured airfoil section data into the finite-step method The numerical procedure was found to be stable only at low angles of attack Author

N78-25057*# Nielsen Engineering and Research Inc, Mountain View Calif
HIGH ANGLE CANARD MISSILE TEST IN THE AMES 11-FOOT TRANSONIC WIND TUNNEL
Richard G Schwind Jun 1978 81 p refs
(Contract NAS2-9211)
(NASA-CR-2993 NEAR-TR-134) Avail NTIS HC A05/MF A01 CSCL 01A

Four blunted ogive-cylinder missile models with a length-to-diameter ratio of 10 4 were tested at transonic speeds and large angles of attack The configurations are body body with tail panels, body with canards and body with canards and tails Forces and moments from the entire model and each of the eight fins were measured over the pitch range of 20 deg to 50 deg and 0 deg to 45 deg roll Canard deflection angles between 0 deg and 15 deg were tested Exploratory vapor screen flow visualization testing was also performed Sample force and moment data are reported along with observations from the vapor screen tests Author

N78-25058*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
A DISTRIBUTED VORTEX METHOD FOR COMPUTING THE VORTEX FIELD OF A MISSILE
Raymond L Barger Jun 1978 19 p refs
(NASA-TP-1183 L-11963) Avail NTIS HC A02/MF A01 CSCL 01A

Vortex sheet development in the flow field of a missile was investigated by approximating the sheets in the cross-flow plane with short straight-line segments having distributed vorticity In contrast with the method that represents the sheets as lines of discrete vortices this distributed vortex method produced calculations with a high degree of computational stability Author

N78-25059*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
AERODYNAMIC CHARACTERISTICS AT MACH NUMBER 0 2 OF A WING-BODY CONCEPT FOR A HYPERSONIC RESEARCH AIRPLANE
James L Dillon and Theodore R Creel Jr Jun 1978 48 p refs
(NASA-TP-1189 L-12063) Avail NTIS HC A03/MF A01 CSCL 01A

The static aerodynamic characteristics were studied on a model wing-body concept for a high-speed research airplane in a low-turbulence pressure tunnel The experiment consisted of configuration buildup from the basic body by adding a wing center vertical tail three-module scramjet and six-module scramjet engine The test Mach number was 0 2 at Reynolds numbers based on fuselage length ranging from 2 78 x 1 million to 23 x 2 million The test angle-of-attack range was approximately -5 to 30 deg at constant angles of sideslip of 0 deg and 4 deg The elevons were deflected from 5 deg to -15 deg Roll and yaw control were investigated Author

N78-25060*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
EFFECTS OF SPANWISE NOZZLE GEOMETRY AND LOCATION ON THE LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A VECTORED-ENGINE-OVER-WING CONFIGURATION AT SUBSONIC SPEEDS
Laurence D Leavitt and Long P Yip May 1978 78 p refs
(NASA-TP-1215 L-12015) Avail NTIS HC A05/MF A01 CSCL 01A

A V/STOL tunnel study was performed to determine the effects of spanwise blowing on longitudinal aerodynamic characteristics of a model using a vectored-over-wing powered lift concept The effects of spanwise nozzle throat area internal and external nozzle geometry and vertical and axial location were investigated These effects were studied at a Mach number of 0 186 over an angle-of-attack range from 14 deg to 40 deg A high pressure air system was used to provide jet-exhaust simulation Engine nozzle pressure ratio was varied from 1 0 (jet off) to approximately 3 75 Author

N78-25067# National Technical Information Service Springfield Va
PARACHUTES AND DECELERATORS, VOLUME 2 A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1974 - Mar 1978
Guy E Habercom Jr Apr 1978 286 p Supersedes NTIS/PS-77/0317 NTIS/PS-76/0259 and NTIS/PS-75/224 (NTIS/PS-78/0320 NTIS/PS-77/0317 NTIS/PS-76/0259, NTIS/PS-75/224) Avail NTIS HC $28 00/MF $28 00 CSCL 01C

Citations describe devices such as towplates ballutes servoactuators patented mechanisms semiautomatic openers and release systems This document discusses inflatable supersonic autorotor retrorocket and other structures Descent characteristics trajectories aerodynamic reefing shroud line and snatch forces and flare engineering are included Also presented are materials on flight testing models wind tunnel tests and computer aided design Applications are to target drone retrieval air drop and delivery coastal upwelling sewage water tracking and mine ventilation GRA

N78-25068*# Virginia Univ Charlottesville Research Labs for the Engineering Sciences
SURVEY OF AIR CARGO FORECASTING TECHNIQUES Final Report
A R Kuhlthan and R S Vermuri May 1978 159 p refs (Contract NAS1-14908)
(NASA-CR-145329 UVA/528156/CE78/110) Avail NTIS HC A08/MF A01 CSCL 05A

Forecasting techniques currently in use in estimating or predicting the demand for air cargo in various markets are discussed with emphasis on the fundamentals of the different forecasting approaches References to specific studies are cited when appropriate The effectiveness of current methods is evaluated and several prospects for future activities or approaches are suggested Appendices contain summary type analyses of about 50 specific publications on forecasting and selected bibliographies on air cargo forecasting air passenger demand forecasting and general demand and modalsplit modeling Author

N78-25069*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
PRELIMINARY ANALYSIS OF HUB AND SPOKE AIR FREIGHT DISTRIBUTION SYSTEM
Allen H Whitehead Jr Apr 1978 36 p refs
(NASA-TM-72656) Avail NTIS HC A03/MF A01 CSCL 01C

A brief analysis is made of the hub and spoke air freight distribution system which would employ less than 15 hub centers world wide with very large advanced distributed-load freighters providing the line-haul delivery between hubs This system is compared to a more conventional network using conventionally-designed long-haul freighters which travel between numerous major airports The analysis calculates all of the transportation costs including handling charges and pickup and delivery costs The results show that the economics of the hub/spoke system are severely compromised by the extensive use of feeder aircraft to deliver cargo into and from the large freighter terminals Not only are the higher costs for the smaller feeder airplanes disadvantageous but their use implies an additional exchange of cargo between modes compared to truck delivery The conventional system uses far fewer feeder airplanes and in many cases, none at all When feeder aircraft are eliminated from the hub/spoke system however that system is universally more economical than any conventional system employing smaller line-haul aircraft Author

N78-25071*# National Aeronautics and Space Administration Ames Research Center, Moffett Field Calif
NASA AVIATION SAFETY REPORTING SYSTEM Quarterly Report, 1 Apr - 30 Jun 1977
Apr 1978 62 p Prepared in cooperation with Battelle Columbus Labs Mountain View Calif
(NASA-TM-78476 A-7373 QR-5) Avail NTIS HC A04/MF A01 CSCL 02A

Reports describing various types of communication problems are presented along with summaries dealing with judgment and decision making Concerns relating to the ground proximity warning system are summarized and several examples of true terrain proximity warnings are provided An analytic study of reports relating to profile descents was performed Problems were found to be associated with charting and graphic presentation of the descents with lack of uniformity of the descent procedures among facilities using them and with the flight crew workload engendered by profile descents particularly when additional requirements are interposed by air traffic control during the execution of the profiles A selection of alert bulletins and responses to them were reviewed Author

