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Aeronautical Engineering
A Continuing Bibliography with Indexes

NASA SP-7037(149)
June 1982

National Aeronautics and Space Administration

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NASA SP-7037(149)

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 149)

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 May 1982 in

- *Scientific and Technical Aerospace Reports (STAR)*
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INTRODUCTION

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

This supplement to *Aeronautical Engineering -- A Continuing Bibliography* (NASA SP-7037) lists 418 reports, journal articles, and other documents originally announced in May 1982 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*.

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

Each entry in the bibliography consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections, *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* and *STAR*, including the original accession numbers from the respective announcement journals This procedure, which saves time and money, accounts for the slight variation in citation appearances

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TABLE OF CONTENTS

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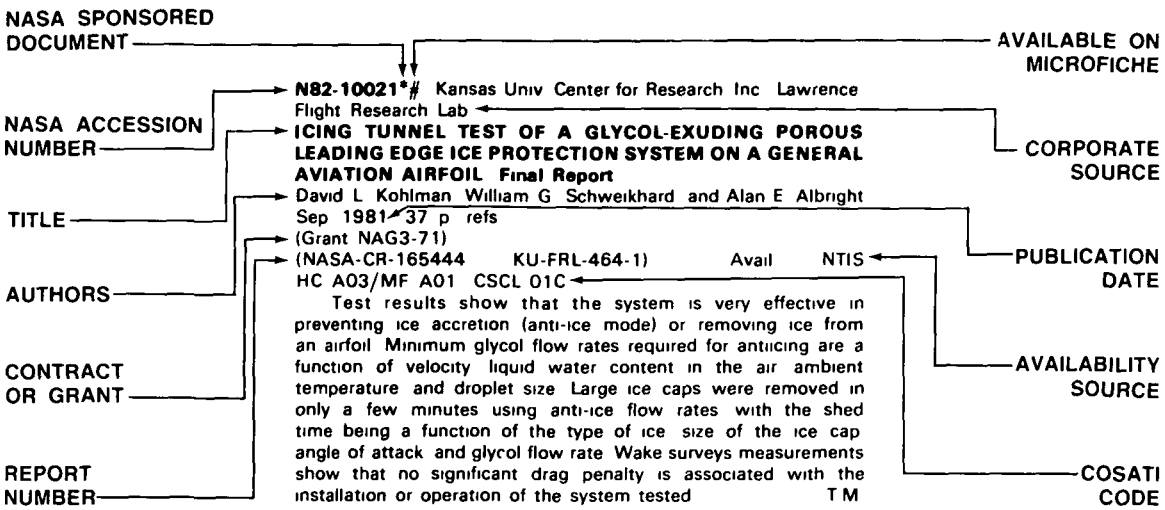

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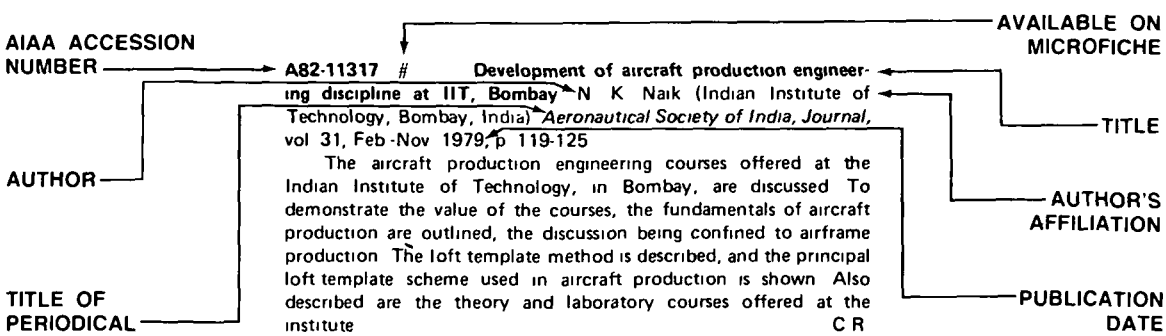

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 149)

JUNE 1982

IAA ENTRIES

A82-22398 † **Analysis and optimization of control systems in piloted flight vehicles (Analiz i optimizatsia sistem upravlenia pilotiruemykh letatel'nykh apparatov)** G I Ryl'skii. Moscow, Izdatel'stvo Mashinostroenie, 1981 200 p 156 refs In Russian

An analysis is given of the activity of a human operator in the control systems of piloted flight vehicles and of the possibility of describing this activity mathematically A classification is suggested, and an analysis made, of recent mathematical models describing human activity in these systems Attention is given to the advantages of the models that use queuing theory, and these models are used in elaborating techniques for determining characteristics of the operator's work C R.

A82-22407 † **Utilization of radio equipment at airports and on airways (Ekspluatatsiia radiooborudovaniia aerodromov i trass)** A A. Kuznetsov and V I Dubrovskii Moscow, Izdatel'stvo Transport, 1981 224 p. 26 refs In Russian

The organization of navigation aids and air traffic control in civil aviation is briefly considered Problems of technical and economic planning, the organization of support and maintenance, and the collection and processing of reliability data pertaining to air navigation and ATC equipment are also considered Specific attention is given to the utilization characteristics of radio navigation and ATC systems, ATC radar stations, automated ATC, display equipment, and methods and models for the utilization of radio navigation and ATC systems B J

A82-22880 **Complete guide to Rutan homebuilt aircraft** D. Downie and J Downie Blue Ridge Summit, PA, Tab Books, Inc , 1981 288 p $8 95.

The development history of a group of home-built sport aircraft characterized by canard configurations and non-metallic construction is presented, from the time that the designer, Burt Rutan, who won an AIAA award for his thesis on roll-yaw coupling started the project to the flight testing of the four-passenger, push/pull propeller Defiant aircraft. Incorporating the canard in order to exploit both its inherent stall-limiting function and its direct-lift generation at low incidence during short takeoffs and landings, the two designs featured are (1) the plywood-structure VariViggen, and (2) the more highly developed VariEze/Long-EZ, whose structure is of fiberglass cloth-reinforced self-curing epoxy layups over pre-shaped styrofoam Additional material on aircraft construction and performance at the hands of the designer and dozens of his hobbyist-clients is also presented. O C

A82-22881 **Computer-generated images for simulators - The cost of technology** G C Larson *Air Force Magazine,* vol 65, Feb 1982, p 54-59

The effectiveness, capabilities, and prospects for computer-controlled flight simulators suitable for combat flight training are examined Current devices offer a wraparound imagery, multiple crewmember interface, and separate cockpit coordinated displays suitable for developing teamwork among pilots of different aircraft The simulators are equipped with realistic cockpits, an instructor's station with full control and recording equipment, a data base with simulator dynamics and ability to translate actions into real-time responses, and a visual system which displays a scene that could be expected in the real world Mechanical limitations are defined by the cost of memory and processing speed necessary for edge generation, the formation of geometric shapes and solids closely resembling real world objects, and texturing has shown promise for defining recognizable areas by rectangular areas which overlap in a fashion acceptable to a human field of vision M S K

A82-22896 # **Lineup of the IM-series aircraft-derivative gas turbines** K. Takeo (Ishikawajima-Harima Heavy Industries Co., Ltd., Tokyo, Japan) *IHI Engineering Review,* vol 14, Oct 1981, p 36-42 5 refs

The development of the IM-series of aircraft derivative gas turbines is reviewed The discussion begins with the IM1500 GL engine, having an output at turbine coupling of 11,100 kW and a thermal efficiency of 26 8%, first used as an industrial gas generator in 1968 Principal characteristics of the IM2000 and IM2500 are then discussed the output and thermal efficiency of these two models are given as 12,800 kW and 33 5% and 19,300 kW and 35.1%, respectively Fundamental specifications of the power turbines are described, and the flowpath design is presented The construction and mechanical design of the engins are described, and results of creep-rupture, high temperature fatigue, and vibratory stress tests are given Finally, the IM5000 power turbine, with an output of 38,000 kW and an efficiency of 38 4% is described It is also shown how heat in the high-temperature exhaust gases from the turbines can be used in waste heat recovery systems to improve the total plant efficiency. J F

A82-22898 # **History of the sweptback wing (Geschichte des Pfeilflugels)** H Ludwieg (Aerodynamische Versuchsanstalt, Institut fur experimentelle Stromungsmechanik, Gottingen, West Germany) *Deutsche Gesellschaft fur Luft- und Raumfahrt, Jahrestagung, Aachen, West Germany, May 11-14, 1981, Paper 81-070.* 15 p. 10 refs. In German

The history of sweptback wings which make use of the sweepback to alter the effective Mach number is reviewed. Principles of the sweptback wing and its effects are discussed for subsonic flight with high Mach numbers, supersonic flight with a subsonic leading edge, and supersonic flight with a supersonic leading edge. The historical development is traced from the first sweptback wing model in 1939 for the Gottinger high speed wind tunnel to various fighter aircraft including the Messerschmitt 262 and Heinkel designs. Results of wind tunnel tests for various angles of sweepback are presented. D L G.

A82-22902 **The use of dynamic mock-ups in the design of advanced systems** M L Gravely (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) and L Hitchcock (U S Naval Material Command, Naval Air Development Center, Warminster, PA) In Human Factors Society, Annual Meeting, 24th, Los Angeles, CA, October 13-17, 1980, Proceedings Santa Monica, CA, Human Factors Society, Inc , 1980, p 5-8

The advantages of using dynamic mock-ups in advanced system design are discussed in terms of the USAF's Digital Avionic Information System (DAIS) Program and the Navy's Advanced Integrated Display System (AIDS) Cockpit Development Program Experienced pilots are employed to judge the acceptability of slide projector displays for radar, low-light level television, and alpha-numeric and vector graphic formats Cost effectiveness is achieved by lowering software costs, minimizing time in constructing the mock-up, and high reliability-low maintenance features The cockpit layout is set up once the required tasks and the number of nultifunction

controls are known, and variations on the instrumentation set-up are tested repeatedly The AIDS concept allows remote location of a slide projector for closed circuit television display of various instrument configurations in different situations, and selected displays are chosen for full scale simulation M S K

A82-22905 Combined multisensor displays A J Josefowitz, R A North (Honeywell Systems and Research Center, Minneapolis, MN), and J Trimble (U S Navy, Office of Naval Research, Arlington, VA) In Human Factors Society, Annual Meeting, 24th, Los Angeles, CA, October 13-17, 1980, Proceedings Santa Monica, CA, Human Factors Society, Inc , 1980, p 17-21 Contract No N00014-77-C-0684

The use of combined multisensor displays which result from preprocessing of various sensor data for shape coding in a display is discussed in terms of lowering the pilot's workload A Forward Looking Infrared (FLIR) radar display was selected as the background for combinations with other sensor displays in trials of suitability, with color coded close, intermediate, and far range conditions Test subjects were 32 right-handed males who performed point of impact, target detection, and tracking tasks The variables were processed in univariate and multivariate analyses of combined and uncombined display types, and individual display comparisons by pairs The combined displays were found to enhance the time-sharing of tasks with other crewmembers and the accurate detection of targets Color coding is recommended to be of secondary value, with some results showing that colors actually slow response times M S K

A82-22974 Direct comparison of community response to road traffic noise and to aircraft noise F L Hall, S E Birnie, S M Taylor, and J E Palmer (McMaster University, Hamilton, Ontario, Canada). *Acoustical Society of America, Journal,* vol 70, Dec 1981, p 1690-1698 23 refs Research supported by the Transport Canada and Natural Sciences and Engineering Research Council of Canada

Previous efforts to synthesize information on community responses to various noise sources have been forced to rely on a variety of surveys conducted in different countries over a number of years Data collected recently around Toronto International Airport provide a direct comparison of response to two sources, based on 673 interviews of persons exposed to a variety of levels of both aircraft and road traffic noise The results of that analysis do not support the assumption that response to these two noise sources is the same For the same value of the 24-h energy-averaging metric, a greater percentage of the sample is highly annoyed by aircraft noise than by road traffic noise Possible reasons for this contradiction of the results of a previous synthesis of noise surveys are discussed (Author)

A82-23027 GTD terrain reflection model applied to ILS glide scope R Luebbers, V Ungvichian, and L Mitchell (Ohio University, Athens, OH) *IEEE Transactions on Aerospace and Electronic Systems,* vol 18, Jan 1982, p 11-20 20 refs USAF-supported research, U S Department of Transportation Contract No. FA7WA-3549

A terrain reflection model based on the geometrical theory of diffraction is described which (1) can accommodate any piecewise linear terrain profile, (2) requires less computer time than physical optics models, (3) is capable of including transverse terrain effects, and (4) determines the reflected fields with all important diffraction and blockage effects included The model's approach to the calculation of the reflected magnetic fields consists of a geometrical process by which the existence and the reflection and/or diffraction points of the rays are determined, and a mathematical process by which the magnitude and phase of the corresponding electric field at the receiver location are evaluated O C

A82-23029 Sensitivity reduction by double perfect model following. T. Okada, M. Kihara, and K Motoyama (Defense Academy, Yokosuka, Kanagawa, Japan). *IEEE Transactions on Aerospace and Electronic Systems,* vol 18, Jan 1982, p 29-38 12 refs

A double perfect model following (DPMF) system is proposed which uses two models one is used to define the desirable response and the other is used to reduce sensitivity to parameter perturbation The concept is shown and methods of model selection and controller synthesis are discussed, followed by numerical examples and an aircraft control example which demonstrate performance of the DPMF concept It is shown that the DPMF system can be less sensitive than a nominally equivalent single perfect model following (SPMF) system and that sensitivity reduction is enhanced by proper selection of the model It is also shown that the sensitivity of multi-input systems can be reduced componentwise or blockwise by using a decoupled type model (Author)

A82-23031 # Stereographic projection in the National Airspace System. R G Mulholland and D W Stout (FAA, Technical Center, Atlantic City, NJ) *IEEE Transactions on Aerospace and Electronic Systems,* vol 18, Jan 1982, p 48-57 10 refs

Consideration is given to the calculation of stereographic representations of airborne targets from observations of slant range, azimuth, and altitude in a multiple radar tracking system Emphasis is placed upon the translation of the accuracy of the surveillance information into the stereographic plane Applications include air traffic control operations in which calculations must be performed repeatedly in real time for numerous targets without overtaxing available computational resources (Author)

A82-23037 * Methodology for multiaircraft minimum noise impact landing trajectories G Cook, I D. Jacobson, R Chang, and R. Melton (Virginia, University, Charlottesville, VA) *IEEE Transactions on Aerospace and Electronic Systems,* vol 18, Jan 1982, p 131-146 14 refs Grant No. NsG-1509

The problem of optimizing landing trajectories with respect to noise impact index is addressed In contrast with previous work, multilandings are considered In order to make the problem tractable the trajectories are specified in functional form with certain parameters left free for selection by the optimization methods Constraint of aircraft dynamic behavior, trajectory separation, pilot workload, passenger comfort, and maximum noise intensity all enter into the determination of what is an allowable trajectory A version of the quasi-Newton iterative procedure is used to determine the optimum parameter values The results show improvement in noise impact to the airport considered and the potential for even greater improvement at many airports (Author)

A82-23225 Linear alpha-ray altimeter (Lineinyi alpha radiatsionnyi vysotomer) P S Kamenov, D N Vasilev, and E N Vapirev (Sofiiski Universitet, Sofia, Bulgaria) *Iadrena Energiia,* no 15, 1981, p 24-28 8 refs In Russian

The paper describes an alpha-ray altimeter which employs scintillation detection and achieves linearity between the number of counts per unit time and the altitude The design of the altimeter is described, and experimental results are presented Causes of errors and nonlinearities are analyzed, and ways to reduce them are discussed B J

A82-23227 # Aircraft parameter identification in the presence of atmospheric turbulence H Okubo (Osaka Prefecture University, Sakai, Japan), T Kanou (Kawasaki Heavy Industries, Ltd , Akashi, Japan), and M Kobayakawa (Kyoto University, Kyoto, Japan) *Kyoto University, Faculty of Engineering, Memoirs,* vol 43, July 1981, p 364-375 7 refs

The paper investigates a method for the identification of unknown parameters in the dynamics of an aircraft, using flight data which are affected by random disturbances due to wind gusts Two general algorithms, the maximum likelihood (ML) method and the extended Kalman filter (EKF) technique, along with a combination of the algorithms are examined for capability by numerical simulations The ML algorithm requires no a priori information on the initial parameter estimates, while the EKF algorithm computes an on-line estimate of the parameter in real time, has a smaller program size, and requires less computational time and memory than the former The combined use of the two algorithms gives a useful method for an on-line parameter estimation, using the ML algorithm as a start-up procedure, and processing the remaining data sequentially with the EKF technique D L G.

A82-23250 † Improving the accuracy of the estimates of surfactant content in jet fuels (Povyshenie tochnosti otsenki soder-

zhaniia pav v reaktivnykh toplivakh). A F Gorenkov, V S Stepanenko, and V A Saleev *Khimiia i Tekhnologiia Topliv i Masel*, no 2, 1982, p 36-39 In Russian

Surface processes associated with the interaction between jet fuels and water are investigated with a view to increasing the accuracy of the estimates of surfactant content in jet fuels It is shown that when analyzing water-fuel interaction, it is essential that the meniscus condition and the presence of drops on the test cylinder walls be taken into account In view of this, modifications to the standard jet fuel quality control procedure are proposed V L

A82-23309 Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980 204 p

Developments towards higher levels of ATC automation are considered along with the requirements for reduced IFR separations on final approach, an analysis of system problems using aviation safety reporting system data, and specification issues and problems in connection with air traffic control computer replacement Attention is given to maintenance concepts for the 1980's, approaches for reducing reflections on the front surface of air traffic control displays, the price of safety, general aviation in the future ATC system, the utilization of the helicopter's versatility to improve the ATC system, the human element, international plans concerning ATC-related developments, and challenges and issues for the future Technological developments are discussed, taking into account distributed data processing modeling for future ATC systems, lightweight ATC systems, the Discrete Address Beacon System, voice communications, and a Microwave Landing System simulation G.R

A82-23311 The requirements for reduced IFR separations on final approach W J Swedish (MITRE Corp , Metrek Div , McLean, VA) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 39-43 U S Department of Transportation Contract No FA80WA-4370

This paper examines the factors which affect the feasibility of reducing IFR standards from a minimum of 3 0 nmi to 2 5 or 2 0 nmi For those aircraft pairs which are not restricted by wake vortices, separation reduction is likely to be limited by the rate at which aircraft must go around to avoid simultaneous runway occupancy The runway occupancy performance required to avoid an unacceptable increase in the go-around rate is determined The impacts of ATC improvements such as metering and spacing on the runway occupancy requirements and on the controller's decision making workload are then presented Alternating arrivals to close-spaced parallel runways are discussed as one means to avoid the constraints of runway occupancy and, possibly, wake vortices Lastly, it is proposed that further research on reduced separations should address a single specific airport, in order to narrow the range of variables and thereby facilitate the identification of problems and solutions (Author)

A82-23312 Analysis of system problems using aviation safety reporting system data. R L Grayson (Battelle Columbus Laboratories, Mountain View, CA) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 45-48

The Aviation Safety Reporting System (ASRS) was inaugurated in 1976 as the result of an interagency agreement between the FAA and NASA. It was designed as a confidential, voluntary reporting system to enable individual users or observers of the National Aviation System to record hazardous occurrences or to report conditions which might adversely affect aviation safety A description is presented of the system operation, the characteristics of the data base compiled by the system as the principal information source, and the ways in which the system has helped in defining and clarifying various aviation system problems G.R

A82-23313 Air Traffic Control computer replacement - Specification issues and problems T L Hannan and M E. Perie (FAA, Washington, DC). In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 51-56

The foundation of today's Air Traffic Control (ATC) system is the ATC specialist, who is supported by ATC automation systems and automated radar terminal systems According to many ATC experts, however, the computer will become the foundation of the future ATC system The transition to the future ATC system will be gradual The extent to which decision-making processes will be accomplished automatically will increase until significant elements of the ATC process are controlled by the computer Attention is given to an ATC Computer Replacement System which is suited for the evolutionary transition process In the form of its initial implementation, the new system must be compatible with the ongoing ATC system But it must also be capable of meeting future ATC functional requirements as it evolves toward automated decision-making The considered requirements are examined in an attempt to define the scope of the ATC computer replacement acquisition G R

A82-23314 Reducing reflections on the front surface of air traffic control displays J W Aschenbach (FAA, Technical Center, Atlantic City, NJ) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 65-71 5 refs

Problems related to the occurrence of surface reflections on the FAA's en route air traffic control displays have become more serious in connection with the installation of the near vertical stroke-writing display in the air route traffic control centers New investigations were initiated to see if it was feasible to raise the display background level, in order to mask reflections and to further reduce the sources of plan view display screen reflections through more modifications to the lighting A study was conducted with the objective to find a method of decreasing the reflectivity of the front surfaces of the display itself By eliminating the extra panel on the front of the display and by etching and coating the outside surface of the CRT with a multilayer dialectric thin film, it was possible to produce a display with very little glare G R

A82-23315 NAS system load - Utilization of the DARC system E P Schmidt (FAA, Hampton, GA) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 73-78

In connection with an unexpectedly large increase in air traffic volume, there is a growing threat that ATS requirements might exceed the processing capacity of the NAS En Route 9020 computer systems An investigation is conducted concerning the feasibility of providing an interim solution to the problem by means of an approach based on the utilization of existing hardware allocations The approach would employ the Direct Access Radar Channel (DARC) system as an associative processor to the NAS 9020 system. DARC is specified to provide a parallel radar data path for use in the event of catastrophic failure of the prime channel, and during planned down time of the NAS 9020 system G R

A82-23316 Utilizing the helicopter's versatility to improve the ATC system A G B DeLucien and F D Smith (Pacer Systems, Inc , Arlington, VA) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 89-96 14 refs

This paper presents an overview of certain operating environments of civilian helicopters, and summarizes selected performance-maneuver envelopes of those models certified for operation under instrument flight rules (IFR) It discusses how the capabilities and limitations which are unique to these vehicles can be used to improve the capability, and expand the capacity, of the Air Traffic Control (ATC) system Helicopter-oriented technical issues which will impact future changes to the system are identified The paper concludes that as controllers become increasingly aware of related helicopter characteristics and operating environments, and take advantage of them, the effect would be to reduce controller workload, and to increase the capacity, expand the functional capabilities, and enhance the overall versatility of the ATC system (Author)

A82-23317 **International plans for civil and military coordination** P J Gray (RAF, National Air Traffic Services, London, England) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 105-108

Attention is given to a review of the common aims of the civil and military controller, certain conflicts of interest inherent in the function of civil and military air traffic control, and the resolution of conflicts related to the existence of national boundaries in Western Europe In connection with the finite nature of air space, it is found to be important that, in an allocation of the utilization of this space, the needs and characteristics of all users, civil and military, must be taken into consideration In the UK, integrated civil and military staffs at HQ and field levels are used to ensure that no one user interest is permitted to unfairly predominate In the wider European context civil and military coordination and cooperation prevails within Eurocontrol, and perhaps most successfully, at NATO CEAC (Committee for European Airspace Coordination) G R

A82-23318 **Operational air traffic in the Federal Republic of Germany** F-W von Schlichtkrull (Bundeswehr, Frankfurt am Main, West Germany) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 111-117

Aspects of traffic volume are considered, taking into account the number of civil and military aircraft flights for 1979 For an appropriate evolution of the performance involved in controlling the total number of flights reported (3,950,000), the geographic size of the Federal Republic of Germany must be taken into account, giving attention also to regulations which exclude military aircraft from an area near the iron curtain border Military operational air traffic can be divided into three categories, including uncontrolled military flights, military air traffic under the control of air defense units, and military air traffic handled by Air Traffic Services The high air traffic density leads to special problems which are partly related to midair collision hazards. Approaches for solving these problems are discussed, taking into account a separation in space for flights of different traffic categories, and an employment of advanced control methods G R

A82-23319 **Distributed data processing modeling for future ATC systems** R R Jones (Hughes Aircraft Co , Fullerton, CA) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 125-131

The use of distributed processing procedures makes it feasible to reduce the processor cost, and to increase, at the same time, maintainability and reliability Other advantages are related to the convenience of system expansion by means of added capabilities The utilization of distributed data processing benefits for air traffic control systems (ATC) is considered, taking into account the use of a rigorous analytic technique for a determination of optimal operational configurations The analytic technique selected is simulation modeling This approach makes use of a Distributed Data Processing Model (DDPM) coupled with a Design Analysis System (DAS) The considered approach has been employed extensively to design many complex systems similar in scope and nature to ATC systems A description is presented of the DDPM and the DAS, giving attention to the use of these techniques in an application involving an ATC system G R

A82-23320 **ATC automation - A look forward Technology/architecture** L M Reppert (Texas Instruments, Inc , Dallas, TX) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 133-136

It is pointed out that ATC automation is going through a revolutionary evolution due to major technological advances in such areas as microprocessors and memories A reasonable projection prediction for the 80's and 90's would specify a high utilization of distributive computer architecture implemented with simple/high technology hardware The considered evolution will require a system which is functional-task oriented, repartitionable, and modular Using distributed computer architecture and available microprocessor and memory technologies, ATC system designers can perform all the required functions and implement the system in a highly efficient and cost effective manner which inherently provides the desired characteristics, taking into account modularity, recoverability, high data integrity, ultra-high reliability, and computer-aided maintainability G R

A82-23321 **Lightweight ATC systems** R Bonitch (Eaton Corp , AJL Div , Farmingdale, NY) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 139-144

The problem of tactical ATC system implementation has been considered, taking into account the generation of light-weight and low-cost equipment which can provide advanced ATC capabilities for forward command posts, tactical command centers, and low traffic density applications, such as remote airfields and oil rigs The considered systems are based on microprocessor technology This technology makes it possible to utilize recent advances related to signal processing, antenna development, and plasma displays Attention is given to the development of the Small Plasma Automated Radar Terminal Area Navigation System (SPARTAN) and its military version, the Very Lightweight Air Traffic Management Equipment (VLATME) The advantages of the employed ac plasma displays are related to light weight, low operating voltage (200 volts), and sustained memory G R

A82-23322 **Discrete Address Beacon System /DABS/** P D Hodgkins (FAA, Washington, DC) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 147-155

In connection with the results of a study conducted in 1969, recommendations had been made to upgrade the Air Traffic Control System These recommendations became the basic system requirements for DABS The recommendations had been concerned with the development of three new systems, including an improved surveillance system for the eventual replacement of the present Secondary Surveillance Radar (SSR), a digital air/ground data link communication system, and a ground-based collision avoidance system Probably the most significant characteristic of the DABS is that it is a direct extension of and fully compatible with the SSR or the ATC Radar Beacon System (ATCRBS), as it is referred to in the U S Although primarily a surveillance system, DABS is also a communications and ground-based collision avoidance system designed with sufficient capacity to accommodate expected air traffic growth well into the next century G R

A82-23323 **A Microwave Landing System simulation.** R P Spengler and R W Zoladz (Computer Sciences Corp , Pomona, NJ) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings Arlington, VA, Air Traffic Control Association, 1980, p 157-162

Computer software is being developed for a series of experiments involving the simulation of Microwave Landing System (MLS) operations The purpose of these experiments is to identify, or at least obtain advanced warning of, potential problem areas in an MLS implementation The MLS simulation model is divided into three phases Each phase represents a different level of avionics and thus provides capabilities for different approach paths Emphasis is placed on the ATC communications and the various approach geometries The MLS is an air derived system in which ground based equipment transmits accurate approach information to a receiver on board the aircraft Azimuth, elevation, and ranging elements comprise the system operating in the microwave band (approximately 5000 megahertz) With MLS, aircraft can enter the approach area from various directions and speeds and fly toward separate approach gates G R

A82-23324 **Voice communications - The vital link.** R E Hustead (Litton Industries, Amecom Div , College Park, MD) In Air Traffic Control Association, Annual Fall Conference, 25th, Arlington, VA, October 19-24, 1980, Proceedings

Arlington, VA, Air Traffic Control Association, 1980, p 165-168

Voice communications provides the vital link among controllers and between controllers and aircrews Communications systems presently in use provide voice communications via three links, including intercom (between different air traffic controllers), interphone (between different sites), and radio (between the air traffic controller and the pilots) It is pointed out that current communications systems at most air traffic control facilities are generally outdated, inflexible, and difficult to maintain Attention is given to needs for a new voice communication system which is able to handle the peak loads of air traffic that the facility will encounter Amecom's Integrated Voice Communications Systems satisfies these needs and is available now The system has been designed specifically for the Air Traffic Control environment Aspects of system operation are discussed in some detail G R

A82-23368 Fighters - Tomorrow's terminology. G. Warwick *Flight International,* vol 121, Feb 6, 1982, p. 291, 292, 301, 302

Consideration is given to the technological features under study for integration into fighter aircraft designs over the course of the 1990s These features include (1) fly-by-wire and fly-by-light active electronic controls, which will permit the modification of flight characteristics through reprogramming of software control laws, (2) the use of primary, directional-reinforced composite structures that will aeroelastically deform in flight to increase aerodynamic efficiency, (3) the improvement of wing aerodynamics through the downstream effect of canards, (4) the use of conformal stores carriages to reduce drag by as much as 60%, (5) the generation of direct lift force control by means of coordinated wing/canard control surface actuation, and (6) the vectoring of engine exhaust nozzles to increase lift and maneuverability O.C

A82-23369 Boeing's big, quiet 737-300 B Sweetman *Flight International,* vol 121, Feb 13, 1982, p 353-356

A description is given of the modifications made on the precursor 737-200 commercial aircraft design to yield the 737-300, which include (1) greater wing and horizontal stabilizer spans, (2) fuselage extensions totalling 104 in, (3) leading edge slat airfoil redesign, (4) the incorporation of adhesive bonding construction techniques and more advanced aluminum alloys for longer service life, and most importantly, (5) a new engine installation that will accomodate either CFM 56-3 or RJ-500 turbofans The modified aircraft is expected to meet FAR 36 Stage 3 noise limits, and to be more fuel-efficient than its predecessor In the context of the present commercial aircraft market, the 737-300 represents a transitional design which will be replaced by a novel, 150-passenger short-haul aircraft O C

A82-23426 Israel Annual Conference on Aviation and Astronautics, 23rd, Tel Aviv and Haifa, Israel, February 11, 12, 1981, Collection of Papers. Conference supported by the Technion - Israel Institute of Technology, Israel Ministry of Defence, Ministry of Transport, et al Haifa, Israel, Technion - Israel Institute of Technology, 1981 251 p

Topics significant to modern aircraft design and performance, design and efficiency, and to control logic were examined Flow past an airfoil in a supersonic stream was discussed, as were drag reduction by means of an active boundary layer thickening, the aerodynamic characteristics of an axisymmetric configuration with transverse jets in the base plane, and coherent structure of the turbulent boundary layer in the lateral direction A general similarity solution of the transonic equation in the physical plane was presented, and perturbations to unidirectional turbulent flow due to small lateral mean velocity gradients were studied Discussions were devoted to the evaluation of stiffened shell characteristics from imperfection measurements, to fixed gain controller design for aircraft, and to a time finite element discretization of Hamilton's law M.S K

A82-23439 # Low grade fuels for turbo and jet engines. B Gal-Or, E. Zahavi, and A. Burcat (Technion - Israel Institute of Technology, Haifa, Israel) In Israel Annual Conference on Aviation and Astronautics, 23rd, Tel Aviv and Haifa, Israel, February 11, 12, 1981, Collection of Papers. Haifa, Israel, Technion - Israel Institute of Technology, 1981, p 170-180

In connection with the energy crisis, a program has been initiated to reexamine the design methodologies and the expected performance characteristics of turbo and jet engines in the light of the higher temperatures and reduced durability that would result from the increasing use of low-grade, high-aromatic aircraft fuels. The discussion focuses on the first phase of the program which includes simulated computer studies of the maximum flame temperatures exptected in jet engine combustors with different fuels under various operating conditions such as takeoff, cruise, and idle performance at various altitudes and Mach numbers. General parameters are proposed for the comparison of alternative fuels in terms of the maximum flame temperatures and the combustion products distributions V L.

A82-23441 # Fixed gain controller design for aircraft Y Baram and D Eidelman (Tel Aviv University, Tel Aviv, Israel) In Israel Annual Conference on Aviation and Astronautics, 23rd, Tel Aviv and Haifa, Israel, February 11, 12, 1981, Collection of Papers. Haifa, Israel, Technion - Israel Institute of Technology, 1981, p 211-216 6 refs Grant No AF-AFOSR-80-0178

A method for designing fixed-gain controllers for systems with large parameter variation is presented, with particular attention to the problem of designing non-adaptive back-up control systems for high performance aircraft The approach, based on minmax information criteria, is used to design a fixed-gain controller and a state estimator for a given aircraft, and is shown to provide good performance qualities (Author)

A82-23444 YF-16 design concept and philosophy H J Hillaker (General Dynamics Corp , Fort Worth, TX) *(Israel Annual Conference on Aviation and Astronautics, 23rd, Tel Aviv and Haifa, Israel, Feb 11, 12, 1981) Israel Journal of Technology,* vol 19, no 1-2, 1981, p 3-18

The design objective of the original YF-16 was to maximize the usable maneuverability and agility of the aircraft in the air combat arena at a mission radius of 500 n mi This objective was to be achieved within a flyaway cost of 3 million dollars per unit To this end, emphasis was placed on small size and low weight/cost, on advanced technologies, and on design/aerodynamic innovations The key configuration elements that offered clear superiority in terms of maximum lift, directional stability, drag-at-lift, and inlet flow field were bottom inlet, wing-body blending, variable camber, and single vertical tail New wing planforms which are being tested on F-16, will allow even greater capabilities while retaining the low-cost concept A single turbofan engine provides the best balance of combat capability and mission radius for the lowest weight V.L

A82-23470 Improvement of fuel economy by flying with maximum rearward center-of-gravity positioning (Verbesserung der Treibstoffokonomie durch Fliegen mit zulassiger ruckwärtiger Schwerpunktlage). M Caspari and D Kricke (Gesellschaft fur Internationalen Flugverkehr mbH, Berlin, East Germany). *Technisch-ökonomische Information der Zivilen Luftfahrt,* vol. 17, no 3, 1981, p. 142-145 In German

The relationship between balance, stability, and maneuverability is established, and means of minimizing the moment of an aircraft's horizontal stabilizers and elevators to conserve energy are discussed Requirements and peculiarities of INTERFLUG aircraft are described, and current techniques to save fuel by achieving a higher rearward center-of-gravity positioning are discussed Particular attention is given to the retention of rearward center-of-gravity positioning in the IL-62/IL-62M aircraft Calculations show that procedures exist to achieve a rearward center-of-gravity positioning of 33%, which would result in a minimum fuel savings of 4 1% at 165 g/km J F

A82-23603 High-frequency monitoring of surface layers of metals A L Dorofeev, N P Kalinin, and V D Ostapenko (Kalinin Carburetor Plant, Perm, USSR) *(Defektoskopiia,* Apr / 1981, p 34-40) *Soviet Journal of Nondestructive Testing,* vol 17, no. 4, Dec. 1981, p 268-272 Translation.

A high-performance electromagnetic device working at 100-500

MHz is reported Main trends in tests on the effects of the electrical conductivity, the gap, the closeness to edges, and the presence of microcracks on the parameters of the device are established A reduction in the quality factor is observed when the transducer is placed on a part with a defect, which causes a reduction in the amplitude or even a halt to the oscillation, indicating that simple self-excited flaw detectors working at elevated frequencies can be made with high sensitivity to surface defects D L G

A82-23678 On the sonic fatigue life estimation of skin structures at room and elevated temperatures. S Maekawa (Kawasaki Heavy Industries, Ltd , Gifu, Japan) *Journal of Sound and Vibration,* vol 80, Jan 8, 1982, p 41-59. 15 refs

The Monte Carlo method of nonlinear response analysis and a fatigue life estimation scheme based on a rheological model have been used to estimate the sonic fatigue life of heated skin structures Calculations for a skin-stringer panel are compared with experimental data and it is found that, with properly selected fatigue notch factor, the analysis provides fairly accurate estimate of the acoustic fatigue life The effects of temperature, static pressure, and oil canning on the acoustic fatigue life are discussed V L

A82-23751 Welding technology for the aerospace industry, Proceedings of the Conference, Las Vegas, NV, October 7, 8, 1980 Conference sponsored by the American Welding Society Miami, FL, American Welding Society, 1981 183 p

The conference focused on the welding processes most important to future commercial and military aeronautic framework design and construction, aircraft hardware reclamation, and materials evaluation Processes covered include diffusion welding, laser welding, electron beam welding, superplastic forming, keyhole plasma arc welding, inertia welding, and resistance welding Other topics include weldability of critical materials and alternatives, welding supports such as adaptive controls, digital arc welding programmers, and the application of fracture control Finally, repair welding is discussed V L

A82-23753 Novel approaches to electron beam welding machine utilization F S Pogorzelski (McDonnell Aircraft Co , St Louis, MO) In Welding technology for the aerospace industry, Proceedings of the Conference, Las Vegas, NV, October 7, 8, 1980 Miami, FL, American Welding Society, 1981, p 41-53

Several applications that require unique and novel approaches to the utilization of electron-beam welding equipment for profitable production are discussed One of the applications is the welding of F-15 pylon posts fabricated from annealed Ti-6Al-4V die forging A 100% penetration first weld pass in a tapered thickness butt joint is produced using a chart programmer set up with the plot of the high voltage required versus position along the length of the tapered joint, the programmer is coupled to the power-stat of the electron-beam welding machines so that the welding power is increased automatically to the proper value as the welding gun traverses from the thick to the thin section of the joint Electron-beam welding of F-15 wing skin 'kick rib' machined from a solid plate of Ti-6Al-4V and the development of a blind tracking device for electron-beam welding are also discussed V L

A82-23754 Diffusion bonding in superplastic forming/diffusion bonding J R Williamson (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) In Welding technology for the aerospace industry, Proceedings of the Conference, Las Vegas, NV, October 7, 8, 1980 Miami, FL, American Welding Society, 1981, p 55-83 8 refs

Mechanisms of the superplastic forming/diffusion bonding process are discussed with reference to the fabrication of titanium structures for aerospace applications Primary factors affecting diffusion bonding are examined including process variables such as pressure, temperature, and time, and material variables such as surface roughness, surface cleanliness, and grain size Two additional factors become important because of the nature of the process When forming must occur prior to bonding, it is necessary to maintain surfaces to be bonded in a noncontaminated, nonoxidized condition Secondly, when a maskant is used for selective diffusion bonding, it is important to insure that the maskant does not interfere with diffusion bonding in the adjacent nonmasked areas V L

A82-23755 Aluminum and its alloys - Weldability I B Robinson (Kaiser Aluminum and Chemical Corp , Pleasanton, CA) In Welding technology for the aerospace industry, Proceedings of the Conference, Las Vegas, NV, October 7, 8, 1980 Miami, FL, American Welding Society, 1981, p 85-108 14 refs

Non-heat-treatable and heat-treatable aluminum alloys are examined with reference to their behavior during welding and their fusion weldability It is shown that with existing aluminum alloys, the properties of fusion welded joints can be improved by minimizing the effective heat input and by using postweld heat treatments High-intensity welding sources can provide greater penetration and narrower welds for higher strengths However, poor fusion weldability of many high-strength alloys is due to their composition and microstructure, and great improvements in weldability and strength would require new alloys The use of solid-state welding techniques in conjunction with heat treatment minimizes the problems of heat damage and offers possibilities of higher-strength welds in high-strength alloys V L

A82-23757 Welding for low-cost advanced titanium airframe structures R W Messler, Jr and C A Paez (Grumman Aerospace Corp , Bethpage, NY) In Welding technology for the aerospace industry, Proceedings of the Conference, Las Vegas, NV, October 7, 8, 1980 Miami, FL, American Welding Society, 1981, p 123-138

The fabrication of F-14 wing center section and other wing and fuselage parts, which relies heavily on electron beam welding, is described to demonstrate that welding is a valuable, versatile, and widely available technique for building low-cost advanced titanium structures for modern airframes The advantages of welding include improved structural efficiency, improved material utilization, expanded near-net-shape processing capability, and structural optimization To be most beneficial, the welding processes employed should provide high joint efficiencies for static and fatigue loading, high quality, low distortion and shrinkage, and high welding speeds or deposition rates to minimize welding labor intensity V L

A82-23771 # Material/structure degradation due to fretting and fretting-initiated fatigue D W Hoeppner (Toronto, University, Toronto, Canada) *(Canadian Aeronautics and Space Institute, Annual General Meeting, Montreal, Canada, May 11, 1981) Canadian Aeronautics and Space Journal,* vol 27, 3rd Quarter, 1981, p 213-221 6 refs

The causes, effects, and possible remedies for fretting fatigue are examined Fretting occurs on the surfaces of two objects in contact and in relative motion to one another, and results in either corrosion or wear, surface stress concentrations or surface and subsurface stresses, or component failure Models of a fretting damage threshold are reviewed, noting that once the threshold has been crossed, no further fretting damage is of concern because fatigue cracks are proceeding from the fret-induced damage Specific areas and components subject to fretting damage on aircraft airframes, transmissions, engines, and shafting are provided, and measures to reduce fretting have included vibration elimination, slip prevention, and sealing off the part from the atmosphere Further techniques for individual cases are indicated. M S K

A82-23772 # A new approach to the problem of stress corrosion cracking in 7075-T6 aluminum W Wallace (National Aeronautical Establishment, Structures and Materials Laboratory, Ottawa, Canada), M C de Malherbe (Carleton University, Ottawa, Canada), and J C Beddoes *(Canadian Aeronautics and Space Institute, Annual General Meeting, Montreal, Canada, May 11, 1981) Canadian Aeronautics and Space Journal,* vol 27, 3rd Quarter, 1981, p 222-232 7 refs Research supported by the Natural Sciences and Engineering Research Council of Canada

A study on the potentials of retrogression and reaging (RRA) aerospace aluminum alloys in the 7000 series to gain the T73 temper and T6 strength levels is reported The investigation covered the determination of the form of the RRA reactions in 7075-T6 Al by using hardness, yield strength, and electrical conductivity measurements, a wider range of temperatures and times which would allow

thicker specimens to be treated, and confirmed the improved stress corrosion resistance Fittings were heat treated in silicone oil baths, subjected to computer controlled servo-hydraulic tests, tested for stress corrosion crack growth rates, and treated with seawater solutions No relation was found between stress corrosion and yield strength, and the RRA treatment produced crack growth rates similar to the T73 alloy with T6 strength Additionally, the stress corrosion resistance of 7075 Al aged to or beyond the T6 condition was found proportional to the electrical conductivity of the material M S K

A82-23774 # **F/A-18 weapon system development** M J Tkach (McDonnell Aircraft Co , St. Louis, MO) *(Canadian Aeronautics and Space Institute, Flight Test Symposium, Cold Lake, Alberta, Canada, Mar. 31-Apr 1, 1981) Canadian Aeronautics and Space Journal,* vol. 27, 3rd Quarter, 1981, p 242-252

The design and operation of the F/A-18 cockpit, controls, avionics displays, and weapons systems control are described The cockpit is equipped with three head-down 5 in x 5 in CRTs, an up-front control for communication, navigation, and identification purposes, and an HUD The pilot needs to move his head only 22 deg from the HUD to the up-front control, while the HUD displays navigation and weapon delivery information, both air-to-air and air-to-ground A Hands On Throttle and Switching has switches on the stick and throttle for pilot control of the weapons, sensors, and displays during time-critical periods, in addition to control of the radar modes All AIM-7 and -9 missile firings to date have resulted in hits, while the lack of traditional airspeed indicators, coupled with the quiet cockpit and new maneuvering flaps have caused problems in maintaining airspeed control, with rectification difficult due to the complexity of the electronics. M.S K.

A82-23826 * # **Design of supercritical swept wings.** P Garabedian and G McFadden (New York University, New York, NY) *AIAA Journal,* vol 20, Mar 1982, p 289-291 11 refs Grants No. NGR-33-015-201, No NSG-1579

Computational fluid dynamics are used to discuss problems inherent to transonic three-dimensional flow past supercritical swept wings The formulation for a boundary value problem for the flow past the wing is provided, including consideration of weak shock waves and the use of parabolic coordinates A swept wing code is developed which requires a mesh of 152 x 10 x 12 points and 200 time cycles A formula for wave drag is calculated, based on the idea that the conservation form of the momentum equation becomes an entropy inequality measuring the drag, expressible in terms of a small-disturbance equation for a potential function in two dimensions The entropy inequality has been incorporated in a two-dimensional code for the analysis of transonic flow over airfoils. A method of artificial viscosity is explored for optimum pressure distributions with design, and involves a free boundary problem considering speed over only a portion of the wing. M S K

A82-23828 # **Oscillating supersonic/hypersonic wings at high incidence** W. H Hui, M F Platzer (U S. Naval Postgraduate School, Monterey, CA), and E Youroukos *AIAA Journal,* vol 20, Mar 1982, p 299-304 11 refs.

