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Aeronautical
Engineering
A Continuing
Bibliography
with Indexes

NASA SP-7037(164)
August 1983



National Aeronautics and
Space Administration



25th Anniversary
1958-1983

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Aeronautical Engineering

ACCESSION NUMBER RANGES

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

STAR (N-10000 Series)

N83-23267 - N83-25650

IAA (A-10000 Series)

A83-29978 - A83-33484

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AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 164)

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 July 1983 in

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

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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 296 reports, journal articles, and other documents originally announced in July 1983 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*.

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

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

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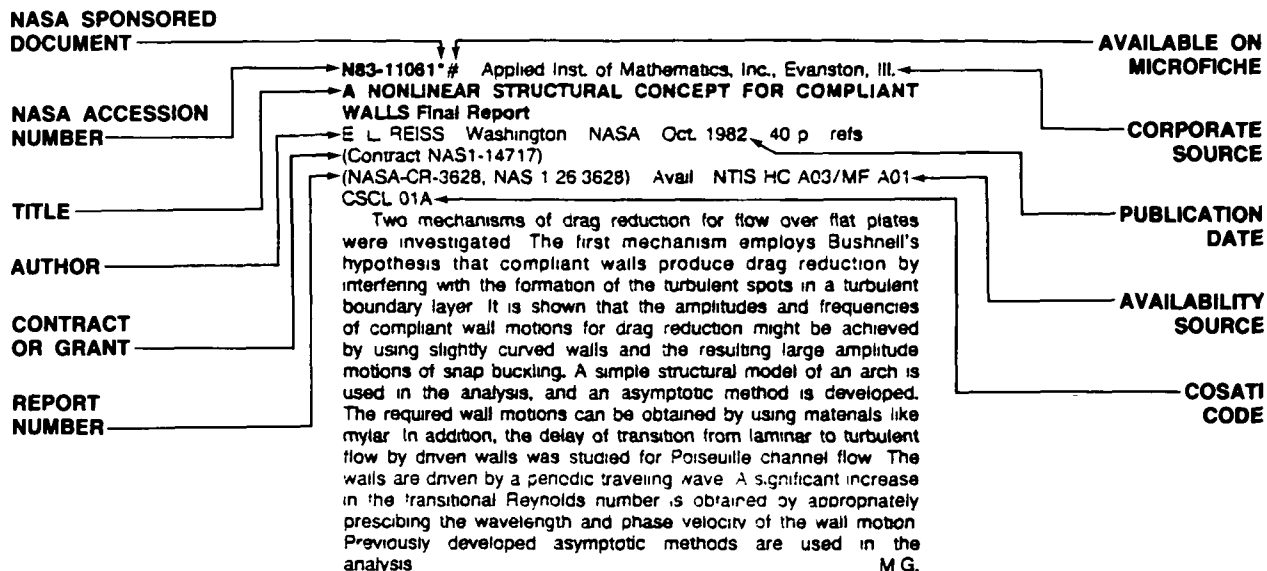
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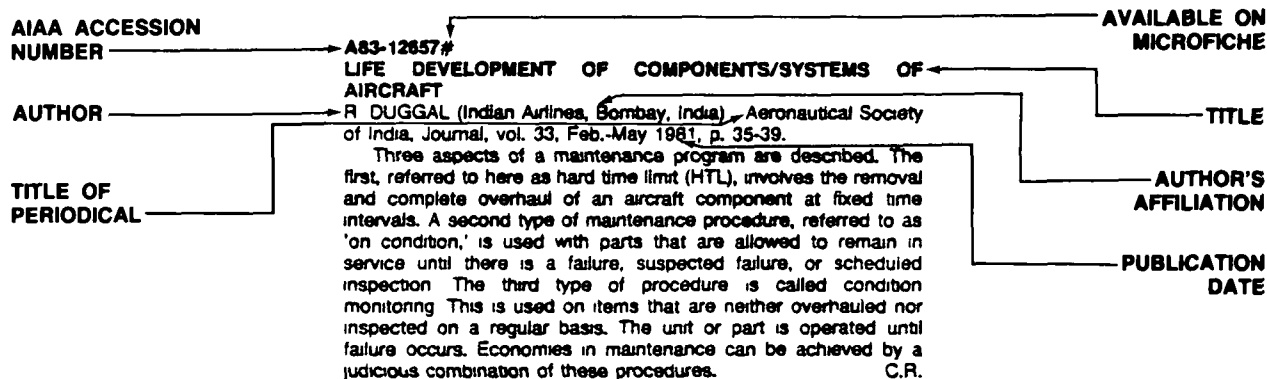
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AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 164)

AUGUST 1983

01

AERONAUTICS (GENERAL)

A83-30074

REPAIRING COMPOSITE STRUCTURES

C BULLOCH *Interavia* (ISSN 0020-5168), vol 38, April 1983, p 317-319

In most cases, composite aircraft structure delamination and disbonding extends beyond the externally visible area of damage. Nondestructive testing methods, of which the most commonly used is ultrasonic scanning, are used to assess the damage. It must then be decided whether to fit a new structural component, to execute a time-limited or interim repair, or to perform a permanent repair. For hole-resembling damage, aluminum or titanium metal patches can be bolted to the underlying composite structure. For more permanent repairs, damaged material must be removed and replaced by a virtually identical fiber-and-resin insert, whose surface is flush with that of the original structure in order to satisfy aerodynamic criteria. Structural accessibility determines the character of repair procedures within an aircraft. Attention is given to the curing of prepreg laminate plies by simultaneous application of heat and pressure by means of electrical heating element mats and vacuum bags. O C

A83-30075

BATTLEFIELD SURVEILLANCE RPVS BRING IT 'LIVE'

B WANSTALL *Interavia* (ISSN 0020-5168), vol 38, April 1983, p 343-345

Recent developments in LSI circuitry enable current and planned Remotely Piloted Vehicle (RPV) designs to carry onboard microprocessors of sufficient computational power to yield three-axis flight control, inertial/Doppler low drift navigation, and fly-by-wire control. RPV power requirements are low, and high-rpm twin cylinder engines of 16-30 HP offer cruising speeds of 110-167 km/hr. Although these speeds appear low, RPV vulnerability is minimized by low acoustic, visual, radar and IR signatures. Attention is given to the sensor payloads, design features and performance characteristics of such military RPVs as the VTOL CL-227, the Chukar-R tactical reconnaissance system, and the Aquila target location/designation RPV which will be employed by the U.S. and other NATO armed forces. O C

A83-30152

FUNDAMENTALS OF FLIGHT

R S SHEVELL (*Stanford University, Stanford, CA*) *Englewood Cliffs, NJ, Prentice-Hall, Inc.*, 1983, 426 p refs

The main purpose of this work is to provide a clear introductory understanding of the science and engineering of heavier-than-air flight vehicles. The discussion covers the basics of fluid mechanics as required for aeronautics, the production of lift and drag, the importance and effects of viscosity and compressibility, methods of estimating performance, the elements of stability, the impact of aircraft design characteristics on performance and stability, and the theory of circulation about an airfoil. The major parameters that affect the design integration of an aircraft are presented,

wing design and propulsion integration being examples of this. The elements of rocket propulsion, rocket trajectories, and orbital performance are also considered. A brief history of aeronautics is presented. B.J