N78-25077# Nationaal Lucht-en Ruimtevaartlaboratorium Amsterdam (Netherlands)
A NON-STATIONARY MODEL FOR ATMOSPHERIC TURBULENCE PATCHES FOR THE PREDICTION OF AIRCRAFT DESIGN LOADS
R Noback 19 Nov 1976 67 p refs
(NLR-TR-76131-U ICAF-999) Avail NTIS HC A04/MF A01

A model for atmospheric turbulence is proposed It is assumed that atmospheric turbulence appears in patches and that within the patches the turbulence can be described as a modulated Gaussian process Statistical properties of the model and of atmospheric turbulence are compared Using data from various sources a probability distribution function for patch lengths was derived and the relation between patch intensity and patch length was investigated Author

N78-25078*# Kansas Univ Center for Research Inc Lawrence
A STUDY OF COMMUTER AIRPLANE DESIGN OPTIMIZATION Status Report
Bob Van Keppel Han Eysink Jim Hammer Kevin Hawley Paul Meredith and J Roskam 12 May 1978 457 p refs (Grant NsG-2145)
(NASA-CR-157210 KU-FRL-313-5 SR-4) Avail NTIS HC A20/MF A01 CSCL 01C

The usability of the general aviation synthesis program (GASP) was enhanced by the development of separate computer subroutines which can be added as a package to this assembly of computerized design methods or used as a separate subroutine program to compute the dynamic longitudinal lateral-directional stability characteristics for a given airplane Currently available analysis methods were evaluated to ascertain those most appropriate for the design functions which the GASP computerized design program performs Methods for providing proper constraint and/or analysis functions for GASP were developed as well as the appropriate subroutines A R H

N78-25079*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
PRELIMINARY STUDY OF A LARGE SPAN-DISTRIBUTED-LOAD FLYING-WING CARGO AIRPLANE CONCEPT
Lloyd S Jernell May 1978 105 p refs
(NASA-TP-1158 L-11943) Avail NTIS HC A06/MF A01 CSCL 01C

An aircraft capable of transporting containerized cargo over intercontinental distances is analyzed The specifications for payload weight density and dimensions in essence configure the wing and establish unusually low values of wing loading and aspect ratio The structural weight comprises only about 18 percent of the design maximum gross weight Although the geometric aspect ratio is 4 53 the winglet effect of the wing-tip-mounted vertical tails increase the effective aspect ratio to approximately 7 9 Sufficient control power to handle the large rolling moment of inertia dictates a relatively high minimum approach velocity of 315 km/hr (170 knots) The airplane has acceptable spiral Dutch roll and roll-damping modes A hardened stability augmentation system is required The most significant noise source is that of the airframe However for both take-off and approach the levels are below the FAR-36 limit of 108 db The design mission fuel efficiency is approximately 50 percent greater than that of the most advanced currently operational large freighter aircraft The direct operating cost is significantly lower than that of current freighters the advantage increasing as fuel price increases Author

N78-25080*# Sikorsky Aircraft Stratford Conn
OIL-AIR MIST LUBRICATION FOR HELICOPTER GEARING Final Report
F McGrogan Dec 1976 52 p refs
(Contract NAS3-18538)
(NASA-CR-135081 SER-50959) Avail NTIS HC A04/MF A01 CSCL 01C

The applicability of a once-through oil mist system to the lubrication of helicopter spur gears was investigated and compared to conventional jet spray lubrication In the mist lubrication mode cooling air was supplied at 366K (200 F) to the out of mesh location of the gear sets The mist air was also supplied at 366K (200 F) to the radial position mist nozzle at a constant rate of 0 0632 mol/s (3 SCFM) per nozzle The lubricant contained in the mist air varied between 32 - 44 cc/hour In the recirculating jet spray mode the flow rate was varied between 1893 - 2650 cc/hour Visual inspection revealed the jet spray mode produced a superior surface finish on the gear teeth but a thermal energy survey showed a 15 - 20% increase in heat generated The gear tooth condition in the mist lubrication mode system could be improved if the cooling air and lubricant/air flow ratio were increased The test gearbox and the procedure used are described Author

N78-25081# Kaman Avidyne Burlington Mass
MODELING OF THE UH-1B TAIL BOOM FOR ANALYSIS BY THE NASTRAN COMPUTER PROGRAM Final Report, 19 Apr - 19 Oct 1976
Raffi P Yeghiayan Feb 1978 52 p
(Contract DAAD05-76-C-0763)
(AD-A052303 KA-TR-139 ARBRL-CR-00358) Avail NTIS HC A04/MF A01 CSCL 01/3

A representative tail boom of the UH-1B helicopter is modeled for dynamic structural analysis by the NASTRAN computer program The finite-element model employs beam and plate elements to construct the structural model which will subsequently be used to study the effects of simulated nuclear detonations subjecting the model to blast overpressure exposure with and without thermal effects The lower mode shapes and frequencies of the structural model are generated and presented as a validation check Author (GRA)

N78-25082# Cleveland Pneumatic Tool Co Ohio
GRAPHITE COMPOSITE LANDING GEAR COMPONENT UPPER DRAG BRACE HARDWARE FOR F-15 AIRCRAFT Final Report, Jul 1975 - Jan 1977
Myron J Bieber and Walter W Fricker Sep 1977 160 p
(Contract F33615-75-C-3152 AF Proj 1369)
(AD-A052764 AFFDL-TR-77-88) Avail NTIS HC A06/MF A01 CSCL 01/3

This report summarizes work performed to design fabricate and test a graphite epoxy composite material upper drag brace suitable for direct replacement of the current titanium upper drag brace for the F-15 aircraft landing gear assembly Design fabrication test procedures test results and failure analysis are presented in detail The composite material brace failed at less than design load The program established at the present time that drag braces and similar landing gear hardware can not be satisfactorily fabricated from graphite epoxy material for use as a direct replacement of existing metallic hardware in some applications The volume and shape of available space in these direct replacement applications does not normally allow the use of optimum graphite epoxy material design and fabrication techniques However as demonstrated by the successful development of a graphite epoxy side brace suitable for direct replacement of existing metallic hardware on the A-37B aircraft weight and cost saving applications to current aircraft are feasible Therefore each potential application must be individually evaluated Work is required to improve analytical fabrication and nondestructive inspection techniques for graphite epoxy materials It can be reasonably expected that current and future efforts by the Air Force industry and the educational community aimed at these improvements will increase the profitable application of graphite epoxy material to landing gear hardware Author (GRA)

N78-25083# Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
AN INVESTIGATION OF THE TRACKING PERFORMANCE OF THE FIRE FLY MANUAL DIRECTOR GUNSIGHT FOR AIR-TO-AIR GUNNERY M S Thesis
David L Frostman Dec 1977 179 p refs
(AD-A053348 AFIT/GGC/EE/77-5) Avail NTIS HC A09/MF A01 CSCL 19/5