An approximate analytic method is developed for predicting the aerodynamic stability of oscillating supersonic/hypersonic flat wings at a mean angle of attack It uses the known exact unsteady unified supersonic/hypersonic flow solution for a two-dimensional flat plate plus the strip theory approximation to obtain the formulas for the stability derivatives They are applicable for wings of arbitrary planform shape at arbitrary angles of attack provided the shock wave is attached to the leading edge of the wing Good agreement is obtained with existing theories in various special cases The formulas for stability derivatives given here become exact in the Newtonian limit (Author)

A82-24001 # **Reliability centered maintenance /RCM/** F S Nowlan (United Air Lines, Inc , Chicago, IL) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 4 p

Inherent reliability characteristics of transport aircraft are described, and principles of reliability-centered maintenance (RCM) are discussed Airworthiness regulations are noted to be directed at failure events that have not yet occurred, but which theoretical analyses indicate have an unacceptable probability of happening Specific requirements are communicated to engineers, and compliance results in either no occurrence of failure, or sufficient redundancy of performance to offset failure RCM procedures involve component inspection at specified intervals, part overhaul before the failure interval is approached, discarding parts before the failure life is passed, and finding failures in hidden-function items which crewmembers may not have noticed On-condition tasks are given higher priority, followed by a rework task and then a discard task The effects on safety of the aircraft is the measure of the task hierarchy M S K

A82-24002 # **A310 - Design for maintenance** R Cutler (Airbus Industrie, Blagnac, Haute-Garonne, France) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 17 p

The way in which Airbus Industrie deals with maintenance during the design phase is described, noting that by giving maintenance the attention it merits, its proportion of direct operating costs is kept to a minimum Aircraft design is continuously subjected to a maintainability and reliability (M & R) review in order to ensure optimum trade-offs between M & R and other goals This review process comprises five steps (1) apportioning M & R goals to systems, components, etc , as required, (2) reviewing in-service experience to identify past problems and areas having the greatest potential for development, (3) evaluating design using M & R analytical techniques to identify questionable areas, (4) holding review meetings with designers and equipment suppliers to determine what improvements can be made, and (5) holding management progress review meetings to assess overall M & R performance in relation to goals, highlighting areas where goal attainment is unlikely, and specifying further actions C R

A82-24003 # **Development of maintenance programmes through the functional, structural and flight test phases** R E Grigg (British Aerospace Public, Ltd , Co , Weybridge, Surrey, England) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 9 p

Methods employed by British Aerospace to develop minimized maintenance plans for use by airline mechanics are described, with particular regard to the B Ae 146 The 146 was designed for simplicity with constraints imposed by maintenance cost targets and monitoring to meet contractual commitments. All systems were monitored at component levels, and the occurrence of full mock-up with real hardware initiated the development of maintenance schedules A logic analysis procedure was used to determine cost effective maintenance programs by scheduling maintenance on parts which affect safety and operational economy, and defined the tasks to be performed Failure modes were defined for each functional component and a probability level of acceptance before catastrophic failure was set. Further steps included flight development maintenance monitoring, task monitoring, the establishment of servicing locations, design of a structural inspection program, and the definition of structure life and inspection goals M S K

A82-24004 # **Air cooled engine test facilities** G F Dawson (Industrial Acoustics Co , Ltd , Staines, Middx , England) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper.* 6 p

The equipment and instrumentation of an operating comprehensive acoustic test facility for aircraft are described Specifications include air cooling and the capability of handling a reheat engine with a back-on-the-bed time of 30 min after engine shut-off. The facility is totally demountable, yet includes an acoustic enclosure, an intake silencer, and augmentor tube, a primary diffuser, a secondary suppressor, a plenum chamber, exhaust splitter elements, an exhaust stack, and a weather-proofed and sound-insulated control room Prerigged engines are mounted on the test bed over a trolley prewired and connected for all pneumatic and electronic parameters Engine test time is reduced by 50% over conventional testing methods due to an instantaneous computerized display of test results, automatic input and logging of data, audible and visual alarm systems, diagnostic checking procedures, and manual reversion capabilities on the controls M S K

A82-24005 # **Maintenance objectives for future aircraft** J G Borger *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 8 p

Maintenance requirements for airline operations are discussed, noting the need for simpler designs which enhance maintenance procedures while still maintaining increasing fuel efficiency Equipment redundancy is useful for safe operation with failed components, and modularizing aircraft parts has permitted on-line monitoring and replacement operations to maintain aircraft in flight-ready status with minimum delays due to repairs The advent of advanced electronics has enhanced maintenance procedures in some cases, while in others the complexity of the monitoring system has led to greater down time Higher performance engines degrade in performance after little more than a year's use, but refurbishment guided by high test stand acceptance standards, has improved engine removal rates Finally, designing for reliability, ease of inspection and removal, and for in-flight potential problem indication are recommended M S K

A82-24006 # **Airworthiness regulation What is our strategy - What are the issues.** M C Beard (FAA, Office of Airworthiness, Washington, DC) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 6 p

The importance of international standards in the design, manufacture, and maintenance is stressed in view of the increase of the leasing, charter, and exchange of aircraft across national boundaries Another trend noted in calling for international standards is the fact that the components of any given aircraft are, to an increasing extent, designed and manufactured in several different countries C R

A82-24007 **Reliable power** J M S Keen (Rolls-Royce, Ltd , Derby, England) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper.* 20 p

Current Rolls-Royce engines are reviewed, with specific attention given to the implementation of a three-shaft concept for the modular development of engine thrust increases and fuel consumption decreases The RB-211 three-shaft concept is reviewed, noting the development followed design goals of a short rigid engine with a minimum number of variables and cooled turbine stages The E-4 engine employs a wide chord fan blade without snubbers and blends the turbine and bypass duct exhaust flows for passage through a single, final nozzle Comprehensive access ports have been designed into the big fan engines, along with chip detectors in the oil system and vibration monitoring equipment for on-condition maintenance Reliability management has resulted in the modular nature of the engines, featuring engine breakdown into separate, self-contained components, with comprehensive use records serving to notify when specific parts are due for inspection or replacement M S K

A82-24008 # **What the operator wants** J Meline *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 6 p

The design and manufacturing goals of aerospace industries for supplying airlines which have formed cooperative pools of maintenance and overhaul facilities and resources are examined The manufacturers have gained feedback from the pooled labor forces who work on the increasingly standardized stocks of components in the common repair facilities, and are enabled to design-in improved features allowing easier and more thorough maintenance Introduction of a new aircraft in any one fleet immediately introduces the vehicle to all maintenance personnel in the pool The ATLAS group is noted to currently maintain a total fleet of 437 aircraft, and member agencies coordinate shared time to meet overhaul requirements Differences in on-condition maintenance and overhaul grouping of work is described, and the benefits of pooling the most qualified personnel are emphasized M S K

A82-24009 # **The way ahead for helicopter maintenance** W. E. Morris (Westland Helicopters, Ltd., Yeovil, Somerset, England) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb. 10-12, 1981, Paper.* 9 p

The progress made by a British helicopter company in improving maintainability and reliability (M & R) is surveyed Among the practices that have been found to be significant are the following (1) maintaining a comprehensive data bank on M & R that is linked with customer data banks, (2) mathematical modeling of the life cycle costs, (3) improving the ability to diagnose sources of vibration without detriment to the operational availability of the helicopter, and (4) introducing check out systems that record in-flight defects and malfunctions, thereby simplifying maintenance programming C R

A82-24010 # **The inter-relation between design, construction and maintenance** J M Ramsden *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 5 p

Methods of improving inspection and maintenance procedures, especially to compensate for an emphasized rise in poor workmanship during construction phases, are outlined An improvement in detail design, to simplify and correctly place aircraft components, is recommended, as is better education of specialists in features of fasteners and electronics On-line monitoring has become possible with self-checking, multiple probes for nearly all functional on-board equipment The need to improve tires and brake systems to cope with increasing landing weights and speeds is noted, as is a necessity to integrate electronic systems and provide protection from disconnects due to the operating environment Further suggestions are made for the elimination of corrosion, improvements in inspectability, and the need to measure in-service aerodynamics, and the demise of the U S Civil Aeronautics Board is mentioned as an erosion of the airline industry's data base M S K

A82-24011 # **MSG-3 structures** S Schofield (British Airways, Hounslow, Middx , England) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 5 p

The paper describes the philosophy and methodology used to develop the aircraft structures maintenance program contained and recently published in the ATA Airline/Manufacturer Maintenance Program Planning Document MSG-3 Particular consideration is given to the evolution of a separate logic analysis for structures, the consequence of failure evaluation, the separate assessment of the different forms of structural damage, the detectability of damage, the establishment of a continuing structural program for the life of the aircraft, fleet leader/age exploration inspections and the role of the manufacturer in the continuing structure program B J

A82-24012 # **Monitoring engine wear by oil analysis** D F Sermin (Applied Research Laboratories of Florida, Inc , Hialeah, FL) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 5 p

The application of spectroscopic techniques to the detection of metal particles in engine oils as an identifier and predictor of specific component wear and incipient failure is described The current rotrode technique involves physically taking an oil sample for electrical discharge vaporization and subsequent spectrography A succeeding step identifies the concentration computer calibrated graph Inaccuracies in the method had led to the development of wear element contraction determination by the use of inductively coupled plasma excitation The sample is introduced to the plasma within a quartz tube surrounded by a coil of wire which creates the magnetic field The oil is nebulized and passed through a tube into the plasma, where the atoms dissociate and create individual optical spectra in the 7000-10,000 K heat The method yields results within 1% of the signal value detected, or within 1 ppm M S K

A82-24014 # **MSG-3 overview** R Valeika (Pan American World Airways, Inc , New York, NY) *International Aircraft Maintenance Engineering Exhibition and Conference, Zurich, Switzerland, Feb 10-12, 1981, Paper* 4 p

The paper surveys experience with programs developed in the framework of the ATA Airline/Manufacturer Maintenance Program Planning Document MSG-3 After a brief review of experience with MSG-1/2, attention is given to MSG-3 development, and to maintenance programs developed for systems, powerplants, and structures within the MSG-3 context B J

A82-24022 * # **Minimum mass sizing of a large low-aspect ratio airframe for flutter-free performance.** W. H Greene and J Sobieszczanski-Sobieski (NASA, Langley Research Center, Hampton, VA) *(AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, 21st, Seattle, WA, May 12-14, 1980, AIAA Paper 80-0724.) Journal of Aircraft*, vol 19, Mar 1982, p 228-234 12 refs

A procedure for sizing an airframe for flutter-free performance is demonstrated on a large, flexible supersonic transport aircraft. The procedure is based on using a two-level reduced basis or modal technique for reducing the computational cost of performing the repetitive flutter analyses The supersonic transport aircraft exhibits complex dynamic behavior, has a well-known flutter problem and requires a large finite-element model to predict the vibratory and flutter response Flutter-free designs are produced with small mass increases relative to the wing structural weight and aircraft payload In view of the ability of the resizing procedure to handle this supersonic transport configuration, it seems likely that the method could be used for many other aircraft (Author)

A82-24023 # **Static pressure in the slipstream of a propeller** G Schouten (Delft, Technische Hogeschool, Delft, Netherlands) *Journal of Aircraft*, vol 19, Mar 1982, p 251-253 9 refs

Prompted by the paradoxical implication of existing theory that static pressure in the slipstream of an active propeller would exceed the static pressure in the fluid outside the slipstream, a consistent theory is developed which yields a static pressure more plausibly tending to the freestream pressure The theory adapts the flat trailing vortex sheet model to a propeller with a finite number of blades which moves at a finite velocity O C

A82-24025 **Air transport in the 21st century.** K G Wilkinson *Aerospace* (UK), vol 9, Jan 1982, p 18-23 8 refs

Trends in aircraft design into the 21st century are discussed, based on the driving need for higher fuel efficiency and alternative fuels Noting that fuel presently accounts for 30% of air transportation, results of an international study on the world energy supply and growth are used to present several scenarios of future aerospace operations Global energy is projected to be provided from renewables and nuclear, coal and gas, and oil, each group producing 1/3 of the world energy demands, with aerospace consuming 3% of the total oil consumed Advances in aerodynamics from NASA studies, in lightweight synthetic materials, in active controls, and in propulsion systems are outlined, with mention made of the CO2 contribution to a global rise in temperature The development of nuclear technology and the availability of nuclear fuels is contrasted against the environmental costs of using hydrocarbon fuels, and the necessity of developing a hydrogen-based fuel economy is emphasized M.S K

A82-24065 **Navigational aids on-board the Concorde (Les moyens de navigation du Concorde)** F Vicens (Compagnie Nationale Air France, Paris, France) *Navigation (Paris)*, vol 30, Jan 1982, p 25-39 In French

The differences of navigational instrumentation on the Concorde from subsonic aircraft due to transonic and supersonic flight regimes are described Speed classes at different heights are defined for optimal flight operations, with each minute of error from the most direct route causing an extra 100 kg of fuel to be consumed The Concorde is equipped with an inertial navigation system (INS), automatic direction finder, distance measuring equipment, VOR, and a ground warning system The INS gathers altitude information, guidance and navigation data, and coupled compass stabilization information with reference to the magnetic pole The Air Data Computer gathers aerodynamic and meteorological information, including altitude and vertical airspeed, from sensors mounted on the nose, and further guidance is aided by radio compass readings (Automatic Directional Finder) and two systems of radio altimetry M S K

A82-24066 **The birth of precision DME (La naissance du DME de précision)** O Carel (Direction Générale à l'Aviation Civile, Paris, France) *Navigation (Paris)*, vol 30, Jan 1982, p 53-65 6 refs In French

The requirements, design, and deployment of precision distance measuring equipment (DME) for implementation at French civil airports is described The system is intended to equal the performance levels of military landing systems, and furnish coordinates at 20 nm distance with a landing aperture of plus or minus 80 deg The DME permits curved approaches, thereby ameliorating flights over some urban areas, and offers the possibility of totally replacing radioaltimetry as an approach guide Polar coordinates are transmitted with an accuracy of 250 m, which is matched by the transverse accuracy, while altimeter readings are made with a 30 m error Methods of obtaining the precision measurements are presented, along with analyses of exponential damping, fabrication of the system, the presence of second or third impulses, and methods of interlocking the impulses, along with a demonstration of a 200 channel dual mode system M S K

A82-24077 # **Recent developments in wing with stores flutter suppression** R Destuynder (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) *(Deutsche Gesellschaft fur Luft- und Raumfahrt and Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt, International Symposium on Aeroelasticity, Nuremberg, West Germany, Oct. 5-7, 1981) ONERA, TP* no 1981-145, 1981 11 p

Active flutter suppression calculations and wind tunnel tests were performed for the case of a half-scale model of the Mirage F-1 fighter wing, equipped with three underwing stores whose distribution has been modified to make flutter occur in the wind tunnel's Mach 0 80-0 94 transonic regime Flutter control was achieved with a numerical control law designed to induce wing aerodynamic stiffness by means of a control surface Further studies were conducted on nonlinearities due to the static aerodynamic characteristics of the control surface at high subsonic Mach numbers, and the influence of phase and gain variations on the control law The results derived demonstrate the possibility of flutter control on military aircraft operating at high Mach numbers O C

A82-24245 **Recent improvements in aircraft Ni-Cd cells** R Bonnaterre, J Leonardi, and P Oliva (Societé des Accumulateurs Fixes et de Traction, Bordeaux, France) In Power sources 8 Research and development in non-mechanical electrical power sources, Proceedings of the Twelfth International Symposium, Brighton, England, September 1980 London, Academic Press, 1981, p 459-468, Discussion, p 469

It is noted that the reliability, power performance, and durability of the alkaline Ni-Cd batteries used in such advanced technical fields as aeronautics and high-speed trains are becoming increasingly important A new aircraft battery generation created to respond to such requirements is described Increased reliability and durability result from the development and use of a new graft copolymer membrane, the properties of which are discussed The use of the new membrane and the optimization of the electromechanical parameters of the cell design have significantly improved the power characteristics of Ni-Cd aircraft batteries In particular, eliminating the 'potential well' phenomenon in low-temperature, high-rate discharges has led to substantial power gains for low-temperature aircraft starts C R

A82-24301 **Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings** Conference sponsored by the Society of British Aerospace Companies London, Society of British Aerospace Companies, Ltd , 1981 713 p $59 50

Among the aircraft transparency design, testing and analysis topics covered are (1) transparency development needs for military aircraft in the 1980s, (2) an aircraft transparency design guide, (3) deficiencies and constraints affecting the design of cockpit transparencies and enclosures, (4) bird strikes, (5) windshield system structural enhancement, (6) aircraft transparency bird impact analysis using the MAGNA computer program, (7) stretched acrylic transparency materials, (8) transport aircraft transparencies, and (9) impact resistance test methods Also considered are (10) abrasion-resistant coatings for aircraft, (11) the role of finite element analysis in the design of birdstrike-resistant transparencies, and (12) the effects of bird orientation on load profile and damage level O C

A82-24302 **Transparency development needs for military aircraft in the 1980's** N C Moore In Conference on Aerospace

Transparencies, London, England, September 8-10, 1980, Proceedings. London, Society of British Aerospace Companies, Ltd , 1981, p 3-13

Attention is given to the improvement and optimization of overall transparency configurations in military aircraft A number of areas for development effort are identified These include (1) the achievement of undistorted views from helicopter transparencies, (2) the need for distortionless, near-360-deg vision from fixed wing strike aircraft windscreens and canopies, (3) the reduction of transparency-induced cockpit noise, (4) the lowering of glint phenomena through transparency surface reflectivity reduction, (5) the design of alternative windscreen washers and wipers, (6) the reduction of strike aircraft combat losses due to pilot injury, by means of transparent armor, (7) emergency repair schemes under battle conditions, and (8) nuclear effects due to overpressure, flash and thermal effects, and radiation levels O C

A82-24303 Deficiencies and constraints that affect the design of cockpit enclosures and transparencies J H Lawrence, Jr (Douglas Aircraft Co., Long Beach, CA) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 15-24

Maximum-visibility cockpit enclosure and transparency design problems are considered in light of experience with the development of the DC-10, in which these design considerations were addressed by means of a systems approach The strongest constraint is shown to be the aerodynamic shaping of the aircraft, which, because of the slopes and shapes required, may be unacceptable to the pilot on the grounds of distortion and can increase the difficulty of designing such subsystems as the electrical, anti-icing, and rain removal. Attention is also given the inadequacies of glass-acrylic laminates under cyclic loading, thermal cycling and contact with moisture, the seals and mounting of the transparencies in their support structures, and up/down-left/right charts for both minimum recommended vision and the captain's binocular vision envelope O C

A82-24304 Fuel-efficient windshields for transport, commuter and business aircraft G L Wiser (Sierracin Corp , Sylmar, CA) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 25-95 34 refs

The effects of weight and drag reduction measures involving windshields and their associated structures and systems on fuel efficiency are explored It is shown that the incorporation of these techniques can save up to 80,000 gallons of fuel/year per aircraft in wide-body commercial aircraft applications, and 12,000 gallons/year per aircraft in the case of commuter designs The alternatives considered include (1) flat glass windshields, (2) curved glass windshields, (3) curved high-strength glass windshields, (4) structurally-integrated curved windshields, (5) curved stretched acrylic windshields, (6) curved, chemically-strengthened glass windshields, and such associated systems as temperature controllers and rain removal O C

A82-24305 Transparencies - What an aircraft designer should know P J Sharp (Lucas Aerospace, Ltd , Luton, Beds , England) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings
London, Society of British Aerospace Companies, Ltd , 1981, p 97-111

The effect of windscreen lay-back angle on aircraft weight, energy requirements and optical characteristics are quantified for a typical, small jet aircraft, and the problems associated with the electrical deicing of irregular areas are examined Weight effects are due to the load-transfer requirements of pressurized cabin transparencies Additional factors considered are bird strikes, windscreen visual distortion, heating element positioning, and certification criteria O C

A82-24306 Transparency design decisions - Assessing their impact on visual performance R G Eggleston and L V Genco (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings
London, Society of British Aerospace Companies, Ltd , 1981, p 113-128

The efficiency of aircraft transparency designs is considered as an information system in which the scene, transparency and pilot are separate elements A transparency may alter the scene visible to a pilot in four ways refraction, reflection, absorption and transmission These are the bases for such common transparency optical degradation problems as (1) distortion, (2) multiple imaging, (3) rainbowing, (4) volume and surface haze, (5) internal reflections, and (6) transmission loss The contribution to each of these defects by transparency slant, flatness, single or compound curvature, material, thickness, absorption characteristics, scratch resistance, UV resistance, and monolithic or laminated construction, are correlated in tabular form along with observer and scene factors that may contribute to the quality or degradation of performance O C

A82-24307 Aircraft transparency design guide L Moosman (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) and J H Lawrence, Jr (Douglas Aircraft Co , Long Beach, CA) In Conference on Aerospace Transparencies, London, England, September 8 10, 1980, Proceedings
London, Society of British Aerospace Companies, Ltd , 1981, p 129-139

The 'Guidelines for the Design of Aircraft Windshield/Canopy Systems' is a design manual which serves as a single source for all requirements, data and systems recommendations relevant to the development of aircraft transparencies The guide covers (1) management of transparencies and related subsystems design, (2) the transparency/aircraft configuration relationship, (3) vision and optical design, (4) structural design and analysis, (5) bird impacts, (6) materials, (7) environmental design, (8) combat exposure design, (9) maintainability, (10) reliability, and (11) transparency design verification and quality assurance requirements The data from which this compilation of requirements was derived include FAR 25, SAE AS580, and the Air Force Systems Command Design Handbook O C

A82-24308 A new angular deviation measurement device for aircraft transparencies H L Task, R G Eggleston, and L V Genco (USAF, Human Engineering Div , Wright-Patterson AFB, OH) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 141-147

An optoelectronic angular deviation measurement device incorporating a CCD array, which offers accuracy, repeatability and ease of operation while occupying a much smaller volume than long-throw laser devices of comparable performance, is described The instrument's resolution is 0 07 mrad, and F-16 windscreen measurements have been found to compare favorably with data produced by alternative techniques The device is to be used in characterizing distortion levels in such transparency-incorporating systems as head-up displays O C

A82-24309 Portable transparency optical test system /P-TOTS/ L V Genco, R G Eggleston, and H L Task (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) In Conference on Aerospace Transparencies, London, England), September 8-10, 1980, Proceedings
London, Society of British Aerospace Companies, Ltd , 1981, p 149-160

The Portable Transparency Optical Test System (P-TOTS) described is a novel device for the collection of visual and optical data from installed transparencies, including the evaluation of time-dependent changes in optical quality Although P-TOTS has to date been employed in the birefringence, distortion, binocular distortion, multiple image and haze characterization of F-111 windscreens, the device may be adapted to other aircraft through a mounting-fixture change estimated to cost $4000 O C

A82-24310 Abrasion resistant coated plastic products for aircraft W F Fischer and W C Harbison (Swedlow, Inc , Garden Grove, CA) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings
London, Society of British Aerospace Companies, Ltd , 1981, p 185-204 10 refs

Experimental results concerning the use of the application of abrasion-resistant coatings to polycarbonate and acrylic transparencies in architectural and ground-transportation installations are correlated to the use of such coatings on aircraft transparencies A failure theory is substantiated through a combination of the experimental data with separate results of accelerated testing A silica-filled polysiloxane coating is shown to offer the greatest resistance to abrasion The failure mode of the coatings is generally mechanical degradation, consisting of cracking or microcracking from repeated tensile elongation/compression associated with thermal, moisture gain/loss and flexural cycling O C

A82-24311 Proposed method for abrasion testing transparent plastics and coatings. A J Bunje (Texstar Corp , Texstar Plastics, Grand Prairie, TX) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 205-213

An examination is presented of methods for the abrasion testing of transparent plastics and coatings, with attention to the preparation and interpretation of the Taber Abraser and Falling Sand tests A test methodology is described which allows the testing of all materials and coatings irrespective of hardness, and in which the entire sample surface is exposed to the abrading action The larger area thereby measured yields more representative results, which are shown to be highly reproducible Test results data are presented in tabular form O C

A82-24312 Windshield system structural enhancement R J Speelman, R H Walker, and R L Peterson (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 217-243 22 refs

Transparency technology investigations with emphases on improved birdstrike resistance and longer service life are being conducted by the Air Force Flight Dynamics Laboratory In addition to supporting such existing systems as the T-38, F-16 and F 111, a technical base is emerging for the development of new transparencies which includes (1) computer-aided design procedures for birdstrike structural analysis (2) birdstrike hazard risk prediction techniques, (3) design procedures for the integration of birdstrike protection and large field-of-view capabilities with high-temperature operation, (4) design procedures for consideration of ballistic fragment impact resistance, (5) testing procedures for improved correlation between laboratory and field performance, and (6) a transparency system design-guideline manual O C

A82-24313 # An analytical methodology to predict potential aircraft losses due to canopy birdstrikes J C Halpin, J M Griffin, and K T Jackson, Jr (USAF, Aeronautical Systems Div , Wright-Patterson AFB, OH) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 245-271

An analysis for the projection of birdstrike damage is presented in which data for the F-4 aircraft is used as a basis for the development of a model and the F-16 is used for verification After determining the operational impact rate (OIR), a kinetic energy matrix is calculated and a line representing the expected canopy capability is drawn through this matrix The canopy capability line from the kinetic energy matrix is then superposed on the birdstrike matrix, and the birdstrike number is derived by summing the appropriate values from the matrix If the failure mode is deflection rather than penetration, critical areas corresponding to certain kinetic energy levels must be determined and then used to recalculate the expected birdstrike matrix O.C

A82-24314 The role of finite element analysis in the design of birdstrike resistant transparencies B S West (Dayton, University, Dayton, OH) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 273-295 8 refs Contracts No F33615-75-C-3134, No F33615-76-C-3103, No F33615-80-C-3401

The Materially and Geometrically Nonlinear dynamics Analysis problems (MAGNA) finite element code, for the efficient analysis of crew enclosure structures during bird impact, is described The design variables typically incorporated into parametric design data in the code are (1) transparency stiffness, which depends on material, configuration and thickness, (2) support structure stiffness, (3) load location, (4) load magnitude, and (5) edge member configuration. Transparency edge member integrity has proved to be critical to the birdstrike resistance of aircraft transparency/support systems Computer run time increases by more than an order of magnitude if the parametric study is conducted using all available nonlinear options rather than linear elastic analysis Several sample analyses are presented to demonstrate the linear and nonlinear solution capabilities of the MAGNA program O C.

A82-24315 Aircraft transparency bird impact analysis using the MAGNA computer program R E McCarty (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 297-313 14 refs

The MAGNA computer program is shown to realistically simulate the nonlinear dynamic structural response of aircraft transparencies to birdstrike loading It is not yet possible, however, to accurately predetermine the loads resulting from bird impact on very flexible transparencies, due to the fact that the magnitude of the loads and the surface area and time period over which they act strongly depend on the dynamic response of the transparency MAGNA is especially applicable to relatively stiff transparencies, in which the effects of load-response coupling may be ignored, and may prove useful in the analysis of any problem involving the response of a structure subject to static or transient loads O C

A82-24316 The effects of bird orientation on load profile and damage level A Challita and B S West (Dayton, University, Dayton, OH) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 315-338 7 refs Contract No F33615-78-C-3402

A number of programs have been initiated with the aim to increase the birdstrike resistance of aircraft and their components A description is presented of specific programs with two basic objectives One objective is related to a characterization of the loads generated during birdstrike to use as input to the modern finite element structural analysis codes which are currently used as a transparency design tool The second objective involves the evaluation of the testing procedures employed to evaluate the level of birdstrike protection afforded by a given flight hardware system Of three orientations tested, end-on orientation was found to be as critical, or more critical, than the other orientations Side-on orientation was the least critical orientation During end-on birdstrike testing, pitch and yaw would tend to decrease criticality G R

A82-24317 Acrylic - A timely review K G Granger (Swedlow, Inc , Garden Grove, CA) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 341-354, 356, 357

The review is concerned with the use of acrylics in applications related to aircraft transparencies, taking into account the principal aircraft grades of acrylic Main qualities of acrylics with respect to the considered applications include its ability to maintain excellent strength, transparency, and clarity in environments which comparatively quickly cause deterioration in other transparent plastics For aircraft glazings applications, only glass is superior to acrylic in terms of weatherability, solvent resistance, and surface hardness However, glass is inferior to plastics in connection with greater weight, failure mode, and relative difficulties with respect to the formation of aerodynamic shapes A number of case histories are discussed which demonstrate the advantages of a use of acrylic Attention is also given to the proposed laminated F-16 canopy design and the development of modified acrylics G R

A82-24318 Lucas stretched acrylic. D B Bell (Lucas Aerospace, Ltd , Luton, Beds , England) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980,

Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 359-368

Selection criteria for the pressing processes in manufacturing stretched acrylic from as-cast billets at the Lucas facility are discussed Advantages of a press over gripping around the edges include more parallel surfaces, better yield from the material, and the avoidance of sheet splitting which sometimes occurs when the material is stretched Specifications for stretched acrylic are discussed, and the facility is described, including a discussion of the stretching press and the grinding/polishing machines The planned expansion of the facility is also discussed, which includes the introduction of a pre-heater and additional polishing machines

D L G

A82-24319 Problems associated with the quality assurance of stretched acrylic sheet. R L Worsdall (Ministry of Defence /Procurement Executive/, Material Quality Assurance Directorate, London, England) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd., 1981, p 371-397

A description is presented of special problems arising in connection with an application of a manufacturer for Type Approval of a material intended for defense-related uses, taking into account the approaches employed to solve these problems The material involved was stretched acrylic sheet There were differences between test results obtained in the laboratories of the manufacturer and the Materials Quality Assurance Directorate The differences were, in particular, observed in thermal relaxation studies, and increased as the thickness of the sheets examined became progressively larger In an investigation of the reasons for these differences, it was found that in the conduction of thermal relaxation studies the temperature control is important and the moisture content is critical An important factor is also the position from which the sample is taken in the sheet G R

A82-24320 The effects of absorbed moisture upon the physical properties of stretched acrylic materials A J Mason (British Aerospace Public, Ltd , Co , Materials Laboratory, Weybridge, Surrey, England) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 399-416 Research supported by the Ministry of Defence (Procurement Executive)

It is noted that stretched acrylic materials are often preferred to 'as-cast' acrylics for the manufacture of aircraft transparencies owing to their superior craze and crack propagation resistance However, the service performance of stretched acrylics can be affected by their operational environment The effects of absorbed moisture upon various physical properties of stretched acrylic materials, including thermal relaxation, surface shrinkback, solvent craze resistance, crack propagation resistance, and surface hardness, are described It is pointed out that the base stock material and method of stretching may also influence physical properties These have been assessed by including in the evaluation three materials that have been manufactured from two base stock materials and produced by two manufacturing techniques C R

A82-24323 The development of high strength light-weight windshields for the new generation of Boeing 757 and 767 airliners R W Wright (Triplex Safety Glass Co , Ltd , Aircraft and Special Products Div , Birmingham, England) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 533-548

Windshields based on multilaminate construction and electroconductive coatings were introduced in the 1970s on such aircraft as the Concorde, A300B, de Havilland Canada Dash 7, and Boeing 747 In all, more than 20,000 hours of flight have been recorded The way in which this technology is being adapted to meet the needs of the new Boeing 757 and 767 aircraft, where weight saving and reliability are fundamental requirements, is discussed A description is also given of design, development and qualification test features C R

A82-24324 D C 9 windshield - Effect of attachment retorque J Christensen (Scandinavian Airlines System, Copenhagen, Denmark) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 549-562

Reference is made to a paper by Christensen (1978) propounding a theory related to the influence of attachment method on failures for D C 8-60 and D C 9 winshields The experience of regular retorquing of attachment fasteners on Scandinavian Airlines System aircraft is reported It is noted that this has had a marked effect on reducing windshield failures Further expected improvements are discussed C R

A82-24325 B A C One-Eleven flight deck glazing product improvement. J F Russell (British Aerospace Public, Ltd , Co , Weybridge, Surrey, England) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 563-576

The modifications described include recessed bus-bars, fiberglass chip retarders, and the introduction of additional interlayer plies of a new material, all for the windshield Another modification involved moving the de-mist film on the side windows from one glass ply to another It is noted that, altogether, these modifications have led to a doubling of the windshield MTBF in eight years and to a great improvement in the side windows C R

A82-24326 Concorde glazings - 5 years of Mach 2 service W P C Soper and R A Brown (British Aerospace Public, Ltd , Co , Bristol, England) In Conference on Aerospace Transparencies, London, England, September 8-10, 1980, Proceedings London, Society of British Aerospace Companies, Ltd , 1981, p 577-601

A description is provided of the level of achievement obtained with respect to the transparencies of the Concorde project Aircraft operating conditions are considered It is pointed out that the transparency configuration was conceived such that the aircraft would key into the normal operating pattern of conventional jet transport traffic and that no preferential treatment would be needed The visor panels of the aircraft are discussed, taking into account the current visor panel construction, aspects of cyclic testing, flight testing, alternative panel designs, and in-service performance Attention is also given to the forward main windscreen, the D V and aft side windows, and the Series aircraft cabin window G R

A82-24338 # Air transportation of handicapped persons (Le transport aérien des handicapés) E Mapelli (Iberia Lineas Aéreas de España, Madrid, Spain) In Annals of air and space law Volume 5. Toronto, Carswell Co , Ltd , Paris, Editions A. Pedone, 1980, p 171-188 16 refs In French

Various legal aspects of the air transportation of handicapped persons are reviewed Consideration is given to the rights and obligations of passengers as they pertain to the handicapped, the physical ability of passengers to travel on aircraft and the right of carriers to exclude the handicapped, obligations of the carrier in relation to the handicapped passenger, and carrier liability in relation to the injury of a handicapped passenger. B J.

A82-24354 The coupling of electromagnetic interference into aircraft systems R V Pankhurst (Aeroplane and Armament Experimental Establishment, Boscombe Down, Wilts , England) In Conference on Electromagnetic Compatibility, Southampton, England, September 16-18, 1980, Proceedings London, Institution of Electronic and Radio Engineers, 1980, p 117-128

Results of tests performed to determine the electromagnetic transfer function for complete aircraft from 100 kHz to 250 MHz are presented The current distribution within the wiring bundle is shown along with the effect of end terminations, and attention is given to the variability between aircraft of the same type and aircraft of different types Also considered are the developing overall picture of these induced currents and the implications of these results for future clearance work as well as for the usefulness of this information to aircraft systems and equipment designers B J

A82-24355 The variation of induced currents in aircraft wiring P M Newton (Ministry of Defence /Procurement Executive/,

London, England). In Conference on Electromagnetic Compatibility, Southampton, England, September 16-18, 1980, Proceedings London, Institution of Electronic and Radio Engineers, 1980, p. 129-134.

The paper examines the use of the bulk current method to measure the variation of induced currents in aircraft wiring due to the operation of onboard transmitters and the variation of the RF environment The measurement method is described and typical results of aircraft samples to date are discussed Results to date have shown that current varies by a factor of three and the RF environment on the average by a factor of two B J

A82-24357 MIL-STD 1553B Aircraft EM environmental susceptibility effects. G Gerbi and E R Totto (Aeritalia S p A, Turin, Italy) In Conference on Electromagnetic Compatibility, Southampton, England, September 16-18, 1980, Proceedings London, Institution of Electronic and Radio Engineers, 1980, p 147-155

The subject of this paper is the technology applied to aircraft to minimize EMI in the installation of MIL-STD-1553B digital transmission links The electromagnetic interference generators normally installed on aircraft are considered, and the susceptibility of a typical MIL-STD-1553B data link is investigated Experimental tests and computer aided analysis using the SEMCAP program, which have been performed for simple geometrical coupling models, are described The results of this work give practical indications about the influence of mechanical and electrical harness parameters on EMC aspects of the aircraft installation of MIL STD-1553B digital transmission lines A good architecture for digital data link installations is also discussed (Author)

A82 24358 Materials aspects of aircraft EMC design M W Baskerville and J Brettle (Plessey Research /Caswell/, Ltd, Allen Clark Research Centre, Towcester, Northants, England) In Conference on Electromagnetic Compatibility, Southampton, England, September 16-18, 1980, Proceedings London, Institution of Electronic and Radio Engineers, 1980, p 157-170 Research supported by the Ministry of Defence (Procurement Executive)

The effect of materials, construction methods, and corrosion protection schemes on the dc and RF impedance of structural and electrical joints in aircraft is considered The development of the theory and practice of making resistance measurements in large structures is examined in the light of a survey of bond resistance measurements in service aircraft It is shown that the resistance of structural and electrical bonds in aircraft is critically dependent on a number of variables, including the type of fastener used, materials, and conditions of the relevant surfaces It is possible to choose a set of variables which give a low bond resistance which is constant with time even when exposed to corrosion conditions B J

A82-24359 EMC clearance of modern military aircraft I P Macdiarmid and D M Wormstone (British Aerospace Public, Ltd, Co., Military Aircraft Div, Warton, Lancs, England) In Conference on Electromagnetic Compatibility, Southampton, England, September 16-18, 1980, Proceedings London, Institution of Electronic and Radio Engineers, 1980, p 171-182. Research supported by the British Aerospace Public, Ltd, Co

An approach to EMC testing which was recently adopted on a production version of a modern strike aircraft is described The procedure involved a quantitative assessment of the switching transients occurring on bus bars and selected signal lines, an interaction test whereby each potentially susceptible system must be observed while other systems are operated in their most emissive modes, a study of the safety margin of the compatibility of aircraft systems with intentional onboard transmitters, an investigation of the compatibility of the aircraft systems with the external RF environment, a quantitative assessment of the extent of data corruption at transducer-computer interfaces due to onboard emissive sources, and an in-depth compatibility study of all onboard RF equipment The methods used and the results obtained were considered adequate to provide an assessment of the EMC of the onboard systems, however, it is noted that the demonstration of compatibility could be improved in certain areas B J

A82-24361 The testing of aircraft under near field conditions M Elliott (Aeroplane and Armament Experimental Establishment, Boscombe Down, Wilts, England) In Conference on Electromagnetic Compatibility, Southampton, England, September 16-18, 1980, Proceedings London, Institution of Electronic and Radio Engineers, 1980, p 199-206

Although the HF band is of considerable interest in external field EMC testing, the environment in a typical trials facility is highly complex in this frequency range This is due to operation in the near field region of the transmitting antenna, the proximity of the ground, and the presence of the fields scattered by the object under test This problem was investigated by comparing the surface currents induced by three near field sources and one far field source on a cylinder which modeled the aircraft The effects of the orientation of the cylinder on the measured magnetic and electric components of the field are examined, and optimum positions and methods of field measurements are discussed B J

A82-24371 Managing computer aided design, Proceedings of the Conference, London, England, November 19, 1980 Conference sponsored by Institution of Mechanical Engineers London, Mechanical Engineering Publications, Ltd (I Mech E Conference Publications 1980-8), 1980 51 p $30

Papers are presented on the problems encountered by the incorporation of computer-aided design and computer-aided manufacturing (CAD/CAM) systems into the process industries, such as aircraft manufacture and chemical production, in Britain Attention is given to the use of CAD graphics by a mechanical engineering firm, the successful management of CAD, the use of CAD/CAM electronic data transfer to integrate geographically distributed aircraft production, experience with computer-aided building design system in an architectural firm, the acceptance of interactive graphics by industry, and the relation between the financial productivity impact of CAD/CAM and labor relations O C

A82-24373 CAD/CAM in British Aerospace - Aircraft Group J S Rawlins (British Aerospace Public, Ltd, Co, Aircraft Group, Kingston-on-Thames, Surrey, England) In Managing computer aided design, Proceedings of the Conference, London, England, November 19, 1980 London, Mechanical Engineering Publications, Ltd, 1980, p 27-34

The use of computer-aided design and computer-aided manufacturing (CAD/CAM) techniques in aspects of aircraft structure geometry and electrical system definition is described for the case of the BAe 146 commuter aircraft The use of electronic design and production data transfer is especially important in aircraft industry projects of the kind described because of the geographical distribution of component fabrication and assembly facilities Emphasis is put on the ability of a CAD/CAM system to make information promptly available, from the conceptual design to the in-service product support stages, without need for manual transcription before distribution O C

A82-24376 Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981 Congress sponsored by the Society of Automotive Engineers Warrendale, PA, Society of Automotive Engineers, Inc, 1981 90 p $18
(SAE SP-500)

The design, testing, maintenance, requirements, and future needs for aircraft power supplies were covered Specific attention was given to design considerations of DC-Link aircraft generator systems and to cost of ownership advantages such as weight reduction and maintainability with a shared-oil system Considerations for the design of variable speed, constant frequency (VSCF) generators are presented, and advanced generating systems technology was discussed The effect of critical design parameters on the selection of a VSCF system was examined, along with the evolution and development of high voltage (270 V), dc aircraft electric systems and packaging the VSCF system for a military aircraft environment Finally, the development of an aircraft electric system test facility was detailed M S K

A82-24377 Design considerations of DC-Link aircraft generation systems M A Rosswurm (Westinghouse Electric Corp,

Aerospace Electrical Div , Lima, OH) In Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981 Warrendale, PA, Society of Automotive Engineers, Inc , 1981, p 1-15

Design considerations in the development of the DC-Link VSCF electrical power systems for aircraft are presented, along with component descriptions, functional details, applications to the AV8-B and F-5G, and comparisons to alternate methods of power generation The DC-Link system is compared with constant speed drive and cycloconverter energy systems, and the major components of the DC-Link system are shown to be a generator module, power electronics module, and the generator control module, which as a system yield a constant frequency output and employ transistorized switching Specific descriptions are provided of the power transistors, the inverter power pole, the commutating diodes, and the base drive circuit Operational characteristics such as the inverter waveform, neutral forming transformer and power stage sensing are considered, and functions of the generator control unit and inverter drive logic module are outlined M S K

A82-24378 Cost of ownership advantages with a shared oil system. R C VanNocker and W A Carmine (General Electric Co , Binghamton, NY) In Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981 Warrendale, PA, Society of Automotive Engineers, Inc , 1981, p 17-21

The benefits and system features of coupling the aircraft gearbox oil to the generator cooling system are outlined It is noted that in a constant speed drive system, weight, maintainability, and life cycle costs are aided by avoiding redundant oil pumping facilities The shared system is favored when generator functions won't contaminate the oil, pose no risk to the gearbox, and do not command the use of excessive amounts of oil A dry cavity concept is described, which features heat exchangers completely isolated from any generator electrical components, and the use of the shared system on the F/A-18 is mentioned The addition of the shared-oil module alters the maintenance concept from on-condition to a scheduled maintenance procedure, and an ultimate repair and maintenance cost figure of $2 70 per flight hr is derived M S K

A82-24379 High speed VSCF generator design consideration. T L Ho (Westinghouse Electric Corp , Aerospace Electrical Div , Lima, OH) In Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981 Warrendale, PA, Society of Automotive Engineers, Inc , 1981, p 23-33

The employment of computer aided design (CAD) for VSCF generator design is examined, specifically with regard to thermal, stress, and dynamic analyses Thermal analysis is accomplished through an iteration of a series of design modifications, and examples are presented for the design of inverter semiconductor stacks, a diode rectifier assembly, and a power pole assembly Finite element programs are implemented in a structural analysis, focusing attention on weight reduction and stress concentration at specified speeds, and procedures are outlined for applications to an inverter cover plate and to a high speed rotor Dynamic study comprises model analysis by a finite element method and a critical speed analysis of the rotating system by means of turbomachine dynamics programs, serving to define the structural stability of the system M S K

A82-24380 Advanced generating system technology R J Kennett (Lucas Aerospace, Ltd , Electrical Div , Hemel Hempstead, Herts , England) In Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981 Warrendale, PA, Society of Automotive Engineers, Inc , 1981, p 35-41 Research supported by the Ministry of Defence (Procurement Executive) and Department of Industry

A design approach to the achievement of a maximum specific output of an aircraft 400 Hz ac 2-pole generator with operation at 24,000 rpm is presented Locating the field assembly inside a nonmagnetic shaft eliminated mechanical conflicts and allowed an inherently stiff rotor, permitted flooding the rectifiers with cooling oil to reduce temperature gradients, and porting to the stator to minimize drag losses and avoid insulation erosion The rectifiers were moved toward the shaft axis, and interconnection with the main exciter was arranged to neutralize centrifugal forces on the rectifier connection The rotor shaft is used to provide maximum support for the stressed elements along the length of the alternator, which has a single coil Weight reduction is also provided over four-pole machines, and bearing life is protected by a low rotating mass and elimination of mechanical unbalance Operation and maintenance are reviewed M S K

A82-24381 The effect of critical design parameters on the selection of a VSCF system D S Yorksie and W E Hyvarinen (Westinghouse Electric Corp , Aerospace Electrical Div , Lima, OH) In Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981 Warrendale, PA, Society of Automotive Engineers, Inc , 1981, p 43-50