A83-30830#

CHANGING THE COURSE OF U.S. AVIATION

J E STEINER and L K MONTLE (*Boeing Co., Seattle, Wa*) *Astronautics and Aeronautics* (ISSN 0004-6213), vol 21, May 1983, p 48-53, 110

The present discussion concerns the near-term measures that may be taken by the aerospace industrial community of the U.S. to ensure commercial superiority over the comparable aircraft production enterprises of Western Europe as well as those recently announced for the turn of the century by Japanese industrial planners. It is noted that civil aviation advances can play a major role in the achievement of urgent military objectives, and that technological readiness for the penetration of potential markets can be managed with moderate risk through the cooperative orchestration of a multiplicity of technology development efforts. Attention is given to the development history of the technologies ultimately integrated in the form of the ring laser gyro, and to the evolution of advanced flight management system avionics, as paradigmatic cases of intensive and coordinated use of the U.S. aerospace industrial base. O C

A83-31804

DESIGN CONSIDERATIONS FOR EASE OF MAINTENANCE IN COMMUTER AIRCRAFT

M G FREEMAN (*Air Midwest, Inc., Wichita, KS*) *Society of Automotive Engineers, Commuter Aircraft and Airline Operations Meeting, Savannah, GA, May 24-26, 1982* 11 p (SAE PAPER 820722)

The operating environment of commuter aircraft and the consequences of that environment for aircraft maintenance are discussed. Commuters generally fly either a hub and spoke or a linear pattern, with spare parts stored at a single maintenance base. This system results in a higher cost per seat than for major air carriers. Improved access is the most important area for structural improvement in commuter aircraft. Maintenance manuals covering the repair and overhaul of mechanical components and containing a system test that can identify inoperative electrical or electronic components are suggested. Recommendations for improving cycle-sensitive items such as landing gear, airstair doors, steps, carpets, floors, and controls are also made. C D

A83-31813#

OPERATOR INFLUENCES ON AIRCRAFT DESIGN

J G BORGER (*American Helicopter Society and Helicopter Association International, Commercial Users Design Conference, Houston, TX, Nov. 4, 5, 1982*, Paper 8 p)

It is contended that the specifications for a new aircraft should originate with the manufacturer and should be developed jointly with the customer or customers until a mutually satisfactory definition of the aircraft is arrived at. If there are several customers, standardization should be the rule in selecting equipment. It is also stressed that customers should be made to understand when their expectations are technologically unrealistic. If a manufacturer makes promises which the company considering a purchase regards as extravagant, the company should ask that it be put in

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writing It is also advised that data from one manufacturer not be compared with those from another because each manufacturer has his own way of analyzing and presenting data For an accurate comparison, the customer should make his own evaluation Once design work begins, the customer should monitor the progress so that he will be prepared to help the designer in making a selection if there are alternative solutions C R

A83-32926

SOCIETY OF FLIGHT TEST ENGINEERS, ANNUAL SYMPOSIUM, 12TH, DAYTON, OH, SEPTEMBER 16-18, 1981, PROCEEDINGS Lancaster, CA, Society of Flight Test Engineers, 1981, 275 p

Trends in cost effectiveness, development testing, test technology, and test techniques in the area of flight test engineering are discussed The subjects addressed include a cost-effective quick response test station, reducing the cost for airborne instrumentation hardware testing, efficiency limits in flight development and certification, flight testing of the Hustler 500, airspeed calibrations on a stretch YC-141B aircraft, and flight test and predicted pressure data comparison on aircraft modifications Also considered are in-flight simulation of a digitally implemented direct force mode, sidestick controller design requirements, principal site testing of the F/A-18 at the Naval Air Test Center, use of simulated ice shapes in known icing certification, and the use of in-flight simulation by the US Air Force For individual items see A83-32927 to A83-32937 C D

A83-33095

BOEING VERTOL - THE LEADING EDGE OF TECHNOLOGY S WARTENBERG Vertiflite (ISSN 0042-4455), vol 29, May-June 1983, p 16-21

An assessment is presented of the development status of proprietary advanced helicopter technologies and future helicopter design configurations Attention is given to the 25-ft diameter glass and graphite fiber-reinforced composite tilt-rotor blades being designed for the XV-15 research aircraft in order to improve its performance in both the hover and fixed wing flight modes, the advanced digital/optical fiber helicopter control system concept, and a moving-base flight simulator which gives the pilot a more realistic sense of nap-of-the-earth flight The model 360 advanced technology helicopter also described will feature a composite primary structure, and an assessment is made of the performance gains obtainable from this design initiative O C

A83-33097

THE HISTORY OF V/STOL AIRCRAFT. II

J J SCHNEIDER (Boeing Vertol Co, Philadelphia, PA) Vertiflite (ISSN 0042-4455), vol 29, May-June 1983, p 36-43

A development history of experimental V/STOL aircraft from 1956 to the present is given, covering French, German, British and Soviet efforts in addition to the more numerous programs funded by the US Army, Navy, and Air Force The configurational classes which recur are those employing wing flap-deflected rotor slipstreams, tilting wing/nacelle structures tilting rotors, vertical axis ducted rotor platforms, turbojet exhaust-vectoring, and auxiliary lift-turbojets The tilt-rotor concept has been developed into the extensively tested, high performance XV-15 aircraft, whose configuration may be the most attractive basis for the fulfillment of the US armed forces' Joint Vertical Lift program specifications O C

N83-23268# Office of Science and Technology, Washington, D C

AERONAUTICAL RESEARCH AND TECHNOLOGY POLICY, VOLUME 2 Final Report

Nov 1982 665 p refs For Volume 1 see N83-17452 Avail NTIS HC A99/MF A01

Policy options on aeronautical research and technology (R&T) are reviewed including current and future needs, capabilities, and incentives in both government and private industry The evolution of the US aeronautics industry and the efforts of the foreign aeronautics industries, militarily and in the civil marketplace, are examined along with long range US military aeronautical needs,

projections of the worldwide civil aviation market, and potential benefits resulting from continued military and civil aeronautical R&T Within this framework, NASA's institutional role and current NASA/DOD programs and resources (facilities and manpower) are examined National goals, government and agency roles, and policy alternatives for operation of aeronautical facilities and dissemination and control of research results are recommended and discussed It is concluded that an advanced aeronautics capability is a unique and vital national and economic asset Military excellence in aeronautics, the significance of aviation in the national transportation system, and the position of civil transport aircraft in international marketing efforts, coupled with the foreign efforts in aviation, warrant government support for aeronautical R&T

J M S

N83-23269# Air Force Inst of Tech, Wright-Patterson AFB, Ohio School of Systems and Logistics
DECISION SUPPORT SYSTEMS: AN APPROACH TO AIRCRAFT MAINTENANCE SCHEDULING IN THE STRATEGIC AIR COMMAND M.S. Thesis