The tracking performance of the Fire Fly manual director gunsight is evaluated during the terminal phase of air-to-air gunnery using the F-106 aircraft as the test bed A digital simulation of the closed loop tracking task is performed The multi-axis analytical pilot model is adapted for use in the F-106/Fire Fly gunsight simulation A set of nominal pilot model parameter values determined by root locus analysis is used in simulating the tracking performance of the Fire Fly gunsight against targets in constant altitude constant airspeed constant rate turns at bank angles of 30 60 and 70 degrees The tracking error responses are found to have characteristics similar to those observed in the tracking responses obtained from man-in-the-loop simulation studies The dependence of the tracking error responses on the pilot model parameter values is demonstrated by simulation runs in which several pilot model parameter values are varied GRA

N78-25084# Naval Air Test Center Patuxent River Md
ENVIRONMENTAL REQUIREMENTS FOR SIMULATED HELICOPTER/VTOL OPERATIONS FROM SMALL SHIPS AND CARRIERS

C W Woomer and R L Williams 12 Apr 1978 35 p refs (AD-A053078 NATC-TM-78-2-RW) Avail NTIS HC A03/MF A01 CSCL 05/9

Helicopter/VTOL operations from ships create demanding flying qualities and performance requirements The environment in which takeoff and landing evolutions must occur has a significant influence on these tasks Aircraft and simulator designers each in their own way must make appropriate provisions for environmental factors such as visual landing aids (VLA) ship motion turbulence relative wind and ground effect The paper discusses the specific requirements for the simulated environment to satisfactorily provide training for shipboard takeoff and landing Test techniques to validate trainer fidelity in flying qualities performance and environmental simulation are discussed The specific subject of calligraphic visual systems is extensively covered including a report on the current state-of-the-art as related to the at-sea environment Finally the utilization of a high-fidelity trainer is explored for research as well as for expanded fleet training GRA

N78-25085# Grumman Aerospace Corp Bethpage N Y
DEMONSTRATION OF ACOUSTIC EMISSION SYSTEM FOR DAMAGE MONITORING OF FULL SCALE METALLIC AIRCRAFT STRUCTURES DURING FATIGUE TESTING Final Report, Aug 1976 - Jul 1977
Alan D Hencken and Charles R Horak Sep 1977 82 p (Contract F33615-76-C-3073)
(AD-A053108 AFFDL-TR-77-87) Avail NTIS HC A05/MF A01 CSCL 01/3

This report describes the acoustic emission monitoring work performed on a full scale metallic aircraft wing carry through structure of the swing wing bomber type The structure was monitored during fatigue testing with a Grumman developed system The program was designed to prove the feasibility of using a real time acoustic emission monitoring system to detect and locate crack propagation in a full scale complex airframe structure during fatigue cycling The report includes a description of the Acoustic Emission System operation and the concepts of noise discrimination used on fatigue tests The installation and monitoring techniques used on the fatigue test are described The test results the problems associated with monitoring the complex structure the conclusions and system monitoring recommendations are also discussed in this report Author (GRA)

N78-25086# Army Test and Evaluation Command Aberdeen Proving Ground Md
TEST OPERATIONS PROCEDURES PHYSICAL CHARACTERISTICS AVIATION MATERIAL
Roy L Miller 29 Nov 1977 15 p Supersedes the aviation portions of TOP-1-3-5
(AD-A053196 TOP-7-3-500 TOP-1-3-5) Avail NTIS HC A02/MF A01 CSCL 15/5

This document identifies testing methods and techniques necessary to determine the degree to which Army aviation materiel s physical characteristics are determined Author (GRA)

N78-25087# Rockwell International Corp Los Angeles Calif
PRELIMINARY DESIGN OF LOW-COST TITANIUM STRUCTURE Final Report, Apr 1976 - Sep 1977
J K Pulley Sep 1977 160 p refs
(Contract F33615-76-C-3066)
(AD-A053327 NA-77-389 AFFDL-TR-77-81) Avail NTIS HC A08/MF A01 CSCL 01/3

Results of a study program to evaluate the application of advanced titanium fabrication techniques to the Air Force B-1 bomber engine nacelle structure for improvements in cost and weight are presented There are five items for the study Two of them are primary structure one of which is a removable access panel The remaining three items are secondary structure Superplastic forming with concurrent diffusion bonding including expanded sandwich were investigated Weight savings range up to 49 percent Potential weight savings are 362 pounds per aircraft Cost savings range up to 69 percent resulting in a potential savings of up to $48 622 800 for 240 aircraft Author (GRA)

N78-25088*# National Aeronautics and Space Administration Hugh L Dryden Flight Research Center Edwards Calif
AIR SPEED AND ATTITUDE PROBE Patent Application
Merle A Economu inventor (to NASA) Filed 30 May 1978 13 p
(NASA-Case-FRC-11009-1 US-Patent-Appl-SN-910708) Avail NTIS HC A02/MF A01 CSCL 01D

A probe was designed which can be mounted on a data boom and extended in parallel with the longitudinal axis of symmetry of an aircraft to provide local air speed and aircraft attitude intelligence The probe employs both static pressure and total pressure transducers mounted in a tubular body supported for wind induced angular displacement about an axis normally related to the longitudinal axis of the aircraft NASA

N78-25089* National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
GAS TURBINE ENGINE WITH RECIRCULATING BLEED Patent
Arthur P Adamson inventor (to NASA) (GE Cincinnati Ohio) Issued 11 Apr 1978 5 p Filed 14 Jun 1976 Sponsored by NASA
(NASA-Case-LEW-12452-1 US-Patent-4,083 181
US-Patent-Appl-SN-695513, US-Patent-Class-60-39 52
US-Patent-Class-60-226R) Avail US Patent Office CSCL 21E

Carbon monoxide and unburned hydrocarbon emissions in a gas turbine engine are reduced by bleeding hot air from the engine cycle and introducing it back into the engine upstream of the bleed location and upstream of the combustor inlet As this hot inlet air is recycled the combustor inlet temperature rises rapidly at a constant engine thrust level In most combustors, this will reduce carbon monoxide and unburned hydrocarbon emissions significantly The preferred locations for hot air extraction are at the compressor discharge or from within the turbine whereas the preferred reentry location is at the compressor inlet Official Gazette of the U S Patent Office

N78-25090* National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
COUNTER PUMPING DEBRIS EXCLUDER AND SEPARATOR Patent
Lawrence P Ludwig inventor (to NASA) Issued 18 Apr 1978 5 p Filed 31 Mar 1976 Supersedes N76-20487 (14 - 11 p 1394)
(NASA-Case-LEW-11855-1 US-Patent-4 084 825
US-Patent-Appl-SN-672222 US-Patent-Class-277-25
US-Patent-Class-277-134) Avail US Patent Office CSCL 21E

A dirt separator and excluder for removing entrained debris from gas turbine shaft seals is described A helical groove pattern is constructed on the rotating shaft with the pumping pattern such that it tends to pump seal pressurizing gas toward the gas turbine seal A second helical groove pattern is provided on the stationary housing or counter rotating member coaxial with the shaft and this pattern is designed to provide pumping in the direction opposite from that of the groove pattern on the shaft Gas with entrained debris entering this grooved area will be subjected to high centrifugal forces due to the swirl motion induced by the groove pattern and the rotation of the shaft This debris is centrifuged outwardly into the outer groove pattern on the housing or counter rotating member Because the outer groove pattern has a pumping direction opposite from that of the seal dirt is pumped away from the seal and can be collected in a suitable debris trap remote from the seal location Official Gazette of the U S Patent Office