A decision model of the critical design criteria for applications of either cycloconverter or DC-Link variable speed, constant frequency (VSCF) electric power generators onboard aircraft are examined Power switching and controlling techniques and components are described for each type of generator, noting the advent of advanced high-power switching transistors Critical parameters of choice include the system rating, cooling method and temperature, efficiency, weight, location, and gearbox speed and range Each parameter is explored for effect in different applications, and it is concluded that rating, cooling temperature, efficiency, and weight are the most critical parameters A fifth element is added to the four most critical criteria, and comprises system-specific features which customize the decision model to the application under consideration M S K

A82-24382 Evolution and development of high voltage /270 volt/ dc aircraft electric systems in the United States J D Segrest (U S Naval Material Command, Naval Air Development Center, Warminster, PA) and W W Cloud (Lockheed-California Co , Burbank, CA) In Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981 Warrendale, PA, Society of Automotive Engineers, Inc , 1981, p 51-63 10 refs

The system concept of high voltage dc power systems for aircraft applications is reviewed, with regard to the state-of-the-art in the hardware available The history of dc system use is outlined, noting the continually increasing demand of higher voltage levels Mention is also made of the inherent unsatisfactory lifetime levels of current constant speed 400 Hz power devices with respect to future aircraft Cycloconverter and DC-Link power generating systems are subject to complex designs and display a poor power factor, wave form distortion, and EM incompatibility Brushless dc motors are available for engine mounting, and provide 270 V dc, which offers high reliability, high efficiency, light weight, power continuity, fuel economy, and personnel safety Existing systems and advanced systems are outlined, with operational performance and requirements, including the need to develop solid-state load controllers for over 50 amps power load M S K

A82-24383 Packaging the VSCF system for an aircraft engine environment D D Pollard and G E Krajci (Westinghouse Electric Corp , Aerospace Electrical Div , Lima, OH) In Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981
Warrendale, PA, Society of Automotive Engineers, Inc , 1981, p 65-76

The integration of microprocessor modules, high power semiconductor arrays, and a high-speed generator to form a compact, low-weight variable speed constant frequency (VSCF) power system is described With specific consideration of military systems, envelope concerns are defined as the allowable space and shape, power and logic electrical interfaces, coolant/lubricant lines and interfaces, and maintainability Military aircraft are noted to require dense packaging, have common disconnect mechanisms, and allow removal of the entire system at once Sensitive components are sealed off from the environment and vibrations, and thermal control is provided by air-oil and fuel-oil heat exchangers Operation without oil flow is feasible for short periods of time due to the thermal inertia, and installations in the F-5G and AV-8B aircraft are detailed M S K

A82-24384 **Aircraft electric system development and test facilities** D Cousins (Sundstrand Corp , Rockford, IL) In Aircraft electrical power systems, Proceedings of the Aerospace Congress and Exposition, Anaheim, CA, October 5-8, 1981
Warrendale, PA, Society of Automotive Engineers, Inc , 1981, p 77-86

Specialized capabilities, requirements, and design considerations for a facility to construct electric power systems for aircraft are described A test area is provided for development and qualification testing of aircraft generating systems, along with a multistand complex for accelerated life testing, and a facility for electronic and electric products Individual test cells are required for examining the performance of test generators during specified voltage drops and impedance Further provision is made for testing prime movers, gearboxes, generator feeders, control consoles, load systems, and main and auxiliary load controls Instrumentation is dedicated to both test stand consoles and from multichannel data acquisition system recorders and displays Finally, electromagnetic compatibility testing is accomplished by examining radiated and conducted EM interference and by exposure to EM pulses M S K

A82-24385 **Wind and temperature database for flight planning** H C True and D E Winer (FAA, Office of Environment and Energy, Washington, DC) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811068* 8 p 17 refs

The importance of timely and accurate wind and temperature data to flight planning and aircraft fuel conservation is pointed out. Recent advances in meteorological data measurement make it possible to obtain the required information Attention is given to aspects of flight planning, the existing observation network, an atmospheric model, fuel considerations, wind and temperature observation technology, the potential of satellite based wind observation systems, and the dissemination of observations to aviation flight planners It is found to be technically and economically feasible to create a wind and temperature database for flight planning based on the Prototype Regional Observation and Forecasting System 'profiler'. G R

A82-24386 * **Airline flight planning - The weather connection** R Steinberg (NASA, Lewis Research Center, Cleveland, OH). *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct. 5-8, 1981, Paper 811067* 12 p

The history of airline flight planning is briefly reviewed Over half a century ago, when scheduled airline services began, weather data were almost nonexistent By the early 1950's a reliable synoptic network provided upper air reports The next 15 years saw a rapid growth in commercial aviation, and airlines introduced computer techniques to flight planning The 1970's saw the development of weather satellites The current state of flight planning activities is analyzed It is found that accurate flight planning will require meteorological information on a finer scale than can be provided by a synoptic forecast Opportunities for a new approach are examined, giving attention to the available options, a mesoscale numerical weather prediction model, limited area fine mesh models, man-computer interactive display systems, the use of interactive techniques with the present upper air data base, and the implementation of interactive techniques G R

A82-24387 * **Integration of energy management concepts into the flight deck** S A Morello (NASA, Washington, DC) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct. 5-8, 1981, Paper 811066* 10 p 7 refs

The rapid rise of fuel costs has become a major concern of the commercial aviation industry, and it has become mandatory to seek means by which to conserve fuel A research program was initiated in 1979 to investigate the integration of fuel-conservative energy/flight management computations and information into today's and tomorrow's flight deck One completed effort within this program has been the development and flight testing of a fuel-efficient, time-based metering descent algorithm in a research cockpit environment Research flights have demonstrated that time guidance and control in the cockpit was acceptable to both pilots and ATC controllers Proper descent planning and energy management can save fuel for the individual aircraft as well as the fleet by helping to maintain a regularized flow into the terminal area G R

A82-24388 **Application of damage tolerance technology to type certification.** T Swift (FAA, Washington, DC). *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct. 5-8, 1981, Paper 811062* 20 p 29 refs

An attempt is made to clarify some of the questions related to the FAA philosophy which are currently being raised by manufacturers in attempting to comply with recently amended regulations for aircraft structures A description is presented of opinions related to good damage tolerance design practice, and fracture analysis methodology In general, an evaluation of the structure, under typical load and environmental spectra must show that catastrophic failure due to fatigue, corrosion, or accidental damage will be avoided throughout the operational life of the aircraft. Attention is given to a damage tolerance evaluation, aircraft utilization, the selection of critical elements, aspects of stress spectra development, environmental effects, and fracture toughness data G.R

A82-24389 **Certification of civil composite aircraft structure** J R Soderquist (FAA, Office of Airworthiness, Washington, DC) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811061* 10 p 19 refs

The certification of composite civil aircraft structures is shown to require a common, allowable material property data base in which the chemical characterization of the resin through the use of high pressure liquid chromatography and Fourier transform infrared spectroscopy is employed In addition, improved damage-tolerance techniques and tougher material systems must be developed to allow higher design strain levels Significant benefits can be derived from the continued operation of a composite structure in the post-buckled regime, provided that investigations continue into environmental effects, combined loading states, curvature, variations in skin thickness and impact damage effects It is recommended that a portable nondestructive inspection technique be devised for use in field repairs O C

A82-24392 **Design technology for improved performance retention in turbofan engines** D L Seiwert (General Electric Co , Fairfield, CT) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811055* 10 p

General causes of performance loss in large turbofan engines after long time field use are examined, and programs whose objectives are to maximize engine performance retention are described Advanced design concepts to produce significant improvement in performance retention of commercial turbofan engines are presented, and factors which cause clearance changes between rotating and static components are discussed Engine generated and externally applied loads, and operating technique effects are addressed, and evaluation techniques for design verification including laser optics are described Performance retention items include a substantially improved high pressure turbine shroud material, which reduces distortion and thereby avoids rubs D L G

A82-24393 **RB 211 powerplant deterioration - Review of current situation and lessons learned** A G Collins (Rolls-Royce, Ltd , London, England) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811053* 6 p

The factors which cause aircraft engines to lose performance in a service environment are briefly examined It is pointed out that in the case of the RB 211 engine many of the fundamental causes of deterioration are avoided or minimized in connection with basic engine design features The -22B was the first of the RB 211 family of engines to enter service Major causes of RB 211-22B deterioration were related to the accumulation of dirt on compressors, the distortion of HP NGV support rings, increased leakages in powerplant area, and erosion of turbine tip sealing segments By suitable modifications of the engine design it was possible to eliminate the observed causes of engine deterioration in the RB211-524 Problems concerning engine deterioration observed in connection with RB 211-524 operation will be corrected in the RB 211-535 by the introduction of appropriate improvements G R

A82-24394 **Management of powerplant maintenance and restoration programs for fuel conservation** C Reid (General Electric

Co , Fairfield, CT) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811052* 15 p

Powerplant operational and maintenance procedures are reviewed to minimize fuel consumption and total operating costs of existing large turbofan engines Recommendations are made to reduce the rate of on-wing performance deterioration and to define cost effective performance refurbishment Measures being taken to increase fuel and cost savings include the development of performance diagnostic/analytical systems to permit better management control of engine operating costs On-wing performance retention can be improved by the observance of line maintenance and operational procedures minimizing the impact of the major causes of performance deterioration, such as increased clearances, erosion, contamination and leakage D L G

A82-24395 Airline fuel saving through JT9D engine refurbishment J W Allison and D R Weisel (United Technologies Corp , Pratt and Whitney Aircraft Group, East Hartford, CT) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811051* 12 p

Since the JT9D engine entered airline service in 1970, increase in the price of jet fuel made it imperative to devise refurbishment procedures for in-service engines to improve their fuel economy Developments leading to performance recovery and improvement of the engine are related to fan leading edge rework, and the one degree open first stator Factors responsible for engine performance recovery and retention include also operational procedures, test configuration, and prevention of aircraft system pneumatic leakage Attention is given to the fan strip panel concentric grinding tool, a properly repaired combustor with recently developed 'S-16' fuel nozzles, recommended refurbishment additions, operational procedures to maximize performance retention, a test configuration, and inspection techniques G R

A82-24396 Airworthiness considerations in the design of commercial transport aircraft J R Koch (Lockheed California Co , Burbank, CA) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811039* 14 p 8 refs

Design requirements and development, and the maintenance practices required in the certification of commercial transport aircraft and in the ensuring of their continuous airworthiness in operation, are considered with attention to (1) airworthiness philosophy and criteria, (2) the evolutionary character of design development, (3) the scope of development testing, and (4) the enlistment of manufacturer, operator and regulatory agency in airworthiness assurance throughout an aircraft's operational life Also considered are the airworthiness regulation revisions and technological advances that have resulted in changes in the substantiation of airworthiness, especially in the case of structures O C

A82-24397 Designing for continued airworthiness - General aviation C A Rembleske (Beech Aircraft Corp , Wichita, KS) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811038* 8 p

The Air Commerce Act of 1926 became the first piece of U S legislation which provided a basis for the writing of airworthiness standards for aircraft The contents of the Air Commerce Regulations are briefly discussed In connection with the technological developments of a rapidly growing industry, the regulations became more complex Beginning in 1974, FAA introduced the term 'continued airworthiness' Continuing airworthiness can be defined as keeping the aircraft flying safely and functioning properly over an indefinite period Attention is given to the airframe, the propulsion system, basic flight instruments, vital hydraulic lines, fuel systems, electrical systems, and problems of wear and tear G R

A82-24398 The anatomy of a technology test bed - Integrated Flight/Fire Control-I /IFFC I/. V M Marti, J Woods, Jr. (McDonnell Aircraft Co , St. Louis, MO), and W F Swartz (USAF, Wright Aeronautical Laboratories, Dayton, OH) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct. 5-8, 1981, Paper 811036* 17 p

The purpose of technology demonstration is to reduce the risk associated with developing an advanced operational system by verifying the capability of advanced, and as yet unproven, technologies Attention is given to today's conditions which require the use of a technology demonstrator aircraft, principally as a precursor to future military tactical aircraft systems The ingredients of a good technology demonstrator are examined, taking into account the selection of the F-15B aircraft for the technology demonstration of the Integrated Flight and Fire Control (IFFC) program. The IFFC system concept is considered along with the IFFC data acquisition systems, and the IFFC onboard simulation systems G R

A82-24399 Mission-adaptive wing flight demonstration program. D K Gould (Boeing Co , Seattle, WA) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811035* 10 p

It is reported that the design and fabrication of the AFTI/F-111 mission-adaptive wing is nearing completion The variable-camber airfoil design, unlike conventional wings, possesses no discontinuities from spoilers, flaps or fairings to disturb the flow of air over the wing The flexible leading edge is continuous from wing root to tip, and the flexible trailing edge is divided into three segments to provide roll control redundancy, permit operation at various sweep-settings of the F-111 variable wing, and to allow spanwise shifting of the aerodynamic load Wind tunnel and flight simulation tests indicate aerodynamic performance benefits, and the structural capability that has been checked by finite element analysis is in turn verified by tests of a wing section loads and actuation test rig Flight tests are to begin in late 1982 O C

A82-24400 Quality, quantity, and technology - A perspective on fighter development S K Jackson, Jr (General Dynamics Corp , Fort Worth, TX) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811097* 14 p 7 refs

The consequences of long-term technological development on military aircraft unit costs are illustrated, by means of comparisons between the capabilities and costs of such World War II aircraft as the P-51 fighter and B-17 bomber, on the one hand, and the contemporary F 16 fighter, on the other A detailed historical analysis of the B-17 Schweinfurt raids and the extrapolation of the capabilities of the F-16 to that 1943 scenario shows that, while the modern fighter is able to deliver a greater bomb load with greater accuracy in a greater variety of conditions than the B-17, its cost, as a fraction of GNP, is only 1 6-2 3 times greater than that of the B-17 Similar improvements are demonstrated for the cases of operational readiness and numbers of maintenance personnel, showing that the continuing development of airframes is justified The development of experimental aircraft is recommended O C

A82-24401 * Aircraft surface coatings for drag reduction/erosion protection R L Kreitinger (Boeing Commercial Airplane Co , Renton, WA) and D B Middleton (NASA, Langley Research Center, Hampton, VA) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811070* 16 p 5 refs

The laboratory testing of a large number of films and liquid coatings for aircraft drag reduction and erosion protection has led to the identification of elastomeric polyurethanes, which fulfil smoothness, durability and protection requirements while being easily applied to large, compound-curvature areas with standard spray equipment It was found that an epoxy primer produced a stronger bond between coating and substrate than a wash primer A drag-reduction value of 0 2% was achieved with a commercially-available elastomeric polyurethane O C

A82-24403 Future strike fighter options - Concepts and technologies P C Bavitz (Grumman Aerospace Corp , Bethpage, NY) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811099* 19 p 10 refs

Results are presented from a study of concepts of operation, and the technological capabilities required by them, for future strike fighter weapon systems The design concepts considered by the study were (1) a low-altitude, medium-payload twin-turbofan design with mission-adaptive supercritical wing and close-coupled canard, (2) a low-altitude, heavy-payload craft with top-mounted inlets, (3) a

high-altitude concept with advanced turbojet engines and Alben-type nozzles, equipped with air-to-ground weapons that are currently in the conceptual-development stage, (4) a high-altitude/dive mission-profile craft possessing high payload/weapon carriage flexibility, (5) an advanced, low radar cross section design incorporating a delta wing planform, flush engine inlets and a top-mounted carriage for WASP weapons, and a gunship with a single, top-mounted turbojet whose primary armament is a GAU-8 30 mm cannon O C

A82-24404 Technology for quality and quantity in a new fighter W E Maillard (Northrop Corp , Los Angeles, CA) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811100* 15 p 15 refs

It is demonstrated to be premature, in view of the complex and evolving character of tactical aircraft design problems requiring tradeoffs between system quality and production quantities, to hold a single design concept as superior to alternatives However, technology application is held to be essential for the mediation of quality and quantity criteria After identifying such major forces in cost escalation as the compounding of requirements and technology-packing, in response to mission requirement uncertainties over the course of a lengthy design development process, a design approach to lower-cost fighter concepts is introduced and quantitative methods are presented to illustrate potential improvements in the operational capabilities of aircraft in the size and cost range represented by the F-5E and F-16 fighters O C.

A82-24405 Operating flight loads and their effect on engine performance R L Martin (Boeing Commercial Airplane Co , Renton, WA) and W J Olsson (United Technologies Corp , Pratt and Whitney Aircraft Group, East Hartford, CT) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811071* 14 p

Flight loads imposed on high bypass turbofan engines and the response of the engines to these loads are examined The effects of nacelle angle of attack, aircraft speed, and engine airflow are discussed Results from an analysis of the NASA JT9D flight load test indicate that aerodynamic loads on the nacelle are the prime cause of cold section clearance closure and rubs, and aerodynamic loads, thrust, and differential thermal expansion cause hot section closure and rubs Inboard and outboard engines are found to be equally affected by flight maneuvers, and a 0 7% increase in cruise thrust-specific fuel consumption is found to be typical of production aircraft acceptance testing D.L G.

A82-24406 Restoration of performance, Models 727, 737, and 747 J C Baer and W M Staab (Boeing Commercial Airplane Co , Seattle, WA) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct. 5-8, 1981, Paper 811072* 12 p

A new generation of advanced technology, fuel-efficient jet transports, including the Models 757 and 767 will enter commercial airline service in 1982 Existing fleets of second-generation jet transports still in production, such as the 727, 737, and 747, have useful economic lives which will extend into the 1990s Because of this longevity and the continual escalation of fuel prices, the economics of these transports will be improved A description is presented of some of the performance improvement programs. Attention is given to aspects of operational efficiency, the in-flight fuel economy, a maintenance program to preserve low drag characteristics for the aircraft, the elimination of surface roughness, Model 727 drag improvement items, Model 747 improvement items, recently developed items, aerodynamic improvements under study, and propulsion system and flight management system improvements G R

A82-24407 High temperature engine control electronics. D. C Dening (General Electric Co., Syracuse, NY). *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct. 5-8, 1981, Paper 811074.* 11 p Contract No N00173-79-C-0010

Integrated injection logic is shown to be operable at temperatures up to 300 C. The logic can thus be used in the digital control mounted on aircraft engines, where it is subjected to high temperatures and severe vibration The design of integrated injection logic circuits for such high-temperature applications is discussed. Particular attention is given to gate design, to the patterns of interconnection, and to the metallization system employed Also described is a data input chip for an engine control computer that has been designed for high-temperature applications C R

A82-24408 Pressure transducer calibration process F Antonazzi, Sr (Bendix Corp , Energy Controls Div , South Bend, IN) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811076* 9 p

It is shown that quartz capsule pressure transducers using a closed loop capacitance bridge can be made highly accurate with virtually identical frequency response by using a calibration process that compensates for the quartz pressure sensor unit-to-unit variations Digital integration gain scheduling as a function of N count results in a constant loop gain that is independent of pressure level As a consequence, constant dynamic characteristics are obtained at all pressure levels It is noted that plug-in pressure transducer units are interchangeable, requiring no select-at-test components or trim adjustments The software loop closure allows use of a common printed wiring board with identical electrical components for a wide range of pressure transducers C R

A82-24409 Performance retention features of the PW2037. J K Carriere (United Technologies Corp , Pratt and Whitney Aircraft Group, East Hartford, CT) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811054* 14 p

Studies that have been carried out on the causes of performance deterioration are surveyed, as are descriptions of design and maintenance features for improving performance retention It is noted that short-term deterioration is caused by flight loads that cause rubbing of blades on seals and consequent loss of module efficiencies Long-term deterioration derives from erosion of airfoils and seals during ground operation and cyclic-induced thermal distortion of the high pressure turbine vanes Design features for improving performance retention include increased case and rotor stiffness, damped bearings on centering springs, a third low rotor bearing, active clearance control, abradable blade tips seals, controlled diffusion airfoils, dirt removal scoop, erosion-resistant compressor outer air seals, improved diffuser and combustor and reduced aspect ratio turbine vanes C R

A82-24410 Reliability analysis of a dual-redundant engine controller E Gai, J V Harrison, and R H Luppold (Charles Stark Draper Laboratory, Inc , Cambridge, MA) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811077* 11 p

A Markov model is developed for predicting the reliability of a full-authority, dual-redundant aircraft engine controller The effects of failures on any of the controller's sensors, electronic interface modules, processors and actuators are modeled, as are the consequences of redundancy management decisions The model's use in performing parameter sensitivity studies and developing quantitative data in support of design trade-offs is described The effects of scheduled maintenance on the inflight shutdown rate of the engine are assessed C R

A82-24411 Propulsion multiplexer /PMUX/ system - The missing link M S Latina and W W Hixson (United Technologies Corp , Hamilton Standard Div , Windsor Locks, CT) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811078* 10 p 7 refs.

The importance placed by commercial airlines on more efficient and reliable engines with lower maintenance costs has led to the use of in-flight engine condition monitoring equipment as part of an airborne integrated data system (AIDS) This monitoring requires that the AIDS receive approximately 25 engine parameter signals Problems arise in that the integrity of the AIDS input signals from the engine is not the responsibility of a single equipment supplier To resolve this problem, a centralized, engine-mounted data processing device for the engine signals is proposed It is pointed out that the unit for this Propulsion Multiplexer System can be divided into three major functional groups (1) pressure sensors and signal interfaces, (2) digital processor and memory, and (3) serial digital data interface C R

A82-24412 **LAMPS III recovery assist, securing and traversing /RAST/ system** F Cracknell (DAF Indal, Ltd , Mississauga, Ontario, Canada) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811080* 9 p

The main portions of the RAST system are outlined, with descriptions given of their functions Some of the ground and flight test experience gained thus far is summarized The system is shown to meet the requirements of the Light Airborne Multi Purpose System (LAMPS) This latter system depends for its success upon the ability to operate helicopters safely and reliably under weather conditions where the ship roll angles reach about 30 deg and the wave heights reach 13 feet C R

A82-24413 **The use of 'Kapton' polyimide film in aerospace applications** D H Berkebile and D L Stevenson (Du Pont de Nemours and Co , Wilmington, DE) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct 5-8, 1981, Paper 811091* 9 p

The principal steps involved in the manufacture of wire and cable insulated with 'Kapton' are described The latest shop handling techniques are reviewed, among them automated stripping and high-speed marking Additional aerospace applications in avionics and insulation blankets are discussed Tables summarizing the performance characteristics of wire insulated with this polyimide film are included C R

A82-24415 **Fighter issues - 2000** D R Kozlowski (McDonnel Douglas Corp , St Louis, MO) *Society of Automotive Engineers, Aerospace Congress and Exposition, Anaheim, CA, Oct. 5-8, 1981, Paper 811096* 13 p 6 refs

Consideration is given to the design requirements formulated for an advanced tactical fighter (ATF) that will operate in the electronic warfare and nuclear/biological/chemical warfare scenarios anticipated for the year 2000 The performance requirements may be characterized as speed, stealth and STOL (SSS) The SSS criteria have nominal values of (1) Mach 1 8 sustained supersonic speed, with Mach 2 5 as maximum for intercept and chase, (2) less than 0 5 sq m radar cross section, reduction of IR signature and engine exhaust contrail, and electromagnetic emission control, and (3) 1500 feet total required runway length Attention is given to the problems posed by maintainability and cost-control criteria, as well as the emerging characteristics of air-to-air combat in view of the technological developments expected from potential adversaries O C

A82-24416 **Annual review of fluid mechanics Volume 14** Edited by M Van Dyke (Stanford University, Stanford, CA), J. V Wehausen (California, University, Berkeley, CA), and J L Lumley (Cornell University, Ithaca, NY) Palo Alto, CA, Annual Reviews, Inc , 1982 463 p $22

Applications of fluid mechanics are discussed for the study of strongly nonlinear waves, the topology of three-dimensional separated flows, and the mathematical theory of frontogenesis Attention is also given to turbulent jets and plumes, gravity currents in the laboratory, atmosphere, and ocean, and to low-gravity fluid flows, specifically for convective flows. The computation of transonic potential flows is considered, as are the strange attractor theory of turbulence, numerical methods in free-surface flows, and the fluid dynamics of heart valves. M S K.

A82-24426 **International Conference on Numerical Methods in Fluid Dynamics, 7th, Stanford University, Stanford and Moffett Field, CA, June 23-27, 1980, Proceedings** Conference supported by NSF, U S Air Force, and U S Navy Edited by W C Reynolds (Stanford University, Stanford, CA) and R W MacCormack (NASA, Ames Research Center, Moffett Field, CA) Berlin and New York, Springer-Verlag (Lecture Notes in Physics Volume 141), 1981. 493 p $28

Topics discussed include polygon transformations in fluid mechanics, computation of three-dimensional horseshoe vortex flow using the Navier-Stokes equations, an improved surface velocity method for transonic finite-volume solutions, transonic flow calculations with higher order finite elements, the numerical calculation of transonic axial turbomachinery flows, and the simultaneous solutions of inviscid flow and boundary layer at transonic speeds Also considered are analytical solutions for the reflection of unsteady shock waves and relevant numerical tests, reformulation of the method of characteristics for multidimensional flows, direct numerical simulations of turbulent shear flows, the stability and separation of freely interacting boundary layers, computational models of convective motions at fluid interfaces, viscous transonic flow over airfoils, and mixed spectral/finite difference approximations for slightly viscous flows B J

A82-24562 # **On-line control for the regulation of power source in multiple-servo electro-hydraulic systems** B N Suresh (Indian Space Research Organization, Vikram Sarabhai Space Centre, Trivandrum, India), W L Green, and D J Sanger (Salford, University, Salford, Lancs., England) *American Society of Mechanical Engineers, Winter Annual Meeting, Washington, DC, Nov 15-20, 1981, Paper 81-WA/DSC-3* 8 p 8 refs Members, $2 00, nonmembers, $4 00

The efficiency of a multiple-servo electrohydraulic system, in which power can be reduced by means of an on-line self-optimizing control, depends on the selection of the most suitable among five search strategies The strategies are considered in light of a hydraulic system mathematical model employing two velocity servos whose individual performance is simulated on a computer Simulation results show that the Simplex is the most useful strategy for on-line implementation in a practical system, where the implementation scheme involves no more than six variables O C

A82-24563 * # **Wide field of view laser beacon system for three-dimensional aircraft position measurement** L M Sweet, R B Miles, S G Webb, and E Y Wong (Princeton University, Princeton, NJ) *American Society of Mechanical Engineers, Winter Annual Meeting, Washington, DC, Nov 15-20, 1981, Paper 81-WA/DSC-9* 9 p 8 refs Members, $2 00, nonmembers, $4 00 Grant No NCC2-94

This paper presents a new wide field of view laser beacon system for measurement, in three dimensions, of aircraft or other remote objects The system is developed for aircraft collision hazard warning independent of ground-based hardware, as well as for flight research, helicopter-assisted construction and rescue, and robotic manipulation applications Accurate information describing the relative range, elevation, and azimuth of the aircraft are generated by the sweep of a low-power fan-shaped rotating laser beacon past an array of optical detectors The system achieves a wide angle of acceptance of laser beacon light through use of compound parabolic concentrators, which collimate the light for spectral filtering to minimize solar interference An on-board microprocessor system converts the pulse sequence to aircraft position in real time System reliability and performance are enhanced through narrow pass filtering of the pulse signals, digital logic design to mask spurious signals, and adaptive modulation of trigger threshold levels (Author)

A82-24565 # **Describing function analysis of nonlinear nose gear shimmy** T D Burton (Washington State University, Pullman, WA) *American Society of Mechanical Engineers, Winter Annual Meeting, Washington, DC, Nov. 15-20, 1981, Paper 81-WA/DSC-20.* 9 p 10 refs Members, $2 00, nonmembers, $4 00 Research sponsored by the Boeing Military Airplane Co

The design of shimmy free nose landing gear is complicated by the action of the gear hydraulic steering system. During shimmy the steering system pressure response results in loads on the gear which are highly nonlinear functions of geat motion In order to obviate the need for extensive numerical work to analyze geat stability, the describing function method has been used to linearize the steering system response, enabling the stability to be analyzed using linear system techniques Application of this approach to a representative nose gear/steering system showed the limit cycle amplitudes and stability boundaries of the shimmy motion to be in good agreement with results obtained numerically, the transient response was also predicted reasonably well (Author)

A82-24566 # **Complete velocity profile and 'optimum' skin friction formulas for the plane wall-jet** G P Hammond (Cranfield Institute of Technology, Cranfield, Beds , England) *American Society of Mechanical Engineers, Winter Annual Meeting, Washing-*

ton, DC, Nov 15-20, 1981, Paper 81-WA/FE-3 7 p 30 refs Members, $2 00, nonmembers, $4 00 Science Research Council Grants No B/RG/98590, No GR/A/44312

An analytic expression for the complete velocity profile of a plane, turbulent wall-jet in 'stagnant' surroundings is obtained by coupling Spalding's single formula for the inner layer with a sine function for the 'wake component' This expression is transformed at the velocity maxima to yield an 'optimum log-law' for skin friction An approximate skin friction formula based on the 'initial conditions' of the wall-jet is also presented The formulas are generally in good agreement with experimental data The complete velocity profile does not exhibit the conventional 'law of the wall' behavior and modifications are consequently recommended to the usual treatment of the near-wall region in numerical calculation procedures for wall-jet flows The use of the 'Clauser plot' method of skin friction measurement is similarly shown to be in error when applied to wall-jets (Author)

A82-24602 * # **Influence of exit impedance on finite difference solutions of transient acoustic mode propagation in ducts** K J Baumeister (NASA, Lewis Research Center, Cleveland, OH) *American Society of Mechanical Engineers, Winter Annual Meeting, Washington, DC, Nov 15-20, 1981, Paper 81-WA/NCA-13* 8 p 24 refs Members, $2 00, nonmembers, $4 00

The cutoff mode instability problem associated with a transient finite difference solution to the wave equation is explained The steady-state impedance boundary condition is found to produce acoustic reflections during the initial transient, which cause finite instabilities in the cutoff modes The stability problem is resolved by extending the duct length to prevent transient reflections Numerical calculations are presented at forcing frequencies above, below, and nearly at the cutoff frequency, and exit impedance models are presented for use in the practical design of turbofan inlets D L G

A82-24643 **Institute of Navigation, Annual Meeting, 37th, U S Naval Academy, Annapolis, MD, June 9-11, 1981, Proceedings** Washington, DC, Institute of Navigation, 1981 171 p Members, $30 , nonmembers, $35

The performance of a ring laser strapdown marine gyrocompass is considered along with a brief history of the use of marine radar, a marine NAVSTAR GPS receiver, the application of NAVSTAR differential GPS in the civilian community, the applications of a multiplexed GPS user set, and initial FAA tests on the NAVSTAR GPS Z-set Attention is given to the Federal Radionavigation Plan, scanning strategies for Air Traffic Control radars, the View-Nav system, operational and economic benefits deriving from use of loran-C RNAV, loran-C RNAV in mountainous areas, and an analysis of loran-C system reliability for civil aviation A description is presented of a strapdown configured land navigation system, aspects of marine simulation, bridge simulation, and an empirical INS difference monitoring procedure used to sequence SSBN NAVAID fixes G R

A82-24644 # **A marine NAVSTAR GPS receiver** R E Maine (Sperry Corp , Sperry Marine Systems, Charlottesville, VA) In Institute of Navigation, Annual Meeting, 37th, Annapolis, MD, June 9-11, 1981, Proceedings Washington, DC, Institute of Navigation, 1981, p 54-59

Attention is given to the design philosophy, construction, programming, testing, and test results of a simplified NAVSTAR Global Positioning System (GPS) receiver for marine applications The GPS signals are received by an omnidirectional antenna, filtered to reduce out-of-band signal levels, amplified by a low noise preamplifier, and transmitted through a coaxial cable to the interior equipment The technique used is to stop the code clock as precisely as possible at the occurrence of a timing mark The GPS front end is considered along with the signal amplitude interface, the receiver gain control, the microcomputer, the phase shift interface, the pseudorandom noise code generator, and a real-time flow chart A breadboard receiver constructed as described, using largely off-the-shelf components, has been found to acquire and track the experimental satellites quite successfully G R

A82-24645 * # **The application of NAVSTAR differential GPS in the civilian community** J. Beser and B W Parkinson (Intermetrics, Inc , Huntington Beach, CA) In Institute of Navigation, Annual Meeting, 37th, Annapolis, MD, June 9-11, 1981, Proceedings Washington, DC, Institute of Navigation, 1981, p 60-74 11 refs NASA-sponsored research

The NAVSTAR Global Positioning System (GPS), currently being developed by the DOD, is a space based navigation system that will provide the user with precise position, velocity, and time information on a 24 hour basis, in all weather conditions and at any point on the globe The baseline GPS system will provide guaranteed high accuracy to only a limited number of users, mostly the military The civilian community has to devise a variation of this system to allow for an assured, uninterrupted level of accuracy Differential GPS provides such a capability In connection with the conceived possibility of the use of GPS by an enemy, it is found to be necessary to implement a selective availability technical capability Differential GPS provides an approach for the civilian community to have a guaranteed level of accuracy better than the 250 meters presently planned for GPS G R

A82-24646 # **Scanning strategies for air traffic control radars** P R Mahapatra and D S Zrnic (NOAA, National Severe Storms Laboratory, Norman, OK) In Institute of Navigation, Annual Meeting, 37th, Annapolis, MD, June 9-11, 1981, Proceedings Washington, DC, Institute of Navigation, 1981, p 100-105 14 refs U S Department of Transportation Contract No FA01-80-1-Y-10524

In connection with a history of weather-related air traffic accidents near terminal areas, it is desirable that air traffic control (ATC) radars possess the capability to detect and identify elements of weather which are hazardous to aviation To possess the capability of hazardous weather detection in a reliable manner, a radar must employ a scan strategy such that the scan cycle is not so slow as to miss shortlived for fast-growing weather phenomena The separation of the elevation levels of the scan cycle must be close enough to ensure the detection of storm features which may endanger air traffic Attention is given to a study conducted to determine the most suitable scanning techniques for ATC radars, taking into account the data base for the study, the photo-interpretation of the multimoment data, the vertical spacing of scan levels, and an investigation of the lifetime of an atmospheric feature by spatial correlation G R

A82-24647 # **Beyond the horizon coverage for air navigation/traffic control** V I Weihe In Institute of Navigation, Annual Meeting, 37th, Annapolis, MD, June 9-11, 1981, Proceedings Washington, DC, Institute of Navigation, 1981, p 106-110 11 refs

An important segment of the aircraft population is engaged in routine flights under instrument flight rule conditions at low altitudes beneath and beyond the coverage of the current land-based air traffic control (ATC) aids If the ATC system were expanded so that it readily accommodated low flying aircraft, many pilots would take advantage of the increased safety thereby made available Attention is given to the available technical options, the Aring Communication Addressing and Reporting System (ACARS), the addition of airborne nodes to common carrier communications networks, and ATC ground communications network radio link interface subsystems Approaches suitable for the Gulf of Mexico systems are also considered G R

A82-24648 # **Loran for precise position location - The VIEW-NAV system** M Rogoff and P M Winkler (Emory University, Atlanta, GA) In Institute of Navigation, Annual Meeting, 37th, Annapolis, MD, June 9-11, 1981, Proceedings Washington, DC, Institute of Navigation, 1981, p 111-113

The VIEW-NAV system consists of a loran receiver which is connected to a digital computer and visual display The onboard computer is a small rugged and reliable digital processor. Aspects of system operation are discussed, taking into account the calibration of the loran grid and the monitoring of the grid A description of system performance is also provided, giving attention to a number of tests which have been conducted in Long Island Sound and Chesapeake Bay When a monitor is employed, errors of as little as a few yards are observed To obtain reliable and accurate results in critical locations, monitors should be employed in such places G R

A82-24649 # **Loran-C RNAV in mountainous areas** L Rzonca (FAA, Technical Center, Atlantic City, NJ) In Institute of Navigation, Annual Meeting, 37th, Annapolis, MD, June 9-11, 1981, Proceedings Washington, DC, Institute of Navigation, 1981, p 129-140

The loran-C kilohertz frequency provides stable ground wave propagation with signal coverage which is not limited to line-of-sight between transmitter and receiver This feature makes loran-C very attractive for aircraft RNAV between airports located in mountainous terrain or other areas not adequately served by the VOR/DME network An important part of an airborne loran-C evaluation program currently being conducted consists of loran-C accuracy testing in mountainous areas The first phase, consisting of flight tests in the state of Vermont, has been completed A description of these tests is presented, taking into account the equipment, the test scenario, and aspects of data processing The test results obtained verify the potential of loran-C to provide aircraft navigation guidance under all terrain conditions However, there appears to be a need for further refinement of hardware and of software techniques G R

A82-24650 # **Analysis of loran-C system reliability for civil aviation** G A Wong (Mitre Corp , McLean, VA) In Institute of Navigation, Annual Meeting, 37th, Annapolis, MD, June 9-11, 1981, Proceedings Washington, DC, Institute of Navigation, 1981, p 141-153 8 refs

The considered analysis is concerned with the ability of the loran-C system to provide continuous and usable navigation signals for airborne applications An overview is provided of the analysis techniques, and a description is presented of the computerized loran-C coverage model which is used extensively in the reliability analysis The probabilistic approach to reliability analysis is discussed, and the overall methodology for the analysis of loran-C system reliability in the conterminous U S is illustrated with the aid of an example The ultimate objective of the loran-C system reliability assessment is to determine the ground station configuration which would meet the civil aviation reliability requirement in the post-1995 time period G R

A82-24651 Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers Conference sponsored by the American Institute of Aeronautics and Astronautics New York, American Institute of Aeronautics and Astronautics, 1982 332 p Members, $30, nonmembers, 40

Techniques, modeling, instrumentation, and applications of wind tunnels, wind tunnel apparatus, and models were discussed The Shuttle testing and data base for aerodynamics predictions are examined, along with comparisons with flight data Further attention was given to wind tunnel design and features, including tunnel liners, a quiet tunnel, choking valves, and slotted wall test sections Techniques for instrumentation of boundary layers, surface shear stress measurements in compressible flows, laminar skin friction, and the use of aerodynamic balance systems to measure cross and cross-coupling derivatives are explored The performance of a computer controlled variable geometry wing is described, along with the development of a self-optimizing flexible technology wing wind tunnel model, improvements in the National Full Scale Facility, and a color video display for flowfield surveys M S K

A82-24656 * # **Numerical design of the contoured wind-tunnel liner for the NASA swept-wing LFC test** P A Newman, E C Anderson, and J B Peterson, Jr (NASA, Langley Research Center, Hampton, VA) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 36-47 26 refs (AIAA 82-0568)

A contoured, nonporous, wind-tunnel liner has been designed in order to simulate a free-flight infinite yawed-wing, transonic-flow condition about a large-chord, supercritical-section, laminar-flow-control (LFC), swept-wing test panel The numerical procedure developed for this aerodynamic liner design is based upon the simple idea of streamlining and incorporates several existing transonic and boundary-layer analysis codes A summary of the entire procedure is presented to indicate what was done and why, the sequence of steps, and the overall data flow The liner is being installed in the NASA Langley 8-Foot Transonic Pressure Tunnel (TPT) Test results indicating the aerodynamic performance of the liner are not yet available, thus, the liner design results given here are examples of the calculated requirements and the hardware implementation (Author)

A82-24657 * # **Mean flow and noise measurements in a Mach 3 5 pilot quiet tunnel** I E Beckwith and W O Moore, III (NASA, Langley Research Center, Hampton, VA). In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 48-70 30 refs (AIAA 82-0569)

The use of Mach 3 5 two-dimensional rapid expansion nozzle for wind tunnel testing at supersonic speeds and low noise conditions encountered in high altitude flights is described The supersonic pilot quiet tunnel is located at the NASA Langley Research Center and a description of the facility is provided, along with instrumentation and noise measurement test data at 30, 50, and 75 psia The mean pitot pressure distributions, rms noise levels, the effect of unit Reynolds number, wall waviness, wall contaminants, and the effects of closing the bleed valve are analyzed Typical laminar and turbulent spectra are presented, along with a summary of the effect of slot throat adjustment on the power spectra Comparisons are made of the power spectra with the bleed valve open and closed, and of the rms fluctuating pressures with levels from conventional nozzles, and the performance capabilities are evaluated for use in transition studies M S K

A82-24658 * # **The effect of ejector augmentation on test-section flow quality in the Calspan 8-ft transonic wind tunnel** W C Rose (Rose Engineering and Research, Inc , Incline Village, NV), R D Hanly, F W Steinle, Jr (NASA, Ames Research Center, Moffett Field, CA), and D W Chudyk (Calspan Advanced Technology Center, Buffalo, NY) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 71-86 (AIAA 82-0571)

Tests to determine the flow disturbances effects of four ejectors located in the corners just downstream of the diffuser in the Calspan wind tunnel are described The flow quality in the nonejector mode is employed as the base-line configuration, and operating parameters are compared with data from other wind tunnels During tests with the ejectors working, fluctuation levels increased between Mach 0 4-0 6, while temperature and vorticity levels remained constant The ejector exhibited broad spectrum noise typical of free jet noise, yet static pressure measurements revealed only a slight increase in the broadband rms levels with the ejectors on, indicating negligible disturbances upstream caused by the ejectors Choking the diffuser eliminated the jet noise, and the use of ejectors in the Mach range considered is concluded to cause no significant degradation in the Calspan tunnel flow quality M S K

A82-24659 # **An ejector augmented choking valve for the metering and control of inlet and bleed duct flows** C H Boccadoro and B G Franco (Northrop Aerosciences Laboratory, Hawthorne, CA) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 87-93 10 refs. (AIAA 82-0575)

The use of a choking valve in wind tunnel inlet-airframe models is described, along with the design of ejectors for augmentation in regulating higher weight flows and for upstream recovery conditions. The choking valve, with a plug insert, is operated by moving a plug in and out of the throat, and is calibrated for weight flow by use of Fliegner's isentropic formula for air The ejectors are designed to produce the proper back pressure to choke the plug for all weight flows and conditions required One-dimensional ejector theory is reviewed and determinations are made for the primary pressure, the primary weight flow, and the area ratio for the ejector system to pump a specified weight flow. An optimization process is outlined for fitting an ejector system to a choke valve, and experimental results are reported in regards the effects of the area ratio, mixing length, and the primary pressure ratio M.S K

A82-24660 # **Technical innovations in testing and analysis of heat and pressure models in hypersonic wind tunnels** H. R

Carroll (Martin Marietta Aerospace, Denver, CO) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 94-100 7 refs (AIAA 82-0578)

Wind tunnel testing and analysis techniques for more cost-effective studies on projects using pressure and heat models to obtain flowfield and aerothermodynamic data in hypersonic flows are presented Timed photographs were taken of paint melting off the nose of an MX missile model, with the paint actually an emulsified wax which retained the protuberance flow patterns when the test was terminated Thin skin steel 0 030 in thick was used on the cone and conic body instrumented with thermocouples and connected to a 260 channel multiplexor for data collection of millivolt output in response to heating and pressure changes due to unsteady shocks and laminar or turbulent flow Temperature recovery methods in supersonic tunnels are discussed, along with tripping turbulent flow by means of twisted wires Entropy measurements were accomplished by combining heating and pressure test results, Schlieren photographs, pressure rake data, and earlier data M S K

A82-24661 # **Slotted wall test section for automotive aerodynamic test facilities** S Raimondo and P J F Clark (DSMA International, Inc , Toronto, Canada) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 101-109 7 refs. (AIAA 82-0585)

The use of slotted walled test sections for automotive facilities was experimentally investigated The experiments were performed at 1/5-scale, with two test section sizes which correspond to 11 sq m and 8 5 sq m equivalent full-scale facilities For the vehicle used, the model blockages tested were 16 4 and 21 4% respectively. Among the parameters varied were the slot open-area ratio, the axial position of model within the test section and the amount of plenum flow diverted directly into the test section diffuser. The results obtained will be important to the design of small auto-aero facilities, and showed that accurate model pressure distribution data which do not require blockage corrections can be achieved for both test sections The importance of properly controlling plenum flow at the downstream end of the test section was evident from the present tests (Author)

A82-24663 * # **Transonic wind tunnel wall interference corrections for three-dimensional models** M H Rizk (Flow Research Co , Kent, WA), M Hafez (Flow Research Co , Kent, WA, George Washington University, Washington, DC), E M Murman (Flow Research Co., Kent, WA, MIT, Cambridge, MA), and D Lovell (NASA, Langley Research Center, Hampton, VA, Flow Research Co , Kent, WA) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p. 120-130 21 refs Contract No NAS1-16262 (AIAA 82-0588)

A procedure for the evaluation of wall interference corrections for three-dimensional models is presented The Mach number and angle-of-attack corrections require the numerical solution of the potential equation about a simplified representation of the experimental model Pressure measurements are required near the wind tunnel walls The correction procedure also requires knowledge of the free-stream Mach number, the model angle of attack, and the lift force experienced by the model. The procedure provides an estimate of the accuracy of the correction For slender configurations at Mach numbers close to one, the Equivalence Rule formulation is adopted to calculate the wall interference effects Preliminary results are presented for both general and slender-body configurations (Author)