S B HACKETT and S E PENNARTZ Sep 1982 132 p refs (AD-A123039, AFIT-LSSR-42-82) Avail NTIS HC A07/MF A01 CSCL 05B

Maintaining increasingly complex Air Force weapon systems requires optimum use of all available resources Timely and accurate resource coordination is vital to ensure continuous mission capability, any improvement in coordination can produce an increase in readiness Essential to such resource coordination is the aircraft maintenance scheduling function at the unit level It is hypothesized that the application of computer technology to the maintenance scheduling decision process could result in improved maintenance resource allocation A promising tool for computer-aided scheduling exists, Decision Support Systems (DSS) are intended to combine the information storage and assimilation powers of the computer with the experienced judgement of the manager to produce more effective decisions The first requirement of a DSS is to model the current decision process, this research effort has generated a maintenance scheduling model of a SAC wing-level organization The architecture of the model is based on Integrated Computer-Aided Manufacturing (ICAM) technology, specifically incorporating the structure explained in the ICAM Definition (IDEFO) Function Modeling Manual GRA

N83-23271# Air Force Inst of Tech, Wright-Patterson AFB, Ohio School of Systems and Logistics

AIRCRAFT AVAILABILITY: AN ACQUISITION DECISION STRATEGY M.S. Thesis

L M DECKER and S J GUILFOOS Sep 1982 104 p refs (AD-A123060, AFIT-LSSR-14-82) Avail NTIS HC A06/MF A01 CSCL 01C

Technological complexity in today's USAF weapon systems coupled with the limiting maintenance factors of skilled manpower, ageing aircraft and overburdened logistics support systems have caused aircraft to spend more time in maintenance By increasing aircraft availability, through decreased maintenance time, additional sorties can be generated, thereby effectively increasing the number of available aircraft Based on A-10 aircraft data, this thesis determined the statistical significance of relating reduced maintenance time to increased availability Three measures of availability were investigated (1) number of sorties generated, (2) number of aircraft waiting to fly, and (3) calculated aircraft availability Secondly, this thesis quantified the relationship between increased availability and equivalent additional aircraft and investigated the possible use of this relationship as an acquisition decision strategy Author (GRA)

N83-23272# Air Force Inst of Tech, Wright-Patterson AFB, Ohio School of Systems and Logistics
AN ANALYSIS OF THE F-16 AIRCRAFT REQUIREMENTS GENERATION PROCESS AND ITS ADVERSE IMPACT ON CONTRACTOR RATE CAPACITY M.S. Thesis
 C M REYNOLDS, JR and R D SCHIKORA Sep 1982 120 p refs
 (AD-A123003, AFIT-LSSR-74-82) Avail NTIS HC A06/MF A01 CSCL 01C

The United States defense industry is experiencing frustration in agglomerating planned Department of Defense production requirements. One probable source of this frustration is inadequate requirement forecast consolidation by the Department of Defense. Several agencies within the Department of Defense are charged with procuring subassemblies and spares for major weapons systems. In the case of the United States Air Force F-16, the Air Force Logistics Command and the Air Force Systems Command are involved in formulation of production requirement forecasts, and may do so independent of one another. Defense suppliers are then subjected to a myriad of unconsolidated forecasts, none of which they can satisfy without significantly reducing their ability to fulfill other demand requirements. Methods, therefore, should be developed to improve the requirement forecast consolidation process. GRA

N83-24466* National Aeronautics and Space Administration, Washington, D C
AERONAUTICAL ENGINEERING. A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 160, APRIL 1983
 Apr 1983 124 p
 (NASA-SP-7037(160), NAS 1 21 7037(160)) Avail NTIS HC \$5 00 CSCL 01A

This bibliography lists 437 reports, articles and other documents introduced into the NASA Scientific and Technical Information System in March 1983. Author

N83-24468# Systems Technology, Inc, Hawthorne, Calif
PROPOSED MIL STANDARD AND HANDBOOK: FLYING QUALITIES OF AIR VEHICLES. VOLUME 1: PROPOSED MIL STANDARD Final Report, Apr. 1980 - Jul. 1982
 R H HOH, D G MITCHELL, I L ASHKENAS, R H KLEIN, R K HEFFLEY, and J HODGKINSON (McDonnell Aircraft Co)
 Wright-Patterson AFB, Ohio AFWAL Nov 1982 59 p
 (Contract F33615-80-C-3604, AF PROJ 2403)
 (AD-A123674, AFWAL-TR-82-3081-VOL-1) Avail NTIS HC A04/MF A01 CSCL 05B

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02

AERODYNAMICS

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

A83-30516
CALCULATION OF FUNDAMENTAL AERODYNAMIC DERIVATIVES OF AIRCRAFT. II

Z SKODA Zprava VZLU, vol Z-40, 1982, 11 p refs

On the basis of a novel theory of the interaction of lifting surfaces, a method is presented which approximates a continuous load by means of lifting lines and leads to the solution of a system of one-dimensional integral equations. A more general method is then introduced, based on the replacement of the continuous load by discrete forces, which yields the solutions of systems of algebraic equations. Together, the methods proposed make full use of the capabilities of state-of-the-art computers, yielding derivatives, by means of a uniform procedure, that could not otherwise be satisfactorily determined. A comparison of calculation results with experimental values demonstrate the faithfulness of the present theoretical view to actual flows over aircraft surfaces, within sufficiently wide limits of the variable parameters. O C

A83-30643
PREDICTION OF TURBULENT FLOWS - A BOEING VIEW

E TJONNELAND (Boeing Military Airplane Co, Seattle, WA) IN Conference on Complex Turbulent Flows Comparison of Computation and Experiment, Stanford, CA, September 14-18, 1981, Proceedings Volume 2 Stanford, CA, Stanford University, 1982, p 971-977 refs

The areas in which computational fluid dynamics (CFD) techniques are applicable in the field of aircraft design are discussed. Aircraft in the design processes are normally built up component-by-component, with integration of parts occurring only after parametric studies have defined fairly optimized individual parts. Rising costs in wind tunnel testing tend to constrain the number of integrated configurations which can be tested. CFD capabilities permit prediction of complex, three-dimensional, and viscous flows encountered by an aircraft. Simple inviscid and boundary-layer or thin-shear-layer models are employed in zonal modeling, wherein partially integrated components in a flow can be considered separately from the rest of the aircraft. The CFD methods involve mesh generation, turbulence modeling, modeling and test validation, and data handling and display steps. M S K

A83-30680
A STUDY OF HYPERSONIC LOW-DENSITY GAS FLOWS IN LOW-PRESSURE BLOWDOWN WIND TUNNELS USING PRESSURE TANKS [ISSLEDOVANIE GIPERZVUKOVYKH TECHENII GAZA NIZKOI PLOTNOSTI V BALLONNO-VAKUUMNOI AERODINAMICHESKOI TRUBE KRATKOVREMENNOGO DEISTVIA]

A S. KOROLEV IN Molecular gas dynamics Moscow, Izdatel'stvo Nauka, 1982, p 227-232 In Russian