N78-25091 Ecole Polytechnique Federale de Lausanne (Switzerland) Inst de Thermique Appliquee
DEPOSITION OF FINE PARTICLES IN THE OPENING OF FILM-COOLED GAS TURBINE BLADES
Jean-Claude Mevillot Zurich Juris-Verlag 1975 197 p refs In FRENCH ENGLISH summary
(EPFL-ITA-2 ISBN-3-260-04048-X) Avail Juris-Verlag Sw Fr 16

The film cooled blades of high temperature gas turbines have tiny cooling air-openings on the blade surface which could eventually get blocked by deposition of fine particles contained in the hot gas formed e g in the combustion chamber To study the risk of blockage two fundamental problems must be treated The trajectories of the particles near the blades and in the cooling-air holes for which the impinging mass-rate is calculated for statistical distributions of the particle size and the problem of adhesion in order to decide whether the particle adheres or is repelled after impact are both studied The governing parameters for both problems are defined together with the probable order of magnitude for application All results are presented in a dimensionless manner in order to facilitate the transposition to any practical case The theoretical results were verified on several experimental stands As a result only the cooling holes near the leading hedge of blades risk being blocked by particles If the cooling air flows correctly little is to be feared from dry solid particles (carbon) Weaker particles existing e g during the starting of the combustion can be more dangerous In any case particles less than 1 5 diameter will not reach the cooling hole walls Author (ESA)

N78-25092*# Pennsylvania State Univ University Park Dept of Aerospace Engineering
RESEARCH ON THE STATICALLY THRUSTING PROPELLER Final Report, Mar 1970 - Jun 1978
Joseph J Eisenhuth Jun 1978 41 p refs
(Grant NGL-39-009-172)
(NASA-CR-157214) Avail NTIS HC A03/MF A01 CSCL 01A

Methods for calculating the induced flow at propeller blades were analyzed by treating the wake formation as an initial problem in time An unsteady vortex lattice technique was applied to the wake formation and the vortex core size was studied B B

N78-25093# National Aerospace Lab Tokyo (Japan)
A HIGH-PRESSURE, SECTOR-SHAPED MODEL COMBUSTOR TEST FACILITY FOR DEVELOPMENT OF TURBOFAN ENGINES
Kunio Suzuki Kenji Nishio Shoji Horiuchi Mamoru Koshinuma Yujiro Kabe and Kyuzo Ishihara Nov 1977 32 p refs In JAPANESE ENGLISH summary
(NAL-TR-517) Avail NTIS HC A03/MF A01

A high-pressure blow-down type turbine combustor test facility is reported that has a capacity of up to 30 atm of air from ambient temperature to 720 K The test section can supply an airflow rate of either 10 kg/s in weight or 0 6 cu m/s in volume at the maximum The combustor inlet temperature and pressure are independently regulated Test duration is limited to between 60 and 100 seconds depending on the experimental condition Control of the facility and experimental measurements are conducted by a minicomputer Author

N78-25094# National Aerospace Lab Tokyo (Japan)
ACOUSTICS AND PERFORMANCE OF HIGH-SPEED, UNEQUALLY SPACED FAN ROTORS
Shoichi Fujii Hideo Nishiwaki and Katsumi Takeda Feb 1977 20 p refs In JAPANESE ENGLISH summary
(NAL-TR-526) Avail NTIS HC A02/MF A01

The effects of uneven blade spacing on the acoustic and aerothermodynamic characteristics of high-speed high-pressure-ratio fan rotors were measured at two selected spacing configurations A test rig consisting of inlet guide vanes and transonic rotor blades was employed to explore the redistribution of harmonics sound energy into a series of multiple tones of lower sound pressure level The measured data indicated that a 10 percent modulated rotor exhibited a six to eight decibel decrease in sound pressure level as compared with the original first blade passage frequency harmonic Disadvantages in aerodynamic performance resulting from spacing modulation were not unfavorable for 10 percent modulated blades However with 5 percent modulated blades, serious deterioration in aerodynamic performance was observed particularly near the blade tip section which produced an unfavourable acoustic signature A calculation method assuming a pulse event for each blade sound pressure provided agreeable results with the measured data Author

N78-25095# National Mechanical Engineering Research Inst Pretoria (South Africa) Aeronautics Research Unit
PERFORMANCE TESTS AND DESIGN MODIFICATIONS OF A WANKEL TYPE ROTARY COMBUSTION AUTOMOBILE ENGINE IN ORDER TO DETERMINE ITS SUITABILITY FOR AIRCRAFT APPLICATION
E R Leeman A J VanWyk and I S Myburgh Jun 1977 19 p refs
(CSIR-ME-1521) Avail NTIS HC A02/MF A01

Performance tests and design modifications are reported for a standard production Mazda RX2 automobile engine of the Wankel type in order to make it suitable for aircraft applications Author

N78-25096# Maxwell Labs Inc Woburn Mass Utility Products Div
INDUCTOR NETWORK DEVELOPMENT FOR AIRCRAFT HIGH POWER SUPPLIES Final Report, Jan 1974 - Feb 1977
J Tenko R L Bryan S Ghoshroy L M Lontai and O K Sonju Apr 1977 248 p
(Contract F33615-74-C-20 AF Proj 3145)
(AD-A052750 AFAPL-TR-77-15) Avail NTIS HC A11/MF A01 CSCL 10/2

This report presents the results of a study program undertaken to perform a comparative analysis of several approaches to the generation of high electrical power by storing tens to hundreds of kilojoules of energy in a compact superconducting inductive system with efficient extraction in short bursts at high repetition rates The critical factors for the comparison were the weight volume dissipation and reliability of the system and components for various operating regimes characterized by pulse power repetition rate and pulse shape Research and development work hitherto undertaken in the U S and abroad indicate the engineering feasibility of operating inductive storage systems storing ten to perhaps one hundred kilojoules of energy with extraction rates of tens of pulses per second at pulse durations of the order of a few hundred microseconds with state-of-the-art technology The major effort of this study was directed towards developing analytical tools to predict the performance of superconducting coils at repetition rates of 100 - 1000 pps with pulse discharge times of 20 - 40 microseconds and to evaluate the relative merits of different circuit configurations for storage and extraction of energy at high average power (3 - 10 MW) At frequencies of a few hundred pulses per second it appears that inductive storage has a distinct advantage over capacitive storage at power levels of the order 1 - 10 MW GRA

N78-25097# McDonnell Aircraft Co St Louis Mo
VARIABLE CYCLE ENGINE EVALUATIONS FOR SUPERSONIC V/STOL FIGHTERS PHASE 2 AND 3 TECHNICAL REPORT Final Report, Jun 1975 - Mar 1978
J E Cupstid and D G Glennie Apr 1978 153 p refs
(Contract N00140-75-C-0034)
(AD-A053361) Avail NTIS HC A08/MF A01 CSCL 21/5