A82-24668 # **Review of support interference in dynamic tests** L. E Ericsson and J P Reding (Lockheed Missiles and Space Co , Inc , Sunnyvale, CA). In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 166-190. 79 refs (AIAA 82-0594)

A review of existing information about support interference has revealed that the support interference effects are much more severe in dynamic than in static tests Furthermore, the support interference is aggravated greatly by a boat-tail or dome shaped base, even by modest base shoulder roundness, from what it is for a flat-based model The general conclusion is that asymmetric stings or sting-strut combinations should be avoided For slender bodies at low angles of attack a transverse rod comes close to permitting the true dynamically destabilizing effect of a bulbous base to be measured whereas even a very slender sting will distort the near wake effect and produce an unconservatively high measure of the dynamic stability At intermediate and high angles of attack the sting support is superior to the other support methods, the transverse rod or the strut mounting In many cases half-model testing provides the means to avoid most of the support interference effects In some cases, as for a short blunt body such as the Viking configuration, the best approach appears to be to allow sting plunging, using a very slender sting (Author)

A82-24669 # **The use of a multi-degree-of freedom dual balance system to measure cross and cross-coupling derivatives** D R Haberman (Calspan Field Services, Inc , Arnold Air Force Station, TN) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 191-201 6 refs (AIAA 82-0595)

Equations of motion and a data reduction method are presented for a dual balance system for measuring dynamic cross and cross-coupling derivatives for aerodynamic models in wind tunnel tests The balances each weigh 1500 lb, with one to provide forced oscillation, pitch/yaw, and cross flexure as a motion generator, and the other to create pitch/yaw, or roll planes as a load measuring device Both balances are noted to be similar to a five-component static force balance, and balance deflections are measured by holographic interferometry The Lagrange method is used to derive the equation of motion in roll, and locations of the center of gravity are calculated from the known balance dimensions Balance measurements are converted into a force and a moment about a selected reference point by substituting the measured load vectors into the static balance equation Further consideration is given to roll data reduction and the correction of existing roll data M S K

A82-24670 # **Cross and cross-coupling derivative measurements on the standard dynamics model at AEDC** S M Coulter and E J Marquart (Calspan Field Services, Inc , Arnold Air Force Station, TN) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 202-214 9 refs (AIAA 82-0596)

A description of newly developed pitch, yaw, and roll forced-oscillation balance systems is presented These systems were designed with a particular goal of obtaining cross and cross-coupling derivative measurements at high angles of attack Results of laboratory and wind tunnel tests (from Mach 0 3 to 1 3) are discussed Cross and cross-coupling derivatives, direct dynamic, and static data, obtained from testing the Standard Dynamics Model (SDM) are shown for several test conditions Comparisons to a previously obtained dynamic and static data base for this model show good agreement, verifying the accuracy of the measured parameters (Author)

A82-24673 # **Development of a self-optimizing flexible technology /SOFT/ transonic wing wind tunnel model** A A McClain and S. Pountney (General Dynamics Corp , Convair Div., San Diego, CA) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 230-238 Contract No. N00014-76-C-0742 (AIAA 82-0601)

The SOFT-wing concept automatically adapts the wing shape through computer control Designing the model to meet the criteria of transonic testing required the investigation and application of innovative techniques Major design and fabrication features of the model included rectangular hydraulic actuators machined integrally in the spar, highly accurate linear potentiometers, leading- and trailing-edge skins of composite materials, a leading-edge extension mechanism, flexible wing tips, and a self-trimming horizontal stabilizer It was concluded that an automated model is expensive to

develop, however, its productivity reduces test costs significantly, thereby offsetting increased model costs (Author)

A82-24674 * # Structural modeling of high Reynolds number wind tunnel models S C Mehrotra (Vigyan Research Associates, Inc , Hampton, VA) and J C Robinson (NASA, Langley Research Center, Hampton, VA) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 239-245 Contract No NAS1-16114 (AIAA 82-0602)

A solid uninstrumented wing and a pressure instrumented wing having a tongue and groove type joint have been structurally modeled by using SPAR Structural Analysis System The solid wing model can be analyzed by SPAR, using either solid elements or plate elements with reasonable accuracy The instrumented wing models with tongue and groove joint can be modeled by using solid elements A solid model representation for the wing with tongue and groove joint can be used for the cases where an error of 6 percent in deflections is acceptable (Author)

A82-24675 * # Evaluation of methods for characterizing surface topography of models for high Reynolds number wind-tunnels E C Teague, T V Vorburger, F E Scire, S M Baker, S W Jensen (National Bureau of Standards, Washington, DC), B B Gloss (NASA, Langley Research Center, Hampton, VA), and C Trahan In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers
New York, American Institute of Aeronautics and Astronautics, 1982, p 246-251 6 refs NASA Order L-4718-B (AIAA 82 0603)

Current work by the National Bureau of Standards at the NASA National Transonic Facility (NTF) to evaluate the performance of stylus instruments for determining the topography of models under investigation is described along with instrumentation for characterization of the surface microtopography Potential areas of surface effects are reviewed, and the need for finer surfaced models for the NTF high Reynolds number flows is stressed Current stylus instruments have a radii as large as 25 microns, and three models with surface finishes of 4-6, 8-10, and 12-15 micro-in rms surface finishes were fabricated for tests with a stylus with a tip radius of 1 micron and a 50 mg force Work involving three-dimensional stylus profilometry is discussed in terms of stylus displacement being converted to digital signals, and the design of a light scattering instrument capable of measuring the surface finish on curved objects is presented M S K

A82-24676 * # Status and capabilities of the National Full Scale Facility 40- by 80-foot wind tunnel modification K W Mort, D F Engelbert, and J C Dusterberry (NASA, Ames Research Center, Moffett Field, CA) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers New York, American Institute of Aeronautics and Astronautics, 1982, p 252-272 30 refs (AIAA 82-0607)

The background, requirements, and aerodynamic design of the modified NASA Ames 40 x 80 ft wind tunnel are reviewed, along with the systems integration and systems test results Advancing vehicle sizes and airspeeds required a larger wind tunnel test section and a capability for 100 and 300 knots airspeed simulation Acoustic mufflers at the inlet and exit of the nonreturn circuit provide noise suppression The enlarged test section is intended to accomodate the complex flowfields of wings with high lift coefficients, and the drive system is designed with minimum residual swirl Features of the fan blades are examined, along with characteristics of the test channels, control vanes and louvers, the exit, circuit losses, temperature rises during operation of the nonreturn circuit, and the facility acoustics Specific construction problems and solutions for the conversion process are outlined, and it is noted that operational status is expected at the end of 1982 M S K

A82-24677 * # A new facility and technique for two-dimensional aerodynamic testing. J B McDevitt, T E Polek, and L. A Hand (NASA, Ames Research Center, Moffett Field, CA) In Aerodynamic Testing Conference, 12th, Williamsburg, VA, March 22-24, 1982, Collection of Technical Papers
New York, American Institute of Aeronautics and Astronautics, 1982, p. 273-295 6 refs (AIAA 82-0608)

The design and operational characteristics of a new test leg for the High Reynolds Number Facility at Ames Research Center are presented, and the unique features of a test section for obtaining two-dimensional airfoil data are reviewed The new facility operates at unit Reynolds numbers ranging from 1,000,000/ft to 30,000,000/ft Boundary-layer suction panels are used in the test section (16 in wide by 24 in. high) to minimize side-wall interference effects Flexible, easily adjustable upper and lower walls allow test-channel area-ruling so as to nullify Mach-number changes induced by mass removal, to correct for longitudinal boundary-layer growth, and to provide contouring compatible with the streamlines of the model in free air (Author)

A82-24701 The Agusta's solution of AHS's hypothetical fatigue life problem G Aldinio and P Alli (Costruzioni Aeronautiche Giovanni Agusta S p A , Gallarate, Italy) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar. 25-27, 1980, Paper* 15 p 8 refs

The Agusta solution to the American Helicopter Society's hypothetical fatigue life problem is presented The fatigue analysis methodology for dynamic components is based on Miner's rule, which necessitates a proper load survey and some fatigue tests The component's life is calculated using peak value flight loads, cycle-counted flight loads, the rainflow method, the range-pair-range method, and counting methods GAG cycles are also discussed. D L G

A82-24703 The challenge of standardizing fatigue methodology B Altman and J Pratt (United Technologies Corp , Sikorsky Aircraft Div , Stratford, CT) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper* 14 p 7 refs

The Sikorsky methodology is described, and the goal of standardization of fatigue methodology as applied to a hypothetical fatigue problem is discussed Areas that can be successfully standardized include S/N curve shapes for specific materials, the use or non-use of Goodman corrections, the selection of test steady loads, and the determination of primary frequency It is concluded that the success with which standardization will set the balance between structural reliability and program costs will depend upon the assessment of the risks involved for the total methodology, a system approach is needed to understand and optimize the risks involved in the total methodology selected and the program advantages D L G

A82-24704 Standardization of helicopter fatigue methodology - A manufacturer's view J M Drees (Bell Helicopter Textron, Fort Worth, TX) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper* 11 p

It is pointed out that each helicopter company has its own way of determining component lives As the existence of such differences has created problems for the Army evaluation teams, it has been recommended that standardization of methods be imposed by the Army for future developments The present investigation is concerned with the question of whether standardization beyond what has already been specified is beneficial from an overall standpoint It is found that there are a number of aspects which make it difficult to recommend at the present time the introduction of new industry-wide standards Thus, it appears unlikely that safety will be improved by such standards, because many field failures are caused by factors which are not part of the methodology presently followed The recommendation is made that an independent 'Helicopter Fatigue Methodology Council' be formed Feasibility of standardization may be explored as well as many other subjects of common interest during workshop-type meetings G R

A82-24705 Application of fatigue, crack propagation and strain survey testing to the CH-46 aft rotor drive shaft. H S Faust (Boeing Vertol Co., Philadelphia, PA) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar. 25-27, 1980, Paper.* 18 p

A fatigue cracking problem in the aft rotor drive shaft of the CH-46 helicopter is described The cracking occurred in a pinned joint between two sections of the shaft, at service times below the retirement life indicated by the original fatigue test and life calculations Crack propagation and strain survey tests are discussed

together with their use in defining periodic inspection intervals and joint improvements In addition, a new stress analysis technique for joints of this type is introduced. (Author)

A82-24706 **Evolution of the Aeroscout** G Fossum, II (U.S Army, Training and Doctrine Command, Fort Monroe, VA) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper* 7 p

The development of the aerial scout is discussed, taking into account medical evacuation roles assigned to the first helicopters purchased by the Army, the role of the helicopter during the Korean War, the scout/gunship role for the OH-13 helicopter, and scout missions performed in Vietnam The adaption of helicopter scout tactics for modern combat conditions is considered, giving attention to the need to increase the helicopter's survivability on the mid to high intensity battlefield The present concept of scout employment calls for the scout to be the integrator of aerial antiarmor firepower of the combined arms team. Four major roles identified are related to operations as air cavalry scout, attack helicopter scout, artillery scout, and an aid to battlefield management G R

A82-24707 **Flight test data acquisition and interpretation** C. Hutchinson and H Steinmann (Boeing Vertol Co , Philadelphia, PA). *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar 25-27, 1980, Paper.* 18 p

Data acquisition comprises the selection of measurements, optimization of recording methods, and processing of the measurements for interpretation Basic measurements are related to the determination of airspeed, altitude, gross weight, the center of gravity, rotor speed, outside air temperature, attitudes, rates, stick positions, and load factor. The complete list of the parameters is dependent on the type of helicopter being tested. However, the intent is to be able to verify the suitability of maneuvers for the flight load survey requirements Data interpretation considers safety of the test aircraft, load studies, and fatigue life predictions Variations in operating restrictions, based on fatigue loads, can have dramatic effects on the outcome of the fatigue life assessment. G R

A82-24708 **Structural testing of composites with known defects** P F Maloney (Kaman Aerospace Corp , Bloomfield, CT) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper.* 14 p. 5 refs

In connection with the application of composite materials in primary structural components of production aircraft, an understanding of the significance of typical defects in the material is very important The present investigation has the objective to make a contribution to such an understanding Specific experiences discussed are derived from four separate development programs of relatively recent completion Attention is given to the composite main rotor blade for the AH-1 Cobra helicopter, the composite rotor hub development program, the composite main rotor blade for the circulation control rotor, and the development of a composite blade for a 300 foot diameter wind turbine A description is presented of salient features of each of these programs, taking into account significant findings relative to defects as they may affect composite materials G R

A82-24709 **A method of determining safe service life for helicopter components.** G W McCloud (Bell Helicopter Textron, Fort Worth, TX) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar 25-27, 1980, Paper* 12 p

It is pointed out that the considered methods have been used by an American helicopter manufacturer for many years and were found to be reliable In general, these methods follow those outlined in FAA Advisory Circular 20-95 The information required for the determination of the fatigue life of a component includes the fatigue strength characteristics of the component, the stresses associated with normal flight maneuvers, and the frequency of occurrence of those maneuvers Attention is given to the approaches employed to obtain information regarding the fatigue strength, the operating loads spectrum, a fatigue life calculation, and prospects for improving state-of-the-art procedures G R

A82-24710 **Hughes helicopters - Fatigue life methodology.** J McDermott (Hughes Helicopters, Inc , Culver City, CA) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper* 20 p

A description is presented of the approach used by an American helicopter manufacturer in solving a hypothetical fatigue problem The solution of the problem was undertaken to identify and evaluate the different methodologies existing in the industry. The hypothetical fatigue problem provides loads data, fatigue test data, and defines the spectrum The required solutions include the calculation of fatigue life using cycle counted data, the calculation of fatigue life using peak loads applied throughout the time slice of duration of maneuver, and the determination of the effect of GAG cycles. The results of the investigation show the importance of the determination of the S-N curve, using either best data fit or standard material curve shape Assumption of peak cycle loads for duration of maneuver is found to be ultra conservative, leaving out the GAG cycle is unconservative G R.

A82-24712 **Flight condition recognition /FCR/ technique.** D M Saylor (U S Army, Research and Technology Laboratories, Fort Eustis, VA) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper* 7 p

A U S Army contract, entitled 'Structural Integrity Monitoring System' was performed to design, qualify, flight test, and demonstrate the Structural Integrity Recording System (SIRS) SIRS provides a cost-effective method of tracking the accumulation of fatigue damage on critical helicopter dynamic components The system monitors the variations in fleet utilization on a helicopter by-helicopter basis for safer and more economical operation SIRS is a total system comprising an airborne microprocessor-based recorder, a portable flight-line retrieval unit, and a data processing package Attention is given to the airborne recorder, the transducer package, the retrieval unit, fatigue damage assessment software, flight test programs, aspects of operational test and evaluation, and a flight test program G R

A82-24713 **NDE of composite rotor blades during fatigue testing** R Shuford, W. Houghton (U S Army, Army Materials and Mechanics Research Center, Watertown, MA), J R Mitchell (Becton, Dickinson and Co., Dunegan-Endevco, San Juan Capistrano, CA), and J W Sobczak (U S Army, Applied Technology Laboratory, Fort Eustis, VA) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar. 25-27, 1980, Paper.* 17 p 11 refs

A description is presented of progress made in a continuing project concerned with the evaluation of the usefulness of several nondestructive evaluation (NDE) techniques for monitoring flaw initation and growth in composite helicopter rotor blades The acoustic emission (AE) results indicate minor fatigued damage It appears, therefore, feasible to project an AE failure curve based on the emissions from periodic proof overloads This technique could have wide application in new product certification and in-service inspection of composite rotor blades Indications from the vibrothermography portion of the program suggest that it may provide an excellent method for locating, characterizing, and understanding defect development and growth during cyclic loading of composite structures Results from the ultrasonic, radiographic and visual examinations indicate that these procedures are very useful for the evaluation of defects in composite rotor blades G R

A82-24714 **Fundamentals of helicopter fatigue life determination.** D P Schrage (U.S. Army, Aviation Research and Development Command, St Louis, MO). *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar. 25-27, 1980, Paper.* 28 p. 10 refs

This paper reviews the fundamentals of helicopter fatigue life determination by discussing the sources and definitions of helicopter loads, the relationships between these loads and critical stresses, and helicopter fatigue methodology Helicopter fatigue methodology is the process by which the various aspects and disciplines are incorporated into a procedure for calculating helicopter fatigue lives (Author)

A82-24715 **Fatigue test of the typical main rotor controls component.** J Slack and J Cernosek (Bell Helicopter Textron, Fort Worth, TX) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar. 25-27, 1980, Paper* 17 p

The general procedure used to qualify a fatigue critical component is illustrated with the aid of a flow chart The decision regarding the condition of fatigue tests for a particular component is made as soon as practical in a program The decision takes into consideration the expected fatigue environment on the helicopter An early diagnosis of potential component fatigue problems is important to prevent certification delays, and costly manufacturing charge requirements Considerations of the plan of test are discussed, giving attention to the test specimen, the type of test, the test loads, and the test machine The more important aspects concerning the implementation of the test plan are related to the test set up, the failure analysis, and the feedback requirements G R

A82-24716 **Hypothetical fatigue life problem - Application of Aérospatiale method** G Stievenard (Societe Nationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du Rhône, France) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper* 34 p

The mean fatigue curve calculation is considered, taking into account the permissible alternating load and the plotting of the unit Wohler curve The Wohler curve makes it possible to calculate, from test results, a mean fatigue curve and a standard deviation repre sentative of the scatter Attention is given to safe fatigue curve calculation, aspects of flight load determination, the fatigue life calculation using peak value flight loads, a fatigue life calculation using cycle-counted flight loads, and the values for a G A G cycle It is pointed out that the Wohler curves for steels loaded without fretting are generally flat and that this results in very high difference in the number of cycles for low variations of loading G R

A82-24717 **The cargo helicopter - A logistical vehicle** R. L Stoessner and R C Heehn (U S Army, Training and Doctrine Command, Fort Monroe, VA) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper.* 13 p 9 refs

The availability of adequate supplies is a crucial factor for an army engaged in a battle In the case of highly mobile forces involved in other than light assault missions, supply requirements combined with the factor of time sensitivity dictate the use of air logistics helicopters The logistical helicopters are considered an integral part of the support command's transportation service Attention is given to the employment of air transport units providing combat service support from a logistical base to a combat force such as a division or brigade which is operating in an underdeveloped area The Tactical Mobility Requirements Board report of 1962, laid the foundation for true airmobility of Army Forces The versatility of the cargo helicopter was demonstrated in Vietnam However, much of the operational experience gained is not applicable to a mid- or high-intensity combat environment The air defense threat envelope will require the cargo helicopter to utilize terrain masking to the maximum G R

A82-24718 **Boeing Vertol fatigue life methodology** G H Thompson (Boeing Vertol Co , Philadelphia, PA) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar 25-27, 1980, Paper* 8 p 7 refs

It is pointed out that, with respect to basic philosophy, the fatigue life methodology of the considered American helicopter manufacturer has changed little over the years Major changes have been only in the mechanics of calculation High-speed computers are performing the work which once had to be done manually The life calculation procedure is started by developing the mission profile This consists of a fatigue loading schedule and flight profile splits To determine the endurance limit of a helicopter dynamic component, full-scale bench fatigue tests are conducted The use of the fatigue life methodology is illustrated with the aid of an example involving the solution of a hypothetical fatigue life problem Attention is given to life calculation without cycle counting, life calculation with cycle counting, and the ground-air-ground condition G R

A82-24719 **Helicopter rotor load prediction** J G Yen (Bell Helicopter Textron, Fort Worth, TX) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St. Louis, MO, Mar 25-27, 1980, Paper.* 10 p 12 refs

In the preliminary design of rotor components, the fatigue design loads must be estimated The methods which have been used for estimating the design loads at Bell Helicopter Textron (BHT) are discussed in this paper A review of rotor loads prediction methods starting with the empirical method used in the earlier years of helicopter design through the application of the sophisticated computer analysis of today is presented Examples of correlation of blade and pitch-link loads between flight test and analytical prediction for a two-bladed teetering rotor and a four-bladed hingeless rotor in level flight are shown Results indicate that the accuracy of analytical prediction depends upon an accurate repre-sentation of the rotor structure and the use of state-of-the-art aerodynamics and, to a great extent, the user's knowledge and experience with the analysis Applications of C81 to predicting loads following blade damage are also discussed briefly (Author)

A82-24720 **Advanced attack helicopter fatigue testing - Overview.** G D Deveaux (Hughes Helicopters, Inc , Test Laboratories, Culver City, CA) *American Helicopter Society, Specialists Meeting on Helicopter Fatigue Methodology, St Louis, MO, Mar 25-27, 1980, Paper* 13 p

A description is presented of tests conducted to study the fatigue life of critical components of the YAH 64 helicopter In accordance with the Airworthiness Qualification Specification six specimens are required to substantiate a fatigue life of 4500 hours Constant load amplitude, S-N type testing is used for all component tests with the exception of the gun support structure, where spectrum loading type testing is specified The components required to be fatigue tested belong to the main rotor group, the tail rotor group, the controls group, the drive system group, and the fuselage The test loading system is discussed, taking into account the general approach, the actuators, and the air springs Details regarding the data acquisition system are also provided G R

A82-24803 **Novel metal-ceramics-composite sealing coatings in aircraft engines (Neuartige Metall-Keramik-Verbund-Dichtungsbelage in Flugtriebwerken).** A Sickinger and V Wilms (Motoren- und Turbinen-Union Munchen GmbH, Munich, West Germany) In Composite materials, Lecture and Discussion Meeting, Constance, West Germany, April 17, 18, 1980, Reports Oberursel, West Germany, Deutsche Gesellschaft fur Metallkunde, 1981, p. 133-140 In German

Requirements for the enhancement of the performance of aircraft engines and the reduction of fuel consumption make it necessary to operate aircraft engines at higher gas pressures and temperatures The development of novel metal-ceramics-composite sealing coatings makes it possible to overcome certain problems related to more exacting sealing requirements and greater thermal extension in connection with the new operational conditions. The sealing coating provides a means to compensate for different thermal extensions and manufacturing tolerances existing for rotating and stationary structural components. It is feasible to obtain minimum clearance values and to reduce attrition effects for the rotating component. Other important benefits of the coating are related to its thermal-barrier characteristics. Attention is given to the requirements which the coating has to satisfy, its application by thermal spraying, the coating composition, and some test results. G.R

A82-24805 **Carbon-fiber composites - A fiber composite material for highly stressed light-construction components (CFK - Ein Faserverbundwerkstoff fur hochbelastete Leichtbauteile)** G Stoffler, W Scheer, and H Wurtinger (M A N - Neue Technologie, Munich, West Germany) In Composite materials, Lecture and Discussion Meeting, Constance, West Germany, April 17, 18, 1980, Reports Oberursel, West Germany, Deutsche Gesellschaft fur Metallkunde, 1981, p 235-250 7 refs. In German

The properties of the basic materials used in fiber-reinforced nonmetallic materials are considered, and the calculation of the strength characteristics of the composite material is discussed, taking into account stresses and fiber orientation in the case of the wing of an aircraft. Attention is given to the elasticity characteristics of a unidirectional layer, a fracture criterion for the unidirectional layer,

a computational flow diagram for the calculation of the loading capacity of the composite, the fracture characteristics and the mechanical characteristics of carbon-fiber composites (CFC), and the thermal properties of CFC A description is presented of examples which illustrate various possibilities for an employment of CFC G.R

A82-24814 # **Efficient combinations of numerical techniques applied to aircraft turning performance optimization** D Blank and J Shinar (Technion - Israel Institute of Technology, Haifa, Israel) *Journal of Guidance, Control, and Dynamics*, vol 5, Mar-Apr 1982, p 124-130 23 refs

This paper presents efficient combinations of numerical optimization techniques summarizing their relative merits. Four basic methods handling constraints without penalty functions, are considered (1) sequential gradient-restoration, (2) quasilinearization, (3) neighboring extremals, and (4) direct shooting The first two are modifications of algorithms introduced by Miele, avoiding numerical differentiation and eliminating the anchoring effect of the original formulation The third one is a generalization of an algorithm due to Bryson and Ho The individual and combined methods are tested by solving the optimization of vertical and three-dimensional turning maneuvers as examples Results show that an appropriate combination of algorithms reduces the computational effort by more than 50% (Author)

A82-24825 **Recent developments in materials and processes for aircraft corrosion control** S J Ketcham and J J De Luccia (U S Naval Material Command, Naval Air Development Center, Warminster, PA) *SAMPE Quarterly*, vol 13, Jan 1982, p 32-37 10 refs

This paper describes advances in materials and processes for aircraft corrosion control currently in use and those under development in the laboratory for future use Areas covered are corrosion preventive compounds, organic and inorganic coatings, alloy selection and heat treatments Available materials highlighted are water displacing compounds, sealant primers, aluminum alloys 7050 and 7010 including a state-of-the-art report on the use of exfoliation and stress corrosion resistant tempers Materials under development that offer promise of contributing to future advances include water displacing paints, flexible primer, crack arrestment compounds, powder metallurgy, aluminum alloys and substitutes for cadmium plating (Author)

A82-24892 † **A method for the investigation of gyrostabilization systems (Ob odnom metode issledovaniia sistem giroskopicheskoi stabilizatsii)** L K Kuz'mina In The direct method in stability theory and its applications Novosibirsk, Izdatel'stvo Nauka, 1981, p 195-200 9 refs In Russian

The paper examines gyrostabilization systems whose differential equations of motion include a large parameter The conditions under which a simplified low-order mathematical model can be used to study such systems are investigated Results are presented for the example of a single-axis gyrostabilizer B J

A82-24970 **Angle of downwash behind a wing in unsteady flow (Srazovy uhel za neustalene obtekanym kridlem).** M. Zadnik *Zpravodaj VZLU*, no 4, 1981, p 167-171 5 refs In Czech

The paper presents a method for determining the angle of downwash behind a wing in the plane of symmetry of the aircraft when the circulation about the wing varies periodically with time The solution is obtained for an inviscid medium on the assumption of the total rollup of the free and starting vortices The results are presented in the form of a nomogram B.J

A82-24972 **The reliability and safety of small passenger aircraft (Problematika spolehlivosti a bezpecnosti maleho dopravniho letounu).** O Gregr and V Kahanek *Zprovodaj VZLU*, no 4, 1981, p 189-195 5 refs In Czech

Problems associated with the reliability and safety assurance of small passenger aircraft during certification are discussed. The philosophy of flight safety assessment according to NLGS-2 requirements is described, and the quantitative limits of the probability of an accident due to damage are determined. Methods of aircraft reliability analysis and testing are briefly described B J.

A82-24973 **Spoilers or auxiliary flaps (Spoilery nebo pomocna kridelka)** V Pokorny *Zpravodaj VZLU*, no 5, 1981, p 213-217 In Czech

The possibilities and advantages of using auxiliary flaps (that part of ailerons or extended flaps controlled by a servo actuator) instead of spoilers for the improvement of lateral control are discussed It is shown that the auxiliary flaps have definite advantages over spoilers and allow a wider range of application B.J

A82-24974 **Oscillations and vibrations of aircraft on runways (Kmitani a vibrace letadel pri pozemnich operacich)** O Kropac, J Sprinc, and M Prochazka *Zpravodaj VZLU*, no 5, 1981, p 219-234 8 refs In Czech

Analytic and experimental studies on the vibration of aircraft on runways are summarized The aircraft and the runway are considered as interacting components of a dynamic system This is taken into account in developing a classification of runways according to surface irregularities and the corresponding dynamic response of the aircraft Attention is given to the motion of the aircraft as a whole, to vibrations of its parts, and to certain special phenomena, particularly the inverse effect of damping B.J

A82-25002 **Analysis of the crossed dipole antenna as a model for aircraft in an electromagnetic environment** R W Burton (Colorado, University, Colorado Springs, CO) and R W P King (Harvard University, Cambridge, MA) In International Symposium on Electromagnetic Waves, Munich, West Germany, August 26-29, 1980, Proceedings Munich, International U R S I -Symposium, 1981, p 311 A/1-311 A/4 14 refs.

The currents and charges induced on the metallic skin of a crossed dipole antenna immersed in an electromagnetic plane wave field are analyzed experimentally and theoretically for both electrically thin and electrically thick arm diameters over a wide range of arm lengths highlighting critical boundary conditions An analysis is also carried out of electrically thick cylinders with flat plate cross arms The boundary conditions at the junction of the crossed dipole with electrically thin arms are developed and correlated with experimental results over a range of arm lengths that clearly define the boundary conditions on charge and current in the junction area The results are interpreted in terms of the forced and resonant currents directly evolved from an understanding of the electrically thin receiving unit C R

A82-25011 **Calculation and measurement of electric field strength for airborne antennas in the LF/MF range** R J Luebbers and J Bash (Ohio University, Athens, OH) In International Symposium on Electromagnetic Waves, Munich, West Germany, August 26-29, 1980, Proceedings Munich, International U R S I -Symposium, 1981, p 334 A/1-334 A/4 5 refs

A technique has been developed to calibrate in absolute field strength the loop antenna and associated receiving system for the Automatic Direction Finding equipment for three different aircraft The calibrated receiving systems are flown at a variety of altitudes over various types of terrains, and field strengths for signals in the desired frequency range are measured A comparison is made between calculated and measured results, showing good agreement to within a few dB, and confirming the accuracy of both the calibration method and the propagation model D L G

A82-25050 # **AFWAL turbine engine controls research and development - Present and future** L L Small (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH). *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 20th, Orlando, FL, Jan. 11-14, 1982, Paper 82-0321.* 7 p 9 refs

It is noted that, within the next few years, digital computer-based engine controls will see operational use in both military and commercial applications. Current and planned activities at the Air Force Wright Aeronautical Laboratories in the areas of multivariable control logic, control system integration, and reliability/flight safety are reviewed C R.

A82-25113 # **Rapid extraction of layer relative humidity, geopotential thickness, and atmospheric stability from satellite sounding radiometer data** W L Smith (NOAA, National Earth

Satellite Service, Madison, WI) and F X Zhou *Applied Optics*, vol 21, Mar 1, 1982, p 924-928 5 refs

Algorithms are presented which allow fast retrieval of major meteorological parameters from individual radiance measurements, thereby avoiding the time consuming radiative transfer equation inversion process as required for detailed vertical profile determina tions The relative humidity and geopotential thickness patterns from satellite data are shown to be consistent with radiosonde data The atmospheric stability index, total-totals, calculated from satellite derived relative humidities and geopotential thicknesses is in good agreement with subsequent convective weather Computer programs based on the proposed algorithms produce contour displays of the humidity, geopotential thickness, and total-totals within 10 min of the ingestion of the satellite data V L

A82-25119 Aircraft/airport compatibility - A constant challenge for aircraft designers W E Parsons and M E Wilfert (Douglas Aircraft Co , Long Beach, CA) *Exxon Air World*, vol 34, no 1, 1982, p 18-21, 30

The consideration given during airport planning and aircraft design to the compatibility of the two systems is described, with attention to the impact of design alternatives on direct, indirect and total operating costs through the reduction of ground time for storage and maintenance Major aspects of existing and planned airport facilities considered during aircraft design include runway length and width, taxiway width, pavement fillets, and pavement strength, along with the location and accessibility of the various servicing points of the aircraft Emphasis is placed on the avoidance of sequencing in servicing operations, so that lavatory, water, electrical, pneumatic and air conditioning systems may be readied for flight simultaneously O C

A82-25154 * # The design of a wind tunnel VSTOL fighter model incorporating turbine powered engine simulators R O Bailey (NASA, Ames Research Center, Moffett Field, CA), M R Maraz, and P E Hiley (Douglas Aircraft Co , St Louis, MO) *American Institute of Aeronautics and Astronautics and NASA Ames Research Center, V/STOL Conference, Palo Alto, CA, Dec. 7-9, 1981, AIAA Paper 81-2635* 27 p 8 refs Contract No. F33615-77-C-2097

A wind-tunnel model of a supersonic VSTOL fighter aircraft configuration has been developed for use in the evaluation of airframe-propulsion system aerodynamic interactions The model may be employed with conventional test techniques, where configuration aerodynamics are measured in a flow-through mode and incremental nozzle-airframe interactions are measured in a jet-effects mode, and with the Compact Multimission Aircraft Propulsion Simulator which is capable of the simultaneous simulation of inlet and exhaust nozzle flow fields so as to allow the evaluation of the extent of inlet and nozzle flow field coupling. The basic configuration of the twin-engine model has a geometrically close-coupled canard and wing, and a moderately short nacelle with nonaxisymmetric vectorable exhaust nozzles near the wing trailing edge, and may be converted to a canardless configuration with an extremely short nacelle Testing is planned to begin in the summer of 1982 A L.W.

A82-25213 Conflicts between random flights in a given area S Ratcliffe and R L Ford (Royal Signals and Radar Establishment, Malvern, Worcs , England) *Journal of Navigation*, vol 35, Jan 1982, p 47-71, Discussion, p 72-74 18 refs

The present investigation is concerned with the segregation of air traffic in space and a division of the available sky in various sections to minimize conflicts between the various users Random air traffic in a bounded volume of airspace outside the controlled airspace is considered It is assumed that aircraft are all in straight line flight The constraints make it possible to construct a model whose behavior can be defined quantitatively as an algebraic function of the small number of input parameters Attention is given to a computer model, two-dimensional traffic, the constraints on the use of airspace, conflicts in three-dimensional airspace, the collision rate as a function of traffic mix, and alarm criteria for an advisory service G R

A82-25216 * # Advanced electronic displays and their potential in future transport aircraft J J Hatfield (NASA, Langley Research Center, Hampton, VA) *International Air Transport Association, Technical Symposium on Aviation Technology in the 80's, Montreal, Canada, Dec 1-4, 1981, Paper* 26 p 29 refs

It is pointed out that electronic displays represent one of the keys to continued integration and improvement of the effectiveness of avionic systems in future transport aircraft An employment of modern electronic display media and generation has become vital in connection with the increases in modes and functions of modern aircraft Requirements for electronic systems of future transports are examined, and a description is provided of the tools which are available for cockpit integration, taking into account trends in information processing and presentation, trends in integrated display devices, and trends concerning input/output devices Developments related to display media, display generation, and I/O devices are considered, giving attention to a comparison of CRT and flat-panel display technology, advanced HUD technology and multifunction controls Integrated display formats are discussed along with integrated systems and cockpit configurations G R

A82-25323 # Secondary radar problems - The presence of false echoes (Problemas del radar secundario - Presencia de ecos falsos) M G Duran (Paracuellos del Jarama, Centro de Control de Navegación Aérea, Paracuellos del Jarama, Spain) *IAA/Ingeniería Aeronáutica y Astronáutica*, vol 34, Jan 1982, p 5-10 In Spanish

Techniques are described for the suppression of false radar echoes due to (1) lateral lobe radar responses, (2) radar responses out of synchrony with the signals of the radar system, (3) responses corresponding to signals from previous radar repetition periods, (4) responses produced by a split in the number of echoes from a target aircraft, and (5) responses due to reflections The most frequently used technique for the correction of these false-echo effects is improved side lobe suppression (ISLS), which involves the emission of radar pulse signals from an omnidirectional antenna Techniques complementing ISLS include the false return elimination device and transponder suppression transmitter. False echo suppression by data processor programming techniques is also described O C

A82-25324 # Electronic flight instrument systems /EFIS/, the instrumentation of the 1980s (La instrumentación de los 80 /E F I S/) J B Galente *IAA/Ingeniería Aeronáutica y Astronáutica*, vol 34, Jan 1982, p 18-23 In Spanish

The development of high-luminosity, high-resolution color coded CRT systems for the display of symbolic and alphanumeric flight data in cabins of 767/757-type commercial aircraft is discussed These electronic flight instrument systems (EFIS) depend for their effectiveness on the incorporation of two techniques (1) the shadow mask tube, derived from the trinitron color CRTs in use in radar color display terminals, and (2) stroke writing, in which each CRT electron gun can prolong its excitation of a given screen area under the control of a microprocessor Progress in the development and experimental validation of these instruments has been so rapid as to allow general aviation use to begin in 1982 The more extensive use of CRTs in an 'all glass cockpit', pending further development, is also considered O C

A82-25325 # The toll of ILS-preventable aviation accidents (Costo de los accidentes aéreos evitables con ILS). E L. Abella. *IAA/Ingeniería Aeronáutica y Astronáutica*, vol 34, Jan 1982, p. 31-34 In Spanish

Based on the statistical analysis of Simpson (1975), observations are presented concerning the aviation accidents which occurred in the U S from January 1964 to December 1972, with emphasis on landings. An attempt is made to determine the portion of those landing approach accidents that could have been prevented through the use of IFR procedures of a high degree of precision Results are presented for the cases of commercial aviation, commuter aviation, and general aviation, and comparisons are made with general aviation VFR accidents All comparative data are presented in tabular form. Attention is given to the estimation of preventable property losses as well as loss of lives U.C.

A82-25347 † Problems of numerical simulation of unsteady three-dimensional viscous-gas flows in nozzles (O zadachakh chislennogo modelirovaniia nestatsionarnykh prostranstvennykh techenii viazkogo gaza v soplakh) A T Fedorchenko. *Zhurnal Vychislitel'noi*

Matematiki i Matematicheskoi Fiziki, vol 22, Jan -Feb 1982, p. 178-196 26 refs In Russian

The paper examines certain general problems involving the use of the complete Navier-Stokes equations for the numerical simulation of unsteady three-dimensional viscous-gas flows in nozzles Models of porous boundaries are examined, and their acoustic characteristics are investigated Attention is given to aspects of the control of gasdynamic (especially acoustic) parameters in such flows. As an example, a numerical analysis is presented of axisymmetric unsteady flows of a viscous gas in a region containing a Laval nozzle

B J

A82-25353 † Stability of a three-stage dynamic stand (Ob ustoichivosti trekhstepennogo dinamicheskogo stenda) N V Osadchenko *Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela,* Jan -Feb 1982, p. 20-27. 10 refs In Russian

The small-parameter method is used to derive equations of partial motion components for a three-stage dynamic stand designed fo, simulating the angular motions of moving objects The fast-motion stability of the system is analyzed using a previously proposed method whereby the stability problem for three-axis systems is reduced to that for single-axis systems A matrix interpretation of this method is presented, and stability bounds are determined

V L

A82-25499 Importance of a tactical cargo aircraft in emergency relief (Intérêt d'un avion cargo tactique dans les secours d'urgence) J P Chabanne (Service de Santé pour l'Armée de l'Air, Ecole d'Application, Centre de Recherche de Médecine Aérospatiale, Paris, France) and G Jacob (Commandement du Transport Aérien Militaire, Vélizy-Villacoublay, Yvelines, France) *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol 20, no 79, 1981, p 210 214 7 refs In French.

The use of the C 160 Transall aircraft in emergency relief operations at the site of medical disasters is discussed Capabilities of the C 160 allow it to be useful for a number of purposes (1) the transport of medical personnel and equipment into the disaster region, (2) the medical evacuation of the seriously ill and injured, (3) the resupply of the stricken area with food, fuel and medical supplies, (4) the supplementation of communications damaged by the disaster Despite limitations in range, velocity and capacity, experience in humanitarian relief operations in Peru, Jordan and Nicaragua has shown its capacity to land on uneven terrain and robustness to make the C 160 a valuable tool in disaster intervention.