An inexpensive low-pressure blowdown wind tunnel for studying low-density gas flows is proposed wherein the gas issues from pressure tanks into a vacuum cavity. In such a tunnel, the large pressure drop makes it possible to obtain hypersonic flows with large Mach numbers, and the use of compressed gas makes it possible to vary the Reynolds number over a wide range. The operation time of this type of tunnel is 0.5 s. V L

02 AERODYNAMICS

A83-30723

INVESTIGATION OF THE POSSIBILITY OF REDUCING AERODYNAMIC DRAG BY A MECHANISM OF INITIAL VORTEX FORMATIONS [ISSLEDOVANIE VOZMOZHNOСТИ SNIZHENIIA AERODINAMICHESKOGO SOPROTVIENIIA S POMOSHCH'IU MEKHAUZMA NACHAL'NYKH VIKHREOBRAZOVANII]

V N KALUGIN, O V KONONENKO (Akademiiia Nauk Ukrainiskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR), V B RIUTIN (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR), and V I SLIUSARENKO Vychislitel'naia i Prikladnaia Matematika (ISSN 0321-4117), no 48, 1982, p 114-119 In Russian refs

A theoretical study is presented of the possibility of modifying aerodynamic drag by the generation of vortices at the tip of a body of revolution which has a flow going longitudinally past it. The vortex generation produces a reduction in the velocity of the flow past the body, and consequently a reduction in the friction drag. The largest drag-reduction effect is achieved in the case of turbulent flow. The study is based on a mathematical model of flow along an axisymmetric body in the presence of a ring vortex.

B J

A83-31079#

AUTOROTATION

LUGT, H J (David W Taylor Naval Ship Research and Development Center, Bethesda, MD) IN Annual Review of Fluid Mechanics Volume 15 Palo Alto, CA, Annual Reviews, Inc, 1983, p 123-147 refs

The phenomenon of autorotation, i.e., the imparting of torque on a body at rest by fluid motion combined with the existence of potential positions where no torque will be applied is investigated. An initial impulse is necessary to begin the process, which continues in a periodic manner parallel to the flow. A steady-state strip theory is devised to account for autorotation and applied to the motions of a Lanchester propeller and a rotating wing. Attention is also given to autorotation in a direction perpendicular to the flow and analyses of a rotating dumbbell and a flat plate rotating perpendicular to the flow. Autorotation at an arbitrary angle to the flow is discussed and consideration is given to autorotation of a spinning and rolling aircraft and a finned missile. Finally, an analogy is drawn between autorotation and vortex-induced vibration.

M S K

A83-31082

LOW-REYNOLDS-NUMBER AIRFOILS

P B S LISSAMAN (AeroVironment, Inc, Pasadena, CA) IN Annual Review of Fluid Mechanics Volume 15 Palo Alto, CA, Annual Reviews, Inc, 1983, p 223-239 refs

The fluid mechanics, performance, and design of low-Reynolds number airfoils are described. The discussion is constrained to incompressible, two-dimensional flows. The controlling factor in low-Re airfoil performance is the separation resistance of the laminar boundary layer which forms over the top section of the airfoil. A laminar separation bubble, i.e., a turbulent boundary layer, forms at the trailing edge when separation occurs. Reattachment is rare below a chord Re of 70,000, while above that number a laminar bubble forms that leads to reattachment. The laminar bubble can be avoided at Re numbers higher than 200,000. Attempts to accelerate the flow transition to eliminate the bubble at lower Re by turbulating airfoil surfaces are outlined, together with wind tunnel testing procedures, theoretical design techniques, and airfoils used for particular purposes, such as doubling as solar cell mounts on the Solar Challenger solar-cell powered aircraft.

M S K

A83-31623

DEVELOPMENT OF TWO AIRFOIL SECTIONS FOR HELICOPTER ROTOR BLADES

K H HORSTMANN, H KOESTER (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Entwurfs-Aerodynamik, Brunswick, West Germany), and G POLZ (Messerschmitt-Boelkow-Blohm GmbH, Munich, West Germany) (European Rotorcraft Forum, 8th, Aix-en-Provence, France, Aug 31-Sept 3, 1982) Zeitschrift fuer Flugwissenschaften und Weltraumforschung (ISSN 0342-068X), vol 7, Mar-Apr 1983, p 82-91 refs

Two novel advanced airfoil profiles have been developed and investigated in wind tunnel tests, which answer mission requirements and blade section design objectives for helicopter rotors. The iterative design procedure employed consists of a subsonic design code and a transonic analysis code. The main results of the experimental tests conducted on the two new airfoil profiles, which have thickness-to-chord ratios of 0.09 and 0.12, are discussed in light of both the design calculations and test figures for comparable airfoils reported in the literature.

O C

A83-31975*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va

RESEARCH ON NON-PLANAR WALL GEOMETRIES FOR TURBULENCE CONTROL AND SKIN-FRICTION REDUCTION

J N HEFNER, D M BUSHNELL, and M J WALSH (NASA, Langley Research Center, Hampton, VA) US Air Force and Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Data Exchange Meeting on Viscous and Interacting Flow Field Effects, Goettingen, West Germany, May 25, 26, 1983, Paper 11 p refs

Eight turbulence-control/drag-reduction concepts under study at NASA Langley Research Center are discussed. These concepts include slot injection, ion wind, large-eddy breakup devices, riblets, relaminarization, convex curvature, passive porous walls, and rigid wavy walls. Of these concepts, passive porous walls and small wavelength wavy walls are found to increase drag. Riblets, slot injection, and large-eddy breakup devices reduce net turbulent drag, at least for some conditions. The ion wind, relaminarization, and convex curvature studies are still in the early stages and require further work to evaluate their applicability for drag reduction.

Author

A83-32514

EXPERIMENT OF A SHOCKLESS TRANSONIC AIRFOIL PARTIALLY MODIFIED FROM AN ARBITRARY AIRFOIL

M NAKAMURA (National Aerospace Laboratory, Chofu, Tokyo, Japan) Physical Society of Japan, Journal (ISSN 0031-9015), vol 51, Dec 1982, p 4084-4090 refs

An experiment is carried out on a transonic flow over an airfoil, which is partially modified from an arbitrary airfoil. The modification is made to satisfy the shockless condition predicted by the same author. Static pressures are measured at 88 points on the airfoil surface, when the Mach number at wind tunnel wall is about 0.5 - 0.8, the measuring angle of attack is about 0 deg - 4 deg and the Reynolds number is about 4.0 - 4.6 million. A shockless transonic flow is observed under a measuring condition close to the design condition. The supersonic region extends from 0.4 percent to 63 percent of airfoil chord length and the local maximum Mach number is 1.36. The results support that shockless airfoils can be designed by partial modifications of an arbitrary airfoil.