Variable cycle engines (VCE) have been evaluated using advanced V/STOL fighter designs The VCE payoffs were assessed in terms of total weapon system cost effectiveness and results indicate that they offer potential benefits in supersonic V/STOL fighters A systematic engine/airframe evaluation procedure was developed and used to assess interactions for advanced engine concepts in L - L/C aircraft designs The evaluation procedure provides a rapid and inexpensive technique for evaluating engine concepts considering a large matrix for engine and airframe design and sizing variables The procedure was used to establish a parametric data base using both fixed cycle turbofans and variable geometry turbine turbojets Specific engine/airframe designs were then selected for detailed comparisons Engine/airframe design evaluations were also conducted using a variable cycle turbofan engine capable of being used with both L - L/C and L/C aircraft These aircraft designs were compared to the fixed cycle turbofan and variable geometry turbine turbojet aircraft designs in terms of TOGW performance life cycle cost and operational flexibility Author (GRA)

N78-25098# McDonnell Aircraft Co St Louis Mo
VARIABLE CYCLE ENGINE EVALUATIONS FOR SUPER-

SONIC V/STOL FIGHTERS MANAGEMENT SUMMARY REPORT Final Summary Report, Jun 1975 - Mar 1978
J E Cupstid and D G Glennie Apr 1978 58 p refs
(Contract N00140-75-C-0034)
(AD-A053362) Avail NTIS HC A04/MF A01 CSCL 21/5
For abstract see N78-25097

N78-25099# National Technical Information Service, Springfield Va
AIRCRAFT SONIC BOOM EFFECTS ON BUILDINGS A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Feb 1978
Guy E Habercom Jr Mar 1978 77 p Supersedes NTIS/PS-77/0219 NTIS/PS-77/0176 2 Vol
(NTIS/PS-78/0239 NTIS/PS-77/0219 NTIS/PS-76/0176)
Copyright Avail NTIS HC $28 00/MF $28 00 CSCL 20A
Research findings are cited on the effects of sonic booms on buildings structural components forms windows and walls Test-house investigations are included along with damage analysis and vibration response Documentation is made on residential buildings Other topics contained in the volume range from theory to failure analysis Sonic boom propagation and effects on biological forms including human responses are cited in separate bibliographies GRA

N78-25100# National Technical Information Service Springfield Va
AIRCRAFT SONIC BOOM STUDIES ON AIRCRAFT FLIGHT, AIRCRAFT DESIGN, AND MEASUREMENT A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Feb 1978
Guy E Habercom Jr Mar 1978 187 p Supersedes NTIS/PS-77/0218 NTIS/PS-76/0175 2 Vol
(NTIS/PS-78/0238 NTIS/PS-77/0218 NTIS/PS-76/0175)
Copyright Avail NTIS HC $28 00/MF $28 00 CSCL 20A
The reports discuss aerodynamic design of aircraft and wings flight characteristics and maneuvers supersonic transport characteristics acoustic fields and noise measurement government policies and regulations meteorological parameters shock waves and supersonic and hypersonic wind tunnel tests along with other theoretical and general investigations Structural and biological effects are documented in separate published searchers GRA

N78-25101*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
MODAL CONTROL THEORY AND APPLICATION TO AIRCRAFT LATERAL HANDLING QUALITIES DESIGN
S Srinathkumar Jun 1978 63 p refs
(NASA-TP-1234 L-12177) Avail NTIS HC A04/MF A01 CSCL 01C
A multivariable synthesis procedure based on eigenvalue/eigenvector assignment is reviewed and is employed to develop a systematic design procedure to meet the lateral handling qualities design objectives of a fighter aircraft over a wide range of flight conditions The closed loop modal characterization developed provides significant insight into the design process and plays a pivotal role in the synthesis of robust feedback systems The simplicity of the synthesis algorithm yields an efficient computer aided interactive design tool for flight control system synthesis Author

N78-25135*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
ENVIRONMENTAL EFFECTS ON COMPOSITES FOR AIRCRAFT
Richard A Pride May 1978 24 p refs Presented at CTOL Transport Technol Conf Hampton Va 28 Feb - 3 Mar 1978 Published in NASA-CP-2036
(NASA-TM-78716 L-12288) Avail NTIS HC A02/MF A01 CSCL 11D
A number of ongoing long-term environmental effects programs for composite materials are evaluated The flight service experience was evaluated for 142 composite aircraft components after more than 5 years and 1 million successful component flight hours Ground-based outdoor exposures of composite material coupons after 3 years of exposure at 5 sites have reached equilibrium levels of moisture pickup which are predictable Solar ultraviolet-induced material loss is discussed for these same exposures No significant degradation was observed in residual strength for either stressed or unstressed specimens or for exposures to aviation fuels and fluids Author

N78-25199# Nationaal Lucht-en Ruimtevaartlaboratorium Amsterdam (Netherlands)
HEAT TREATMENT STUDIES OF ALUMINUM ALLOY TYPE 7050 FORGINGS THE EFFECT OF HEAT TREATMENT ON A VARIETY OF ENGINEERING PROPERTIES Interim Report
L Schra and H P vanLeeuwen 19 Jan 1976 131 p
(NLR-TR-76008-U IR-2) Avail NTIS HC A07/MF A01
The effect of variety of heat treatments on various engineering properties was studied with the aim to derive an optimum heat treatment The engineering properties comprised Vickers hardness short-time tensile strength fatigue crack propagation resistance fracture toughness and stress corrosion resistance The test results were compared with those obtained in earlier investigations on the older forging alloys of American and British origin 7079 and DTD 5024 and on the newly developed German forging alloy AZ74 61 The performance of the alloy 7050 proved to be generally superior to that of AZ74 61 and far superior to that of 7079 and DTD 5024 However it was found that quenching in boiling water leads to relatively inferior fracture toughness and stress corrosion properties while in the SCC resistant condition the alloy proved to be very susceptible to general corrosive attack if exposed to an aggressive environment Author

N78-25235*# Gordian Associates Inc New York
COMPUTER MODEL FOR REFINERY OPERATIONS WITH EMPHASIS ON JET FUEL PRODUCTION VOLUME 3 DETAILED SYSTEMS AND PROGRAMMING DOCUMENTATION Final Report
Daniel N Dunbar and Barry G Tunnah 27 Jun 1978 53 p
(Contract NAS3-20620)
(NASA-CR-135335 Rept-1099-1-Vol-3) Avail NTIS HC A04/MF A01 CSCL 21D
The FORTRAN computing program predicts flow streams and material energy and economic balances of a typical petroleum refinery, with particular emphasis on production of aviation turbine fuels of varying end point and hydrogen content specifications The program has a provision for shale oil and coal oil in addition to petroleum crudes A case study feature permits dependent cases to be run for parametric or optimization studies by input of only the variables which are changed from the base case Author