A L W

A82-25510 Selection of telecommunication equipment - A new approach to the equivalent cost concept (Choix d'investissements en matériels de télécommunications - Une nouvelle approche de la notion de coût équivalent) M Minoux (CNET, Paris, CNET, Issy-les-Moulineaux, Hauts-de-Seine, France) and A Guerard (CNET, Issy-les-Moulineaux, Hauts-de-Seine, France) *Annales des Télécommunications,* vol 36, Nov -Dec 1981, p 602-612 5 refs In French

In order to apply cost equivalence to the purchase of telecommunication equipment from components with equal functional features, but with different costs and length of payback, an extension of amortization calculations was performed It is shown that the increase in demand is not necessarily exponential, that the law of variation of optimal cost equivalence can be read directly from the curve of net costs of the equipment under consideration, that actualized costs depend on the criteria of the actual payback period Each year of functional addition to the operating system is included in the calculations, rather than the projected lifetime The payback period then becomes the prime criteria for determining the economics of the equipment added incrementally to the capacity of the network The economics of a linear growth of demand are determined, and then extended to any form of growth with a constant economy-of-scale coefficient

M S K

A82-25538 Where is cobalt irreplaceable (Wo ist Kobalt unersetzlich) J C Agarwal (Charles River Associates, Inc , Boston, MA) *(International Conference on Cobalt-Metallurgy and Uses, Brussels, Belgium, Nov 10-13, 1981, Paper) Metall,* vol. 36, Mar 1982, p 292, 293 In German

It is pointed out that cobalt, at least on a short-term basis, is nearly irreplaceable in connection with certain of its applications, taking into account, in particular, its use in catalysts and in heat-resistant superalloys Cobalt-containing superalloys are employed in gas turbines and engines, in connection with efforts related to the search for oil reservoirs and their exploitation, and in medical implants A number of aircraft engines utilize cobalt as alloy component The irreplaceableness of cobalt on a short-term basis is partly related to the long time required to develop a new aircraft engine Cobalt is also widely used in the manufacture of permanent magnets A crucial asset of cobalt with respect to its employment in equipment used for offshore drilling operations is its resistance against hydrogen sulfide and effects of marine climate conditions Attention is also given to aspects of cobalt production and market trends

G R

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STAR ENTRIES

N82-18119# Deutsche Gesellschaft fuer Luft- und Raumfahrt Cologne (West Germany)
SEVENTH EUROPEAN ROTORCRAFT AND POWERED LIFT AIRCRAFT FORUM
1981 951 p refs Proceeding of Conf Held in Garmisch-Partenkirchen West Germany 8-11 Sep 1981 Original contains color illustrations
Avail NTIS HC A99/MF A01
Aspects of helicopter and turbine rotor are addressed

N82-18120# Southampton Univ (England) Dept of Aeronautics and Astronautics
DEVELOPMENTS IN ROTARY WING AIRCRAFT AERODYNAMICS
I C Cheeseman *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 27 p refs

Avail NTIS HC A99/MF A01
Developments in helicopter aerodynamics are reviewed, including new blade sections and planforms Computer modelling of the flow and the need for further work in predicting oscillating loadings are considered The greater attention being given to the need to reduce drag in forward flight due to extended range and fuel conservation costs is recognized A forecast of advances is made NW

N82-18121# Massachusetts Inst of Tech Cambridge
A SIMPLIFIED APPROACH TO THE FREE WAKE ANALYSIS OF A HOVERING ROTOR
R H Miller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs

Avail NTIS HC A99/MF A01
Rotor wake geometry and the number of blades are analyzed Simplified approaches to the free wake aerodynamic analysis of hovering rotors permitting rapid evaluation of rotor aerodynamic characteristics are discussed Analytical results are compared with existing measurements of blade bound circulation and wake geometry NW

N82-18122# Politecnico di Milano (Italy) Instituto di Ingegneria Aerospaziale
AN EXPERIMENTAL ANALYSIS OF THE SHAPE OF A ROTOR WAKE
Sergio DePonte and Luigi Vigevano *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 8 p refs

Avail NTIS HC A99/MF A01
Although the shape of a rotor wake may be described by potential flow methods, to get reasonable calculation costs it is necessary to introduce some simplification in the calculations In order to check the accuracy and the validity field of the various assumptions a set of experimental data may be a good tool for comparisons A hot wire technique to detect the presence of the blade wake is presented NW

N82-18123# Tokyo Univ (Japan)
AN EXTENSION OF THE LOCAL MOMENTUM THEORY TO THE ROTORS OPERATING IN TWISTED FLOW FIELD

Akira Azuma Ken-ichi Nasu and Takatoshi Hayashi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs
Avail NTIS HC A99/MF A01
The local momentum theory was developed to calculate the dynamic airloading of a helicopter rotor where the velocity perpendicular to the plane of rotation was assumed to be negligibly low in comparison with the rotating velocity In the case of propellers or windmills, however this assumption is no longer adequate and the flow field seen in the rotor-fixed-coordinate system is noticeably twisted along the span In order to permit calculation of the induced velocity distribution as well as the airloading of the blade in such a twisted flow field we have carried out an extension of the local momentum theory Since our method of calculation is based on the instantaneous circulation distribution rather than the instantaneous momentum balance, it may be called the Local Circulation Method The present method is also applicable to propellers and windmills in yawed flow Author

N82-18124# Nanjing Aeronautical Inst (China)
A SIMPLIFIED METHOD FOR PREDICTING ROTOR BLADE AIRLOADS
Wang Shi-cun and Xu Zhi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 28 p refs

Avail NTIS HC A99/MF A01
Relations of first two harmonic induced velocities to the lower and same-order harmonic circulations are obtained from the generalized classical vortex theory of the rotor Then, based on the blade element theory, a closed form of equations for circulation is established and by taking the flapping condition into account simplified formulae for predicting rotor blade airloads are set up In particular expressions of flapping coefficients are derived including the effect of variable induced velocity distribution but in terms of blade parameters and flight parameters only Finally, a calculation of a typical example is made and comparisons of airloads with those from the more accurate numerical solution are shown that the present method is fairly suitable for aerodynamic analysis and preliminary design of helicopters Author

N82-18125# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt Goettingen (West Germany) Inst fuer Aeroelastik
A THREE-DIMENSIONAL APPROACH TO LIFT AND MOMENT COEFFICIENTS OF ROTATING BLADES
Wolfgang Send *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary

Avail NTIS HC A99/MF A01
The three dimensional incompressible flow around a thick blade is calculated in the limiting case of an infinitely high Reynolds number The solution for a four bladed rotor is achieved by interacting the mutual influence of the induced velocities on the blades Several properties of the three dimensional approach are compared with two dimensional theories Unsteady results are obtained by combining the quasi-steady flow with the calculation for a given oscillation mode The integral equation for the flow around the blades is solved by a higher order panel technique for the vorticity vector, continuous on the blade and downstream in the wake An improper description of the wake integral is evident The helical wake is substituted by its rectilinear counterpart for which an analytical description was found NW

N82-18126# Societe Nationale Industrielle Aerospatiale, Marignane (France) Helicopter Div
A COMPLETE METHOD FOR COMPUTATION OF BLADE MODE CHARACTERISTICS AND RESPONSES IN FORWARD FLIGHT
J P Lefrancq and B Masure *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 9 p

Avail NTIS HC A99/MF A01
Hypotheses and equations methods of calculation and numerical adaptation concerning the dynamics of helicopter rotors are dealt with Two problems raised by a spinning rotor are also dealt with determination of natural models qualified by their eigen frequency and damping and forward flight using the azimuth method which avoids those difficulties inherent to the modal methods The calculation process used to improve a rotor while at design stage is illustrated NW

N82-18127# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt Goettingen (West Germany) Inst fuer Aeroelastik
MODAL CHARACTERISTICS OF ROTOR BLADES: FINITE

ELEMENT APPROACH AND MEASUREMENT BY GROUND VIBRATION TEST
D Ludwig *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs

Avail NTIS HC A99/MF A01

The mass and stiffness matrices for a rotating blade are established by the finite element method The formulation is based on the Lagrange function for combined flapwise bending chordwise bending, and torsion of twisted nonuniform rotor blades The element matrices are created by the non-numeric computer program REDUCE An ordering scheme was introduced to demonstrate which terms may be simplified or neglected As examples, eigen analyses with the finite element computer program, are performed for a homogeneous beam and for the nonrotating blade of a wind energy converter The results of the calculations for the beam are compared with the analytical solutions The rotor blade of the wind energy converter was tested in a ground vibration test A short description of the ground vibration test technique and performance is given NW

N82-18129# Westland Helicopters Ltd Yeovil (England) Dynamics Dept
A STUDY OF THE TECHNIQUES OF DYNAMIC ANALYSIS OF HELICOPTER TYPE STRUCTURES
G M Venn and D J Boon *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p

Avail NTIS HC A99/MF A01

The techniques used in the dynamic analysis of helicopter type structures using finite elements are discussed A test structure was designed and built which incorporated many design features found in helicopter structures Experiments were performed on this structure to determine the natural frequencies and normal modes These experimental results were compared with theoretical finite element results Altering the build state added one or two extra problems so that these could be studied The modelling problems investigated were riveted panel-stringer constructions deep fabricated beams discontinuous load paths, bolted joints, honeycomb panels, gearboxes engine mounts, and engines The techniques used to model these features are discussed Problems were found when attempting to compare the theoretical and experimental results NW

N82-18130# Virginia Polytechnic Inst and State Univ, Blacksburg
THE EFFECTS OF SLIGHT NON-LINEARITIES ON MODAL TESTING OF HELICOPTER-LIKE STRUCTURES
D J Ewins (Imperial College of Science and Technology) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 11 p refs

Avail NTIS HC A99/MF A01

A comprehensive series of modal tests was made on a specially built test piece designed to simulate many of the characteristics of helicopter structures These tests identified the presence of a 'slight degree of nonlinearity and further established that this almost unnoticed effect causes significant discrepancies in the modal properties deduced from measured data However, systematic analysis of the measurements may be used to isolate the nonlinear effects and to eliminate them from the results Author

N82-18131# Societe Nationale Industrielle Aerospatiale, Marignane (France) Helicopter Div
PARAMETRIC STUDY OF THE INFLUENCE OF THE ENGINE UPON THE OPERATING COST OF A CIVIL HELICOPTER

Gilbert Beziac, Jean-Pierre Dedieu, and Philippe Cabrit *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 5 p
Avail NTIS HC A99/MF A01

The influence of engine characteristics (weight fuel consumption, price, power range) upon the helicopter operating cost were studied The parametric relationship between the various factors were defined Several engine alternatives for a medium weight helicopter were compared The following conclusions were made (1) a sufficient power reserve is necessary but too high a value is not profitable (2) the fuel consumption should be the result of a compromise interest of a low value, engine complexity reliability and (3) a substantial increase in helicopter cost effectiveness is obtained thanks to a simultaneous evolution of aircraft and engine M D K

N82-18132# Technische Hogeschool Delft (Netherlands) Dept of Aerospace Engineering
PREDICTION OF OFF-DESIGN PERFORMANCE OF TURBO-SHAFT ENGINES A SIMPLIFIED METHOD
H Wittenberg *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs

Avail NTIS HC A99/MF A01

Estimation of the off-design performance of a given gas turbine is generally based on detailed performance characteristics of compressor and turbine(s) An approximate method for the estimation of the off-design behavior of turbojet and turbofan engines was developed using thermodynamic relationships only The method is based on a matching procedure with generalized mass flow characteristics of the turbine(s) or exhaust nozzle(s) The method was adopted to turbo-shaft engines for this study Examples are given for an actual engine type There is fair agreement between the calculated off-design performance and the data derived from the manufacturer's engine brochure M D K

N82-18133# Rolls-Royce Ltd, Watford (England)
MEASUREMENT TECHNIQUES USED TO ASSESS THE INSTALLED POWER OF A HELICOPTER ENGINE
T G Morton *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p Original contains color illustrations

Avail NTIS HC A99/MF A01

To improve helicopter performance predictions, it is important to quantify any change in engine performance between the test bed and as installed' in the aircraft, and to attribute the reasons for any change as accurately as possible Measurement techniques used to quantify performance for a particular Rolls-Royce Gem Engine installation is discussed Extra sensors were added to engines in a production Lynx helicopter which was fitted with recorder equipment in the cabin and flown to a defined schedule If the engine is considered as a thermodynamic unit, the input/output equation must balance Test point data based on these inlet and exhaust conditions were obtained from both test bed and flight tests Analysis of results when compared to a thermodynamic model of the engine, shows that the resultant data is very sensitive to the quality of measurements and will quickly show the deviation from predicted characteristics Author

N82-18134# Motoren- und Turbinen-Union Muenchen G m b H (West Germany)
COMPONENT DESIGN AND DEVELOPMENT FOR FUTURE HELICOPTER ENGINES
Jean Hourmouziadis and Horst B Kreiner *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs
Avail NTIS HC A99/MF A01

Advances achieved today and results available from both rig and demonstrator test programs for present and future helicopter engines are discussed These will form the basis for further component improvement required to yield a successful next generation engine The significance of reduced fuel consumption, improved overall system performance, and reliability are considered in relation to design activity and reaction to changing customer needs M D K

N82-18135# General Electric Co, Cincinnati, Ohio Systems and Controls
THREE-ENGINE CONTROL SYSTEM FOR THE PROTOTYPE EH-101 HELICOPTER
E A Chiuchiolo and J J Curran *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft 1981 10 p refs

(AEBG-9/81-1568L) Avail NTIS HC A99/MF A01

The T700 control system configured for installation in the three-engined WG 34A helicopter (prototype for European Helicopter Industries EH-101) provides for a versatile control system which may be operated normally to provide the helicopter propulsion or may be operated as a totally independent system to power airframe avionics and power accessories It is designed to maintain constant speed for accessories or load share with second and third engines and is independent of position in the aircraft The total system is automatic and provides not only constant rotor speed but also closely matched torques Modifica-

tions made to the T700 control system to provide the above capabilities are discussed Discussion of the need for these modifications and the present status of the design is also designed Author

N82-18136# I A M Rinaldo Piaggio, Finale Ligure (Italy)
ENGINE SUPERFICIAL TEMPERATURE AND INFRARED SIGNATURE
A M Ricci A N Allavena and W Esposti (I C I T E S Giuliano Milanese Italy) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p

Avail NTIS HC A99/MF A01

A system calibration and data processing method was set up to provide spatial information on temperature and a spatially accurate radiant intensity map under different angles The methodology was developed to evaluate the thermal exchange between engine and engine-cowling and their infrared signature in the 1 - 6 micrometer range in order to evaluate special infrared treatment to reduce infrared emission The infrared imagery camera was coupled to an analogic/digital data acquisition system *Calibration studies were conducted in an infrared laboratory to* provide the absolute calibration on the thermograph in the previously defined spectral range The results are presented in profiles of temperature and radiance Author

N82-18137# Societe Nationale Industrielle Aerospatiale, Marignane (France) Helicopter Div
POINT OF VIEW OF A HELICOPTER MANUFACTURER ON AIRWORTHINESS REGULATIONS
Jean Boulet *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 5 p

Avail NTIS HC A99/MF A01

Helicopter airworthiness regulations are discussed The need for airworthiness regulations to be drafted and modified through a process of constant consultation between Civil Aviation Authorities and manufacturers is discussed The need to introduce the concept of probability to be able to come closer to the actual risks and to avoid penalizing aircraft with useless systems and demonstration requirements is also considered It is suggested that these regulations tend toward one single international set of regulations and one single demonstration of compliance with the regulations The possibility of reconciling a continuously improved safety level and a progressive reduction in helicopter costs is also considered M D K

N82-18138# Italian Army General Staff, Rome
MILITARY REQUIREMENTS. TOO LITTLE OR TOO MUCH
Emidio Valente *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 18 p

Avail NTIS HC A99/MF A01

Concepts useful for a better understanding of the military requirements, operational requirements for helicopters are discussed The need for an understanding between military operators of rotary-wing aircraft, helicopter designers, and manufacturers is considered Two viewpoints are summarized (1) The helicopter is a weapon system featuring the same indispensability level of all other systems required to integrate the battlefield (2) The helicopter must be designed to reflect military requirements which cover all those elements likely to condition its operation this is to say operational environment, human factor and economical aspects The following considerations are recommended for further investigation (1) whether commercial operators are really affected and (2) whether solutions can be found which in the end prove to be a saving rather than a deterioration in cost weight and complexity M D K

N82-18139# Italian Air Force Pratica di Mare Rome Flight Test Centre
PARAMETRIC CRITERIA AND IMPACT ON DESIGN TRENDS
Roberto dePompeis and Fulvio Gagliardi (Ministry of Defence) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 25 p refs

Avail NTIS HC A99/MF A01

Laws or trends of typical parameters which contribute to the definition of an 'ideal specific helicopter which can be used as a reference model and give a nondimensional measure of effectiveness are discussed Operative requirements, taking into *account the main factors affecting missions were transferred into* a mathematical model The procedure was derived from theoretical studies already applied to aircraft selections and consists of three main steps (1) Effectiveness program (2) Total operating cost estimation and (3) Evaluation of effectiveness-cost ratio and optimization of the fleet selection All costs (manufacturing, maintenance, training, operating, etc) for the operative life are estimated with a similar methodology and lead to the determination of the effectiveness-cost ratio which may be optimized taking into account the fleet consistency required to fulfill the task M D K

N82-18140# Hughes Helicopters, Culver City, Calif
DESIGN PHILOSOPHY OF THE HUGHES MODEL 600 HELICOPTER
R S Taylor *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p

Avail NTIS HC A99/MF A01

The design philosophy of a new model helicopter, the Hughes model 600X, which took into consideration a number of factors is discussed The following subjects are discussed and a rationale for the selected approach is given (1) whether to grow or develop a totally new configuration To be cost effective, a growth helicopter would need to produce significant additional advantages which would be offset by the ever present compromises of the old design, (2) how to grow an 'egg', especially one with internal structure, (3) how to replace the old model or is the new model to be produced in addition to the old one, and (4) how is the market potential to be assessed Details of approaches are presented with reasons for accepting or rejecting each one Results of market analysis and response of the helicopter public is presented to show the viability of the selected configuration M D K

N82-18141# United Technologies Corp, East Hartford Conn Aircraft Div
SH-60B TEST PROGRAM
Frederick J Silverio *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p

Avail NTIS HC A99/MF A01

The SEAHAWK Program, a successful helicopter development program, is discussed in detail The following program tests are described modifications for shipboard compatibility and mission requirements, preflight ground tests, flight and shakedown testing, evaluation of the pitot-static system and digital computer system, reliability tests and component systems analysis Failure modes not detected in flight tests or qualifications bench tests, but discovered in testing under service use, are discussed M D K

N82-18142# Societe Nationale Industrielle Aerospatiale, Marignane (France) Helicopter Div
NAVAL VERSIONS OF THE DAUPHIN AND THE AS 15 TT WEAPON SYSTEM
J P Dubreuil *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 10 p

Avail NTIS HC A99/MF A01

Aerospatiale's Dauphin II helicopter family, initially intended to satisfy civil market demand, is presently subject to development that makes it possible to derive military versions from it The equipment specific to naval versions whose basic system is the AS 15 TT is discussed in detail All the arrangements and modifications that were necessary to adapt the N aircraft to naval, rescue and attack missions and which led to the SA 365 F version are discussed The AS 15 TT and surface vessel system are described in detail The modifications which affected almost all the constitutive elements and aimed at improving not only performance but also maintenance led to a reduction in fabrication and operation costs M D K

N82-18143# Westland Helicopters Ltd Yeovil (England)
ARMY LYNX. PRODUCT DEVELOPMENT MATCHED TO MILITARY COMBAT DEVELOPMENT
D A S Howell *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p

Avail NTIS HC A99/MF A01

The Lynx helicopter program to date and planned product

development related to the evolution of military combat thinking especially the anti-armour role are presented The background for this product development is the impact of technology in the areas of materials, sensors, armaments and systems, both in the context of the helicopter as a total weapon system and the development of air defense systems that pose a threat to the helicopter in the battlefield scenario Author

N82-18144# Societe Nationale Industrielle Aerospatiale, La Courneuve (France)
A LIGHT HELICOPTER FOR NIGHT FIRING
J F Candau *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 18 p

Avail NTIS HC A99/MF A01
Structural design criteria and armament system requirements for a flight combat helicopter for night firing are discussed Helicopter characteristics and performance requirements for night time antitank missions are considered The following areas of consideration are discussed piloting, navigation, target seeking, and firing Operational use crew organization, and program development are also reviewed M D K

N82-18145# Dornier-Werke G m b H, Friedrichshafen (West Germany)
TETHERED ROTORPLATFORMS AND THEIR MISSION POTENTIAL
W Goeller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 13 p

Avail NTIS HC A99/MF A01
A definition of tethered rotorplatforms is given and the main objectives that are pursued with these vehicles are presented A short retrospect on rotorplatform history is given The Dornier 'Kiebitz' is described It is designed to lift payloads for battlefield surveillance air defense, EW or communication to some hundred meters above ground for long mission times A very small tethered rotorplatform for elevating electro optical sensors of 5 to 10 kg is described The energy for its flight time of about 70 seconds is stored in a massive momentum ring surounding its rotor Finally, a proposed rotorplatform with an electric drive system for payloads of about 30 kg for target acquisition and target designation, is also discussed M D K

N82-18146# Southampton Univ (England)
WIND TUNNEL INVESTIGATION OF HIGH SPEED ROTOR NOISE
H Tadghighi and I C Cheeseman *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 25 p refs

Avail NTIS HC A99/MF A01
A high speed model rotor (tip Mach number of 0 75) was developed to investigate tail rotor noise in forward flight conditions The existing 2 1 by 1 5 m low speed (30 m/sec) closed circuit wind tunnel was modified and utilized to enable acoustic measurements of forward flight to be made Check tests in the 24 ft anechoic wind tunnel show excellent agreement with the development tests The model rotor noise data are found to correlate well with full scale helicopter rotor values Simultaneously recorded aerodynamic performance of the model rotor (blade loading, steady thrust, torque and trimmed moments) is compared with theoretical aeroacoustic treatments It is concluded that the model rotor accurately simulates full scale rotor aeroacoustic data J M S

N82-18147*# Army Research and Technology Labs, Moffett Field, Calif Aeromechanics Lab
PREDICTION OF BLADE VORTEX INTERACTION NOISE FROM MEASURED BLADE PRESSURE
Yoshiya Nakamura *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 20 p refs Sponsored by NASA
Avail NTIS HC A99/MF A01 CSCL 0 1A
The impulsive nature of noise due to the interaction of a rotor blade with a tip vortex is studied The time signature of this noise is calculated theoretically based on the measured blade surface pressure fluctuation of an operational load survey rotor in slow descending flight and is compared with the simultaneous microphone measurement Particularly, the physical understanding of the characteristic features of a waveform is extensively studied in order to understand the generating mechanism and to identify the important parameters The interaction trajectory of a tip vortex on an acoustic planform is shown to be a very important parameter for the impulsive shape of the noise The unsteady nature of the pressure distribution at the very leading edge is also important to the pulse shape The theoretical model using noncompact linear acoustics predicts the general shape of interaction impulse pretty well except for peak amplitude which requires more continuous pressure information along the span at the leading edge Author

N82-18148# Westland Helicopters Ltd Yeovil (England)
PRELIMINARY THOUGHTS ON HELICOPTER CABIN NOISE PREDICTION METHODS
J S Pollard *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 14 p refs

Avail NTIS HC A99/MF A01
The problems of predicting helicopter cabin noise are discussed with particular reference to the Lynx helicopter Available methods such as modal analysis adopted for propeller noise prediction do not cope with the higher frequency discrete tone content of helicopter gear noise, with the airborne and structure-borne noise contributions Statistical energy analysis methods may be the answer but until these are developed, one has to rely on classical noise transmission analysis and transfer function methods Author

N82-18149# Royal Aircraft Establishment Farnborough (England) Aerodynamics Dept
THE MEASUREMENT OF THE MOBILITY OF STRUCTURES AT ACOUSTIC FREQUENCIES
Susan M Damms *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p refs

Avail NTIS HC A99/MF A01
The development of a technique to measure the response of structures to vibrational input forces and moments is described So far, simple structures with known properties have been used but it is intended to apply the technique in the design of an interface which isolates vibrationally the gearbox of a helicopter from the cabin at acoustic frequencies In a first experiment, no moments were applied The main object was to demonstrate that measurements could be made on two components of a structure with sufficient accuracy to correctly predict measurements on the assembled structure The two components were a beam and a dynamic absorber In a second experiment a special block was attached to a beam to enable forces and moments to be applied and translations and rotations to be measured The particular mobilities measured were chosen so that they could be easily compared with theory and also with measurements without a block J M S

N82-18150# Messerschmitt-Boelkow-Blohm G m b H, Munich (West Germany)
FLIGHT CHARACTERISTICS DESIGN AND DEVELOPMENT OF THE MBB/KHI BK117 HELICOPTER
H Huber and T Masue (Kawasaki Heavy Industries) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p refs
Avail NTIS HC A99/MF A01
The BK 117 light twin-engine helicopter was designed to provide high flexibility of operations attractive performance characteristics, and outstanding handling qualities Dominant features result from the hingeless rotor system which provides inherent high control power and high angular velocity damping Further optimization is achieved through refinement of the fuselage aerodynamic design, and by a proper layout of the empennage configuration taking into account the interactional aerodynamic phenomena The particular design features and their impact on the helicopter flight characteristics are described The results obtained in the areas of static and dynamic stability (longitudinal lateral directional), control response and maneuver characteristics aeromechanical stability and loads and vibrations are presented, including correlation of flight test data with computer model simulations J M S

N82-18151# Politecnico di Milano (Italy) Dipartimento di Ingegneria Aerospaziale
A GENERAL PURPOSE PROGRAM FOR ROTOR BLADE DYNAMICS
M Borri, M Lanz and P Mantegazza *In* DGLR Seventh European

Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs

Avail NTIS HC A99/MF A01

A computer program for rotor blade dynamics capable of dealing both with hinged and hingless rotors, suitable for steady state flight analysis and stability evaluation was developed Blade motion is represented by finite elements in the space-time domain covering the span of one or more rotor revolutions and allowing for different nonlinearities This method gives a flexible unitary approach for the very different model complexities required by the different design phases, such as the simplest rigid blade schemes and the more sophisticated ones including nonlinearities arising from large blade flexibilties and large movements in control links The aerodynamics at the present development state, considers prescribed wake geometry and blade element theory, including stall and compressibility effects J M S

N82-18153# National Aerospace Lab Amsterdam (Netherlands)
A CONTROL MODEL FOR MANEUVERING FLIGHT FOR APPLICATION TO A COMPUTER-FLIGHT TESTING PROGRAM
H Havenaings *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs

Avail NTIS HC A99/MF A01

A computer-flight-testing (CFT) program for helicopters to evaluate helicopter dynamics and handling and control qualities is described The nonlinear six degrees of freedom helicopter model is driven by control inputs generated by a specially developed control model (or pseudo pilot') to eliminate problems in estimating control inputs during maneuvering flight This is an adaptation of a linear optimal control model as used in human factor analysis The helicopter model is based on two-dimensional strip aerodynamics steady-state rotor blade dynamics using only out-of-plane bending mode shapes, which are suitable for various types of rotor articulation The pilot' model consists of a flight path generation (FPG)-model and a stabilitization (STAB)-model The FPG-model is based on linearized system dynamics using terminal optimal control, generating both required flight path and the control inputs to achieve it These controls are input into the helicopter model The two flight paths are compared, and differences are fed back to the STAB-model to generate corrective control inputs of such a nature that the helicopter-model-generated flight path tracks the required flight path generated by the FPG-model Also the STAB-model is based on linearized system dynamics As an example, two flare maneuvers are 'flown', and the results discussed The pseudo-pilot model performs well, provided that helicopter dynamics do not change much during a specific maneuver J M S

N82-18154# Westland Helicopters Ltd Yeovil (England)
THE ROLE OF SIMULATION IN THE DESIGN PROCESS

I F Montgomerie and G C F Wyatt *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p

Avail NTIS HC A99/MF A01

Real-time simulation of helicopters and their avionic systems is discussed The nature of the problems facing the helicopter and systems designers are reviewed, and the potential benefits accuring from the timely and effective use of simulation are examined The development of simulation as a design tool over the last two decades are reviewed, and the characteristics of the simulation facilities are described J M S

N82-18155# Royal Aircraft Establishment, Farnborough (England)
PRELIMINARY INVESTIGATION INTO THE ADDITION OF AUXILIARY LONGITUDINAL THRUST ON HELICOPTER AGILITY
P J Legge, P W Forestcue (Southampton Univ) and P Taylor (Southampton Univ) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p refs

Avail NTIS HC A99/MF A01

The agility requirements in specific maneuvers performed by military helicopters are investigated A simple mathematical simulation of the helicopter accelerating and decelerating longitudinally is used to examine the advantages of auxiliary thrust For helicopters operating in the Nap-of-Earth environment the longitudinal acceleration and deceleration performance is shown to be uniquely important Large improvements in agility measured by a performance function, are obtained by adding auxiliary thrust The need for the helicopter to change its attitude is drastically reduced, and the pilot workload improved The type of flight profile used is also examined using a nondimensional Froude number There was no benefit in a maximum effort' flight profile, which consequently further improves the pilot workload Auxiliary thrust improved agility performance by increasing the helicopter s ability to change position while maintaining precise attitude control J M S

N82-18156# National Defence Academy, Yokosuka (Japan) Dept of Aeronautical Engineering
OPTIMUM PERFORMANCE AND WAKE GEOMETRY OF CO-AXIAL ROTOR IN HOVER
Tomoari Nagashima and Kenji Nakanishi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p refs

Avail NTIS HC A99/MF A01

Numerical studies to clear out the rotor-wake interference effects on the optimum performance and wake geometry of a coaxial rotor in hover are performed using the generalized momentum theory and the simplified free wake analysis For applying the momentum concept to the performance predictions of the coaxial rotor system each wake of rotors and flow fields around them are modeled so as to properly incorporate wake contractions, rotational velocities and nonlinear mutual interference effects In case of the free wake analysis, it is approximated by a finite number of discrete circular vortices whose numbers and core radii are deduced from the sensitivity analysis The numerical results clearly show that the performances and its wake geometries are largely dependent on the axial spacings and the pitch differences between rotors and there are unique combinations of them which could produce the optimum performance It is also understood that the upwash effect of the contracted upper rotor wake on the lower rotor plays a fundamental role to improve the hover performance with coaxial rotor arrangement Author

N82-18157# Tokyo Univ (Japan) Inst of Interdisciplinary Research
A NUMERICAL APPROACH TO CO-AXIAL ROTOR AERODYNAMICS
Shigeru Saito and Akira Azuma *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs

Avail NTIS HC A99/MF A01

In the simple momentum theory, the aerodynamic characteristics of the lower rotor of a coaxial rotor system are usually evaluated under the highly deteriorated conditions caused by the fully developed wake of the upper rotor specifically under the conditions of hovering flight Analysis using the Local Momentum Theory not only shows the performance of the lower rotor to be higher than that calculated by the simple momentum theory but also makes it possible to calculate the instantaneous airloading of blades operating in a complex wake system By introducing the radial shrinkage of the rotor wake, the accuracy of the analysis of blade airloading is further improved The calculated results are compared with those of wind tunnel tests in both hovering and forward flights In forward flight the performance of the lower rotor improves not only with increases in the forward speed but also with increase in the vertical distance between the upper and lower rotors In hovering flight, the improvement in the performance is not remarkable because the lower rotor is strongly influenced by the upper rotor wake Author

N82-18158# Institut fuer Flugmechanik, Brunswick (West Germany)
HELICOPTER ROTOR DOWNWASH RESULTS OF EXPERIMENTAL RESEARCH AT THE DFVLR-ROTOR TEST STAND AND THEIR COMPARISON WITH THEORETICAL RESULTS
B Junker and H -J Langer *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs

Avail NTIS HC A99/MF A01

System tests and dynamic researches at the rotor test stand were compared with several downwash measurements to demonstrate the dependency between mathematical parameter values and rotor control values, e g thrust advance ratio and

control angles For comparisons mathematical models like the local momentum theory, and a fixed vortex model were applied For these experiments a four bladed hingeless rotor and a two bladed See Saw rotor with an advance ratio of up to mu = 0 2 were used Numerous tests were performed to study the flow field of rotor downwash in different wind tunnels The measuring equipment for the downwash was set up on both sides of the rotor stand So it was possible to receive two values at the same time At first pneumatic probes were applied that gave acceptable mean values, and then hot-wire probes in X-configuration were used to investigate downwash dynamics in more detail Measurements were conducted in the x-z-plane Wind tunnel test results, correlation to the mathematical models and errors are discussed J M S

N82-18159*# Ohio State Univ , Columbus Dept of Mechanical Engineering
HOVER TESTS OF A MODEL H-FORCE ROTOR
H R Velkoff *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs

(Contract NCA2-OR565-001)
Avail NTIS HC A99/MF A01
The potential of using tip vanes at the ends of helicopter rotor blades to obtain a controllable H-force is considered The addition of vanes placed perpendicular to the blade tips can be used to obtain an inplane force By varying the angle of the vanes a radial force can be created which can be controllable in azimuth position Such a force could be used to provide translational motion of the rotor and aircraft without the requirement for rotor tilting In addition an H-force generated at high flight speed could be used as a propulsive force in a matter similar to a propeller The force generated by the vanes could also affect the aircraft s stability characteristics The H-force could also modify rotor performance in hovering since they could be thought to act as a virtual shroud Tests were run with a model rotor which has a 6 foot diameter with a 3 inch chord blade Test data are presented on the effects of various tip-vane configurations on the hovering figure of merit The extreme sensitivity of the performance to vane arrangement is shown Author

N82-18160# Messerschmitt-Boelkow-Blohm G m b H Munich (West Germany)
THE PROBLEM OF CALCULATION OF THE FLOW AROUND HELICOPTER ROTOR BLADE TIPS
H Stahl *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 18 p refs

Avail NTIS HC A99/MF A01
There are special problems with the theoretical analysis of the flow around helicopter rotor blade tips that are based on the fact that the flow is three dimensional unsteady, rotational and on the advancing blade in fast forward flight also transonic Theories for this problem based upon potential flow theory are presented Calculations show that this approach can lead to a sufficient discription of the actual flow Computer programs for the three dimensional steady and the unsteady two dimensional flow past fixed wings were modified for rotating rotor blades Results are shown T M

N82-18161# Office National d Etudes et de Recherches Aeronautiques, Paris (France)
APPLICATION OF THE ONER DYNAMIC STALL MODEL TO A HELICOPTER BLADE IN FORWARD FLIGHT
C T Tran and D Falchero (SNIAS Marignane France) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 26 p refs

Avail NTIS HC A99/MF A01
The model was applied to the case of a helicopter rotor system in forward flight Aspects of stability and periodic response are described and include the form of the Floquet modes-subharmonic oscillation and almost periodic oscillation the evolution of these modes as functions of the rotor advance ratio, the periodic response and aerodynamic force and moment, and a comparison with a quasi-steady aeroelastic calculation showing the effects of unsteady phenomena T M

N82-18162# Royal Aircraft Establishment, Farnborough (England)
SOME UNSTEADY AERODYNAMIC EFFECTS ON HELICOPTER ROTORS
P G Wilby, M J Riley and Judith Miller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 14 p refs
Avail NTIS HC A99/MF A01
Unsteady effects have an important influence on the aerodynamic loading experienced by a helicopter rotor in forward flight These effects include dynamic stall characteristics with the associated stall delay and large nose-down change in pitching-moment All unsteady effects must be taken into account when predicting rotor loads performance and flight envelope However the full unsteady effects on the rotor result from simultaneous oscillatory variations of both incidence and Mach number, and it is difficult to study these effects in isolation from the rest of the rotor environment Empirical methods for modelling these effects, especially dynamic stall characteristics, were developed and incorporated in the rotor loads prediction methods Results from a program of work involving oscillatory aerofoil tests, flight experiments and unsteady aerodynamic prediction methods are presented T M

N82-18163# Messerschmitt-Boelkow-Blohm G m b H Munich (West Germany)
SEPARATED FLOW AROUND HELICOPTER BODIES
G Polz and J Quentin *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs

Avail NTIS HC A99/MF A01
On the rear part of the helicopter fuselage, flow separation is often unavoidable owing to the shape of the afterbody which is often defined more in accordance with operational requirements (for example cargo door) and with only minor consideration to aerodynamic aspects Because of the separated flow an analytical calculation of the flow field using potential flow theory is not possible After an overview about the separated flow phenomena a method is explained based on a combination of panel methods with boundary layer analysis In this method the wake flow region is represented by a wake body which consists of a uniformly distributed vorticity Calculated pressure distributions and flow fields are shown in comparison with wind tunnel test results The main interest lies in the more downstream part of the wake which is very important for the tail surface and tail rotor effectiveness Author

N82-18164# Southampton Univ (England) Dept of Aeronautics and Astronautics
A METHOD OF PREDICTING FUSELAGE LOADS IN HOVER
P Taylor *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 13 p refs

Avail NTIS HC A99/MF A01
A computer program called DOWNLOAD was developed in which the fuselage separated flow is modelled using a vortex sheet representation The vortex sheet model can predict the separated flow pressure distribution provided the separation point is known Unfortunately the poor behavior of the vorticity vector in the separation region prevents an accurate prediction of the separation line DOWNLOAD was applied to three simple fuselage shapes with a simple triangular representation of the rotor downwash The predicted download values were in the lower region of the figures usually quoted as a percentage of thrust T M

N82-18165# Messerschmitt-Boelkow-Blohm G m b H Munich (West Germany)
IMPACT OF SYSTEMS TECHNOLOGY AND INTEGRATION ON HELICOPTER DESIGN
K Schymanietz *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 20 p refs

Avail NTIS HC A99/MF A01
A helicopter design depends on a variety of parameters, criteria and requirements A new design is generated either by a direct order of a customer or due to industrial investigations in the different fields like market trend studies, application of advanced or new technologies and/or overall efficiency improvements A complete design includes not only the vehicle design with its main functional groups but also the integration of the systems/equipment concept In the past a new helicopter design was conducted mainly due to the task for a new vehicle The

fact that - especially in the military field - the impact of systems gets an increasing influence in all design areas gives an impression of the importance of systems technology and integration in the helicopter design Future changes in design concepts are considered in terms of the chronological advance in the design of the different system components new technologies for new systems, e g in the field of visionics and system architecture based on a digital bus connection T M

N82-18166# Army Aviation Research and Development Command St Louis, Mo
REVIEW OF HELICOPTER MAST MOUNTED SIGHT (MMS) BASE MOTION ISOLATION AND LINE-OF-SIGHT (LOS) STABILIZATION CONCEPTS
Daniel P Schrage *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs

Avail NTIS HC A99/MF A01

Incorporation of a MMS or any precision stabilized pointing system on a helicoper is a complex and interesting dynamic design problem which combines automatic control through a servomechanism with vibration reduction techniques Generally the helicopter disturbance inputs to the MMS must be accomodated by a stiffer MMS structure and servo-system However weight and cost are usually critical and many benefits could be derived from incorporation of a lightweight vibration isolator There are important design considerations on both sides of the interface, the airframe and the MMS A review of these design considerations and several vibration isolation concepts is presented The need for adequate simulation modeling of this complex dynamic environment is discussed T M

N82-18167# Messerschmitt-Boelkow-Blohm G m b H Munich (West Germany)
MAST MOUNTED VISUAL AIDS
R D vonReth *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 24 p refs
Avail NTIS HC A99/MF A01

Initial flight tests with a spherical mock up, having the same shape, weight and moments of inertia as the actual system were carried out on a Bo 105 with two different rotormast extensions (90 and 120 cm) A vibration survey over most of the Bo 105 s flight envelope showed vibrational loads which can be tolerated by the actual system As a next step the actual stabilized platform with FLIR, TV-camera and laser range finder was installed on the rotormast In addition several subsystems used for the display of the video images with superimposed symbology are described For direct comparison purposes three different systems head up head down and helmet mounted sight and display were evaluated The influence of the rotorplane vibrational loads and meteorological conditions on the performance of the FLIR image is described T M

N82-18168# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany) Inst fuer Flugfuehrung
EXPERIMENTAL INVESTIGATION OF VISUAL AIDS FOR HELICOPTERS LOW LEVEL FLIGHT AT NIGHT AND POOR VISIBILITY
R Beyer E Danneberg, E Kohnen and H Stein *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs
Avail NTIS HC A99/MF A01

The potential and the limitations of advanced display systems for visual aids in helicopters were investigated A combination of the sensor image and computer generated instrument displays in a head-down display helmet mounted sight/display and night goggles were evaluated The layout of the instrument display is considered assuming transport mission and various display modes are implemented The visual aids were flight tested in Bo 105 and Bell UH-1D helicopters with particular emphasis on the usefulness of the display modes on flight performance and low level flight performance T M

N82-18169# Litton Systems (Canada) Ltd , Toronto (Ontario) Advance Programs
THE MULTI MODE MATRIX FLAT PANEL DISPLAY TECHNOLOGY AND APPLICATIONS
A Moffat and P Wright *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs

Avail NTIS HC A99/MF A01

An important aspect of current developments in advanced cockpit design is the introduction of a small number of interactive multi-function electronic displays with digital data processing in conjunction with a MIL-STD-1553 type of multiplex data bus in an integrated system as opposed to the conventional approach of large numbers of stand-alone electro-mechanical instruments and a variety of different and independent dedicated inputs Advances in high speed vector graphic display systems based on modular LED flat panel technology and micro-programmable multiprocessor data handling with MIL-STD-1553B compatible interfaces are described Applications and systems performance are discussed in terms of typical military airborne mission-oriented display image formats and associated hardware and software characteristics The real-time vector graphic presentations as described include flight control navigation communications, engine and fuel management weapons management symbolic map, signal communication and other types of real-time cockpit advisory information T M

N82-18170# *Bodenseewerk Geraetetechnik G m b H , Ueberlingen* (West Germany)
A REDUNDANCY CONCEPT FOR A DIGITAL CSAS
P Wuest and M Keller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 12 p refs
Avail NTIS HC A99/MF A01

One of the promises of digital technology is the possibility of implementing more intelligent monitoring techniques for example, self monitoring methods Typical redundancy and monitoring concepts, which were realized in aircraft, helicopter and engine control systems were reviewed A system which was orginally not designed for a helicopter application but which shows all characteristics of a CSAS is described The system is based on two essentially autonomous computing lanes each able to provide all the necessary control and monitoring functions T M

N82-18171# Newmark (Louis) Ltd , Croydon (England)
THE INFLUENCE OF SENSOR AND ACTUATOR CHARACTERISTICS ON OVERALL HELICOPTER AFCS DESIGN
S G Spreadborough *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p
Avail NTIS HC A99/MF A01

The overall performance of a flight control system is dependent on the characteristics of sensors-type and performance, control low computing and logic actuation-performance, configuration redundancy and authority The specifications in each of these areas are considered in producing an integrated AFCS design which is compatible with the basic aircraft characteristics The choice of sensors and the configuration and performance of the actuation, important decisions involving a high level of interdependence with the control law and system logic design, are discussed T M

N82-18172# Institut fuer Flugmechanik Brunswick (West Germany)
EVALUATION OF THE HELICOPTER LOW AIRSPEED SYSTEM LASSIE
J Kaletka *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs
Avail NTIS HC A99/MF A01

To evaluate the airspeed sensing capability and the dynamic response characteristics of the system, both flight tests and wind tunnel tests were conducted The system uses a swivelling pitot static probe designed to operate within rotor downwash in the low airspeed regime and out of downwash for higher speeds Due to nonlinearities in the sensor transition phase an accurate system characterization is necessary to obtain reliable airspeed data Flight tests that were conducted to characterize the system for a Bo 105 helicopter are described The evaluation method and results, showing uncalibrated and calibrated data are discussed in detail To investigate the dynamic behaviour of the system, dynamic tests in a wind tunnel equipped with a gust generating system were conducted LASSIE transfer functions were measured for four different wind tunnel speeds Representative results are shown and discussed T M

N82-18173# Elektronik-System G m b H Munich (West Germany)
INTEGRATION OF INERTIAL SENSORS IN HELICOPTERS

Volkmar Held *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p
Avail NTIS HC A99/MF A01

The demand for saving weight, volume and especially cost requires new design concepts for avionic systems In future, highly integrated systems will replace the conventional systems with specific stand-alone equipment for each system function A concept for the integration of inertial function flight control, sight-stabilization, navigation of a helicopter is presented A configuration with a minimum number of dislocated inertial sensors is proposed The system functions are accomplished on system level by integration and multiple use of the sensor signals It is shown that the navigation functions, attitude and heading can be derived from the flight control and stabilization hardware so that the usually required separate attitude and heading reference system for the navigation is saved Moreover, the proposed concept provides as an additional function the autonomous initial alignment to north TM

N82-18179*# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
AN ANALYTICAL INVESTIGATION OF THE FREE-TIP ROTOR FOR HELICOPTERS
Robert H Stroub Feb 1982 30 p refs
(NASA-TM-81345, A-8806) Avail NTIS HC A03/MF A01 CSCL 01A

A rotor configuration called the free-tip rotor was analytically investigated for its potential to improve helicopter forward-flight performance characteristics This rotor differs from a conventional rotor only in the blade tip region In this configuration, the tip is self-adjusting in pitch with respect to the rest of the blade, in accordance with a moment balance about its pitch axis With this self-adjusting capability, the resulting pitch motion generates a more uniform airload distribution around the azimuth Computer math models were used to compare performance characteristics of the free tip rotor with those of a conventional rotor operation at flight speeds from 130 to 160 knots The results of this analysis indicate that the free-tip rotor improves cruise-lift-drag ratio by at least 22% Author

N82-18183*# National Aeronautics and Space Administration Langley Research Center Hampton Va
SPIN-TUNNEL INVESTIGATION OF A 1/13-SCALE MODEL OF THE NASA AD-1 OBLIQUE-WING RESEARCH AIRCRAFT
William L White and James S Bowman Jr Feb 1982 28 p ref
(NASA-TM-83236 L-14834) Avail NTIS HC A03/MF A01 CSCL 01A

The spin and recovery characteristics of a 1/13-scale model of the NASA AD-1 oblique-wing research aircraft at wing-skew positions of 0 25, 45 and 60 deg (right wing forward) were investigated Spins were obtained for all wing-skew positions tested For the unskewed wing position two spin modes were possible One spin mode was very steep and recoveries were obtained within 1 turn or less by rudder reversal The second spin mode was flat and fast the angle of attack was about 75 deg and the spin rate was about 145 deg/sec (2 5 seconds per turn) For the skewed wing positions spins were obtained only in the direction of the forward-skewed wing (right wing forward) No spins were obtained to the left when the wing was skewed with the right wing forward Recoveries should be attempted by deflecting the rudder to full against the spin the ailerons to full with the spin, and movement of the wings to 0 deg skew If the wing is skewed the recovery may not be effected until the wing skew approaches 0 deg B W

N82-18187# Messerschmitt-Boelkow-Blohm G m b H Ottobrunn (West Germany) Betriebsbereich
ON THE CALCULATION OF TRANSONIC BLADE TIP FLOW FOR HELICOPTER ROTORS [ZUR BERECHNUNG DER TRANSSONISCHEN BLATTSPITZENUMSTROEMUNG BEI HUBSCHRAUBERROTOREN]
H Stahl and V Mikulla 8 May 1981 27 p refs In GERMAN Presented at DGLR Jahrestagung 1981, Aachen 12-14 May 1981
(MBB-UD-320-81-O DGLR-81-025) Avail NTIS HC A03/MF A01

Blade element theory (two dimensional) based on the rotor calculation program, its radials and its chronological relationship was demonstrated Blade tip flow is three dimensional and interstationary and the forward moving blade in a fast forward flight becomes transonic Theories based on potential theory are proposed, though these do not perform on rotary wings This method demonstrates the real flow rate A three dimensional calculation of the aerodynamic characteristics of the fixed wings was utilized, to show that by introducing a Mach number per gradient along the rotor radius, rotor calculation can be modified Transl by E A K

N82-18188# Messerschmitt-Boelkow-Blohm G m b H Ottobrunn (West Germany)
ON THE CALCULATION OF SEPARATED FLOW ON HELICOPTER FUSELAGES [ZUR BERECHUNG DER ABGELOESTEN STROENUNG AN HUBSCHRAUBER-RUEMPFEN]
G Polz 11 May 1981 28 p refs In GERMAN Presented at DGLR Jahrestagung 1981 Aachen 12-14 May 1981
(MBB-UD-321-81-O DGLR-81-026) Avail NTIS HC A03/MF A01

Separated flows in helicopters with dead water formation on the fuselage tail were examined A model was developed which is based on a combination of panel and interface calculation method, which is simulated in the dead water area by a similar circulation coated track alignment body The point of gravity lies more on the fuselage, which is especially significant for helicopter, because of its effect on tail rotor and tail plane Results from wind tunnel tests and flight tests are presented Transl by E A K

N82-18189# Messerschmitt-Boelkow-Blohm G m b H, Ottobrunn (West Germany) Unternehmensbereich Flugzeuge
INVESTIGATIONS OF THE SEPARATION BEHAVIOR ON AIRFOILS AT HIGH ANGLES OF ATTACK, USING LINEAR LIFT THEORY Thesis - Hochschule der Bundeswehr, Munich [UNTERSUCHUNGEN ZUM ABREISSVERHALTEN VON TRAGFLUEGELN IM HOHEN ANSTELLWINKELBEREICH MIT HILFE DER TRAGLINIENTHEORIE]
Karl-Heinz Haerdtl 1 Nov 1980 157 p refs In GERMAN
(MBB-FE-122/S/PUB/37, Rept-80/7) Avail NTIS HC A08/MF A01

Different methods for calculating the lift coefficient of an airfoil wing were examined The calculation of aerodynamic characteristics of airplanes is of great importance Complex three dimensional boundary layers, especially for swept back wings with leading edge slats and trailing edges with split flaps which very much effect airfoil flows Two different methods to calculate three dimensional boundary layers are presented Transl by E A K

N82-18190# European Space Agency, Paris (France)
LAMINAR AIRFOILS FOR TRANSPORT AIRCRAFT
Armin Quast Oct 1981 33 p refs Transl into ENGLISH of "Laminarprofile fuer verkehrsflugzeuge" Rept DFVLR-Mitt-80-07 DFVLR, Brunswick, Mar 1980 33 p
(ESA-TT-680, DFVLR-Mitt-80-07) Avail NTIS HC A03/MF A01 DFVLR, Cologne DM 8,30

The development of laminar airfoils in order to save fuel by reducing drag is discussed Laminarization through shaping is considered Laminar and turbulent boundary layer theory and subjective assessment indicate that laminar airfoils for high Reynolds numbers are feasible, with a 22% fuel saving The reduced cruising speeds required, however decrease passenger comfort, making them more suitable for freight carrying Author (ESA)