Author

A83-32583#

ALLEVIATION OF THE SUBSONIC PITCH-UP OF DELTA WINGS

D M RAO (Vigyan Research Associates, Inc, Hampton, VA) and T D JOHNSON, JR (Kentron International, Inc, Hampton, VA) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 530-535

Previously cited in issue 08, p 1178, Accession no A82-22052

A83-32584#

AN AXISYMMETRIC NACELLE AND TURBOPROP INLET ANALYSIS INCLUDING POWER SIMULATION

D P. GOLDEN, T J BARBER, and W C CHIN (United Technologies Corp., Pratt and Whitney Group, East Hartford, CT) *Journal of Aircraft* (ISSN 0021-8669), vol 20, June 1983, p 536-542 refs

Previously cited in issue 07, p 966, Accession no A82-19789

A83-32977*# MASSACHUSETTS INST. OF TECH, CAMBRIDGE AERODYNAMIC THEORY FOR WING WITH SIDE EDGE PASSING SUBSONICALLY THROUGH A GUST

R MARTINEZ and S E WIDNALL (MIT, Cambridge, MA) *AIAA Journal* (ISSN 0001-1452), vol 21, June 1983, p 808-815 refs (Contract NSG-2142)

An approximate solution for the unsteady loading near the square-shape tip of a wing passing through an oblique gust is obtained in closed form. The aerodynamic theory developed can be used to predict airloads felt by a helicopter blade experiencing a blade/vortex interaction for high blade tip speed and/or for small vertical blade/vortex separation. Under these conditions one can show that the blade's trailing edge has little influence on the character of the chordwise loading at all spanwise sections, thus, the chord may be allowed to extend to infinity in the downstream direction. Therefore, the model considered here is that of a quarter-infinite flat plate wing with side edge passing subsonically through an oblique gust. Author

A83-32982#

A MORE ACCURATE TRANSONIC COMPUTATIONAL METHOD FOR WING-BODY CONFIGURATIONS

L T CHEN (McDonnell Douglas Corp., St Louis, MO) *AIAA Journal* (ISSN 0001-1452), vol 21, June 1983, p 848-855 refs (Contract N000167-81-C-0057)

Previously cited in issue 06, p 797, Accession no A82-17815

A83-32986#

COMPRESSIBLE HELICOIDAL SURFACE THEORY FOR PROPELLER AERODYNAMICS AND NOISE

D B HANSON (Hamilton Standard Div., Design Dept., Windsor Locks, CT) *AIAA Journal* (ISSN 0001-1452), vol 21, June 1983, p 881-889 refs

Acceleration potential techniques from three-dimensional thin wing theory have been generalized for propeller and prop-fan analysis. Helicoidal reference surfaces take the place of the planar surface in wing theories, otherwise the theories are equivalent. The acoustic branch of the theory, including nonlinear source terms, extends and unifies frequency domain noise theories dating back to Gutin. For aerodynamic applications, it is shown that prop-fans satisfy well-known criteria for use of linearized theory at transonic speeds by virtue of small aspect ratio and small thickness ratio. The results are in the form of integral equations for downwash as functions of thickness and steady or unsteady loading distributions. For the case of no rotation, the kernel functions reduce to well-known kernels of wing theory. The analysis, within the restrictions of linearization, treats rigorously any planform and any flight condition including the combination of subsonic roots and supersonic tips typical of prop-fans. The effects of thickness, camber, angle of attack, sweep, offset, blade interference, and tip relief are all treated without approximation. Author

A83-33002

CERTAIN ASPECTS OF THE OPTIMUM DESIGN OF HYDRODYNAMIC LIFTING COMPLEXES [NEKOTORYE VOPROSY OPTIMAL'NOGO PROEKTIROVANIYA GIDRODINAMICHESKIKH NESUSHCHIKH KOMPLEKSOV]

A N PANCHENKOV IN *Perturbation methods in mechanics* Novosibirsk, Izdatel'stvo Nauka, 1982, p 3-29 In Russian refs

General problems of the optimum design of the lifting complexes of flight vehicles are discussed. In particular, consideration is given to the following problems: (1) maximization of aerodynamic characteristics, and (2) dynamic perfection of flight vehicles. A particular implementation of the dynamic perfection goal, i.e.,

optimum stabilization of a flight vehicle at a specified altitude, is discussed in detail. V L

A83-33003

THE PROBLEM OF AN OPTIMUM WING OF CONSTANT SEAWORTHINESS [ZADACHA OB OPTIMAL'NOM KRYLE S POSTOIANNOI MOREKHODNOST'IU]

A N PANCHENKOV, M N BORISIUK, and A M IANCHEVSKII IN *Perturbation methods in mechanics* Novosibirsk, Izdatel'stvo Nauka, 1982, p 29-46 In Russian refs

Three classes of problems concerning optimization of the aerodynamic shapes of lifting surfaces moving near a support surface are investigated. Particular attention is given to the problem of searching for the optimum curvature of the transverse axis of a wing in the case where a quantitative criterion of seaworthiness is an additional constraint. In the analysis, the area between the trailing edge of the wing and the screen or the volume under the dome are used as seaworthiness criteria. V L

A83-33004

SECOND APPROXIMATION OF QUADRUPOLE WING THEORY IN LIFTING SURFACE THEORY [VTOROE PRIBLIZHENIE KVADRUPOLO'NOI TEORII KRYLA V TEORII NESUSHCHEI POVERKHNOSTI]

R IU SHLAUSTAS IN *Perturbation methods in mechanics* Novosibirsk, Izdatel'stvo Nauka, 1982, p 56-69 In Russian refs

A method is proposed for refining the solutions of the quadrupole theory for a wing moving at a small distance from a limiting surface. In accordance with this method, the problem is reduced to that of solving differential equations with variable coefficients. The results obtained are also valid for moderate distances from the surface. In the case of small distances, the results are in good agreement with first-approximation solutions of quadrupole wing theory, for moderate distances, good agreement is obtained with solutions based on the functional parameter method. V L

A83-33005

A STUDY OF THE MOTION OF THIN-SECTION WINGS OF COMPLEX CONFIGURATIONS NEAR A SOLID SURFACE [ISSLEDOVANIE DVIZHENIYA TONKIKH KRYL'EV SLOZHNOI FORMY VBLIZI TVERDOI POVERKHNOSTI]

V M EZHOV IN *Perturbation methods in mechanics* Novosibirsk, Izdatel'stvo Nauka, 1982, p 69-75 In Russian refs

Equations for stationary flow past thin-section wings of complex configurations near a solid surface are obtained using the methods of the quadrupole wing theory proposed by Panchenkov (1974). Aerodynamic characteristics are calculated for several wing configurations of small and large aspect ratios. The results are presented in graphical form. V L

A83-33090#

METHOD OF CALCULATING OPTIMUM ANGULAR BLADE PITCHES IN FAN WITH UNEQUALLY PITCHED BLADES

Y. SEGAWA, K SHIOHATA, and F FUJISAWA (Hitachi, Ltd., Mechanical Engineering Research Laboratory, Hitachi, Ibaraki, Japan) *JSME, Bulletin* (ISSN 0021-3764), vol 26, March 1983, p 351-355 refs