N78-25239# Exxon Research and Engineering Co Linden N J Government Research Lab
EVALUATION OF METHODS TO PRODUCE AVIATION TURBINE FUELS FROM SYNTHETIC CRUDE OILS, PHASE 3, VOLUME 3 Final Report, 24 Apr 1976 - 30 Apr 1977
William F Taylor J L Kaufman E C Brown A R Cunningham and C A Smith Jun 1977 88 p refs
(Contract F33615-74-C-2036 AF Proj 3048)
(AD-A053106 EXXON/GRU 3PEA 77-Vol-3
AFAPL-TR-75-10-Vol-3) Avail NTIS HC A05/MF A01 CSCL 21/4

An engineering planning study was made of the effect of processing shale oil in a refinery processing both shale oil and petroleum to a full product slate including jet fuel This study was part of an overall program whose object was to investigate the feasibility of producing aviation turbine fuels from synthetic crude oils In this Phase 3 engineering planning study the results and conclusions of the Phase 1 state-of-the-art assessment and Phase 2 pilot plant experimental study were further investigated The Exxon RESCUE Linear Program for Refinery Planning was used to provide a framework for the analysis The study which involved a number of arbitrary but well-defined assumptions was done in the context of a grass roots refinery processing shale oil and petroleum in segregated operations Shale oil processing was restricted to distillation and hydrotreating of the kerosene and gas oil fractions whereas petroleum processing involved a full spectrum of refinery processes with a relatively high level of conversion of heavier fractions to lighter fractions to meet a high motor gasoline demand GRA

N78-25240# Exxon Research and Engineering Co Linden N J Government Research Lab

ALTERNATE FUELS NITROGEN CHEMISTRY Final Technical Report, 19 Oct 1976 - 20 Oct 1977

John W Frankenfeld and William F Taylor Nov 1977 62 p refs

(Contract N00019-76-C-0675)

(AD-A053299 EXXON/GRUS 1KWC 77) Avail NTIS HC A04/MF A01 CSCL 21/4

An investigation of the effects of nitrogen compounds on sediment formation was initiated Several different nitrogen compounds were studied including 2 5-dimethylpyrrole indole carbazole and a number of aromatic and aliphatic amines The diluent employed was purified n-decane All of the compounds caused darkening of the fuel although appreciable amounts of sediment were formed only with the pyrrole derivatives The sediment formation was found to be strongly catalyzed by light and by organic acids Some phenols retarded the sedimentation A start was made toward characterizing the sediment obtained from 2 5-dimethylpyrrole It appeared to be a low molecular weight oligomer of partially oxidized pyrrole units Author (GRA)

N78-25359*# Aeronautical Research Associates of Princeton Inc N J

APPLICATION OF SECOND-ORDER TURBULENT MODELING TO THE PREDICTION OF RADIATED AERODYNAMIC SOUND

Alan J Bilanin and Joel E Hirsh Jun 1978 76 p refs

(Contract NAS2-8832)

(NASA-CR-2994) Avail NTIS HC A05/MF A01 CSCL 20D

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

N78-25453# National Aerospace Lab Tokyo (Japan) Second Airframe Div

RELATIONSHIP BETWEEN SCATTER OF FATIGUE LIFE AND S-N CURVE OF 2024-T4 AIRCRAFT STRUCTURAL ALUMINUM ALLOY SPECIMENS WITH A SHARP NOTCH (Kt EQUALS 8 25) UNDER A CONSTANT TEMPERATURE AND HUMIDITY CONDITION

Toshiyuki Shimokawa and Yasumasa Hamaguchi Oct 1977 14 p refs Repr from J of the Japanese Soc for Strength and Fracture of Mater (Japan) v 10 no 2 1975

(NAL-TR-412T) Avail NTIS HC A02/MF A01

The accumulated effect of all factors producing fatigue life scatter which is found in a fatigue test by nominally identical specimens subjected to nominally identical repeated stresses is regarded as an error in applied stress Equivalent stress is defined as the sum of applied stress and the error in applied stress This concept is used for analyzing the results of a series of fatigue tests on aircraft structural aluminum alloy specimens with a sharp notch under a constant temperature and humidity condition The interrelationship between scatter of equivalent stress and fatigue life scatter is discussed It is shown that equivalent stresses are distributed in almost normal distribution and their standard deviation is nearly constant regardless of stress level and that fatigue life distribution has a strong correlation to the slope and shape of S-N curve Author

N78-25454# Technion - Israel Inst of Tech Haifa Dept of Aeronautical Engineering

THE DAMAGE SUM IN FATIGUE OF STRUCTURE COMPONENTS

Alfred Buch 1978 15 p refs Repr from Eng Fracture Mech (England) v 10 1978 p 233-247

(ICAF-1032) Avail NTIS HC A02/MF A01

The effect of loading spectrum parameters and type of tested specimen was studied from the viewpoints of deviations from Miner s rule and of the value of the minimum cycle ratio sum at failure A minimum cycle sum may be chosen for sufficiently high values of spectrum parameters sigma max and sigma min The increase of the cycle ratio sum with the parameters of the spectrum is connected with the effect of increased strain hardening and residual compressive stresses Some complex effects of sigma max and of the failure stress level on the damage sum were observed which cannot be explained by the residual stress concept A normal and a reversed loading sequence effect was established in two-stress level tests Author

N78-25455# Israel Aircraft Industries Ltd Lod

ANALYTICAL AND EXPERIMENTAL FATIGUE PROGRAM FOR THE KFIR MAIN AND NOSE LANDING GEARS

B Abraham 1977 7 p refs Repr from Israel J of Tech (Israel) v 15 1977 p 70-78 Presented at the 19 ISR Ann Conf on Aviation and Astronautics Israel 1977

Avail NTIS HC A02/MF A01

The fatigue program began in the detail phase next came the development of loading spectra used for analysis and test A fatigue analysis was then performed for several suspected critical locations on both gears A flight-by-flight test was performed on both landing gears with the aim of demonstrating four service lifetimes of operation Design modifications were introduced based on the results of these tests Rational inspection and replacement intervals were established for the main and nose gear some of which require monitoring of aircraft Author

N78-25466# Naval Postgraduate School Monterey Calif

AN EXPERIMENTAL STUDY TO DETERMINE THE REDUCTION IN ULTIMATE BENDING MOMENT OF A COMPOSITE PLATE DUE TO AN INTERNAL DELAMINATION M S Thesis

Robert Gary Sprigg Dec 1977 38 p refs

(AD-A052662) Avail NTIS HC A03/MF A01 CSCL 20/11

The purpose of this study was to determine experimentally the effects of internal delaminations in a graphite-epoxy composite plate on the plate s ultimate bending moment The experiments were conducted using 4 inch by 7 inch specimens with a balanced 0 or - 45 90, 8 ply layup The delaminations were created by inserting a thin teflon disc between two lamina during layup preparation The location of the disc i e delamination was varied in each test and two disc sizes were considered The test results revealed that delaminations located near an outer surface resulted in a greater reduction in the ultimate moment than those located near the center of the layup Furthermore the reduction in ultimate bending moment was found to be independent of the disc size The tendency for the internal delaminations to propagate at relatively low load levels was observed and recorded Author (GRA)