N82-18192# Rockwell International Corp, El Segundo, Calif
MULTIPLE EJECTION EFFECTS ANALYSIS Final Report, 8 May - 30 Dec 1980
G A Freeman and G R Casteel Wright-Patterson AFB, Ohio Air Force Medical Research Labs Aug 1981 92 p refs
(Contract F33615-80-C-0519, AF Proj 7231)
(AD-A108277 NA-80-545 AFAMRL-TR-80-140) Avail NTIS HC A05/MF A01 CSCL 05/5

Wind tunnel data for the ACES-B1 ejection seat in the presence of the B-1 forebody are documented and analyzed Significant aerodynamic interactions exist at high speed between dual seats and between seat/forebody Trajectory data are presented with and without the forebody effect upon the seat The forebody flow field is shown to increase the human engineering/biomechanical problems during high-speed ejection Author (GRA)

N82-18193# Douglas Aircraft Co, Inc, Long Beach, Calif

AIRCREW RESTRAINT AND MOBILITY TEST FIXTURE Final Report
A Blair McDonald Wright-Patterson AFB, Ohio AMRL Jul 1981 33 p refs
(Contract F33615-79-C-0522 AF Proj 7231)
(AD-A108274 AFAMRL-TR-81-27) Avail NTIS HC A03/MF A01 CSCL 14/2

The next generation combat aircraft with advanced aerodynamic and control features will have combat maneuver capability which will impose multiaxial accelerations on the aircrew Advanced aircrew systems will be required for restraint, support, and mobility during these combat conditions New concepts for these systems have been defined, but tests under representative dynamic conditions are necessary to evaluate the effectiveness of these concepts when implemented Author (GRA)

N82-18194# Naval Air Development Center, Warminster, Pa Aircraft and Crew Systems Technology Directorate
PHYSIOLOGICAL ACCEPTABILITY TESTS OF THE SJU-5/A EJECTION SEAT: SECOND PHYSIOLOGICAL ACCEPTANCE DEMONSTRATION Final Report
William G Ward, Jr and Kenneth L Miller 1 Jul 1981 23 p refs
(AD-A108688, NADC-81215-60) Avail NTIS HC A02/MF A01 CSCL 01/3

This program was conducted to evaluate solutions to deficiencies of the F18 Aircraft Martin-Baker SJU-5/A escape system which had been identified during the initial Physiological Acceptability Demonstration (Report No NADC-79040-60) The proposed solutions evaluated during this program included incorporation of 'toe guides' on the rudder pedals, relocation of the head rest, modification of the back support, and incorporation of leg garters into the anti-'G' suit Of these, the head rest and back support still require additional modification Upon satisfactory correction of the head rest and back support deficiencies, physiological acceptance of the F18 escape system will be recommended for the pilot's station Author (GRA)

N82-18195# RAND Corp Santa Monica, Calif
DISTRIBUTED INTELLIGENCE FOR AIR FLEET CONTROL Interim Report
Randall Steeb, Stephanie Cammarata, Frederick A Hayes-Roth, Perry W Thorndyke and Robert E Wesson Jun 1981 59 p refs
(Contract MDA903-78-C-0029 ARPA Order 3640)
(AD-A108611, RAND/R-2728-ARPA LC-81-13913, ISBN-0-8330-0353-4) Avail NTIS HC A04/MF A01 CSCL 17/7

Distributed planning and control techniques provide potential advantages over centralized processing in speed, cost, reliability, flexibility, and minimization of long-distance communications for a variety of tasks, including military threat assessment command and control decisionmaking disaster relief coordination, and civilian air traffic control Six different architectures for distribution of control among multiple processors are presented and the influences of different task environments on each are discussed The work focuses primarily on the use of distributed planning and control for civilian air traffic control One architecture, in which each aircraft is controlled by a separate processor, is described in detail in an illustrative scenario An initial system design is presented in which cooperating experts comprise a processor These cooperating experts sense or infer aircraft intentions, generate and evaluate plans, control and monitor plan execution, and communicate with other processors
Author (GRA)

N82-18196# Army Missile Command, Redstone Arsenal Ala Guidance and Control Directorate
SOFTWARE FEATURES APPLICABLE TO INERTIAL MEASUREMENT UNIT SELF ALIGNMENT
H V White J C Hung, and W G Cantrell Dec 1980 36 p refs
(AD-A108511, AD-E950182 DRSMI/RG-81-11-TR) Avail NTIS HC A03/MF A01 CSCL 12/1

This report documents two software features applicable to inertial measurement unit self-alignment Features are the continuous-time algorithm and the 'scraping' technique FORTRAN programs for least-square with and without scraping are included Author (GRA)

N82-18197# Nebraska Univ, Lincoln Dept of Electrical Engineering
IMPROVEMENTS AND EXTENSIONS OF THE GEOMETRICAL DILUTION OF PRECISION (GDOP) CONCEPT FOR SELECTING NAVIGATION MEASUREMENTS Final Report, 1 May 1980 - 1 May 1981
William L Brogan Wright-Patterson AFB, Ohio AFWAL Sep 1981 69 p refs
(Contract F33615-80-C-1092, AF Proj 6095)
(AD-A108607 AFWAL-TR-81-1142) Avail NTIS HC A04/MF A01 CSCL 17/7

The optimal measurement selection problem was studied for the Global Positioning Satellite system (GPS) The fundamentals of the Geometrical Dilution of Precision (GDOP) concept were briefly reviewed because GDOP is frequently used to rank the effectiveness of potential measurements It is shown that GDOP does not always select the best measurements in the sense of minimum mean square navigation error For this reason weighted least-squares and minimum variance (Kalman filter) methods were used to derive several improved measurement ranking schemes Nonuniform measurement noise and a prior knowledge about the state are taken into account Any specified weighted combination of the component error variances can be minimized Eigenvalue-eigenvector theory was used to derive useful bounds and to provide geometrical insight A purely algorithmic approach is also presented and applied to a number of representative GPS cases GRA

N82-18198# European Space Agency, Paris (France)
A POSSIBLE WAY OF SPECIFICALLY CORRECTING LOCATION AND NAVIGATIONAL ERRORS CAUSED BY REFLECTION AND OTHER PROPAGATION ANOMALIES
Fritz Stelzel Jul 1981 125 p refs Transl into ENGLISH of "Uber eine Moeglichkeit zur gezielten Korrektur von Ortungs- u Navigationsfehlern, die durch Reflexionen u sonstige Ausbreitungsanomalien verursacht werden" Rept DFVLR-Mitt-79-17 DFVLR Oberpfaffenhofen, West Germany, May 1979
(ESA-TT-667, DFVLR-Mitt-79-17) Avail NTIS HC A06/MF A01, DFVLR, Cologne DM 21,20

Electromagnetic wave propagation in urban areas is discussed in relation to vehicle location Current methods are reviewed for vehicles on a arbitrary route Isophase and hyperbola systems are compared The isophase system is more accurate A correction procedure for multipath induced errors is presented, based on measuring time signals from four transmitters The use of measured times in order to reduce location errors caused by propagation anomalies is described The methods were tested on a simulated city area covered by transmitters on the corners of a 25 km square Results are inconclusive Author (ESA)

N82-18199# European Space Agency Paris (France)
EXTENSION OF PROPORTIONAL NAVIGATION BY THE USE OF OPTIMAL FILTERING AND CONTROL METHODS
Hans-Dieter Joos Aug 1981 31 p refs Transl into ENGLISH of 'Erweiterung der Proportionalnavigation durch Anwendung optimaler Filterungs- und Regelungsmethoden Rept DFVLR-FB-80-10 DFVLR, Oberpfaffenhofen, West Germany Mar 1980 38 p
(ESA-TT-683, DFVLR-FB-80-10) Avail NTIS HC A03/MF A01, DFVLR Cologne DM 8,30

A suboptimal guidance law for homing missiles, based on quadratic optimal stochastic control theory is investigated On-line backward integration from final time to actual time is not required A Kalman-Bucy filter which takes nonlinearity and target maneuvers into account is presented The model is compared to the conventional and extended proportional navigation systems (simulated on a nonlinear guidance loop model) Positional error behavior improves by 45% Author (ESA)

N82-18200# European Space Agency Paris (France)
MIDAIR AND NEAR MIDAIR COLLISIONS ON TWO- AND THREE-DIMENSIONAL CURVILINEAR FLIGHT PATHS
Otto Weber Aug 1981 119 p refs Transl into ENGLISH of Zusammenstoesse und gefaehrliche Begegnungen bei zwei- und dreidimensionalen Kurvenfluegen", Rept DFVLR-FB-80-13 DFVLR, Brunswick, Mar 1980 107 p
(ESA-TT-685, DFVLR-FB-80-13) Avail NTIS HC A06/MF A01, DFVLR, Cologne DM 21

Collision avoidance by the see and avoid concept, advanced

secondary radar systems on the ground, and independent electronic systems onboard are discussed For two and three dimensional stationary turns, basic geometrical and physical aspects of conflict detection are derived and details are given on the apparent size and motion of the other aircraft on the windshield For conflict warning by means of ground based or onboard electronic systems, a linear track model is used The predicted minimum distance at the closest approach, the lead times to this event or to the penetration of a zone of protection around the intruder, and the zeta parameter are analyzed as potential conflict criteria Similarity rules and the separation of three dimensional conflicts into horizontal and vertical problems are treated Commercial pilots lack special training in optically based risk assessment Autonomous onboard warning systems do not make the see and avoid concept obsolete Author (ESA)

N82-18201# National Ocean Survey Rockville, Md
UNITED STATES COAST PILOT 9 PACIFIC AND ARCTIC COASTS ALASKA CAPE SPENCER TO BEAUFORT SEA
Jan 1981 425 p Revised
(PB82-109562, NOAA-81021105) Avail NTIS HC A18/MF A01 CSCL 17G

Coast Pilot subjects include navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, freshets routes, pilotage, and port facilities Information is included on navigation regulations, Cape Spencer to Beaufort Sea, Cape Spencer to Cook Inlet, Kodak Island, Alaska Peninsula Aleutian Islands Bering Sea and Arctic Ocean GRA

N82-18202*# McDonnell-Douglas Corp , Long Beach, Calif
A STUDY TO DEFINE THE RESEARCH AND TECHNOLOGY REQUIREMENTS FOR ADVANCED TURBO/PROPFAN TRANSPORT AIRCRAFT Final Report
Irene M Goldsmith Feb 1981 313 p refs
(Contract NAS2-10078)
(NASA-CR-166138, ACEE-16-FR-0016) Avail NTIS HC A14/MF A01 CSCL 01C

The feasibility of the propfan relative to the turbofan is summarized, using the Douglas DC-9 Super 80 (DS-8000) as the actual operational base aircraft The 155 passenger economy class aircraft (31,775 lb [14 413 kg] payload) cruise Mach at 0 80 at 31,000 ft (8,450 m) initial altitude, and an operational capability in 1985 was considered Three propfan arrangements wing mounted, conventional horizontal tail aft mounted, and aft fuselage pylon mounted are selected for comparison with the DC-9 Super 80 P&WA JT8D-209 turbofan powered aircraft The configuration feasibility, aerodynamics, propulsion structural loads, structural dynamics, sonic fatigue acoustics weight maintainability, performance, rough order of magnitude economics and airline coordination are examined The effects of alternate cruise Mach number, mission stage lengths, and propfan design characteristics are considered Recommendations for further study, ground testing, and flight testing are included Author

N82-18203*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
SLOTTED VARIABLE CAMBER FLAP Patent Application
Dana G Andrews inventor (to NASA) (Boeing Commercial Airplane Co Seattle) Filed 30 Oct 1981 13 p Sponsored by NASA
(NASA-Case-LAR-12541-1, US-Patent-Appl-SN-315588) Avail NTIS HC A02/MF A01 CSCL 01C

Variable camber actuator assemblies broaden the range of speeds at which lift to drag performance is maximized for slotted flap wings Lift is improved by varying wing camber with rotational flap movements that do not introduce wing slots and induced drag Forward flaps are secured to forward flange links which extend from, and are a part of forward flap linkage assemblies The forward flaps rotate about flap pivots with their rotational displacement controlled by variable camber actuator assemblies located between the forward flaps and the forward flange links Rear flaps are held relative to the forward flaps by rear flap linkage assemblies which may act independently from the forward flap linkage assemblies and the variable camber actuator assemblies Wing camber is varied by rotating the flaps with the variable camber actuator assemblies while the flaps are in a deployed or tucked position Rotating flaps in a tucked position does not introduce significant wing surface discontinuities and reduces aircraft fuel consumption on most flight profiles NASA

N82-18204*# National Aeronautics and Space Administration Langley Research Center Hampton, Va
DYNAMICS OF AIRCRAFT ANTISKID BRAKING SYSTEMS
John A Tanner Sandy M Stubbs Robert C Dreher, and Eunice G Smith Feb 1982 100 p refs
(NASA-TP-1959 L-14788) Avail NTIS HC A05/MF A01 CSCL 01C

A computer study was performed to assess the accuracy of three brake pressure-torque mathematical models The investigation utilized one main gear wheel, brake, and tire assembly of a McDonnell Douglas DC-9 series 10 airplane The investigation indicates that the performance of aircraft antiskid braking systems is strongly influenced by tire characteristics, dynamic response of the antiskid control valve and pressure-torque response of the brake The computer study employed an average torque error criterion to assess the accuracy of the models The results indicate that a variable nonlinear spring with hysteresis memory function models the pressure-torque response of the brake more accurately than currently used models T M

N82-18205# Committee on Armed Services (U S House)
REVIEW OF DEFENSE-RELATED VERTICAL AND SHORT TAKEOFF AND LANDING (V/STOL) AIRCRAFT PROGRAMS
Walter Z Collings Washington GPO 1979 206 p refs Presented to the Comm on Armed Serv , 96th Congr 1st Sess , Sep 1978 Prepared by AIAA New York
(GPO-55-278) Avail Committee on Armed Services

A technology review of bases supporting the development of Vertical of Short Takeoff and Landing (V/STOL) aircraft is presented Representative aircraft were summarized according to their type of lift generation mechanisms Successes, failures, problems encountered in development and plans for the future are also presented Some discussion of the Navy's envisionment/commitment to V/STOL aircraft is also presented M D K

N82-18206# Rockwell International Corp Columbus Ohio Aircraft Div
XFV-12A DIAGNOSTIC AND DEVELOPMENT PROGRAMS Summary Report, Jan 1979 - May 1981
P M Bevilaqua and C P Combs Nov 1981 367 p refs
(Contract N00019-73-C-0053)
(AD-A108354 NR81H-50) Avail NTIS HC A16/MF A01 CSCL 01/3

Activity during the XFV-12A thrust augmenter development program conducted from May 1979 to June 1981 is reported and documented Diagnostic tests indicated a major source of performance deficiency could be attributed to feed duct/augmenter component interface problems rather than basic augmenter configuration Interface problems seriously affected both isolated performance and flow quality of the primary augmenter nozzles resulting in significantly low levels of augmentation A remedial program, the subject of this report, was initiated The primary objective of this program was to systematically improve the performance of the XFV-12A aircraft s thrust augmenter lift systems Major emphasis was placed not only on correcting flow deficiencies but also identifying and incorporating improvements in the augmenter design which would increase its performance potential GRA

N82-18207# General Accounting Office Washington D C
POTENTIAL REDUCTIONS IN AIRCRAFT OPERATION AND MAINTENANCE COSTS BY USING THRUST COMPUTING SUPPORT EQUIPMENT Report to the Honorable Joseph P Addabbo, Chairman, Subcommittee on Defense, Committee on Appropriations, House of Representatives
27 Oct 1981 17 p
(AD-A108463 GAO/PLRD-82-4) Avail NTIS HC A02/MF A01 CSCL 01/2

This report addresses the evaluation of thrust measuring equipment We interviewed Air Force officials and contractor representatives reviewed documentation pertaining to the key events in the evaluation of the thrust computing system program, reviewed test data and analyses by Air Force and contractor engineers and observed the operation of the thrust computing system Our analyses show that the accurate measurement and setting of thrust for installed jet engines is of vital importance not only for aircraft readiness and safety but also for operation and maintenance cost reductions Although test results indicate

that a system is available that can perform such measurements the services have not been using it The Air Force has conducted extensive tests that will measure thrust for installed J85-5 engines, but has not implemented a system The Navy has not performed any tests to determine whether its aircraft jet engines might benefit from such a system GRA

N82-18208# Institute for Defense Analyses Arlington, Va Systems Evaluation Div

C-5A AUSTERE AIRFIELD OPERATIONAL UTILITY EVALUATION PHASE 2 OPERATION ON UNPAVED SOIL SURFACES FOLLOWING RAINFALL Final Report

Waldemar O Breuhaus Oct 1981 46 p refs

(Contract MDA903-79-C-0018)

(AD-A108597 AD-E500466 IDA-P-A1621 IDA/HQ-81-23896) Avail NTIS HC A03/MF A01 CSCL 01/3

During the summer of 1980 and the winter of 1980-1981 an Operational Utility Evaluation (OUE) was conducted to determine operating characteristics of the C-5A airplane when taxiing or being towed and off-loaded on unpaved soil surfaces and on snow-covered surfaces Subsequent to the successful completion of those tests questions arose concerning the effects of rainfall that wets otherwise adequate bare soil areas to a significant depth Tests with simulated rainfall of various amounts applied by agricultural sprinkler systems were conducted at March AFB, California during July 1981 The airplane performed well though it approached its performance limits in the most severe test conditions Difficulties were encountered in arriving at a sprinkler system configuration reasonably approximating naturally occurring rainfall and in arriving at a single simple descriptor to properly characterize the strength of soil in such a complex situation GRA

N82-18209# Army Aeromedical Research Lab Fort Rucker Ala Biodynamics Research Div

VIBRATION LEVELS IN ARMY HELICOPTERS MEASUREMENT RECOMMENDATIONS AND DATA Final Report

John C Johnson and David B Priser Sep 1981 35 p refs (DA Proj 3E1-6277-A-878)

(AD-A108131 USAARL-81-5) Avail NTIS HC A03/MF A01 CSCL 01/3

Surveys on vibration levels found in currently fielded helicopters were used to prepare a comparative summary of vibration exposure levels at crew stations and of the test methods used to measure these levels This effort was initiated at the request of the Air Standardization Coordinating Committee (ASCC) Working Party 61 and because of the wide variety of methods used in data capture and instrumentation documentation Sources of the literature reviewed included technical reports of U S Government agencies and papers in open literature Articles were reviewed based upon three criteria (1) quantitative description of vibration in currently fielded U S Army rotary winged aircraft, (2) article contents are unclassified and available for publication in open literature, (3) article describes human exposure levels of aircraft vibration Author (GRA)

N82-18210# Aeronautical Systems Div, Wright-Patterson AFB Ohio Flight Technology Div

A DIGITAL SIMULATION PROGRAM DESCRIBING THE MOTION OF AN AIRCRAFT UNDERGOING ENGINE FAILURE DURING ITS TAKEOFF GROUND ROLL Final Report, Jun 1980 - Mar 1981

Michael J Miedlar Sep 1981 77 p refs

(AD-A108420 ASD-TR-81-5030) Avail NTIS HC A05/MF A01 CSCL 01/2

This report presents a non-interactive MIMIC program developed to generate the time history of an aircraft undergoing an engine failure during its ground roll The program calculates the forces and moments acting on the aircraft and uses MIMIC's implicit integration routine to track its motion The equations and assumptions used are presented and discussed This report also lists the program and delineates its functions Author (GRA)

N82-18211# Messerschmitt-Boelkow-Blohm G m b H Ottobrunn (West Germany) Unternehmensbereich Flugzeuge

THEORETICAL INVESTIGATIONS ON THE INFLUENCE OF DIFFERENT STRAKE, TAIL UNIT, AND CONVENTIONAL HLW ARRANGEMENT AS WELL AS OF CCV ON THE AERODYNAMIC CHARACTERISTICS OF FIGHTER AIRCRAFT CONFIGURATIONS Thesis - Hochschule der Bundeswehr, Munich [THEORETISCHE UNTERSUCHUNGEN UEBER DEN EINFLUSS VON VERSCHIEDENEN STRAKE, ENTENLEITWERKS- UND KONVENTIONELLEN HOEHENLEITWERKSANORDNUNGEN SOWIE VON C C V AUF DIE AERODYNAMISCHEN EIGENSCHAFTEN VON KAMPFFLUGZEUG-KONFIGURATIONEN]

Herbert Klimt Dieter Oberst and Walter Schmalhofer 1 Oct 1980 486 p refs In GERMAN

(MBB-FE-122/S/PUB/36) Avail NTIS HC A01/MF A01

Linear and nonlinear aerodynamic characteristics for fighter airplane configurations with three separate tail-wing-surface ratios as related to lift coefficients were optimized The optimal configurations were reduced by 5% for stability and 10% for instability and their lifting responses are compared Fuselage effect and convergence of aerodynamic factors are also studied Transl by E A K

N82-18212# Messerschmitt-Boelkow-Blohm G m b H Ottobrunn (West Germany) Unternehmensbereich Flugzeuge

INTERPRETATION AND CONSTRUCTION OF A DYNAMIC SIMILARITY MODEL OF THE A 310 WINGS [AUSLEGUNG UND BAU EINES DYNAMISCH AEHNLICHEN MODELLS DES A 310 FLUEGELS]

H Hoenlinger 5 May 1981 34 p refs In GERMAN Presented at DGLR-Jahrestagung 1981, Aachen 11-14 May 1981

(MBB-FE-17/S/PUB/42 DGLR-81-035) Avail NTIS HC A03/MF A01

The design and construction of a model for directional oscillation flutter for the A-310 wing with supercritical profile is discussed The rigidity distribution in the model is simulated by a simple metal box The profile geometry and the mass distribution of the model is copied exactly by a foam structure coated with a fiberglass laminate A finite element model is used to explain the complicated engine mount which is supported by a profile beam Data on rigidity and vibration measurements are included Transl by E A K

N82-18213# Messerschmitt-Boelkow-Blohm G m b H Ottobrunn (West Germany)

CHARACTERIZATION OF THE AIRBUS HORIZONTAL STABILIZERS OF CFRP CONSTRUCTION AND STRUCTURAL ANALYSIS WITH THE FINITE ELEMENT METHOD [AUSLEGUNG DES AIRBUSSEITENLEITWERKS IN CFK-BAUWISE UND STRUKTURANALYSE MIT DER FINITE-ELEMENTE-METHODE]

Erhard Winkler May 1981 22 p Reprint from Verarbeiten u Anwenden kohlenstoffaserverstaerkter kunststoffe Vereins Deut Ingr May 1981 p 181-198 In GERMAN

(MBB-UT-13-81-O) Avail NTIS HC A02/MF A01

The use of carbon fiber reinforced plastics as a substitute for light weight metals in aircraft construction which decreases the weight by 30% is discussed Environmental parameters like temperature and humidity must be considered A construction method with a variety of possibilities to fulfill these requirements and which competes with metal structures is developed This means either a simplified weight reduction at the same or less cost or a less costly method for the same or less weight Transl by E A K

N82-18214# European Space Agency Paris (France)

TENDENCIES IN THE DEVELOPMENT OF SUBSONIC TRANSPORT AIRCRAFT WITH SPECIAL CONSIDERATION OF AERODYNAMICS

Horst Koerner Oct 1981 42 p refs Transl into ENGLISH of "Entwicklungstendenzen bei Unterschall-Transportflugzeugen unter besonderer Beruecksichtigung der Aerodynamik Rept DFVLR-Mitt-80-15 Brunswick Jun 1981 62 p

(ESA-TT-705 DFVLR-Mitt-80-15) Avail NTIS HC A03/MF A01

Tendencies in subsonic transport aircraft development specifically due to progress in aerodynamics are surveyed Prospective wing profile designs and improved integration of body dimensions are considered citing examples from the AIRBUS development program Possible fuel savings through supercritical wing technology and by optimizing reduction in friction drag are also studied Advantages to be gained by active control particularly from adaptive wing technology, are reviewed As a potential application an unconventional canard configuration including transonic propellers for an aircraft in the AIRBUS class is proposed Author (ESA)

N82-18215 Royal Aircraft Establishment, Farnborough (England)

NEW DEVELOPMENTS IN COCKPIT-HUMAN INTERFACES

E B Davies and J B Peckham 15 Jun 1981 16 p Presented at 12th ICAS Congr Munich, Oct 1980

(RAE-TM-FS-412, BR80500) Copyright Avail Issuing Activity

Touch sensing displays, helmet sights and direct voice inputs (DVI) are discussed Cathode ray tubes (CRT) are cheaper than keyboards for touch sensing, but lack tactile differentiation capabilities For designation tasks, e g , touching the required radar return accuracy must be much higher than for keyboarding Head movement filtering is a problem with helmet sights, since output is delayed if too much filtering is attempted, and accuracy suffers if vibration is ignored Cuing by LED s is restricted by the number of leads the helmet can incorporate and CRT's are too heavy Factors affecting DVI performance include electronic noise on intercoms, microphone to mouth distance, voice changes caused by stress, and the number of commands pilots can remember Author (ESA)

N82-18216# Instituto de Pesquisas Espaciais Sao Jose dos Campos (Brazil)

AN ON BOARD SUPERVISORY SYSTEM FOR APPLICATIONS IN SPACE MISSIONS [UM SISTEMA DE SUPERVISAO DE BORDO PARA APLICACOES EM MISSOES ESPACIAIS]

Jose Carlos Maldonado and Ricardo deAzevedo Mendes Jun 1981 13 p refs In PORTUGUESE, ENGLISH abstract Presented at the 2nd Natl Automation Meeting, Salvador, Bahia, Brazil, Jul 1981

(INPE-2097-RPE/327) Avail NTIS HC A02/MF A01

The system, developed in the digital and analog system group/program, enables full duplex communication between an onboard and a ground microcomputer, based on a reserved protocol The system performs the following functions data acquisition, control, transmission and reception between an onboard payload and a ground station It also executes housekeeping tasks and telecommand operations This systems was, in particular utilized in the balloon mission PEROBA-I The performance of the system in the mission was satisfactory T M

N82-18217# Hughes Aircraft Co Canoga Park Calif

ANALYSIS OF BUILT-IN-TEST (BIT) FALSE ALARM CONDITIONS Final Technical Report, 24 Jan 1980 - 28 Feb 1981

John G Malcolm and Richard W Highland Griffiss AFB N Y RADC Aug 1981 122 p refs

(Contract F30602-80-C-0074 AF Proj 2338)

(AD-A108752 RADC-TR-81-220) Avail NTIS HC A06/MF A01 CSCL 14/2

Usefulness of BIT is seriously affected by the presence of false alarms False alarms can degrade mission effectiveness of systems and contribute to the expenditure of excessive maintenance resources The objectives of this study were to determine the root causes of the false alarm problem and to develop design guidelines to minimize the occurrence and the effect of false alarms False alarm rates have been established for the three systems investigated and prediction factors defined Author (GRA)

N82-18218# Lockheed-Georgia Co , Marietta

ANALYTICAL STUDY OF COCKPIT INFORMATION REQUIREMENTS Final Report, Oct 1979 - Nov 1980

J D Caldwell and T G Jones Washington FAA Apr 1981 165 p refs

(Contract DOT-FA79WA-4368)

(AD-A108524 LG80ER0200, FAA/RD-81/4) Avail NTIS HC A08/MF A01 CSCL 01/3

An assessment is made of cockpit information requirements likely to be imposed on aircraft in the next fifteen years as a result of improvements in the ATC system and in aircraft design These requirements are analyzed by work centers and include flight control navigation, collision avoidance flight management, communications, caution/warning and monitoring and checklist functions From a baseline of current requirements and technology, the application of new requirements and technology is analyzed Three aircraft are hypothesized representing three time periods of technical development The purpose is to investigate the impact of future ATC changes on differently equipped aircraft GRA

N82-18219# Arinc Research Corp Annapolis, Md

IMPACT OF TECHNOLOGY ON AVIONICS COST TRENDS

Steven Toth, William Lovelace, and Kelly Markin Nov 1981 84 p

(Contract DTFA-01-80-C-10030)

(AD-A108494 Rept-1378-40-2-2553, FAA-EM-82-6) Avail NTIS HC A05/MF A01 CSCL 09/3

This study provides an overview of nonmilitary generally aviation and commercial avionics price and cost structures as influenced by technology It quantifies computes, and evaluates the unique characteristics and behavior patterns of the industry, especially those that affect the frequency of innovation the rate of technology diffusion from manufacturer to manufacturer or from product to product, and the anticipated major cost drivers of the future The report reviews the impact of technology on the cost of avionics during the past 20 years and projects this impact for the next 20 years This report concentrates on avionics in the low-performance general aviation aircraft category because they are the major components of the avionics industry Typical units of detailed study are transponders, transceivers navigation receivers and course deviation indicators (CDIs) An examination of the price histories of more than twenty equipment families indicates that unit prices have been and are likely to continue increasing at the Producer Price Index (PPI) rate This rate of price growth results from a balance between costs rising at the Consumer Price Index (CPI) rate and manufacturing cost reductions made possible through the introduction of new technologies Author (GRA)

N82-18220# National Aerospace Lab Amsterdam (Netherlands) Scientific Services Div

TRENDS IN AIRLINE AVIONICS

F J Abbink 13 Mar 1980 30 p refs Presented at Netherlands Assoc of Aeron Engr Symp on Develop in Avionics, Delft, 25 Apr 1980

(NLR-MP-80013-U) Avail NTIS HC A03/MF A01

The evolution of aeronautical electronics is described Trends towards system integration for airliners are indicated The development of airline avionics specifications by the airlines and constructors is outlined The design and function of avionics equipment, e g navigation aids, are explained The Aeronautical Radio Incorporated 700 automatic flight system is introduced as an example of a system suited to the next generation of airliners Radio navigation, communication and identification equipment are controlled by the digital frequency/function selection unit Automatic flight control and auto-throttle functions are executed by flight control and thrust control computers Author (ESA)

N82-18221# Messerschmitt-Boelkow-Blohm G m b H Ottobrunn (West Germany) Betriebsbereich

INTEGRATION OF COMPLEX SYSTEMS IN CURRENT AND FUTURE AIRCRAFT PROJECTS FOR THE EXAMPLE OF AVIONICS [INTEGRATION KOMPLEXER SYSTEME IN LAUFENDE UND ZUKUENFTIGE FLUGZEUGPROGRAMME AM BEISPIEL DER AVIONIK]

H Haeuser 31 Jan 1980 38 p In GERMAN

(MBB-UH-18-80-O) Avail NTIS HC A03/MF A01

Equipment for electrical and avionic systems, and special equipment needed in the airplane program were developed Avionics is defined as airplane structure, airplane equipment (besides the mechanical system) includes that part of the equipment system which is supported by the electric and electronic system and construction and general instruments necessary in airplane construction Avionics enables the supply, transfer processing and production (activation) of information for the management of airplane systems control of airplanes and the execution of special functions Transl by E A K

N82-18222*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

EFFECTS OF FAN INLET TEMPERATURE DISTURBANCES ON THE STABILITY OF A TURBOFAN ENGINE

Mahmood Abdelwahab Dec 1981 36 p refs

(NASA-TM-82699 E-982) Avail NTIS HC A03/MF A01 CSCL 21E

The effects of steady-state and time-dependent fan inlet total temperature disturbances on the stability of a TF30-P-3 turbofan engine were determined Disturbances were induced by a gaseous-hydrogen-fueled burner system installed upstream of the fan inlet Data were obtained at a fan inlet Reynolds number index of 0 50 and at a low-pressure-rotor corrected speed of 90 percent of military speed All tests were conducted with

a 90 deg extent of the fan inlet circumference exposed to above-average temperatures T M

N82-18223# Vereinigte Flugtechnische Werke-Fokker G m b H Bremen (West Germany)
FURTHER DEVELOPMENT OF THE TEST CONCEPT OF THE ALPHA JET ENGINE LARZAC 04 [WEITERENTWICKLUNG DES PRUEFKONZEPTES FUER DAS ALPHA-JET-TRIEBWERK LARZAC 04]
Ernst Lerche 1981 33 p In GERMAN Presented at Seminars Prueftech und Pruefstandstech , Hannover, 3 Apr 1981
Avail NTIS HC A03/MF A01

The test stand for the LARZAC 04 jet unit for the Alpha jet aircraft was developed The test stand is outlined and equipment extension, and a maintenance procedure for the driving system are presented Transl by E A K

N82-18224# Honeywell Systems and Research Center, Minneapolis, Minn Aerospace and Defense Group
INTEGRATED CONTROL DESIGN TECHNIQUES Final Report, Jun. 1979 - Nov 1980
A L Jones, J K Mahesh, M A Kollodge, D P Pledger, E R Rang, and K D Graham Wright-Patterson AFB Ohio AFWAL Aug 1981 314 p refs
(Contract F33615-79-C-3609 AF Proj 2403)
(AD-A108223 Rept-80SRC82, AFWAL-TR-81-3074) Avail NTIS HC A14/MF A01 CSCL 01/3

A total systems approach methodology and computer-aided design tool for integrated flight control design and evaluation has been formulated This methodology is a composition of classical system design steps and system performance, reliability/ survivability packaging and cost evaluation techniques assembled for interactive computer-based execution The interactive sensor integration program developed under this methodology addresses the sensor requirements of the flight control, guidance and navigation and weapon delivery functions as directed interactively by the designer and the mission the system configuration, cost, power weight volume constraints and total system performance The demonstration program contains performance reliability size power weight cost data for gyros, accelerometers, radars, seekers and air data systems in addition to analysis tools for evaluating navigation system accuracy probability of target acquisition, and probability of kill for selected targets and weapons
Author (GRA)

N82-18225# Instituut TNO voor Bouwmaterialen en Bouwconstructies Delft (Netherlands)
INVESTIGATION INTO THE UTILITY OF SOME QUICK SETTING CEMENTS FOR RUNWAY REPAIR [ONDERZOEK NAAR DE BRUIKBAARHEID VAN ENKELE SNELVERHARDENDE BINDMIDDELEN VOOR REPARATIE VAN START-BANEN]
Mar 1980 39 p refs In DUTCH
(B-80-157/60 7 0157, TDCK-75056) Avail NTIS HC A03/MF A01

The application of quick setting cements in rapid runway repair was investigated Needed strength and layer thickness of the hardening material was determined The following results are reported (1) it is possible to fill up a hollow space with quick setting cements even in combination with proper additives like super plastifiers (2) pressure strength for hardening time is accomplished within one hour (3) a fast operating method is needed to prevent debinding of cement, continuous mixers for smaller quantities are recommended Transl by E A K

N82-18226# Institute for Perception RVO-TNO Soesterberg (Netherlands)
THE LINK-HILES DRIVER TRAINING SIMULATOR FOR TRACKED VEHICLES THE EFFECT OF METHOD AND DURATION OF TRAINING ON THE TRANSFER OF TRAINING
K J Poll 1980 20 p refs In DUTCH ENGLISH summary
(Contract A76/KL/148)
(IZF-1980-28 TDCK-75019) Avail NTIS HC A02/MF A01

Transfer of training through different methods and durations of training from a driving simulator to a task was investigated In method A the candidates were under strict guidance of the instructor while in method B the candidates trained more on their own and paid more attention to the integration of the part-tasks The duration of training was dependant on the performance-level on which the candidate turned over from the simulator to the real tanks These performance-levels were the single trial execution of all tasks (low level) having all tasks under control (medium level) and sufficient integration of all part-tasks (high level) From the results it is clear that when the candidates were trained in pairs the mean number of kilometers for the two candidates shows to difference as a function of training method Although the first candidate needs less kilometers with method B and 'second' candidate learns more from the 'first with method A The number of kilometers on the tank necessary to pass the final drivers test, is a linear relation as a function of the duration of simulator training
J M S

N82-18227# Coppin State Coll Baltimore Md
TASK ANALYTIC TECHNIQUES APPLICATION TO THE DESIGN OF A FLIGHT SIMULATOR INSTRUCTOR/ OPERATOR CONSOLE Final Report
Charles D Sanders Brooks AFB Tex Air Force Human Resources Lab Dec 1981 21 p refs Prepared for Southeastern Center for Electrical Engineering Education, St Cloud Fla Submitted for publication
(Contract F49620-79-C-0038 AF Proj 9983)
(AD-A108724 AFHRL-TP-81-38) Avail NTIS HC A02/MF A01 CSCL 14/2

Instructional Systems Development (ISD) has contributed to the efficiency and low cost of air flight training through the medium of the simulator Task analysis is a component of ISD and its application to the improvement of devices such as simulator instructor/operator consoles will continue to enhance the quality of flight training Task analytic techniques are inextricably interwoven into the design of an instructor/operator console The application involves the process persons and a machine within the context of a flight simulator The tasks of the instructor and student are primary in the design process The efficiency and economy of the task analytic process has implications for its use in the future developments of automated flight training
Author (GRA)

N82-18228# SRI International Corp Arlington Va
EVALUATION OF THE NORTH ISLAND A/C CRASH/ RESCUE TRAINING FACILITY
R S Alger Aug 1981 153 p refs
(Contract N00014-80-C-0696 SRI Proj PYU-1943)
(AD-A108740) Avail NTIS HC A08/MF A01 CSCL 05/9

Under Executive Order 11752, the Navy and the Air Force began a cooperative effort to develop training facilities that could provide more fire fighting training with less smoke and water pollution Soon the central issue of pollution control was surrounded by a series of satellite questions that had to be answered before training facilities could be designed, e g , what type of training is required, how much training should be provided, where should fireman train and how much departure from the real emergency situation is permissible Various public and private groups contributed answers The Naval Air Station, North Island, San Diego, Calif , Aircraft/Crash Fire Rescue Training Facility is the first Navy facility constructed as an outgrowth of this effort to improve training while reducing the environmental impact to an acceptable level This report evaluates the performance of the North Island facility in a series of environmental and training tests The scope includes (1) the evaluation procedure and results (2) a comparison to other training options and (3) recommendations for future training activity GRA

N82-18229# Army Engineer Waterways Experiment Station, Vicksburg Miss Geotechnical Lab
BOMB CRATER REPAIR TECHNIQUES FOR PERMANENT AIRFIELDS REPORT 1 SERIES 1 TESTS Technical Report, Jul - Nov 1978
David L Cooksey Oct 1981 129 p refs
(AD-A108716, WES/MP/GL-81-12) Avail NTIS HC A07/MF A01 CSCL 13/2

A test section with six simulated bomb craters was constructed for the purpose of developing an improved field method of repair and restoration of air base runways damaged by enemy attack The crater repair materials tested in the reconstruction were a high-quality crushed stone grouted concrete portland cement concrete (PCC), and asphaltic concrete (AC) The performances of the different materials were evaluated under full-scale load testings with the F-4 and C-141 aircraft loadings The gravity grout solution and the high-quality crushed stone method performed beyond required coverage levels and seem to be the two high candidate material systems for further research The solutions were accomplished with the time,

manpower, equipment, and performance constraints of operational requirements GRA

N82-18230# Army Engineer Waterways Experiment Station Vicksburg, Miss Geotechnical Lab
INVESTIGATION OF COMPACTION CRITERIA FOR AIRPORT PAVEMENT SUBGRADE SOILS Final Report, Mar 1978 - Apr 1981
William N Brabston Washington D C FAA Oct 1981 174 p refs
(Contract DOT-FA78WAI-876)
(AD-A108518 WES/TR/GL-81-11 FAA-RD-81-48) Avail NTIS HC A08/MF A01 CSCL 08/13

A study was conducted to determine the effect of lowering soil density requirements for subgrades under airport pavements The investigation was primarily a laboratory effort in which molded specimens of three different soil types, compacted to densities at and below those currently specified by FAA criteria, were subjected to repeated axial loadings in a triaxial compression chamber The primary response parameters of interest were permanent and resilient axial strain Test results were formulated into a statistical model to predict permanent soil strain based on soil characteristics such as density clay content, compaction characteristics, and sheer strength The strain model was used to calculate values of permanent soil deformation at the surface of the subgrade for various combinations of soil density Results of the test indicated that the wide variation in soil response among the three materials tested precluded any general alteration in current FAA compaction criteria Author (GRA)

N82-18231# Textron Bell Helicopter Fort Worth Tex
ROTORCRAFT FLIGHT SIMULATION COMPUTER PROGRAM C81 WITH DATAMAP INTERFACE VOLUME 2 PROGRAMMER'S MANUAL Final Report
P Y Hsieh Oct 1981 264 p Supersedes USAAMRDL-TR-76-41A, USAAMRDL-TR-76-41B and USAAMRDL-TR-76-41C
(Contract DAAK51-79-C-0015, DA Proj 1L1-62209-AH-76)
(AD-A108294 BHT-699-099-111-Vol-2, USAAVRADCOM-TR-80-D-38B USAAMRDL-TR-76-41A, USAAMRDL-TR-76-41B, USAAMRDL-TR-76-41C) Avail NTIS HC A12/MF A01 CSCL 09/2

This report documents the current version in the C81 family of rotorcraft flight simulation programs developed by Bell Helicopter Textron This current version of the digital computer program is referred to as AGAP80 The accompanying program for calculating fully coupled rotor blade mode shapes is called DNAM05, and an associated rotor wake program is called AR9102 The AGAP80 version of C81 was developed by adding some analytical features to the AGAJ76 version and including the ability to generate Data Transfer Files for use by the File Creation Program of DATAMAP An overview of the computer program capabilities and the principal mathematical models incorporated in the program are given in Volume I of the documentation for the AGAJ76 version of the program Volume I, the User's Manual, contains detailed information necessary for setting up an input data deck and interpreting the computed data Volume II includes a catalog of subroutines and a discussion of programming considerations GRA

N82-18232# Naval Air Engineering Center, Lakehurst N J Ship Installation Engineering Dept
INVESTIGATION OF CROSSDECK PENDANT CATAPULT SLOT INTERACTION, PROPOSED CORRECTIVE MEASURES Final Report, Apr 1978 - Mar 1979
Alvin Hittner 20 Nov 1981 56 p ref
(AD-A108149 NAEC-91-7964) Avail NTIS HC A04/MF A01 CSCL 01/5

This report documents the investigation of the crossdeck pendant failure aboard USS JOHN F KENNEDY (CV 67) in March 1978, which caused the loss of an F-14A Included are the results of a survey to determine the scope of the deck pendant/catapult slot interaction problem testing to confirm the failure sequence and the evaluation of slot filler devices (buttons) to resolve the problem Author (GRA)

N82-18233# MGA Research Corp , Buffalo N Y
TEST SITE INSTRUMENTATION STUDY VOLUME 2 CRASH 1 AND CRASH 2 RAW DATA Final Report, 22 Mar 1980 - 31 Mar 1981
Rudy H Arendt and Patrick M Miller Jun 1981 150 p refs
(Contract DOT-HS-8-01936)
(PB82-111832, G22-V-2 DOT-HS-805980-Vol-2) Avail NTIS HC A07/MF A01 CSCL 13F

The data acquisition and reduction practices at fifteen crash and sled testing facilities which normally produce impact test data for the NHTSA were reviewed Attention was focused on dynamic response characteristics instrumentation calibration procedures filtering techniques equipment properties and analog to digital conversion techniques GRA

N82-18327*# Boeing Commercial Airplane Co , Seattle, Wash
A STUDY OF THE EFFECTS OF LONG-TERM EXPOSURE TO FUELS AND FLUIDS ON THE BEHAVIOR OF ADVANCED COMPOSITE MATERIALS Final Report
E Y Tanimoto Aug 1981 40 p ref
(Contract NAS1-12428)
(NASA-CR-165763, D6-41185-9) Avail NTIS HC A03/MF A01 CSCL 11D

The periodic testing and evaluation of graphite/epoxy and Kevlar/epoxy material systems after subjecting test specimens to prolonged exposure to several laboratory-controlled environments deemed typical of normal aircraft operations is discussed It is noted that specimen immersion in water or water-based fluids resulted in the greatest effect on the mechanical properties tested Also the environmental fluids showed a tendency to affect Kevlar/epoxy systems at an earlier exposure period than the graphite/epoxy systems Results also indicate mechanical property strength retention generally being lower for the Kevlar/epoxy systems when compared to the corresponding graphite/epoxy systems in similar environments, after prolonged exposure B W

N82-18349# Naval Weapons Center, China Lake, Calif
FUEL-RICH PLUME COMBUSTION Annual Progress Report, 1 Oct. 1980 - 30 Sep 1981
K C Schadow, M J Lee, and K C Wilson 30 Sep 1981 7 p refs
(AD-A108136) Avail NTIS HC A02/MF A01 CSCL 21/2

Experiments are being performed using an axisymmetric gas generator ramjet Axial and radial profiles of pressure, velocity, turbulence intensity temperature, and species concentration are being determined using non-interference optical diagnostic techniques (laser Doppler velocimeter (LDV)) and intrusive probes The experimental data are being compared with analytical models developed by Science Application, Inc (SAI) under an Air Force Office of Scientific Research (AFOSR) contract An axisymmetric, 5-inch diameter laboratory ramjet combustor was built and checked out Experiments were initiated using (1) an LDV and a hot-wire anemometer for velocity and turbulence intensity measurements, (2) coated thermocouples for temperature measurement, and (3) a gas chromatograph for analysis of gas samples GRA