A method of iteratively calculating the optimum angular pitches for blades of a high-speed fan with blades of unequal angular pitch is presented which permits the level of the tonal annoying noise in such a fan to be reduced. The method, which combines the influence coefficient and least-squares methods, makes the harmonic spectrum associated with the angular blade pitches to converge to a target harmonic spectrum. The level of the discrete frequency noise is emphasized. C D

02 AERODYNAMICS

A83-33161

REMARKS ON THE EVOLUTION OF METHODS OF CALCULATION FOR PROPELLERS AND ROTORS [REMARQUES SUR L'EVOLUTION DES METHODES DE CALCUL DES HELICES ET ROTORS]

R HIRSCH and T S LUU (CNRS, Laboratoire d'Informatique pour la Mecanique et les Sciences de l'Ingenieur, Orsay, Essonne, France) Association Aeronautique et Astronautique de France, Colloque d'Aerodynamique Appliquee, 19th, Marseille, France, Nov 8-10, 1982 31 p In French (AAAF PAPER NT 82-03)

The development of numerical models for airfoils used as propellers and/or rotor blades is traced. Airfoils were defined in the late 19th century as a curve tending toward the elliptical, and a blade is built up of equidistant profiles. The center of stress of the blade was found to be 2/3 of the distance out from the axle. Twist was also introduced in keeping with the imitation of bird feathers. The principles of the downstream turbulent wake and the actuator disk were established in the early 20th century. Von Karman discovered vortex sheets and the Biot-Savart law described the turbulent flow induced downstream of the rotating blades. Prandtl introduced the notion that blade lift can be calculated by the sum of the two-dimensional sections of the profiles. Fourier series describe the circulation distribution and the Cauchy integral sums the induced velocities. Optimization is carried out through a succession of approximations of partial derivatives of the induced velocities. The calculations have been extended to separated flows in the sonic regime and to rotating boundary layers. Modern calculations depend on use of computers for obtaining convergences of approximation equations. ONERA research on counter-rotating propfans is cited as an example. M S K

A83-33373#

TURBULENT BOUNDARY LAYER ASSOCIATED WITH PERIODIC ROTATING WAKES

Y YAMAMOTO, M INOUE, T IKUI (Kyushu University, Fukuoka, Japan), and F A-E ABD-ELKHALEK (Kyushu University, Faculty of Engineering, Memoirs (ISSN 0023-6160), vol 42, Dec 1982, p 279-316 refs)

The objective of this paper is to develop a better understanding of the nature of annulus wall boundary layer that is influenced by periodic disturbances of rotor wakes in an axial flow turbomachine. The mean and phase-locked measurements were made in the turbulent boundary layer on hub wall behind a rotor with circular cross-section blades. It was found that the periodic disturbances imposed by the rotor wakes cause a considerable deviation of the mean flow properties of the boundary layer from those of undisturbed boundary layer (natural turbulent boundary layer). This phenomenon is caused by interaction of the rotor wakes and the boundary layer which results in a secondary flow associated with redistribution process of kinematic energy. Introducing the periodic disturbances into the mean boundary layer equation, a term of unsteady force was included in the momentum integral equation. The effect of this term on the boundary layer development was discussed in comparison with the experimental results. Author

N83-23275*# Textron Bell Helicopter, Fort Worth, Tex
EFFECTS OF AERODYNAMIC INTERACTION BETWEEN MAIN AND TAIL ROTORS ON HELICOPTER HOVER PERFORMANCE AND NOISE

R P MENDER, T L WOOD, and J T BRIEGER Feb 1983 343 p refs (Contract NAS2-10771) (NASA-CR-166477, NAS 1 26 166477) Avail NTIS HC A15/MF A01 CSCL 01A

A model test was conducted to determine the effects of aerodynamic interaction between main rotor, tail rotor, and vertical fin on helicopter performance and noise in hover out of ground effect. The experimental data were obtained from hover tests performed with a 151 scale Model 222 main rotor, tail rotor and vertical fin. Of primary interest was the effect of location of the tail rotor with respect to the main rotor. Penalties on main rotor power due to interaction with the tail rotor ranged up to 3%

depending upon tail rotor location and orientation. Penalties on tail rotor power due to fin blockage alone ranged up to 10% for pusher tail rotors and up to 50% for tractor tail rotors. The main rotor wake had only a second order effect on these tail rotor/fin interactions. Design charts are presented showing the penalties on main rotor power as a function of the relative location of the tail rotor. S L

N83-23276# Advisory Group for Aerospace Research and Development, Paris (France) Fluid Dynamics Panel
WIND TUNNEL FLOW QUALITY AND DATA ACCURACY REQUIREMENTS

F STEINLE (NASA), E STANEWSKY (DFVLR-AVA), and R O DIETZ, ed Nov 1982 35 p refs (AGARD-AR-184, ISBN-92-835-1440-8) Avail NTIS HC A03/MF A01

Flow quality and data accuracy requirements for wind tunnel testing are discussed. The emphasis is on transonic test conditions. The current level of testing technology, the requirements for the future, and what needs to be done were considered. To aid in understanding the impact of flow quality and data accuracy, a detailed examination of their contributions to the test results of a transport-type configuration is included. The approach can be adapted to other types. The results of this effort correlate well with what is generally accepted. The result of this effort brought focus on the need to document the flow quality in each facility and that the measurements should include a standard set of both instrumentation and data reduction methods. Aside from the already well known need to improve angle of attack measuring capability, the need to understand the role of aero noise on Reynolds number effects was highlighted. S L

N83-23278# Von Karman Inst for Fluid Dynamics, Rhode-Saint-Genese (Belgium)

PRELIMINARY RESULTS OF LDV SURVEYS IN THE COMPRESSIBLE LEADING EDGE VORTEX OF A DELTA WING
G VORROPOULOS and J F WENDT Aug 1982 60 p refs (VKI-TN-137) Avail NTIS HC A04/MF A01

Preliminary laser Doppler velocimetry surveys were performed in the lee-side vortex field on an AR = 2 sharp leading edge delta wing at 10 deg incidence and in the Mach number range from 0.4 to 1.0. It was possible to measure three velocity components. Compressibility effects were detected in both the vortex core position and in the behavior of a velocity component approximating the axial one. The problems encountered and associated errors are discussed and suggestions for future work are made. M G

N83-23279# Societe Nationale Industrielle Aerospatiale, Toulouse (France) Direction Etudes

THE EPSILON PROTOTYPE CORKSCREW PHENOMENON [LE PHENOMENE TIRE-BOUCHON SUR LE PROTOTYPE DE L'EPSILON]

J IRVOAS 29 Sep 1982 31 p In FRENCH Presented at 19th Colloq d'Aerodyn Appl, Marseille, 8-10 Nov 1982, Sponsored by Association Aeronautique et Astronautique de France (SNIAS-822-111-101) Avail NTIS HC A03/MF A01

The prototype Epsilon was subject to oscillation, which occurred under large sideslip, longitudinal and lateral oscillations coupled together. It was due to a conjunction of circumstances among them, the action of the propeller slipstream. Author

N83-23280# Aeronautical Research Inst. of Sweden, Stockholm. Dept. of Aerodynamics.