N78-25545*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
PROGRESS ON COAL-DERIVED FUELS FOR AVIATION SYSTEMS
Robert D Witcofski May 1978 27 p refs Presented at CTOL Transport Technol Conf Hampton Va 28 Feb - 3 Mar 1978 Published in NASA-CR-2036
(NASA-TM-78696 L-12275) Avail NTIS HC A03/MF A01 CSCL 21D

Synthetic aviation kerosene (Syn Jet-A) liquid methane (LCH4) and liquid hydrogen (LH2) appear to be the most promising coal-derived fuels Liquid hydrogen aircraft configurations their fuel systems and their ground requirements at the airport are identified These aircraft appear viable particularly for long haul use, where aircraft fueled with coal derived LH2 would consume 9 percent less coal resources than would aircraft fueled with coal derived Syn Jet-A Distribution of hydrogen from the point of manufacture to airports may pose problems Synthetic JET-A would appear to cause fewer concerns to the air transportation industry Of the three candidate fuels LCH4 is the most energy efficient to produce, and an aircraft fueled with coal derived LCH4 may provide both the most efficient utilization of coal resources and the least expensive ticket as well Author

N78-25787# National Technical Information Service Springfield Va
AEROSPACE COMPUTER SYSTEMS PART 1 AVIONICS APPLICATIONS, VOLUME 2 A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1976 - Jan 1978
William E Reed Mar 1978 208 p Supersedes NTIS/PS-77/0126, NTIS/PS-76/0042
(NTIS/PS-78/0289, NTIS/PS-77/0126 NTIS/PS-76/0042) Copyright Avail NTIS HC $28 00/MF $28 00 CSCL 09B

This updated bibliography contains 203 abstracts of research reports on onboard data processing equipment as well as navigation and guidance computers for aircraft applications Fifty-two of the abstracts are new entries to the previous edition Author

N78-25827*# Avco Lycoming Div, Stratford Conn
YF 102 IN-DUCT COMBUSTOR NOISE MEASUREMENT, VOLUME 1 Final Report, 24 Jul 1976 - 31 Aug 1977
Craig A Wilson Nov 1977 72 p refs 3 Vol
(Contract NAS3-20052)
(NASA-CR-135404-Vol-1 LYC-77-56-Vol-1) Avail NTIS HC A04/MF A01 CSCL 20A

The combustion chamber from a YF 102 gas turbine engine was instrumented with semi-infinite acoustic wave guide probes and installed in a test rig to complement the combustor noise test These combustor rig tests are described and the recorded data are listed Internal dynamic pressure level measurements were made at the same locations and at the same operating conditions of the NASA YF 102 test In addition the combustor was operated at various off-designed points where one parameter at a time was varied Background noise recordings were made to determine the magnitude of facility or test rig noise present Author

N78-25829*# Avco Lycoming Div Stratford Conn
YF 102 IN-DUCT COMBUSTOR NOISE MEASUREMENT, VOLUME 3 Final Report
Craig A Wilson Nov 1977 194 p 3 Vol
(Contract NAS3-20052)
(NASA-CR-135404-Vol-3, LYC-77-56-Vol-3) Avail NTIS HC A09/MF A01 CSCL 20A

For abstract see N78-25827

N78-25831*# United Technologies Research Center East Hartford, Conn
EXPERIMENTAL ASSESSMENT OF THEORY FOR REFRACTION OF SOUND BY A SHEAR LAYER Final Report
Robert H Schlinker and Roy K Amiet Jun 1978 122 p refs (Contract NAS1-14973)
(NASA-CR-145359) Avail NTIS HC A06/MF A01 CSCL 20A

The refraction angle and amplitude changes associated with sound transmission through a circular open-jet shear layer were studied in a 0 91 m diameter open jet acoustic research tunnel Free stream Mach number was varied from 0 1 to 0 4 Good agreement between refraction angle correction theory and experiment was obtained over the test Mach number frequency and angle measurement range for all on-axis acoustic source locations For off-axis source positions good agreement was obtained at a source-to-shear layer separation distance greater than the jet radius Measureable differences between theory and experiment occurred at a source-to-shear layer separation distance less than one jet radius A shear layer turbulence scattering experiment was conducted at 90 deg to the open jet axis for the same free stream Mach numbers and axial source locations used in the refraction study Significant discrete tone spectrum broadening and tone amplitude changes were observed at open jet Mach numbers above 0 2 and at acoustic source frequencies greater than 5 kHz More severe turbulence scattering was observed for downstream source locations Author

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

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

N78-25840# National Technical Information Service Springfield Va
NONLINEAR ACOUSTICS A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1966 - Feb 1978
George W Reimherr Mar 1978 141 p Supersedes NTIS/PS-77/0203 NTIS/PS-76/0235 NTIS/PS-75/351 COM-74-10868
(NTIS/PS-78/0240 NTIS/PS-77/0203 NTIS/PS-76/0235 NTIS/PS-75/351 COM-74-10868) Copyright Avail NTIS HC $28 00/MF $28 00 CSCL 20A

This updated bibliography contains 135 abstracts 18 of which are new entries to the previous edition Topics covered include nonlinear acoustic theory and applications to sound transmission in the atmosphere underwater solids liquids and gases Nonlinear relationships are presented for shock tubes, sonar equipment sonic booms acoustic defectors sound generators acoustic delay lines porous materials pipes ducts and jet engine noise GRA

N78-25966*# City Coll of the City Univ of New York
AN ADAPTIVE LEARNING CONTROL SYSTEM FOR AIRCRAFT
Ralph Mekel and Solomon Nachmias Apr 1978 222 p refs
(Grant NsG-1169)
(NASA-CR-156930) Avail NTIS HC A10/MF A01 CSCL 05A

A learning control system and its utilization as a flight control system for F-8 Digital Fly-By-Wire (DFBW) research aircraft is studied The system has the ability to adjust a gain schedule to account for changing plant characteristics and to improve its performance and the plant s performance in the course of its own operation Three subsystems are detailed (1) the information acquisition subsystem which identifies the plant s parameters at a given operating condition, (2) the learning algorithm subsystem which relates the identified parameters to predetermined analytical expressions describing the behavior of the parameters over a range of operating conditions and (3) the memory and control process subsystem which consists of the collection of updated coefficients (memory) and the derived control laws Simulation experiments indicate that the learning control system is effective in compensating for parameter variations caused by changes in flight conditions Author

N78-25970# Defense Systems Management School Fort Belvoir Va
DOCTRINE VERSUS CAPABILITIES A PROJECT MANAGER'S DILEMMA WITH THE CH-47 HELICOPTER
Billy V Genter Nov 1977 37 p refs
(AD-A052376 PMC-77-2) Avail NTIS HC A03/MF A01 CSCL 01/3

This report examines an existing dilemma facing the CH-47 Modernization PM The dilemma is the conflict between the tactical doctrine and the CH-47 external load capabilities including the near term modernized capabilities The external load limitations are defined and future technology to improve the CH-47 capabilities is identified Two promising external load carrying concepts are highlighted The primary recommendation is for the user to question if the external load NOE all weather day-night capability is a valid requirement Author (GRA)