N82-18419# Messerschmitt-Boelkow-Blohm G m b H Ottobrunn (West Germany) Betriebsberetch
ELECTROFORMING OF SPACE AND AIRCRAFT STRUCTURES
R Suchentrunk 1981 9 p refs
(MBB-BB-491-0) Avail NTIS HC A02/MF A01

Application of electroforming, a production technique for complicated structures, to aircraft and spacecraft structures and components is addressed The process of electrodeposition is described and the advantages of the electroformed structures are highlighted Materials suitable for the mandrels and for electrodeposition are discussed emphasizing preferred properties J M S

N82-18464# Rome Air Development Center, Griffiss AFB N Y
TM/TE POLARIZATION RATIOS IN A SAMPLE OF 30 kHz SFERICS RECEIVED AT ALTITUDES FROM 0 TO 70 km
R P Harrison E A Lewis, J B Donohoe (Megapulse, Inc), and J E Rasmussen Aug 1981 17 p refs
(AF Proj 4600)
(AD-A108182, RADC-TR-81-235) Avail NTIS HC A02/MF A01 CSCL 20/14

A rocket-borne payload, carrying both vertical and horizontal magnetic dipole antennas and receiving instrumentation, was flown from Wallops Island, Virginia, to observe the Transverse Electric (TE) and Transverse Magnetic (TM) polarization components of individual sferics at 30 kHz During the 2-1/2 min flight to apogee at 96 km, 293 individual sferics were observed Upon applying corrections for difference in azimuthal antenna patterns, it was concluded that the TM noise fields were larger than the

TE fields by about 15 dB near the ground and approximately equal at 60 km Author (GRA)

N82-18471# Strategic Air Command Offutt AFB Nebr Aircraft Engineering Div
AN/ALQ-135 TAIL WARNING SYSTEM FOLLOW-ON OPERATIONAL TEST AND EVALUATION Final Report
Vincent M Jenkins 23 Nov 1981 5 p
(AD-A108348, SAC/LGME-P-405) Avail NTIS HC A02/MF A01 CSCL 15/3

This is a study of the reliability and maintainability of the tail warning system (TWS) AN/ALQ-153 This TWS is a solid state pulsed Doppler radar designed to provide warning and initiate countermeasures against threats attacking from the tail of B-52G/H aircraft Author (GRA)

N82-18483# European Space Agency Paris (France)
VOLUMETRIC PATTERN PREDICTION OF ANTENNAS ON AIRCRAFT USING THE GEOMETRICAL THEORY OF DIFFRACTION Ph D Thesis - Kaiserslautern Univ
Thomas Jank Oct 1981 146 p refs Transl into ENGLISH of 'Bestimmung des raeumlichen Strahlungsdiagramms von Antennen auf Flugzeugen mittels des geometrischen Beugungstheorie', Rept DFVLR-FB-80-01 DFVLR Oberpfaffenhofen West Germany, Nov 1979
(ESA-TT-677, DFVLR-FB-80-01) Avail NTIS HC A07/MF A01 DFVLR Cologne DM 29 90

High frequency radiation patterns of aircraft dipole and slot antennas are calculated using the geometrical theory of diffraction (GTD) A mathematical model of an aircraft is presented Arbitrary pattern sections are obtained by solving the ray tracing problem for rays which contribute significantly to the total field Storage techniques and integration methods for the ray tracing problem (a boundary value problem) are discussed Comparison with measured results obtained from physical models validate the use of the GTD and model Author (ESA)

N82-18493* National Aeronautics and Space Administration Hugh L Dryden Flight Research Center, Edwards Calif
APPARATUS FOR DAMPING OPERATOR INDUCED OSCILLATIONS OF A CONTROLLED SYSTEM Patent
John W Edwards and John W Smith inventors (to NASA) Issued 3 Nov 1981 13 p Filed 29 Feb 1980 Supersedes N80-20488 (18 - 11, p 1409)
(NASA-Case-FRC-11041-1 US-Patent-4 298,833, US-Patent-Appl-SN-126064 US-Patent-Class-318-561 US-Patent-Class-318-620 US-Patent-Class-318-621 US-Patent-Class-318-622) Avail US Patent and Trademark Office CSCL 09C

Flight control-related apparatus for damping operator induced oscillations of a controlled system responding to an operator controlled signal is described The device utilizes a lag-lead filter for frequency and amplitude estimation of the control input, and a rectification and smoothing filter for producing a signal proportional to the absolute value of the frequency and amplitude estimate for use in suppression of the control system output signal In one embodiment, this is accomplished by computing a correction signal in a correction generating section In a second embodiment, a second rectification and smoothing filter produces a signal proportional to the absolute value of the controlled input signal A ratio of the outputs of the first and second rectification and smoothing filters is then used in a generator to generate a gain factor k sub q for the control system to reduce the gain of the output signal of the control system, thereby to provide a damped control output signal without rate limiting the controlled element

Official Gazette of the U S Patent and Trademark Office

N82-18503 Royal Aircraft Establishment Farnborough (England)
A DESIGN FOR A 32-CHANNEL MULTIPLEXER
P F Martinson 26 Jan 1981 35 p refs
(RAE-TM-RAD-NAV-145 BR77700) Copyright Avail Issuing Activity

A time scan analog system multiplexer used for recording data during flight trials of unmanned aircraft navigation sensors is described The 32 inputs are buffered then multiplexed in groups of 8 onto 4 lines These four are multiplexed onto one line and the signal passes through the output buffer to the recorder Aircraft attitude, heading and height are recorded Signals from a camera and a kinetheodolite tracking system are synchronized Operating conditions were simulated using a helicopter Noise and drift are due to the recorder The multiplexer copes well with signals of several kHz bandwidth (raw data) and signals of a few Hz bandwidth (processed data, test signals) It can be used with any multitrack tape recorder having an FM recording format on at least two tracks It can be converted for use in a digital telemetry system Author (ESA)

N82-18553# Thermo Electron Corp, Waltham Mass
OPEN-CYCLE VAPOR COMPRESSION HEAT PUMP Annual Progress Report, 1980
Ravi Sakhuja and Frederick E Becker 5 May 1981 54 p
(Contract GRI-5011-342-0094)
(PB82-110503 TE4224-243-81, GRI-80/0064) Avail NTIS HC A04/MF A01 CSCL 13A

Recovery and upgrading of low-grade steam or waste heat sources offers a great potential of energy conservation Thermo Electron is developing an open cycle vapor compression steam heat pump to meet this objective The system utilizes excess low-pressure steam or that produced from an industrial excess heat source with a waste heat boiler and compresses this steam to the desired pressure level for process use The compressor is driven by a prime mover such as a gas turbine, gas engine, etc The prime mover exhaust heat also can be recovered to generate additional process steam The fuel consumption of this system can be as low as 30 to 50 percent in comparison to a direct-fired boiler over the expected range of process conditions Simple payback periods as low as one year can be achieved GRA

N82-18612*# National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio
METAL HONEYCOMB TO POROUS WIREFORM SUBSTRATE DIFFUSION BOND EVALUATION
A Vary, P E Moorhead and D R Hull 1982 12 p refs Presented at the Spring Conf of the Am Soc for Nondestructive Testing, Boston, 22-25 Mar 1982
(NASA-TM-82793, E-959) Avail NTIS HC A02/MF A01 CSCL 14D

Two nondestructive techniques were used to evaluate diffusion bond quality between a metal foil honeycomb and porous wireform substrate The two techniques, cryographics and acousto-ultrasonics are complementary in revealing variations of bond integrity and quality in shroud segments from an experimental aircraft turbine engine S L

N82-18628# Purdue Univ Lafayette, Ind School of Aeronautics and Astronautics
A COMPILATION OF STRESS INTENSITY FACTOR SOLUTIONS FOR FLAWED FASTENER HOLES Final Report, Jun 1978 - Aug 1981
A F Grandt Jr and T E Kullgren (US Air Force Academy) Nov 1981 86 p refs
(AF Proj 2307 AF Proj 2418)
(AD-A108753 AFWAL-TR-81-4112) Avail NTIS HC A05/MF A01 CSCL 20/1

Several sets of stress intensity factor solutions are provided for through-the-thickness corner and surface flawed holes Results are given for both remote tensile and crack face pressure loading It is suggested that the crack face pressure solutions can be used with the linear superposition method to analyze many other practical crack problems The superposition technique is demonstrated with several sets of example calculations Author (GRA)

N82-18803*# Colorado State Univ Fort Collins Dept of Atmospheric Science
AIRCRAFT MEASUREMENTS AND ANALYSIS OF SEVERE STORMS· 1976 FIELD EXPERIMENT Final Report
P C Sinclair Feb 1982 101 p refs
(Grant NsG-5105)
(NASA-CR-168519) Avail NTIS HC A06/MF A01 CSCL 04B

Severe storm aircraft measurements are documented as well as the instrumentation and operational features of aircraft mobility capabilities The measurements and data analyses indicate that the concept of a highly mobile research aircraft capability for obtaining detailed measurements of wind temperature, moisture spherics, etc near and within severe storm systems forecast 48 hours in advance in a 1000 nm operating radius is feasible and was successfully demonstrated The measurements and analyses reveal several severe storm features and insights with respect to storm air flow circulations and inflow-outflow

orientation Precipitation downdraft air is recirculated back into the updraft core below the scud cloud in both back and front feeder type storms In a back feeder type storm the downdraft outflow air ahead of the storm is also recirculated back into the updraft region near cloud base S L

N82-18835# National Oceanic and Atmospheric Administration, Boulder Colo
DEVELOPMENT OF A CLEAR AIR RADAR TO DETECT METEOROLOGICAL HAZARDS AT AIRPORTS Final Report, 1 Oct 1978 - 21 Sep 1981
R B Chadwick K P Moran, W C Campbell K B Earnshaw, and T R Detman 21 Sep 1981 113 p refs
(Contract ESD-0-0630 AF Proj 6670)
(AD-A108236 AFGL-TR-81-0268) Avail NTIS HC A06/MF A01 CSCL 17/9

To be useful in detecting meteorological hazards such as low-level wind shear near airports a radar must be able to (1) detect backscatter from both clear air and rain (2) operate at short ranges and low elevation angles and (3) measure Doppler frequencies caused by air motion The development of a radar with these characteristics is described and the results of testing this radar at airports are presented Special emphasis is placed on the problems of low elevation angle operation and clutter suppression The importance of proper siting is pointed out In addition it is demonstrated that the radar can readily detect the turbulent wakes of large jet aircraft Author (GRA)

N82-18920# Naval Research Lab , Washington D C Computer Science and Systems Branch
A-7E SOFTWARE MODULE GUIDE *Interim Report*
K H Britton and D L Parnas 8 Dec 1981 36 p refs
(AD-A108649, NRL-MR-4702) Avail NTIS HC A03/MF A01 CSCL 09/2

This document describes the basic organization of NRL s version of the A-7E onboard flight software The report describes a structure in which modules have been designed in accordance with the Information Hiding Principle Because of the larger number of modules that result when this principle is applied, the modules are arranged in a hierarchy The hierarchy should simplify the task of a maintenance programmer assigned to make a specific modification The document also describes the principles used in the design of the software It is intended to be useful both as a guide to the A-7E software and as a model for those developing other software systems Author (GRA)

N82-18922# Massachusetts Inst of Tech , Cambridge Artificial Intelligence Lab
A PROGRAM TESTING ASSISTANT
David Chapman Nov 1981 25 p refs
(Contract N00014-80-C-0505)
(AD-A108147, AI-M-651) Avail NTIS HC A02/MF A01 CSCL 09/2

This paper describes the design and implementation of a program testing assistant which aids a programmer in the definition, execution and modification of test cases and executes them automatically when appropriate It modifies test cases to preserve their usefulness when the program they test undergoes certain types of design changes The testing assistant acts as a fully integrated part of the programming environment and cooperates with existing programming tools including a display editor, compiler, interpreter, and debugger Author (GRA)

N82-18995*# Modern Analysis, Inc , Ridgewood, N J
STUDY OF CABIN NOISE CONTROL FOR TWIN ENGINE GENERAL AVIATION AIRCRAFT
R Vaicaitis and M Slazak Hampton, Va NASA Langley Research Center Feb 1982 147 p refs
(Contract NAS1-16117)
(NASA-CR-165833 MAI-1) Avail NTIS HC A07/MF A01 CSCL 20A

An analytical model based on modal analysis was developed to predict the noise transmission into a twin-engine light aircraft The model was applied to optimize the interior noise to an A-weighted level of 85 dBA To achieve the required noise attenuation, add-on treatments in the form of honeycomb panels, damping tapes acoustic blankets, septum barriers and limp trim panels were added to the existing structure The added weight of the noise control treatment is about 1 1 percent of the total gross take-off weight of the aircraft B W

N82-18996*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
ANNOYANCE CAUSED BY PROPELLER AIRPLANE FLYOVER NOISE PRELIMINARY RESULTS
David A McCurdy and Clemans A Powell Dec 1981 35 p refs
(NASA-TM-83244) Avail NTIS HC A03/MF A01 CSCL 20A

The annoyance response of people to the noise of propeller airplane flyovers was examined The specific items of interest were (1) the annoyance prediction ability of current noise metrics, (2) the effect of tone corrections on prediction ability, (3) the effect of duration corrections on prediction ability and (4) the effect of 'critical band corrections on the prediction ability of perceived noise level Preliminary analyses of the data obtained from two experiments are presented The first experiment examined 11 propeller airplanes with maximum takeoff weights greater than or equal to 5700 kg The second experiment examined 14 propeller airplanes weighting 5700 kg or less Also included in each experiment were five different commercial service jet airplanes Each airplane noise was presented at D-weighted sound pressure levels of 70, 80 and 90 dB to subjects in a testing room which simulates the outdoor acoustic environment Subjects judged 108 stimuli in the first experiment and 132 stimuli in the second experiment Perceived noise level predicted annoyance better than A D or E-weighted sound pressure level Corrections for tones greater than of equal to 500 Hz generally improved prediction ability for the heavier propeller airplanes B W

N82-19084*# National Aeronautics and Space Administration, Washington, D C
NASA POCKET STATISTICS
Jan 1982 70 p
(NASA-TM-84134) Avail NTIS HC A04/MF A01 CSCL 05A

NASA program goals and objectives, major mission performance, USSR space flights comparisons of the USA and USSR space records, and selected technical financial and manpower data are summarized N W

N82-19132*# National Aeronautics and Space Administration Washington, D C
BIBLIOGRAPHY OF NASA PUBLISHED REPORTS ON GENERAL AVIATION, 1975 TO 1981
Jun 1981 277 p
(NASA-TM-83307) Avail NTIS HC A13/MF A01 CSCL 01B

This bibliography lists 478 documents which relate to all heavier-than-air fixed wing aircraft exclusive of military types and those used for commercial air transport An exception is the inclusion of commuter transport aircraft types within the general aviation category NASA publications included in this bibliography are conference publications (CP) reference publications (RP) technical memorandums (TM TMX), technical notes (TN), technical papers (TP), and contractor reports (CR) In addition, papers and articles on NASA general aviation programs published by technical societies (AIAA, SAE etc) are included as well as those listed in NASA's Scientific and Technical Aerospace Reports (STAR) Journal Author and subject indexes are also provided to facilitate use of the bibliography T M

N82-19134*# National Aeronautics and Space Administration Langley Research Center Hampton, Va
ELECTRIC FLIGHT SYSTEMS
Nelson J Groom ed and Ray V Hood, ed Feb 1982 269 p Proceedings of workshop held in Hampton, Va 9-10 Jun 1981
(NASA-CP-2209 L-14965) Avail NTIS HC A12/MF A01 CSCL 01C

Materials illustrating presentations on the development of electric flight systems for the all-electric aircraft and for spacecraft are presented

N82-19135*# Lockheed-California Co Burbank
ELECTRIC FLIGHT SYSTEMS, OVERVIEW
Michael J Cronin *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 61-94

Avail NTIS HC A12/MF A01 CSCL 01C

Materials illustrating a presentation on electric flight systems

are presented Fuel consumption the power plant assembly flight control technology, electromechanical actuator systems and components of possible power systems are surveyed J D H

N82-19136*# General Electric Co , Cincinnati, Ohio Aircraft Engine Group
A PROPULSION VIEW OF THE ALL-ELECTRIC AIRPLANE

Robert P Wagner *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 95-102

Avail NTIS HC A12/MF A01 CSCL 21E
Materials illustrating a presentation on electric propulsion systems are presented The electric engine and engine/generator configurations are described and NASA s role outlined J D H

N82-19137*# Pratt and Whitney Aircraft Group, East Hartford Conn Commercial Products Div
POTENTIAL PROPULSION CONSIDERATIONS AND STUDY AREAS FOR ALL-ELECTRIC AIRCRAFT
Thomas G Lenox *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 103-112

Avail NTIS HC A12/MF A01 CSCL 21E
Materials illustrating a presentation on all-electric aircraft propuls on systems are presented Propulsion system impacts on aircraft design and areas requiring further study are outlined J D H

N82-19138*# Westinghouse Electric Corp Lima, Ohio Air All-Electronics Div
A LOOK INTO THE FUTURE THE POTENTIAL OF THE ALL-ELECTRIC SECONDARY POWER SYSTEM FOR THE ENERGY EFFICIENT TRANSPORT
Alan E King *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 113-124

Avail NTIS HC A12/MF A01 CSCL 01C
Materials illustrating a presentation on the all-electric aircraft power system are presented The advantages of the system and the planning time table are outlined J D H

N82-19139*# Sundstrand Aviation-Rockford, Ill
THE 400-HERTZ CONSTANT-SPEED ELECTRICAL GENERATION SYSTEMS
Richard McClung *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 125-146

Avail NTIS HC A12/MF A01 CSCL 09C
Materials illustrating a presentation on 400 Hz constant speed generation systems are presented The system features are outlined, components and functioning described, and display graphics illustrated J D H

N82-19140*# AiResearch Mfg Co Torrance Calif
ELECTRIC ECS
Dale O Moeller *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 147-154

Avail NTIS HC A12/MF A01 CSCL 01C
Materials illustrating a presentation on electric environmental control systems for electric flight systems are presented Requirements are outlined and schematics presented J D H

N82-19141*# Hamilton Standard Windsor Locks Conn
ENVIRONMENTAL CONTROL SYSTEMS
Fred M Rosenbush *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 155-188

Avail NTIS HC A12/MF A01 CSCL 01C
Materials illustrating a presentation on environment control systems for electric flight systems are presented Schematics and flow diagrams of fresh air source and air conditioning systems, and vapor cycle and air cycle parts lists are presented J D H

N82-19142*# Honeywell Inc Clearwater Fla
OVERVIEW OF HONEYWELL ELECTROMECHANICAL ACTUATION PROGRAMS
Charles Wyllie *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 163-187

Avail NTIS HC A12/MF A01 CSCL 01C
Materials illustrating a presentation on electromechanical actuation programs (EMA) are presented The development history is outlined Space shuttle flight control systems and the advantages of EMAS and EMA technology status and development requirements are outlined J D H

N82-19143*# Rockwell International Corp Cedar Rapids Iowa
DIGITAL FLIGHT CONTROLS
John C Hall *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 189-212

Avail NTIS HC A12/MF A01 CSCL 01C
Materials illustrating a presentation on digital flight controls for electric flight systems are presented System architecture and design criteria are outlined and components described J D H

N82-19144*# Boeing Commercial Airplane Co Seattle Wash
ELECTRIC FLIGHT SYSTEMS
C William Clay *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 213-234

Avail NTIS HC A12/MF A01 CSCL 09C
Materials used to illustrate a presentation on the development of electric flight systems are presented Systems concepts are outlined J D H

N82-19145*# National Aeronautics and Space Administration Lewis Research Center, Cleveland Ohio
ENGINE TECHNOLOGY
Anthony C Hoffman *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 235-240

Avail NTIS HC A12/MF A01 CSCL 21E
Materials used in a presentation on development of engine technology for electric flight systems are presented Component and system technology issues, NASA s role and flight test requirements are outlined J D H

N82-19146*# National Aeronautics and Space Administration Lewis Research Center, Cleveland Ohio
POWER SYSTEMS
Robert Finke *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 241-246

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

N82-19148*# National Aeronautics and Space Administration Lyndon B Johnson Space Center, Houston Tex
ELECTROMECHANICAL ACTUATORS
James Bigham *In* NASA Langley Research Center Elec Flight Systems Feb 1982 p 253-258

Avail NTIS HC A12/MF A01 CSCL 01C
Materials illustrating a presentation on the development of electromechanical actuators (EMA) for electric flight systems are presented Technology issues are identified, and major steps relative to EMA development NASA's role and a technology procurement plan are outlined J D H

N82-19149*# National Aeronautics and Space Administration Langley Research Center, Hampton Va
DIGITAL FLIGHT CONTROLS
Billy Dove *In its* Elec Flight Systems Feb 1982 p 259-261

Avail NTIS HC A12/MF A01 CSCL 01C
Materials illustrating the presentation on digital flight controls are presented Technology issues the role of NASA, and steps in the development of flight controls are outlined J D H

N82-19150*# National Aeronautics and Space Administration Langley Research Center Hampton, Va
ELECTRIC FLIGHT SYSTEMS INTEGRATION
Ray V Hood *In its* Elec Flight Systems Feb 1982 p 263-268
Avail NTIS HC A12/MF A01 CSCL 01C
Materials illustrating a presentation on the integration of

components and subsystems of electric flight systems are presented The technology issues are outlined, and near and far term implications of issues affecting the systems integration are outlined J D H

N82-19154# Office National d'Etudes et de Recherches Aerospatiales, Paris (France)
MULTIVARIABLE AIRCRAFT CONTROL BY MANEUVER COMMANDS. AN APPLICATION TO AIR TO SURFACE GUNNERY
Binh DangVu *In its* La Rech Aerospatiale, Bimonthly Bull No 1981-3 May-Jun 1981 (ESA-TT-714) Oct 1981 p 9-19 refs Transl into ENGLISH of 'La Rech Aerospatiale, Bull Bimestriel (Paris) No 1981-3, May-Jun 1981" p 149-159

Avail NTIS HC A05/MF A01, original report in FRENCH available at ONERA, Paris FF 45

Aircraft control where pilot commands are variables directly related to aircraft motion in opposition to deflection angles of control surfaces is described Linear optimal control theory is applied so as to improve flight qualities and reduce the work load of the pilot A control system for sideslip, rate of roll, and rate of pitch was tested in numerical simulation and its efficiency for aiming in air-to-surface gunnery was assessed Results show that control of the rate of pitch is well adapted for cancelling longitudinal aiming devitions, but that control of yaw rate is preferable to roll for cancelling lateral deviations Another system obtained by integrating the flight control and fire control systems is also suggested Author (ESA)

N82-19156# Office National d'Etudes et de Recherches Aerospatiales, Paris (France)
ELECTRICAL GROUND TESTING OF AIRCRAFT ANTISTATIC PROTECTION
A Bruere *In its* La Rech Aerospatiale, Bimonthly Bull No 1981-3, May-Jun 1981 (ESA-TT-714) Oct 1981 p 47-56 refs Transl into ENGLISH of "La Rech Aerospatiale, Bull Bimestriel (Paris), No 1981-3, May-Jun 1981" p 187-196

Avail NTIS HC A05/MF A01, original report in FRENCH available at ONERA, Paris FF 45

Methods of ensuring aircraft protection against electrostatic spurious phenomena are reviewed and a device for ground testing of this protection is described The equipment provides for checking the surface resistance of antistatic treatments as well as the quality of the electrical connections between the various components of the external structure and the aircraft potential reference point Problems in electrostatic quality control for aircraft when testing in the presence of a finishing coat of paint are emphasized The prototype device is depicted while operating and performance principles are explained Author (ESA)

N82-19158# Office National d'Etudes et de Recherches Aerospatiales Paris (France)
INDUCTION DRIVEN TRANSONIC WIND TUNNEL T2 OPERATION AT ROOM TEMPERATURE AND CRYOGENIC ADAPTATION
A Mignosi D Faulmann, and A Seraudie *In its* La Rech Aerospatiale, Bimonthly Bull No 1981-3, May-Jun 1981 (ESA-TT-714) Oct 1981 p 63-74 refs Transl into ENGLISH of La Rech Aerospatiale Bull Bimestriel (Paris), No 1981-3 May-Jun 1981 p 203-215

Avail NTIS HC A05/MF A01, original report in FRENCH available at ONERA, Paris FF 45

The transformation of the induction driven wind tunnel T2 (0 4 m X 0 4 m) into a cryogenic intermittent wind tunnel which uses high pressure air as driving gas and nitrogen as coolant is described The operating mode and optimization of the wind tunnel for low temperature operation are discussed Theoretical and experimental aspects of the transformed facilities, i e modification of the circuit thermal insulation techniques liquid nitrogen injection, startup process, cryogenic operating mode and expected performance, are presented Author (ESA)

N82-19160# Network Analysis Corp , Vienna Va
NATIONAL AIRSPACE DATA INTERCHANGE NETWORK (NADIN) SUPPORT OF REMOTE MAINTENANCE MONITORING SYSTEM (RMMS) Final Report
Dec 1981 111 p refs
(Contract DOT-FA79WA-4335)
(AD-A109125 NAC/FR-303J/01 FAA-RD-81-109) Avail NTIS HC A06/MF A01 CSCL 05/2

National Airspace Data Interchange Network (NADIN) architectural enhancements necessary to support the Remote Maintenance Monitoring System (RMMS) and MMS programs are described Several alternative approaches are formulated These alternatives are compared and recommendations are made It is found that The NADIN backbone has sufficient capacity to handle initial RMMS traffic at adequate performance levels An X 25 compatible interface for the NADIN and MPS connection is recommended, Additional frame routing capabilities at the NADIN concentrator and front end processors are required and Future MPS communications will be best served by a fully distributed packet switched NADIN capable of supporting complete X 25 functions Author (GRA)

N82-19161# Aeronautical Research Labs , Melbourne (Australia)
AERONAUTICAL RESEARCH LABORATORIES STRUCTURES DIVISION Annual Report, 1979 - 1980
F H Hooke ed Apr 1981 46 p
(AD-A109049 ARL/STRUC-NOTE-473) Avail NTIS HC A03/MF A01 CSCL 01/3

This report describes the functions organization, staffing, unclassified research activities and ad-hoc investigations in progress in the Structures Division Aeronautical Research Laboratories during the year 1979/80 Author (GRA)

N82-19167*# Boeing Military Airplane Development Seattle Wash
TRANSONIC PERTURBATION ANALYSIS OF WING-FUSELAGE-NACELLE-PYLON CONFIGURATIONS WITH POWERED JET EXHAUSTS
J C Wai C C Sun and H Yoshihara Feb 1982 67 p refs (Contract NAS1-15887)
(NASA-CR-165852) Avail NTIS HC A04/MF A01 CSCL 01A

A method using a transonic small disturbance code with successive line over-relaxation is described for treating wing/fuselage configurations with a nacelle/pylon/powered jet Examples illustrating its use for the NASA transport research model are given Reasonable test/theory comparisons were obtained Author

N82-19170*# National Aeronautics and Space Administration Washington, D C
NASA/HAA ADVANCED ROTORCRAFT TECHNOLOGY AND TILT ROTOR WORKSHOPS VOLUME 1 EXECUTIVE SUMMARY
5 Dec 1980 115 p refs Workshop held at Palo Alto Calif 3-5 Dec 1980
(NASA-TM-84149) Avail NTIS HC A06/MF A01 CSCL 01A

This presentation provides an overview of the NASA Rotorcraft Program as an introduction to the technical sessions of the Advanced Rotorcraft Technology Workshop It deals with the basis for NASA s increasing emphasis on rotorcraft technology NASA s research capabilities, recent program planning efforts highlights of its 10-year plan and future directions and opportunities L F M

N82-19171*# National Aeronautics and Space Administration Washington D C
NASA/HAA ADVANCED ROTORCRAFT TECHNOLOGY AND TILT ROTOR WORKSHOPS VOLUME 2 OPERATORS' VIEWS
5 Dec 1980 111 p refs Workshop held at Palo Alto Calif 2-5 Dec 1980
(NASA-TM-84148) Avail NTIS HC A06/MF A01 CSCL 01A

A special panel of helicopter users give presentations in 12 basic areas of helicopter applications Development of the helicopter and the needs for future growth are discussed L F M

N82-19172*# National Aeronautics and Space Administration Washington, D C
NASA/HAA ADVANCED ROTORCRAFT TECHNOLOGY AND TILT ROTOR WORKSHOPS VOLUME 3 AERODYNAMICS AND STRUCTURES SESSION
4 Dec 1980 285 p refs Workshop held at Palo Alto, Calif 2-5 Dec 1980

(NASA-TM-84147) Avail NTIS HC A13/MF A01 CSCL 01A

Advanced rotorcraft technology and tilt rotor aircraft were discussed Rotorcraft performance acoustics and vibrations were discussed as was the use of composite materials in rotorcraft structures Rotorcraft aerodynamics specifically the aerodynamic phenomena of a rotating and the aerodynamics of fuselages, was discussed R J F

N82-19173*# National Aeronautics and Space Administration Washington, D C

NASA/HAA ADVANCED ROTORCRAFT TECHNOLOGY AND TILT ROTOR WORKSHOPS. VOLUME 4· FLIGHT CONTROL AVIONICS SYSTEMS AND HUMAN FACTORS

5 Dec 1980 149 p refs Workshop held at Palo Alto, Calif 2-5 Dec 1980

(NASA-TM-84146) Avail NTIS HC A07/MF A01 CSCL 01A

Helicopter user needs, technology requirements and status, and proposed research and development action are summarized It is divided into three sections flight dynamics and control, all weather operations, and human factors L F M

N82-19181*# National Aeronautics and Space Administration Langley Research Center Hampton, Va

EFFECTS OF INSTALLATION OF F101 DFE EXHAUST NOZZLES ON THE AFTERBODY-NOZZLE CHARACTERISTICS OF THE F-14 AIRPLANE

David E Reubush and John R Carlson Mar 1982 133 p refs

(NASA-TM-83250 L-14895) Avail NTIS HC A07/MF A01 CSCL 01A

A wind-tunnel investigation was conducted to determine the effects of F101 DFE (derivative fighter engine) nozzle axial positioning on the afterbody-nozzle longitudinal aerodynamic characteristics of the F-14 airplane The model was tested in the Langley 16-Foot Transonic Tunnel at Mach numbers from 0 7 to 1 25 and angles of attack from about -2 to 6 degrees Compressed air was used to simulate nozzle exhaust flow at jet total-pressure ratios from 1 (jet off) to about 8 The results of the investigation show that for subsonic Mach numbers the intermediate cruise nozzle position of the three positions tested resulted in the lowest drag Author

N82-19194# Bristol Univ (England) Dept of Aeronautical Engineering

THE EFFECT OF A WELL ON THE AERODYNAMICS OF A SPOILER B S Thesis

N A Cemm and J J Ovens Jun 1981 82 p refs Original contains color illustrations

(BU-268) Avail NTIS HC A05/MF A01

As an aid to spoiler design the aerodynamics of a spoiler and its well were investigated Particular attention was paid to gap and deployment angle Three different shapes of spoiler and three types of well were tested All tests were two dimensional, the spoiler being attached to a flat plate at zero incidence A well was cut into the plate such that the spoiler was flush when not deployed The Reynolds number was 62 000, based on fence chord Flow visualization techniques and static pressure measurements were used both along the flat plate and around the spoiler to determine and understand the pressure distribution Integration of the pressure results shows the normal force distribution The application of the results to spoiler design is discussed through examples Author (ESA)

N82-19195 *Department of Trade and Industry, London (England)*

REPORT OF THE AIR TRAFFIC FORECASTING WORKING PARTY, 1981

Sep 1981 30 p ref

Copyright Avail Issuing Activity

The U K forecasting model (improved by including relative tourist prices as a variable in leisure traffic equations and by refining business traffic specifications) is used to predict air traffic demand in the 1990 s London airports are treated separately The effects of oil price rises, a channel tunnel and hotel constraints in London are discussed An increase of between 28 and 70 million passagers is predicted, i e a 2 5% to 5% annual growth rate Growth rates for domestic traffic are lower than those projected for international traffic so that domestic traffic, which was 26% of the total in 1979, falls by 1995 to 23% on the low scenario and 20% on the high scenario Author (ESA)

N82-19196*# Little (Arthur D) Inc , Cambridge Mass

AN ASSESSMENT OF THE CRASH FIRE HAZARD OF LIQUID HYDROGEN FUELED AIRCRAFT Final Report

Feb 1982 132 p refs

(Contract NAS3-22482)

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

The crash fire hazards of liquid hydrogen fueled aircraft relative to those of mission equivalent aircraft fueled either with conventional fuel or with liquefied methane were evaluated The aircraft evaluated were based on Lockheed Corporation design for 400 passenger Mach 0 85 5500 n mile aircraft Four crash scenarios were considered ranging from a minor incident causing some loss of fuel system integrity to a catastrophic crash Major tasks included a review of hazardous properties of the alternate fuels and of historic crash fire data a comparative hazard evluation for each of the three fuels under four crash scenarios a comprehensive review and analysis and an identification of areas further development work The conclusion was that the crash fire hazards are not significantly different when compared in general for the three fuels although some fuels showed minor advantages in one respect or another R J F

N82-19197# Federal Aviation Administration, Atlantic City N J

ANALYSIS OF A NONLINEAR ALTITUDE TRACKING METHOD Final Report, Sep. - Dec 1980

Barry R Billmann Nov 1981 57 p refs

(FAA Proj 052-242-320)

(AD-A108878 FAA-CT-81-15 FAA-RD-81-60) Avail NTIS HC A04/MF A01 CSCL 01/2

This report analyzes the performance of the nonlinear altitude tracker developed for the Active Beacon Collision Avoidance System (BCAS) by Lincoln Laboratory The tracker is intended for use in the collision avoidance logic of the BCAS system The nonlinear tracker performance was characterized through comparisons with the previous altitude tracker The original tracker, used by the collision avoidance logic was a simplistic alpha-beta tracker The nonlinear tracker performance evaluation was conducted in three phases (1) The stand-alone error characteristics of the tracker were obtained Simulated mode C report sequences were provided directly to the tracker (2) The nonlinear tracker was integrated directly into the collision avoidance logic With the use of the Fast-Time Encounter Generator (FTEG), a comparative study of performance with the nonlinear tracker versus the alpha-beta tracker was made (3) Selected live flight test encounters were used to analyze the relative performance of the alpha-beta tracker versus the nonlinear tracker The stand-alone analysis revealed that the nonlinear tracker consistently had smaller maximal errors in vertical rate estimation and a smaller transient rate response delay than did the alpha-beta tracker Both the live flight test encounter simulations and the FTEG scenario simulation indicated that nonlinear tracking often caused an increase in separation for encounters with vertically accelerating threats and reduced occurrences of incorrect command sense choice Author (GRA)

N82-19198# Federal Aviation Administration, Washington, D C Office of Management Systems

FAA STATISTICAL HANDBOOK OF AVIATION Annual Report, period ending 31 Dec 1980

31 Dec 1980 183 p

(AD-A109289) Avail NTIS HC A09/MF A01 CSCL 01/2

This report presents statistical information pertaining to the Federal Aviation Administration The National Airspace System, Airports, Airport Activity, U S Civil Air Carrier Fleet, U S Civil Air Carrier Operating Data, Airmen, General Aviation Aircraft, *Aircraft Accidents, and a Glossary of the terms used in this* publication Author (GRA)

N82-19199# Aeronautical Research Labs , Melbourne (Australia)

DISENGAGEMENT OF SAFETY HARNESS BUCKLES - CT4 Report, Aug - Dec 1979

S R Sarrailhe and G A Thomas Mar 1981 25 p

(AD-A109048 ARL/STRUC-NOTE-469) Avail NTIS HC A02/MF A01 CSCL 13/12

During the crash of a CT4 Airtrainer in August 1979 both safety harness buckles disengaged The crash was very severe but the harnesses did not show signs of overloading After a series of tests it was concluded that the buckles disengaged because of misalignment of the loads onto the buckle This misalignment may not be represented in the standard test procedures and they may give a false sense of security New

tests are proposed but further work would be desirable to establish design and test criteria Author (GRA)

N82-19200 Virginia Univ Charlottesville
OPTIMAL AIRCRAFT LANDING PATTERNS FOR MINIMAL NOISE IMPACT Ph D Thesis
Robert Chi-Tuan Chang 1981 183 p
Avail Univ Microfilms Order No 8129300

A total system to perform the task of optimizing aircraft landing trajectories with respect to aircraft noise annoyance in the area near airports was developed The noise annoyance considered was solely due to aircraft Multiple aircraft on multiple landing paths were studied by the total system developed While many of the subsystems such as the aircraft noise signature model annoyance model optimization methods etc already existed, the task was to combine all these together into a single working system The various subsystems included an annoyance model (aircraft noise signature model population model impact intensity weighting function) formulation of aircraft landing paths and constraints performance measure and optimization A single numerical number noise impact index which represents the average severity of noise impact over the entire population of a community was adopted as the annoyance index Dissert Abstr

N82-19201# Committee on Science and Technology (U S House)
AIRCRAFT COLLISION AVOIDANCE SYSTEMS
Washington GPO 1981 443 p refs Hearings before the Subcomm on Transportation Aviation and Mater of the Comm on Sci and Technol 97th Congr 1st Sess No 5 31 Mar and 3 Apr 1981
(GPO-79-431) Avail Subcommittee on Transportation Aviation and Materials

Midair collision avoidance systems especially the beacon collision avoidance system is discussed Magazine articles, letters, and statements of government and industry personnel are included R J F

N82-19202# Committee on Science and Technology (U S House)
AIR TRAFFIC CONTROL EN ROUTE COMPUTER SYSTEM
Washington GPO 1981 10 p Rept to accompany H R 202 presented by the Comm on Sci and Technol 97th Congr 1st Sess , 14 Oct 1981
(GPO-89-008 H-Rept-97-271) Avail US Capitol House Document Room

Amendments to the House Resolution requiring the Administrator of the FAA to submit full research and development program planning documentation to the Committee with respect to the modernization and replacement of the en route computer system are presented Background material included covers the current ATC system as well as the justification, benefits, costs and acquisition strategy for replacing the computer It is recommended the FAA establish a mechanism whereby the judgements and experience of operating personnel and users of the air system be included in the en route computer development process A R H

N82-19203# Mitre Corp McLean Va
ACTIVE BEACON COLLISION AVOIDANCE SYSTEM (BCAS) LOGIC PERFORMANCE DURING OPERATIONAL FLIGHT TESTS Report, 13 Jul - 9 Sep 1980
R A Tornese and A L McFarland Washington FAA Jan 1981 123 p refs
(Contract DTFA01-81-C-10001)
(AD-A108893 MTR-80/W352 FAA-RD-80-138) Avail NTIS HC A06/MF A01 CSCL 17/7

Between 13 July and 9 September 1980, operational flight tests of an Active BCAS Experimental Unit (BEU) were conducted The flight tests included 129 approaches to 28 different airports during 60 hours of flight 14 unplanned encounters which gave rise to BCAS alerts were recorded In each of the encounters the aircraft carrying the BEU came into a conflict with another aircraft entirely by chance The other aircraft was not associated with the BCAS test program in any way The primary purpose of the flight tests was to determine how many unplanned alerts would occur during normal flight operations and to assess whether each was a desirable or unwanted alert In addition alert correctness timeliness, and utility were considered along with the potential impact of BCAS on the ATC system The data was also used to determine approximately the region(s) where desensitization of BCAS threat logic should be applied to limit unwanted alerts GRA

N82-19205*# Jet Propulsion Lab California Inst of Tech , Pasadena
VEHICLE TEST REPORT BATTRONIC PICKUP TRUCK
Theodore W Price, Thomas W Shain Raymond J Freeman, and Michael F Pompa 1 Jan 1982 47 p refs
(Contracts NAS7-100 DE-AI01-78CS-54209)
(NASA-CR-168637 JPL-Pub-82-8 DOE/CS-54209/6) Avail NTIS HC A03/MF A01 CSCL 13F

An electric pickup truck was tested to characterize certain parameters and to provide baseline data that can be used for the comparison of improved batteries that may be incorporated into the vehicle at a later time The vehicle tests were concentrated on the electrical drive subsystem, i e , the batteries, controller, and motor The tests included coastdowns to characterize the road load and range evaluations for both cyclic and constant speed conditions A qualitative evaluation of the vehicle's performance was made by comparing its constant speed range performance with other vehicles S L

N82-19206# Canyon Research Group Inc , Westlake Village, Calif
DESCENT-RATE CUING FOR CARRIER LANDINGS EFFECTS OF DISPLAY GAIN, DISPLAY NOISE AND AIRCRAFT TYPE Interim Report, 1 May 1980 - 30 Nov 1981
Gavan Lintern, Daniel J Sheppard, and Charles E Kaul Oct 1981 42 p refs
(Contract N61339-78-C-0060)
(AD-A108801 TR-81-015, NAVTRAEQUIPCEN-78-C-0060-8) Avail NTIS HC A03/MF A01 CSCL 01/2

Two studies are reported concerning the utility of modifying a conventional Fresnel Lens Optical Landing System (FLOLS) to include variable-length vertical light arrays, or arrows, in order to provide descent-rate information to pilots making carrier landings In the first study, the Descent-Rate Cuing (DRC) algorithm incorporated an angular gain to provide glideslope displacement information The DRC system did not significantly improve glideslope tracking performance Lineup performance was not adversely affected The effects of aircraft type and noise on the DRC were also examined In the second study the DRC algorithm incorporated a modified linear gain to provide glideslope displacement information The DRC system consistently reduced glideslope error throughout the approach Comparison of the data and previous research suggests that a DRC system incorporating a linear gain can produce a strong and consistent improvement in glideslope control in carrier landings Author (GRA)

N82-19207# Federal Aviation Administration, Atlantic City, N J
TRANSPORT AIRCRAFT COCKPIT STANDARDIZATION (FEDERAL AVIATION REGULATIONS PART 25) Final Report
Richard Sulzer Nov 1981 42 p
(FAA Proj 161-200-130)
(AD-A108924, FAA-CT-80-54, FAA-EM-81-11) Avail NTIS HC A03/MF A01 CSCL 01/3

The present status of transport aircraft cockpit standardization was evaluated by examination of regulations and other design practice documents and by interviews with airline pilots and engineers Flight critical areas most in need of increased standardization were identified as (1) primary flight guidance instrumentation and (2) pilot input keyboards Additional areas proposed for further industry consultation, possibly leading to further standardization at a future date, include flap, slat, and leading-edge device control and display systems indicated airspeed (IAS)-Mach indicators, powerplant instrumentation, and electric and hydraulic power diagrams, displays, and controls The continued use of a mixed metric and English unit measurement plan in both United States and foreign manufactured aircraft is noted and the incidence of pilot dual qualifications and the need for criteria for digital system software certification are also discussed GRA

N82-19208# Army Aviation Engineering Flight Activity, Edwards AFB, Calif Directorate of Development and Qualification
HELICOPTER ICING SPRAY SYSTEM (HISS) NOZZLE IMPROVEMENT EVALUATION Final Report
Daumants Belte Sep 1981 53 p refs
(AD-A109405, USAAEFA-79-02-2) Avail NTIS HC A04/MF A01 CSCL 01/2

The U S Army Aviation Engineering Flight Activity (USAAEFA) operates a modified CH-47C helicopter as an airborne spray tanker to create a simulated icing test environment This system was modified to improve its spray cloud characteristics with respect to uniformity of liquid water content (LWC) and reduction of drop size median volumetric diameter (MVD) The existing atomizers on the spray boom assembly were replaced by Sonic Development Corporation model 125-H 'Sonicore nozzles A UH-1H helicopter equipped with particle measuring spectrometers conducted in-flight sampling and calibration of a modified HISS spray cloud in conjunction with other helicopter icing tests Average cross sectional dimensions of the present spray cloud was estimated as 36 ft wide and 8 ft deep Usable values of cloud LWC in excess of 1 gram per cubic meter with a drop size MVD range of 20 to 35 microns can be generated at a 90 knot airspeed GRA

N82-19209# Kaman Aerospace Corp , Bloomfield Conn
DEVELOPMENT OF MANUFACTURING TECHNOLOGY FOR FABRICATION OF A COMPOSITE HELICOPTER MAIN ROTOR SPAR BY TUBULAR BRAIDING Final Report, Sep 1978 - Sep 1980
Mark L White St Louis, Mo Army Aviation Research and Development Command Apr 1981 81 p refs
(Contract DAAG46-78-C-0070)
(AD-A109377 R-1618, AVRADCOM-TR-81-F-9) Avail NTIS HC A05/MF A01 CSCL 11/4