AN EXPERIMENTAL INVESTIGATION OF THE INFLUENCE FROM CONTROLS ON SUPERSONIC AXISYMMETRIC FLOW OVER AFTERBODIES WITH A CENTERED PROPULSIVE JET

J AGRELL Nov 1982 44 p refs
(Contract FMV-F-FL-81713-74-013-07-001, FMV-F-FL-82223-76-001-21-001)
(FFA-TN-1982-50) Avail NTIS HC A03/MF A01

Wind tunnel tests of the influence from controls on the pressure distribution on one cylindrical and two conical afterbodies were made at free stream Mach number 2.0 and zero angle of attack. A propulsive air jet with an exit Mach number 2.5 forced the flow to separate from the afterbody for high jet pressures. The results are presented in tabular form and as plotted pressure distributions which also were integrated to give the drag and the side force. The flow separation is studied from the pressure distribution as well as from selected oil flow and Schlieren photographs. The influence of deflected controls is large on the afterbody pressure distribution, on the location of the jet induced separation and on the level and the circumferential distribution of the base pressure.

Author

N83-24471*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
LOADS AND PERFORMANCE DATA FROM A WIND-TUNNEL TEST OF MODEL ARTICULATED HELICOPTER ROTORS WITH 2 DIFFERENT BLADE TORSIONAL STIFFNESSES

W T YEAGER, JR and W R MANTAY Apr 1983 322 p refs
(NASA-TM-84573, L-15507, NAS 1 15 84573, AVRADCOM-TR-82-B-9) Avail NTIS HC A14/MF A01 CSCL 01A

A passive means of tailoring helicopter rotor blades to improve performance and reduce loads was evaluated. The parameters investigated were blade torsional stiffness, blade section camber, and distance between blade structural elastic axis and blade tip aerodynamic center. This offset was accomplished by sweeping the tip. The investigation was conducted at advance ratios of 0.20, 0.30, and 0.40. Data are presented without analysis, however, cross referencing of performance data and harmonic loads data may be useful to the analyst for validating aeroelastic theories and design methodologies as well as for evaluating passive aeroelastic tailoring or rotor blade parameters.

M G

N83-24472*# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
TRENDS OF REYNOLDS NUMBER EFFECTS ON TWO-DIMENSIONAL AIRFOIL CHARACTERISTICS FOR HELICOPTER ROTOR ANALYSES

G K YAMAUCHI and W. JOHNSON Apr 1983 45 p refs
(NASA-TM-84363, A-9343; NAS 1 15 84363) Avail NTIS HC A03/MF A01 CSCL 01A

The primary effects of Reynolds number on two dimensional airfoil characteristics are discussed. Results from an extensive literature search reveal the manner in which the minimum drag and maximum lift are affected by the Reynolds number. $C_{sub d}$ and $C_{sub l}$ are plotted versus Reynolds number for airfoils of various thickness and camber. From the trends observed in the airfoil data, universal scaling laws and easily implemented methods are developed to account for Reynolds number effects in helicopter rotor analyses.

S L

N83-24473*# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
THE EFFECT OF ASYMMETRIC ATTACK ON TRIM ANGLE OF ATTACK

R. L. KRUSE May 1983 16 p refs
(NASA-TM-84309, A-9164, NAS 1 15 84309) Avail NTIS HC A02/MF A01

Ballistic range tests were conducted to determine the effect of an asymmetrically ablated heat shield on the trim angle of attack of an entry vehicle. The tests, which were in support of Project

Galileo, were conducted in atmospheric air at Mach numbers from 0.7 to 2.0. For the results for the configuration that was tested, the deduced trim angle varied between 13 deg and 21 deg.

Author

N83-24474*# Universities Space Research Association, Columbia, Md
IMPROVED DESIGN OF SUBCRITICAL AND SUPERCRITICAL CASCADES USING COMPLEX CHARACTERISTICS AND BOUNDARY LAYER CORRECTION Final Report

J M SANZ May 1983 16 p refs
(Contract NAS3-22531)
(NASA-CR-168166, NAS 1 26 168166) Avail NTIS HC A02/MF A01 CSCL 01A

The method of complex characteristics and hodograph transformation for the design of shockless airfoils was extended to design supercritical cascades with high solidities and large inlet angles. This capability was achieved by introducing a conformal mapping of the hodograph domain onto an ellipse and expanding the solution in terms of Tchebycheff polynomials. A computer code was developed based on this idea. A number of airfoils designed with the code are presented. Various supercritical and subcritical compressor, turbine and propeller sections are shown. The lag-entrainment method for the calculation of a turbulent boundary layer was incorporated into the inviscid design code. The results of this calculation are shown for the airfoils described. The elliptic conformal transformation developed to map the hodograph domain onto an ellipse can be used to generate a conformal grid in the physical domain of a cascade of airfoils with open trailing edges with a single transformation. A grid generated with this transformation is shown for the Korn airfoil.

S L

N83-24478*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
EFFECTS OF TWIN-VERTICAL-TAIL PARAMETERS ON TWIN-ENGINE AFTERBODY/NOZZLE AERODYNAMIC CHARACTERISTICS

L D LEAVITT and E A BARE May 1983 106 p refs
(NASA-TP-2158, L-15570, NAS 1 60 2158) Avail NTIS HC A06/MF A01 CSCL 01A

The Langley 16-foot transonic tunnel was used to determine the effects of several empennage and afterbody parameters on twin-engine aft-end aerodynamic characteristics. Model variables included twin-vertical-tail cant angle, toe angle, airfoil camber, and root-chord length and afterbody/engine interfering shape. Tests were conducted over a Mach number range from 0.6 to 1.2 and over an angle-of-attack range from 2 deg to 10 deg. Nozzle pressure ratio was varied from 1.0 (jet off) to approximately 10.0.

Author

N83-24479*# Boeing Commercial Airplane Co., Seattle, Wash
AEROELASTIC LOADS PREDICTION FOR AN ARROW WING. TASK 3: EVALUATION OF THE BOEING THREE-DIMENSIONAL LEADING-EDGE VORTEX CODE Final Report

M E MANRO Washington NASA Apr 1983 216 p refs
(Contract NAS1-15678)
(NASA-CR-3642, NAS 1 26 3642, D6-51762-3) Avail NTIS HC A10/MF A01 CSCL 01A

Two separated flow computer programs and a semiempirical method for incorporating the experimentally measured separated flow effects into a linear aeroelastic analysis were evaluated. The three dimensional leading edge vortex (LEV) code is evaluated. This code is an improved panel method for three dimensional inviscid flow over a wing with leading edge vortex separation. The governing equations are the linear flow differential equation with nonlinear boundary conditions. The solution is iterative, the position as well as the strength of the vortex is determined. Cases for both full and partial span vortices were executed. The predicted pressures are good and adequately reflect changes in configuration.