N78-25974# Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
A STUDY OF THE F-4 PROGRAM MANAGEMENT RESPONSIBILITY TRANSFER (PMRT) FROM THE AIR FORCE SYSTEMS COMMAND TO THE LOGISTICS COMMAND M S Thesis
Wesley K Darrell Dec 1977 155 p refs
(AD-A052903 AFIT/GSM/SM/77D-19) Avail NTIS HC A08/MF A01 CSCL 01/3

The increasing costs of weapon systems have created a demand for more efficient program management The Air Force organizational structure for acquiring and supporting weapon systems results in two commands sharing this responsibility The Air Force Systems Command is responsible for research development procurement and production The Air Force Logistics Command is responsible for supply maintenance and other logistical support Program management responsibility transfers from the Systems Command to the Logistics Command at some point in the acquisition cycle This transition has in the past resulted in confusion duplication and fragmented responsibility In an effort to provide for more efficient program management during program transition the Program Management Responsibility Transfer concept was initiated in 1975 The F-4 program was the first program to transfer under this new concept The purpose of this study is to provide a critical analysis of the new transfer process through a study of the F-4 transfer GRA

N78-25979*# Stanford Univ Calif Dept of Civil Engineering
AIR FREIGHT DEMAND MODELS AN OVERVIEW
Jarir S Dajani and Gerald W Bernstein May 1978 31 p refs
(NCAZ-OR745-720)
(NASA-CR-152148) Avail NTIS HC A03/MF A01 CSCL 05C

A survey is presented of some of the approaches which have been considered in freight demand estimation The few existing continuous time computer simulations of aviation systems are reviewed with a view toward the assessment of this approach as a tool for structuring air freight studies and for relating the different components of the air freight system The variety of available data types and sources without which the calibration validation and the testing of both modal split and simulation models would be impossible are also reviewed Author

N78-25985*# United Technologiês Research Center East Hartford Conn
APPLICATIONS OF ADVANCED TRANSPORT AIRCRAFT IN DEVELOPING COUNTRIES Contractor Report, Mar 1977 - Apr 1978
F W Gobetz R J Assarabowski and A A LeShane May 1978 340 p refs
(Contract NAS1-14795)
(NASA-CR-145343 R78-912839-14) Avail NTIS HC A15/MF A01 CSCL 05A

Four representative market scenarios were studied to evaluate the relative performance of air-and surface-based transportation systems in meeting the needs of two developing contries Brazil and Indonesia which were selected for detailed case studies The market scenarios were remote mining low-density transport tropical forestry and large cargo aircraft serving processing centers in resource-rich remote areas The long-term potential of various aircraft types together with fleet requirements and necessary technology advances is determined for each application Author

N78-25986*# Delco Electronics Santa Barbara Calif
ELECTROMECHANICAL FLIGHT CONTROL ACTUATOR, VOLUME 2 Final Report
Jan 1978 192 p 3 Vol
(Contract NAS9-14952)
(NASA-CR-151734 R78-1-Vol-2) Avail NTIS HC A09/MF A01 CSCL 13F

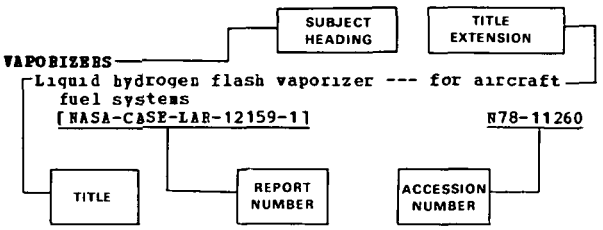
Schematic diagrams are given for both the four-channel electromechanical actuator and the single-channel power electronics breadboard Detailed design data is also given on the gears used in the differential gearbox and a copy of the operations manual for the system is included Performance test results are given for the EMA motor and its current source indicator the drive control electronics and the overall system The power converter waveform test results are also summarized Author

N78-25987*# Delco Electronics Santa Barbara Calif
ELECTROMECHANICAL FLIGHT CONTROL ACTUATOR, VOLUME 3 Final Report
Jan 1978 188 p 3 Vol
(Contract NAS9-14952)
(NASA-CR-151735 R78-1-Vol-3) Avail NTIS HC A09/MF A01 CSCL 13F

The design verification tests which were conducted on the electromechanical actuator are described A description is also given of the power components tests which were conducted to aid in selecting the power transistors for use in the single-channel power electronics breadboard and the results of tests which were conducted on the power electronics breadboard Author

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 three 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

I

M

N

O

P

Q

R

S

T

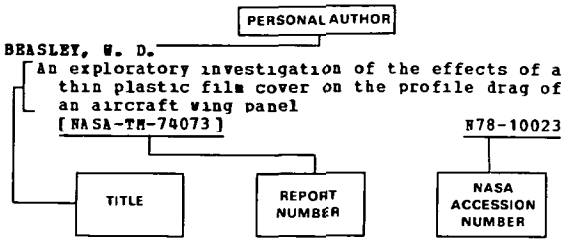
U

Y

Z

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 N78-10023 Under any one author s name the accession numbers are arranged in sequence with the *IAA* accession numbers appearing first

A

B

C

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing

NASW-2483 — CONTRACT NUMBER

N78-11061 — NASA ACCESSION NUMBER

Listings in this index are arranged alphanumerically by contract number Under each contract number the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order with the *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 (100)		

4 Title and Subtitle	5 Report Date
AERONAUTICAL ENGINEERING A Continuing Bibliography (Supplement 100)	September 1978
	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 295 reports, articles, and other documents introduced into the NASA scientific and technical information system in August 1978.

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

19 Security Classif (of this report)	20 Security Classif (of this page)	21. No of Pages	22 Price*
Unclassified	Unclassified	100	$4.75 HC

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

NASA-Langley, 1978

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA distributes its technical documents and bibliographic tools to ten 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

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

MISSOURI
Kansas City Public Library
St Louis Public Library

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 Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library

OKLAHOMA
Oklahoma County Libraries, Oklahoma City

TENNESSEE
Memphis 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, 750 Third Avenue, New York, New York, 10017

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 or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols #" and "*", from ESRO/ELDO Space Documentation Service, European Space Research Organization, 114, av Charles de Gaulle 92-Neuilly-sur-Seine, France

NASA CONTINUING BIBLIOGRAPHY SERIES

NUMBER	TITLE	FREQUENCY
NASA SP–7011	AEROSPACE MEDICINE AND BIOLOGY Aviation medicine, space medicine, and space biology	Monthly
NASA SP–7037	AERONAUTICAL ENGINEERING Engineering, design, and operation of aircraft and aircraft components	Monthly
NASA SP–7039	NASA PATENT ABSTRACTS BIBLIOGRAPHY NASA patents and applications for patent	Semiannually
NASA SP–7041	EARTH RESOURCES Remote sensing of earth resources by aircraft and spacecraft	Quarterly
NASA SP–7043	ENERGY Energy sources, solar energy, energy conversion, transport, and storage	Quarterly
NASA SP–7500	MANAGEMENT Program, contract, and personnel management, and management techniques	Annually

Details on the availability of these publications may be obtained from:

SCIENTIFIC AND TECHNICAL INFORMATION OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546