Mechanical tubular braiding has been shown to be a viable blade spar manufacturing process in a program which included preliminary design of an improved main rotor blade for the OH-58 helicopter The blade incorporates an advanced aerodynamic shape and has as its primary structural member a Kevlar 49/epoxy spar fabricated by braiding Achievement of an analytically acceptable blade and spar design meeting critical structural and dynamic requirements was not hindered by braiding process constraints Mechanical property tests of flat panels and spar sections exhibited excellent correlation with analytical predictions, substantiating the applicability of normal composite laminate analysis methods and the validity of the specific design Ballistic testing of spar sections demonstrated superior containment of structural damage compared to composite spars produced by more conventional methods Manufacturing cost estimates predict a price reduction of 1/3 for the braided spar relative to a similar S-glass/epoxy spar for an OH-58 blade of identical external shape fabricated by orthodox, low-cost technology Author (GRA)

N82-19210# Messerschmitt-Boelkow-Blohm G m b H , Ottobrunn (West Germany) Betriebsbereich
EXPERIENCE DURING THE DEVELOPMENT OF THE GERMAN-JAPANESE HELICOPTER BK 117 [ERFAHRUNGEN WAEHREND DER ENTWICKLUNG DES DEUTSCH-JAPANISCHEN HUBSCHRAUBERS BK 117]
Klaus Szczeponik and Hans Fabian 1981 17 p In GERMAN Presented at DGLR Jahrestagung, Brunwick 1980
(MBB-UD-318-81-O) Avail NTIS HC A02/MF A01

The German-Japanese colaboration in building the BK 117 helicopter is described The exchange of know-how, information dissemination telecommunication, and technical expertese, are enumerated It is shown that since international cooperation is possible, the German industries should be able to exchange and cooperate in the development of new products Transl by E A K

N82-19211# Messerschmitt-Boelkow-Blohm G m b H , Ottobrunn (West Germany) Unternehmensbereich Raumfahrt
PERSPECTIVES FOR CONTROLLED WEAPONS TECHNOLOGY REPORT OF THE 90TH HELICOPTER FORUM [PERSPEKTIVEN DER LENKWAFFENTECHNIK FUER DIE 90ER JAHRE VORTRAGE VOR DEM HUBSCHRAUBER FORUM BUECKEBURG]
D Weis 2 May 1980 13 p In GERMAN Forum held in Bueckeburg West Germany 5-7 May, 1980
(MBB-UA-532-80-O) Avail NTIS HC A02/MF A01

A general forecasting for the essential guided missile system technology in the 1990s is presented The development of armored guided missiles since its conception in 1955 and an outline of goals and trends of armored defense for the near and far future are presented Possibilities of acceleration in mission accomplishments of future armored defensive weapon systems are examined Transl by E A K

N82-19212# National Aerospace Lab , Amsterdam (Netherlands) Flight Div
A METHOD FOR APPLYING LINEAR OPTIMAL CONTROL THEORY TO THE DESIGN OF A REGULATOR FOR A FLEXIBLE AIRCRAFT
L J J Erkelens and J L Simons 31 Mar 1980 83 p refs Previously announced as NLR-TR-75118-C Sponsored by Directorate of Material Air RNLAF
(NLR-TR-80032-U NLR-TR-75118-C) Avail NTIS HC A05/MF A01

A hypothetical control system that provides improved rigid body and structural mode damping of a flexible aircraft in order to improve the riding quality and minimize the wing bending moment during flight in turbulence is considered The equations of motion are related to a high performance fighter aircraft with external stores The feedback gains are determined using linear optimal control theory A quadratic optimization criterion taking into account the normal acceleration at the pilot seat and the wing root bending moment is used A number of optimal and suboptimal regulators are calculated The system performance is expressed in terms of pole location frequency response and power spectra for both pilot seat acceleration and wing root bending moment Aircraft response to a deterministic gust disturbance is presented Author (ESA)

N82-19213# Technische Hogeschool, Delft (Netherlands) Dept of Aerospace Engineering
ON THE DESIGN OF SOME AIRFOILS FOR SAILPLANE APPLICATION
L M M Boermans and H J W Selen Apr 1981 47 p refs Presented at 17th OSTIV Congr Paderborn West Germany 1981
(VTH-LR-326) Avail NTIS HC A03/MF A01

Airfoils were designed such that by adding material to the surface an existing wing could be modified and tested in flight Wind tunnel experiments on inner and outer wing segments are described giving information on the quality of actual airfoils achieved in serial production and of the LSL airfoil analysis and design computer program The characteristics of several modern airfoils used in standard class sailplanes are analyzed and typical differences in the case of smooth surface and of rough leading edge are clarified Wind tunnel measurements with real insect remains on a wing segment are compared with a well known simulated bug pattern and shown to have greatly different drag characteristics The application of pneumatic turbulators to reduce the drag of an airfoil is discussed The computer program was used to modify the wing of an ASW-193 sailplane Flight tests are satisfactory Author (ESA)

N82-19214# Bristol Univ (England) Dept of Aeronautical Engineering
A FURTHER STUDY OF HELICOPTER ROTOR PITCH-FLAP-PHASE COUPLING B S Thesis
A East and N S Sehmi Jun 1981 81 p refs
(BU-259) Avail NTIS HC A05/MF A01

Pitch-flap phase coupling between the blades of a helicopter rotor was studied in order to improve overall aircraft stability A mathematical model was constructed for the Westland Lynx helicopter which incorporates a semiarticulated rotor head Full expressions are derived in a lengthy but accurate fashion for the blade flapping motion as well as for rotor hub forces and moments The rotor state defined is believed to be more accurate than that of any previous known treatment Pitch-flap phase coupling of the form blade pitch angle at rotor center line - blade pitch control angle + pitch-flap coupling gain (blade flap angle + pitch-flap-phase coupling lead/lag) is introduced The effect on the rotor derivatives is given with change in phase lead/lag angle and control gain A full six degrees of freedom model is extensively used for the study of stability with the results beset with problems which are discussed Author (ESA)

N82-19215# Bristol Univ (England) Dept of Aeronautical Engineering
A DESIGN STUDY OF THE MARSHAL B S Thesis
D Suen and G H Tan Jun 1981 55 p refs
(BU-262) Avail NTIS HC A04/MF A01

The feasibility of a six seat variant of the Britten Sheriff twin-engined aircraft the Marshal was studied Results show that the Marshal, powered by two 200 h p engines and at an all-up-weight (AUW) of 3550 lb can compete in the open market both in terms of performance and price No major structural alterations, except on the fuselage to accommodate two additional passengers, are envisaged This aircraft is expected to be suitable

for a touring role For business flying a high cruise speed is favored and so a turbocharged version was also considered The performance level attainable with two 200 h p turbocharged engines compares well with the competition However at an AUW of 3700 lb certain modifications to the wing are necessary The indication is that the Marshal is a commercially viable project Author (ESA)

N82-19216# Bristol Univ (England) Dept of Aeronautical Engineering
DESIGN STUDY INTO A HIGH ENDURANCE MINI-ROTORCRAFT B S Thesis
D A E Beedell and J C Hendy Jun 1981 71 p refs Original contains color illustrations
(BU-265) Avail NTIS HC A04/MF A01

Competing models in a minirotorcraft competition for maximum endurance with an all up weight no greater than 5 kg, must fly above a height of 5 m within an area 10 m square are discussed A design in which aerodynamics stability and control, and mechanical and structural aspects are considered to obtain the size and angular velocity of the rotor for minimum *power while sufficient stability and control for a long flight are* still inherent in the overall system is presented Weights of individual components are also examined It is found that a rotor mounted engine configuration with rotor radius about 1 6 m and rotational velocity 4 to 5 revs/sec with engines half way along the rotors and with Hiller control rotors, is the most promising design The possible endurance is some 12 hr and hence pilot error and mechanical failure become deciding factors Author (ESA)

N82-19217*# Mitre Corp McLean, Va
A CONCEPT FOR A FUEL EFFICIENT FLIGHT PLANNING AID FOR GENERAL AVIATION Final Report
B P Collins A L Haines and C J Wales Washington NASA Mar 1982 96 p refs
(Contract NAS1-16430)
(NASA-CR-3533 MTR-81W233) Avail NTIS HC A05/MF A01 CSCL 01D

A core equation for estimation of fuel burn from path profile data was developed This equation was used as a necessary ingredient in a dynamic program to define a fuel efficient flight path The resultant algorithm is oriented toward use by general aviation The pilot provides a description of the desired ground track standard aircraft parameters, and weather at selected waypoints The algorithm then derives the fuel efficient altitudes and velocities at the waypoints B W

N82-19218# Institute for Defense Analyses Arlington Va
ASSESSMENT OF AVIONIC EQUIPMENT FIELD RELIABILITY AND MAINTAINABILITY AS FUNCTIONS OF UNIT COST
Mark I Knapp and Joseph W Stahl 7 Oct 1981 24 p refs Presented at the 16th Ann Dept of Defense Cost Analysis Symp , Arlington, Va 4-7 Oct 1981
(AD-A109373) Avail NTIS HC A02/MF A01 CSCL 01/3

Pound-for-pound avionics is generally recognized as the most *expensive complex and sophisticated part of an aircraft Reliability* and maintainability are critical characteristics that influence spares provisioning maintenance resource requirements system operational availability and, ultimately investment and operating costs Consequently much attention has been focused upon improving the reliability and maintainability of avionics which in the past, have been disappointingly low This paper addresses avionics reliability and maintainability The analysis was performed last year in partial response to a request of IDA by OASD (C(3)I) to provide information for use by DSARC principals at the Full-Scale Development milestone Since the 5000 series of DoD Directives and Instructions emphasize analytical comparisons of any new systems under consideration by the DSARC with current, comparable systems, we undertook analyses to determine if there may be one or more historical relationships between field reliability and maintainability and avionic equipment characteristics that would assist in forecasting those attributes GRA

N82-19219# European Space Agency Paris (France)
EQUIPMENT FOR TESTING AND MEASURING A 'HELMET MOUNTED SIGHT AND DISPLAY' SYSTEM WITH A COUPLED MOVABLE TV CAMERA IN THE FLIGHT *SIMULATOR FOR RESEARCH OF THE DFVLR*
Friedrich Erdmann R Dierke E Biertuempel, R Ehlers, and H Loehr Nov 1981 70 p refs Transl into ENGLISH of Ein Versuchsaufbau zum Ausmessen eines Helmet Mounted Sight/Display mit Nachgeschaltetem Kameraschwenkrahmen im Forschungsflugsimulator der DFVLR Rept DFVLR-Mitt-80-04 DFVLR, Brunswick Jan 1980 Original report in GERMAN previously announced as ESA-95301
(ESA-TT-675 DFVLR-Mitt-80-04) Avail NTIS HC A04/MF A01 DFVLR Cologne DM 17 40

A test installation capable of static and dynamic measurements on a helmet mounted sight and display (HMS/D) during simulated helicopter motion, by means of a steerable camera rotation framework was built The rotation frame is gyro controlled and moves about two axes (in pitch and yaw) The HMS/D generates the helmet line of sight referred to the simulator platform (the aircraft based system) in terms of azimuth and elevation Through the helmet mounted display using a semitransparent mirror an electronically produced cross hair (the helmet mounted sight) is superimposed on the image in the right eye of the pilot The TV picture is also reflected into his eye enabling him to aim at a target on the sensor image Test equipment accuracy is 40 min in azimuth, 20 min in elevation Author (ESA)

N82-19220*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
DILUTION JET BEHAVIOR IN THE TURN SECTION OF A REVERSE FLOW COMBUSTER
Steven M Riddlebaugh Abraham Lipshitz (Ahuza, Haifa Israel), and Isaac Greber (Case Western Reserve Univ , Cleveland, Ohio) Jan 1982 15 p refs Presented at the 20th Aerospace Sci Meeting, Orlando Fla , 10-14 Jan 1982 sponsored by AIAA
(NASA-TM-82776 E-1107 AIAA-82-0192) Avail NTIS HC A02/MF A01 CSCL 21E

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

N82-19221*# Garrett Turbine Engine Co , Phoenix Ariz
COOLED VARIABLE-AREA RADIAL TURBINE TECHNOLOGY PROGRAM Final Report
G D Large and L J Meyer Jan 1982 303 p refs
(Contract NAS3-22004)
(NASA-CR-165408) Avail NTIS HC A14/MF A01 CSCL 21E

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

N82-19222*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
PERFORMANCE OF SINGLE-STAGE AXIAL-FLOW TRANSONIC COMPRESSOR WITH ROTOR AND STATOR ASPECT RATIOS OF 1 63 AND 1 78, RESPECTIVELY, AND WITH DESIGN PRESSURE RATIO OF 1 82
Royce D Moore and Lonnie Reid Feb 1982 112 p refs
(NASA-TP-1974 E-259) Avail NTIS HC A06/MF A01 CSCL 21E

The overall and blade-element performance of a transonic

compressor stage is presented over the stable operating flow range for speeds from 50 to 100 percent of design The stage was designed for a pressure ratio of 1 82 at a flow 20 2 kg/sec and a tip speed of 455 m/sec At design speed the stage achieved a peak efficiency of 0 821 at a pressure ratio of 1 817 The stage stall margin at design speed based on conditions at stall and peak efficiency was about 11 percent Author

N82-19223 Royal Aircraft Establishment, Farnborough (England)
A CRITERION FOR THE PREDICTION OF THE RECOVERY CHARACTERISTICS OF SPINNING AIRCRAFT
T H Kerr 1981 24 p refs
(RAE-TN-AERO-2251) Copyright Avail Issuing Activity

Full scale spinning tests were analyzed in order to produce a recovery estimation method for straight and swept wing aircraft The rate of rotation about spin axis X wing span/true rate of descent in ft/sec, was estimated from the general layout and loading of the aircraft Antispin rolling moment coefficient (wind axis) due to the body at a mean incidence of 45 deg and antispin moment due to the movement of the rudder from neutral to fully antispin were calculated The unbalanced (antispin) rolling moment coefficient is derived This is plotted against (I- (pitching moment of inertia/rolling moment of inertia)) and whether the aircraft is likely to have a satisfactory spin recovery characteristic is assessed by reference to the empirical boundary tables provided Data for Spitfire and Hurricane aircraft are provided Recovery standards improve as pitching moment of inertia/rolling moment of inertia increases Author (ESA)

N82-19224*# Pennsylvania State Univ University Park Dept of Aerospace Engineering
AN EXPERIMENTAL STUDY OF THE EFFECT OF TAIL CONFIGURATION ON THE SPINNING CHARACTERISTICS OF GENERAL AVIATION AIRCRAFT M S Thesis
Mark G Ballin Mar 1982 182 p refs
(Grant NAG1-73)
(NASA-CR-168578) Avail NTIS HC A09/MF A01 CSCL 01C

The feasibility of using static wind tunnel tests to obtain information about spin damping characteristics of an isolated general aviation aircraft tail was investigated A representative tail section was oriented to the tunnel free streamline at angles simulating an equilibrium spin A full range of normally encountered spin conditions was employed Results of parametric studies performed to determine the effect of spin damping on several tail design parameters show satisfactory agreement with NASA rotary balance tests Wing and body interference effects are present in the NASA studies at steep spin attitudes but agreement improves with increasing pitch angle and spin rate, suggesting that rotational flow effects are minimal Vertical position of the horizontal stabilizer is found to be a primary parameter affecting yaw damping and horizontal tail chordwise position induces a substantial effect on pitching moment A R H

N82-19225*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
SIMULATOR STUDY OF VORTEX ENCOUNTERS BY A TWIN-ENGINE, COMMERCIAL, JET TRANSPORT AIRPLANE
Earl C Hastings Jr and Gerald L Keyser, Jr Feb 1982 65 p refs
(NASA-TP-1966 L-14187) Avail NTIS HC A04/MF A01 CSCL 01C

A simulator study of vortex encounters was conducted for a twin-engine, commercial, jet transport airplane encountering the vortex flow field of a heavy, four-engine commercial, jet transport airplane in the final-approach configuration The encounters were conducted with fixed controls and with a pilot using a state-of-the-art, manual-control system Piloted encounters with the base-line vortex flow field out of ground effect (unattenuated) resulted in initial bank-angle excursions greater than 40 deg, coupled with initial sideslip-angle excursions greater than 10 deg The severity of these initial upsets was significantly reduced when the vortex center was moved laterally or vertically away from the flight path of the encountering airplane Smaller reductions occurred when the flow field was attenuated by the flight spoilers on the generating airplane The largest reduction in the severity of the initial upsets, however, was from aging in ground effect The severity of the initial upsets of the following airplane was relatively unaffected by the approach speed Increasing the lift coefficient of the generating airplane resulted in an increase in the severity of the initial upsets Author

N82-19226*# Boeing Aerospace Co , Kent, Wash
A STUDY OF FLIGHT CONTROL REQUIREMENTS FOR ADVANCED, WINGED, EARTH-TO-ORBIT VEHICLES WITH FAR-AFT CENTER-OF-GRAVITY LOCATIONS Final Report
Andrew K Hepler Howard Zeck William H Walker and Alexander Polack Washington NASA Feb 1982 121 p
(Contract NAS1-16128)
(NASA-CR-3491) Avail NTIS HC A06/MF A01 CSCL 01C

Control requirements of Controlled Configured Design Approach vehicles with far-aft center of gravity locations are studied The baseline system investigated is a fully reusable vertical takeoff/horizontal landing single stage-to-orbit vehicle with mission requirements similar to that of the space shuttle vehicle Evaluations were made to determine dynamic stability boundaries, time responses, trim control operational center-of-gravity limits and flight control subsystem design requirements 'Study tasks included a baseline vehicle analysis, an aft center of gravity study a payload size study and a technology assessment Author

N82-19227# Purdue Univ Lafayette, Ind School of Aeronautics and Astronautics
FLUTTER AND TIME RESPONSE ANALYSES OF THREE DEGREE OF FREEDOM AIRFOILS IN TRANSONIC FLOW Final Report, Nov 1979 - Dec 1980
T Y Yang and C H Chen Wright-Patterson AFB, Ohio AFAWL Aug 1981 60 p refs
(Grant AF-AFOSR-3523-78 AF Proj 2307)
(AD-A108987, AFWAL-TR-81-3103) Avail NTIS HC A04/MF A01 CSCL 20/4

Flutter and time response analyses are performed for a NACA 64A006 conventional and a MBB A-3 supercritical airfoil, both oscillating with plunge, pitch, and aileron pitch d o f s in small disturbance, transonic flow The aerodynamic coefficients are calculated using the transonic code LTRAN2-NLR The effects of various kinds of aeroelastic parameters on flutter speeds for the bending-torsion, bending-aileron, and torsion-aileron branches are studied The flutter speeds associated with the bending-torsion branch are plotted against Mach number for different parameter values The flutter speed, the amplitude ratio, and the phase difference at different Mach numbers are plotted against the mass ratio for both of two d o f and a three d o f case Time-response results are obtained for the NACA 64A006 and the MBB A-3 airfoils at M = 0 85 and 0 765, respectively Using the same sets of parameter values, the flight speeds used to obtain all the neutrally stable response are very close to the flutter speeds obtained in the flutter analysis The principle of linear superposition of airloads is used in the flutter analysis but not in the response analysis Author (GRA)

N82-19228# Messerschmitt-Boelkow-Blohm G m b H Ottobrunn (West Germany) Unternehmensbereich Flugzeuge
ACTIVE GUST AND MANEUVER LOAD CONTROL CONCEPTS WITH THE EXAMPLE OF THE AIRBUS A300 PART 1 EXPLANATION OF A REGULAR IN THE TIME ZONE OF WIND GUST LOAD DECREASE AND EXAMINATION OF ITS EFFECTIVENESS IN STOCHASTIC GUSTS [AKTIVE BOEEN- UND MANOEVERLASTREGELUNGSKONZEPTE AM BEISPIEL DES AIRBUS A-300 TEILL AUSLEGUNG EINES REGLERS IM ZEITBEREICH ZUR BOENLASTMINDERUNG UND NACHPRUEFUNG DER WIRKSAMKEIT FUER STOCHASTISCHE BOEEN]
J Becker O Sensburg and F Weiss 28 Apr 1981 60 p refs In GERMAN Presented at DGLR-Jahrestagung 1981 Aachen 11-14 May 1981
(MBB-FE-172/S/PUB/39-Pt-1) Avail NTIS HC A04/MF A01

The development of active control technology and its application to flutter stabilization in aviation as well as maneuvering squall load control In the structural reduction and improvement of flying comfort was investigated The design of the squall load control and the plotting of the simulation model for the flexible airplane are examined Transl by E A K

N82-19231# Bristol Univ (England) Dept of Aeronautical Engineering
THE PRESSURE SIGNATURE METHOD FOR BLOCKAGE CORRECTIONS, AND ITS APPLICATIONS TO THE INDUSTRIAL WIND TUNNEL B S Thesis
A S Walker and N P Wiseman Jun 1981 43 p refs
(BU-263) Avail NTIS HC A03/MF A01

A recent method of correcting for errors due to blockage applicable to complex shapes and high blockage ratios was applied to the Aeronautical Engineering Department industrial wind tunnel A tunnel centerline source-sink distribution was derived from measured wall pressure signatures The interference effect of the tunnel walls was calculated blockage corrections were applied to in-tunnel measurements of forces and pressures The drag coefficient of a normal flat plate of deliberately high blockage ratio (12%) was measured in the tunnel then corrected to the value in unconfined flow This is found to be close to the expected value and indicates that the pressure signature method can be reliably used to correct measurements obtained from models, up to this value of blockage The effective body implied by the equivalent potential flow was also calculated This compares well with the known effective body shapes of flat normal plates in confined flow Author (ESA)

N82-19343# Federal Aviation Administration, Atlantic City N J
WORKSHOP ON MATHEMATICAL FIRE MODELING
Aug 1981 227 p Workshop held 24-27 Mar 1981
(AD-A108876 FAA-CT-81-209) Avail NTIS HC A11/MF A01 CSCL 01/2

Computerized simulation of aircraft fires is discussed Cabin fires are emphasized with particular attention given to the study of the flammability of construction materials Three types of aircraft fires are analyzed ramp fires in-flight fires and post crash fires Flame spread heat fluxes and fire dynamics are discussed R J F

N82-19358*# Rockwell International Corp , El Segundo Calif Aircraft Operations
EVALUATION OF SUPERPLASTIC FORMING AND CO-DIFFUSION BONDING OF Ti-6Al-4V TITANIUM ALLOY EXPANDED SANDWICH STRUCTURES Technical Report, May 1979 - Dec 1980
G H Arvin, L Israeli, J H Stolpestad, and G W Stacher Sep 1981 134 p refs
(Contract NAS1-15788)
(NASA-CR-165827 NA-81-185-1) Avail NTIS HC A07/MF A01 CSCL 11F

The application of the superplastic forming/diffusion bonding (SPF/DB) process to supersonic cruise research is investigated The capability of an SPF/DB titanium structure to meet the structural requirements of the inner wing area of the NASA arrow-wing advanced supersonic transport design is evaluated Selection of structural concepts and their optimization for minimum weight, SPF/DB process optimization, fabrication of representative specimens, and specimen testing and evaluation are described The structural area used includes both upper and lower wing panels, where the upper wing panel is used for static compression strength evaluation and the lower panel, in tension is used for fracture mechanics evaluations The individual test specimens, cut from six large panels, consist of 39 static specimens, 10 fracture mechanics specimens and one each full size panel for compression stability and fracture mechanics testing Tests are performed at temperatures of -54 C (-65 F), room temperature, and 260 C (500 F) B W

N82-19391# Naval Ship Research and Development Center Annapolis Md Propulsion and Auxiliary Systems Dept
FOUNDATIONS FOR COMPUTER SIMULATION OF A LOW PRESSURE OIL FLOODED SINGLE SCREW AIR COMPRESSOR M S Thesis - Purdue Univ
Thomas W Bein Dec 1981 122 p refs
(AD-A108230 DTNSRDC/PAS-81/24) Avail NTIS HC A06/MF A01 CSCL 13/7

The necessary logic to construct a computer model to predict the performance of an oil flooded single screw air compressor is developed The geometric variables and relationships used to describe the general single screw mechanism are developed The governing equations to describe the processes are developed from their primary relationships The assumptions used in the development are also defined and justified The computer model predicts the internal pressure, temperature, and flowrates through the leakage paths throughout the compression cycle of the single screw compressor The model uses empirical external values as the basis for the internal predictions The computer values are compared to the empirical values and conclusions are drawn based on the results Recommendations are made for future efforts to improve the computer model and to verify some of the conclusions that are drawn Author (GRA)

N82-19396# Engineering Dynamics International, St Louis, Mo
AIRPORT RELATED RESIDENTIAL ACOUSTICAL INSULATION DEMONSTRATION PROJECT REPORT 1720 Final Report
J T Weissenburger, J C McBryan and L F Heitkamp Jun 1981 107 p refs Sponsored by St Louis Airport Authority Mo
(PB82-100777) Avail NTIS HC A06/MF A01 CSCL 13B

A demonstration project to evaluate the feasibility of retrofit acoustical insulation in single family residences as a possible remedial measure for homes impacted by airport and aircraft noise is described Six private residences generally located in an area to the east and southeast of Lambert St Louis International Airport were used The program involved making before and after noise measurements selecting contractors and overseeing the installation of selected acoustical controls and evaluating the effectiveness of the program A description of each individual house and measured data pertaining to the house is presented GRA

N82-19419# Radio Technical Commission for Aeronautics Washington D C
FM BROADCAST INTERFERENCE RELATED TO AIRBORNE ILS, VOR AND VHF COMMUNICATIONS
18 Nov 1981 96 p refs
(RTCA/DO-176 RTCA/SC-141) Avail NTIS HC A05/MF A01

Recommendations for controlling the problem of FM broadcast interference with airborne communications are given

N82-19420# Radio Technical Commission for Aeronautics Washington D C
INVESTIGATION OF TECHNICAL REQUIREMENTS
In its FM Broadcast Interference Related to Airborne ILS VOR and VHF Commun 18 Nov 1981 p 7-8

Avail NTIS HC A05/MF A01

Tolerances and standards applicable to FM broadcast stations are given, and minimum performance standards for airborne receiving equipment are identified Performance standards for ILS localizer receiving equipment for VOR receiving equipment operating at 108-118 MHz, and for radio communication receiving equipment operating at 117 975-136 000 MHz are considered J D H

N82-19421# Radio Technical Commission for Aeronautics, Washington, D C
INVESTIGATION OF AIRBORNE VHF COMMUNICATION AND NAVIGATION EQUIPMENT
In its FM Broadcast Interference Related to Airborne ILS, VOR and VHF Commun 18 Nov 1981 p 9-22 ref

Avail NTIS HC A05/MF A01

The Federal Aviation Administration test program investigating the problem of FM broadcast interference is described The communication signal level to be protected receiver minimum performance standards antenna characteristics and receiver interference tests are described for airborne VHF communications and for ILS and VOR navigation equipment J D H

N82-19422# Radio Technical Commission for Aeronautics, Washington D C
INVESTIGATION OF THE EFFECTS OF AIRBORNE INSTALLATION FACTORS ON RECEIVER INTERFERENCE
In its FM Broadcast Interference Related to Airborne ILS VOR and VHF Commun 18 Nov 1981 p 23-52

Avail NTIS HC A05/MF A01

Significant variables which may have an impact on protection criteria are discussed A rationale for developing voltage limits at a VHF receiver input is presented A system model consisting of an antenna transmission line and receiver is developed to define system equations Distance criteria using model and 100 kW ERP FM broadcast propagation data is developed for various transmission line lengths J D H

N82-19423# Radio Technical Commission for Aeronautics Washington D C
FAA/FCC COORDINATION PROCEDURES FOR FM BROADCAST STATIONS
In its FM Broadcast Interference Related to Airborne ILS VOR and VHF Commun 18 Nov 1981 p 53-60

Avail NTIS HC A05/MF A01

Procedures for coordination between the Federal Aviation Administration and the Federal Communications Commission are given and their effectiveness evaluated Recommendations for strengthening the present informal coordination procedures are presented J D H

N82-19448# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div

ANTENNA (SELECTED ARTICLES)

4 Nov 1981 64 p refs Transl into ENGLISH from Antenny (USSR), no 15 1972 p 31-79

(AD-A108174, FTD-ID(RS)T-0940-81) Avail NTIS HC A04/MF A01 CSCL 20/14

A statistical analysis of field focused systems and the properties of connected vibrator structures was made The efficiency and input impedance of analyzing and reducing the directive gain and direction dispersion of the main maximum of the beam pattern of a sectional traveling wave antenna were derived and are discussed An assessment of aircraft capacitive circuit medium wave antennas' efficiency is also presented

N82-19453# Air Force Systems Command Wright-Patterson AFB, Ohio Foreign Technology Div

ASSESSMENT OF AIRCRAFT CAPACITIVE CIRCUIT MEDIUM WAVE ANTENNAS ACCORDING TO THEIR EFFICIENCY

E O Brudnyy and L Ya Ilnitskiy *In its* Antenna (Selected Articles) (FTD-ID(RS)T-0940-81) 4 Nov 1981 p 53-59 refs Transl into ENGLISH from Antenny (USSR), no 15 1972

Avail NTIS HC A04/MF A01 CSCL 20/14

A method for assessing aircraft capacitive circuit medium wave antennas according to their efficiency is presented The measure of efficiency is the product of the antenna capacitance times the active altitude An expression was obtained which links the antenna efficiency to its geometric dimensions The suggested method discussed produces the optimal dimensions for aircraft capacitive circuit antennas direction during their designing Author

N82-19570# National Aerospace Lab , Tokyo (Japan)

ACOUSTIC FATIGUE ENDURANCE TEST OF USB FLAP STRUCTURE MODELS AT ELEVATED TEMPERATURE

Masaaki Sano Yoshinori Fukimori, Soushiro Iida, Keiji Komatsu and Koichi Egawa Oct 1981 59 p refs In JAPANESE ENGLISH summary

(NAL-TR-683) Avail NTIS HC A04/MF A01

Five substructural models of upper surface blown flaps were tested to verify the safety of the flap structure during a planned flight evaluation of the NAL-STOL experimental aircraft All models consisted of the face panel with stringers and ribs rivetted on the backside in shape Four panels were flat one had the same curvature as the actual flap structure Three face panels and stiffeners were of Ti-6Al-4V the others were of 2024C-T3 alloy Results of thermal buckling tests resonant frequencies of all panels, the dynamic and the measurement of dynamic strain response are discussed All structural models proved strong enough to resist both acoustic and thermal loading No detectable damage was found on the panel face nor around the rivet holes Estimated lives based on simulated and experimental strain histories suggest confirmation of the fatigue test results A R H

N82-19571# Advisory Group for Aerospace Research and Development Neuilly-Sur-Seine (France) Structures and Materials Panel

PRACTICAL APPLICATIONS OF FRACTURE MECHANICS

Harold Liebowitz ed (George Washington Univ) May 1980 425 p refs

(AGARD-AG-257 ISBN-92-835-1359-2) Avail NTIS HC A16/MF A01

Practical applications of fracture mechanics for all aspects of aircraft design manufacture and testing are presented Although theoretical discussions are included to provide an appreciation of the complexity of the problems involved the emphasis is on practical examples Applications to engine components built-up structures joints, lugs and fasteners integral structures and forgings are covered The effects of stress corrosion and problems of scatter affecting determination of stress concentration factors fatigue crack propagation and residual strength are discussed S L

N82-19583# Kaman Aerospace Corp , Bloomfield Conn

STRUCTURAL SYSTEM IDENTIFICATION TECHNOLOGY VERIFICATION Final Report

N Giansante A Berman W G Flannelly and E J Nagy Ft Eustis Va Army Research and Technology Labs Nov 1981 218 p refs

(Contract DAAK51-78-C-0017 DA Proj 1L1-62209-AH-76) (AD-A109181 R-1631 USAAVRADCOM-TR-81-D-28) Avail NTIS HC A10/MF A01 CSCL 13/13

Structural system identification is the method of obtaining structural and dynamic mathematical models and improving existing mathematical models using ground vibration test data The purpose of the subject program was to perform experimental development, and research work to verify the concepts of structural system identification technology To accomplish this system identification techniques were applied to a U S Army AH-1G helicopter fuselage to create a mathematical model from ground vibration test data to improve a reduced model of an existing NASTRAN model of the AH-1G using shake test data and to test the effectiveness of these new mathematical models in predicting the effects of stiffness and mass changes to the airframe The results of the program indicate that system identification is a viable and cost-effective technique for developing new models and for improving existing finite-element models of an airframe using ground vibration test data Author (GRA)

N82-19587# Georgetown Univ Washington D C Dept of Civil Mechanical and Environmental Engineering

FRACTURE AND FATIGUE CHARACTERIZATION OF AIRCRAFT STRUCTURAL MATERIALS UNDER BIAXIAL LOADING Final Scientific Report, 1 Oct 1976 - 30 May 1980

D L Jones and J Eftis Dec 1981 204 p refs

(Grant AF-AFOSR-3096-76, AF Proj 2307)

(AD-A109054, AFOSR-81-0856TR) Avail NTIS HC A10/MF A01 CSCL 01/3

A general fracture mechanics analysis was performed to examine the influence of biaxial applied loads on the mechanical state of the body The geometries examined were the single crack and two coplanar cracks with an arbitrary orientation and the cracked shear panel It was found that the biaxial loads influenced all aspects of the mechanical state of the body with the exception of the stress intensity factor for a crack oriented parallel to the biaxial load The extent and nature of the biaxial effect on the crack-tip stress field stress intensity factor, angle of initial crack extension crack-tip displacements elastic strain energy fracture load and fatigue crack growth rates are all discussed A biaxial test facility was developed and a considerable number of photoelastic fracture toughness and fatigue crack growth rate experiments were performed Confirmation of the analytical predictions was obtained for the biaxial effects on the crack-tip stress field the angle of initial crack extension, the fracture load and the fatigue crack growth rates The biaxial loads were seen to influence all of these parameters in varying degrees GRA

N82-19707*# National Aeronautics and Space Administration Langley Research Center Hampton Va

EFFECTS OF REPETITION RATE AND IMPULSIVENESS OF SIMULATED HELICOPTER ROTOR NOISE ON ANNOYANCE

Clemans A Powell and David A McCurdy Feb 1982 59 p refs

(NASA-TP-1969, L-14936) Avail NTIS HC A04/MF A01 CSCL 20A

Annoyance judgements were obtained for computer generated stimuli simulative of helicopter impulsive rotor noise to investigate effects of repetition rate and impulsiveness Each of the 82 different stimuli was judged at 3 sound pressure levels by 48 subjects Impulse repetition rates covered a range from 10 Hz to 115 Hz, crest factors covered a range from 3 2 dB to 19 3 dB Increases in annoyance with increases in repetition rate were found which were not predicted by common loudness or annoyance metrics and which were independent of noise level The ability to predict effects of impulsiveness varied between the noise metrics and was found to be dependent on noise level The ability to predict the effects of impulsiveness was not generally improved by any of several proposed impulsiveness corrections Instead, the effects of impulsiveness were found to be systematically related to the frequency content of the stimuli A modified frequency weighting was developed which offers improved annoyance prediction Author

N82-19944*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio

EFFECT OF FACILITY VARIATION ON THE ACOUSTIC CHARACTERISTICS OF THREE SINGLE STREAM NOZZLES

Orlando A Gutierrez 1980 38 p refs Presented at the *100th Meeting of the Acoust Soc of Am Los Angeles* 17-21 Nov 1980

(NASA-TM-81635 E-646) Avail NTIS HC A03/MF A01 CSCL 20A

The characteristics of the jet noise produced by three single stream nozzles were investigated statistically at the NASA-Lewis Research Center outdoor jet acoustic facility The nozzles consisted of a 7 6 cm diameter convergent conical, a 10 2 cm diameter convergent conical and an 8-lobe daisy nozzle with 7 6 cm equivalent diameter flow area The same nozzles were tested previously at cold flow conditions in other facilities such as the Royal Aircraft Establishment (RAE) 7 3 m acoustic wind tunnel The acoustic experiments at NASA covered pressure ratios from 1 4 to 2 5 at total temperatures of 811 K and ambient The data obtained with four different microphone arrays are compared The results are also compared with data taken at the RAE facility and with a NASA prediction procedure Author

N82-19945# National Aerospace Lab Tokyo (Japan) Noise and Emission Research Group

AERODYNAMIC NOISE GENERATED BY JET WING/FLAP INTERACTIONS OF THE EXTERNAL USB CONFIGURATION OF STOL AIRCRAFT PART 2 FULL SCALE MODEL EXPERIMENT USING FJR710 TURBOFAN ENGINE

Masataka Maita Shigemi Shindo Shin Nakayama Masakatsu Matsuki Tadao Torisaki Mitsuo Morita Akira Yoshida, Katsumi Takeda, Shizuo Sekine, and Hiroshi Kondo Oct 1981 26 p refs

(NAL-TR-687T-Pt-2 ISSN-0389-4010) Avail NTIS HC A03/MF A01

Acoustic characteristics of the external upper surface blowing (USB) concept of a propulsive lift configuration were studied by full scale model static experiments Test components included an FJR710 turbofan engine with an acoustically treated nacelle and a USB wing/flap assembly These were utilized in conjunction with the ground verification testing of the propulsive systems of the National Aerospace Laboratory Quiet STOL Research Aircraft Results were compared with the previous 8% scale cold flow model data The defect of shielding provided by the wing/flap surface on aftradiated turbofan engine noise was studied and some attempts were made to reduce USB noise Author

N82-19946*# National Aeronautics and Space Administration Langley Research Center, Hampton Va

AIRCRAFT NOISE PREDICTION PROGRAM THEORETICAL MANUAL, PART 1

William E Zorumski Feb 1982 180 p refs 2 Vol

(NASA-TM-83199-Pt-1 L-14805-Pt-1) Avail NTIS HC A09/MF A01 CSCL 20A

Aircraft noise prediction theoretical methods are given The prediction of data which affect noise generation and propagation is addressed These data include the aircraft flight dynamics the source noise parameters and the propagation effects R J F

N82-19947*# National Aeronautics and Space Administration Langley Research Center Hampton, Va

AIRCRAFT NOISE PREDICTION PROGRAM THEORETICAL MANUAL, PART 2

William E Zorumski Feb 1982 296 p refs 2 Vol

(NASA-TM-83199-Pt-2 L-14805-Pt-2) Avail NTIS HC A13/MF A01 CSCL 20A

Detailed prediction methods for specific aircraft noise sources are given These sources are airframe noise, combustion noise fan noise single and dual stream jet noise and turbine noise Modifications to the NASA methods which comply with the International Civil Aviation Organization standard method for aircraft noise prediction are given R J F

N82-19952# *Air Force Wright Aeronautical Labs, Wright-Patterson AFB, Ohio*

ACOUSTIC MEASUREMENTS OF F100-PW-100 ENGINE OPERATING IN HUSH HOUSE NSN 4920-02-070-2721 Final Report, May - Sep 1981

Vincent R Miller, G A Plzak, and J M Chinn Sep 1981 58 p refs

(AD-A108814 AFWAL-TM-81-133-FIBE) Avail NTIS HC A04/MF A01 CSCL 20/1

The purpose of this test program was to measure the acoustic environment in the hush house facility located at Kelly AFB Texas during operation of the F100-PW-100 engine to ensure that engine structural acoustic design limits were not exceeded *The acoustic measurements showed that no sonic fatigue problems* are anticipated with the F100-PW-100 engine structure during operation in the hush house The measured acoustic levels were less than those measured in an existing F100-PW-100 engine wet-cooled noise suppressor but were increased over that measured during operation on an open test stand It was recommended that the acoustic load increases measured in this program should be specified in the structural design criteria for engines which will be subjected to hush house operation or defining requirements for associated equipment Author (GRA)

N82-19956# Loughborough Univ of Technology (England) Dept of Transport Technology

AN EXPERIMENTAL STUDY OF THE EFFECTS OF AN INLET FLOW CONDITIONER ON THE NOISE OF A LOW SPEED AXIAL FLOW FAN

J Scoles and J B Ollerhead Jan 1981 92 p refs

(Contract AT/2170/049/XR)

(TT-8101) Avail NTIS HC A05/MF A01

The effects of inflow condition on the noise generated by a 40kW 560mm diameter, seven blade ducted fan at speeds up to 5000rpm in an anechoic chamber were measured A 1 25m diameter hemisperical honeycomb flow conditioner (HFC) which could be fitted with an internal gauze liner was used Fan entry flow was measured by static and rotating hot-wire anemometers Noise levels in the first few harmonics of blade passing frequency are very sensitive to inflow condition, but the HFC reduces them to a residual level independent of upstream disturbance levels Broadband noise is reduced (by a smaller amount) at high blade angles and flow rates No systematic effect of the gauze liner is detected Experimental difficulties are caused by unsteadiness in the chamber airflow which causes harmonic level fluctuations *with amplitudes of up to 10dB Although the inlet flow conditioner* reduces these fluctuations markedly, long term variations reduce confidence in the data Author (ESA)

N82-19957# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany) Abt Technische Akustik

NOISE MEASUREMENTS ON THE HELICOPTER BK 117 DESIGN WEIGHTED NOISE LEVELS AND INFLUENCE OF AIRSPEED

Wolf R Splettstoesser, Klaus P Anders, and Karl-Heinz Spiegel Aug 1981 93 p refs In GERMAN, ENGLISH summary Report will also be announced as translation (ESA-TT-748)

(DFVLR-Mitt-81-18) Avail NTIS HC A05/MF A01, DFVLR, Cologne DM 22,95

Noise measurements on the prototype helicopter BK 117 were performed in strict compliance with the proposed International Civil Aviation Organization regulations for noise certification of helicopters Measurement procedure, noise data acquisition, analysis and reduction as well as applied correction procedures are described Effective perceived noise levels (EPNL) and other noise descriptors were evaluated and related to the proposed noise limits Additional level flyover tests with variable airspeed were conducted to investigate the resulting effect on the EPNL and other noise measures Author (ESA)

N82-19958# Deutsche Forschungs- und Versuchsanstalt fuer *Luft- und Raumfahrt, Brunswick (West Germany)* Abteilung Technische Akustik

COLLECTION AND EVALUATION OF PROPELLER AIRCRAFT NOISE CERTIFICATION DATA

Manfred Ahlswede and Klaus Peter Anders Aug 1981 87 p refs In GERMAN, ENGLISH summary

(DFVLR-Mitt-81-20) Avail NTIS HC A05/MF A01, DFVLR, Cologne DM 25,20

More than 300 individual noise certification levels were *measured for propeller driven airplanes up to 5700 kg takeoff* weight and for powered gliders in accordance with the rules and regulations as set forth in International Civil Aviation Organization Annex 16 Information on the airplanes, the engines and the propellers is provided as well as on the prevailing meteorological parameters and the operational parameters together with acoustic data Of the latter, the measured

A-weighted levels with their 90% confidence limit are listed, the performance correction is given and the certification level as well as the noise-limit are provided Data are evaluated by plotting the measured A-weighted levels versus the helical blade tip Mach number Author (ESA)

N82-20126*# Jet Propulsion Lab, California Inst of Tech Pasadena

GLOBAL POSITIONING SYSTEM TIMING RECEIVERS IN THE DSN

P A Clements *In its* The Telecommun and Data Acquisition Rept 15 Feb 1982 p 90-99 refs

Avail NTIS HC A07/MF A01 CSCL 17G

The system (GPS) is a worldwide navigation system using a constellation of Earth satellites with onboard clocks The GPS is also usable to transfer time and frequency Preliminary tests with the breadboard receiver at NBS produced precision in time and frequency transfer between the United States Naval Observatory (USNO) and NBS JPL's plans to install receivers in the DSN to demonstrate their ability to transfer time and frequency within the DSN and between the DSN and outside agencies are discussed T M

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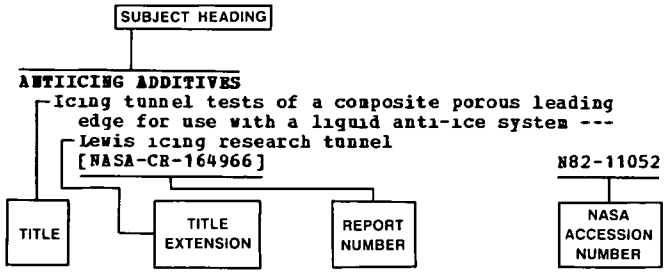

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B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

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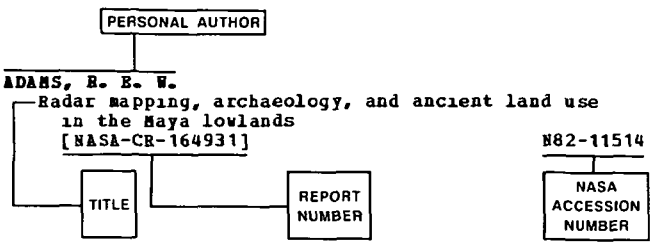

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A

B

C

D

E

F

G

H

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

Y

Z

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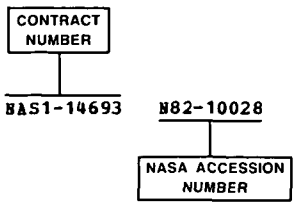

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