S L

02 AERODYNAMICS

N83-24480# European Space Agency, Paris (France)
DEVELOPMENT OF THE FLOW FIELD IN STREAMWISE CORNERS AT HYPERSONIC SPEEDS AND EFFECTS OF THE CORNER FLOW ON DOWNSTREAM FITTED FLAPS Ph.D. Thesis - Rhenish-Westphalian Tech. Coll. Aix-la-Chapelle
H J SCHEPERS Dec 1982 114 p refs Transl into ENGLISH from "Ausbildung des Stromungsfeldes in laengsangestromten Ecken und Auswirkungen auf stromabwaerts angeordnete Klappen bei Hyperschallanstromung" DFVLR, Cologne Rept DFVLR-FB-78-23, Aug 1978 (ESA-TT-583, DFVLR-FB-78-23) Avail NTIS HC A06/MF A01, original report in GERMAN available from DFVLR, Cologne DM 49,80

A description is given of the results obtained from investigations carried out on three different configurations of streamwise corners. The experiments were conducted at a free stream Mach number of $M = 8.8$ and a Reynolds number of $Re/m = 4,566,000$ in the hypersonic wind tunnel. The pitot pressure, static pressure and total temperature in the flow field were measured, so that it was possible to determine the essential flow quantities. A semi-empirical analysis drawn up on the basis of known shock relations revealed that the state variables behind curved secondary shocks coincide nearly with the experimental results. The major characteristics of the near to wall flow were both pointed out and explained in the corner by making the wall streamlines visible and by measuring the heat transfer and static pressure at the wall. An approximate correlation was achieved between the calculation and the experiment in the estimation of the influences on the rudder efficiency produced by the corner flows. S L

N83-24482# Flow Research, Inc., Kent, Wash Research and Technology Div
CALCULATION OF TRANSONIC POTENTIAL FLOW AROUND A WING-BODY-TAIL COMBINATION Final Report, 7 May 1980 - 30 Sep. 1981
J MERCER, W H JOU, and M JOHNSON Apr 1982 39 p refs
(Contract N00014-80-C-0453)
(AD-A124247, FR-227) Avail NTIS HC A03/MF A01 CSCL 20D

An embedded mesh system for transonic flow analysis is described. The method has been applied to the finite-volume potential flow calculation of flows around wing-body-tail configurations. A local C-type mesh is fitted to a horizontal tail mounted on a wing-body around which a wraparound c-type mesh has also been used. Sample calculations for a modified A-7 configuration and another wing-body-tail configuration are given. The results show rapid convergence and excellent details of pressure distribution over the entire configuration in both cases. Author (GRA)

N83-24483# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio School of Engineering
COMPUTER PREDICTION OF STORE AERODYNAMIC LOADING DURING SEPARATION M.S. Thesis
A C POWELL Dec 1982 180 p refs
(AD-A124693, AFIT/GAE/AA/82D-22) Avail NTIS HC A09/MF A01 CSCL 09B

An advanced fighter design is modeled using the Nielsen store separation and trajectory program with the non-circular fuselage cross section option. The theory required to build the computer model is consolidated for better understanding, with the major points referenced to the appropriate report. The details of the process to generate the computer model are described. The computer model of the aircraft and ogive store is used to predict store forces and moments which are compared with wind tunnel results on the same configuration. The prediction accuracy, at Mach number 0.6, at a store position of three store diameters away from the aircraft, is within ten percent of experiment in the region of interest, which is the area under that portion of the fuselage occupied by the wing. Author (GRA)

N83-24486# Sandia Labs, Albuquerque, N Mex Parachute Systems Div
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE REDUCTION IN PARACHUTE DRAG CAUSED BY FOREBODY WAKE EFFECTS: DATA COMPILATION AND PROGRAM SUMMARY

C W PETERSON and D W JOHNSON Nov 1982 43 p refs

(Contract DE-AC04-76DP-00789)

(DE83-005364, SAND-81-0510) Avail NTIS HC A03/MF A01

An experiment was conducted to evaluate approximate analytical methods for predicting the reduction in parachute drag caused by forebody wake effects. The drag of a 200 conical ribbon parachute was measured at several axial stations behind an ogive cylindrical forebody with and without fins. The same parachute was tested in undisturbed flow (where wake effects were negligible) so that the effects of suspension line length on parachute drag could be separated from the drag losses caused by the turbulent wake. Total head pressure surveys were made across the forebody wake and integrated across the canopy skirt area to determine the effective dynamic pressure acting on the parachute. Experimental results confirmed the validity of the underlying physical model of the parachute/wake interaction: the ratio of parachute drag behind a forebody divided by wake-free parachute drag is equal to the ratio of effective dynamic pressure acting on the parachute divided by free-stream dynamic pressure. DOE

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations, and aircraft accidents

A83-31588#

CRASHING FOR SAFETY

Mechanical Engineering (ISSN 0025-6501), vol 105, May 1983, p 46-53

The general aviation aircraft crash dynamics test program being performed by NASA for the FAA is described. Light aircraft are instrumented, attached to cables, hoisted into the air, swung back, and allowed to swing forward until released to crash in front of a marked-grid background. The gantry that lifts the aircraft was formerly used for the Apollo Lunar Module trainer for landing simulation. Instrumentation for the crash specimens include accelerometers and high speed photography. The tests have been oriented toward the types of accidents that occur near airfields in take-off and landing. The aircraft subfloor and the seats have been shown to be the critical aircraft components relative to occupant safety, with vertical loading being the dominant parameter. An Impact Dynamics analytical program has been developed and is available to manufacturers and designers. Altering the subfloor supports so that they would collapse in a controlled manner is recommended for improving small aircraft crashworthiness. M S

A83-32936

USE OF SIMULATED ICE SHAPES IN KNOWN ICING CERTIFICATION

P M STERLING (Piper Aircraft Corp., Santa Maria, CA) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 17-1 to 17-24 refs

The methodology used in developing the simulated ice shapes used for aircraft icing certification tests is addressed. The calculations which show how much ice will accumulate on the unprotected flight surfaces in a given period of time, and what areas of a surface will be covered with ice, are presented. The selection of critical conditions for establishing ice shapes are discussed, including the mission profile and the determination of the most critical FAR 25 Appendix C environmental parameters.

Sample results are obtained for OAT, droplet size, continuous maximum, and intermittent maximum at 4000 ft and 7000 ft. Icing conditions for an enroute segment, departure segment, and arrival segment are obtained. The process used in building ice shapes is summarized, and the process and results of clear air testing and natural encounter tests are discussed. C D

A83-33355#
INTERACTION OF THE SMALL COMMUTER OPERATION WITHIN THE HUB TERMINAL

A R KUHLTHAU (Virginia, University, Charlottesville, VA) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 8 p (AIAA PAPER 83-1584)

There are a large number of communities in the US which have no regularly scheduled air service. Another large group have only limited total service, or have certain submarkets which enjoy little or no service. Attention is given to the interaction points at a hub terminal for a small commuter airline entering such a terminal for the first time. In particular, the scenario of a newly formed commuter airline providing the only air service to a local community is considered. Passenger satisfaction with new airline service and the financial strain on the commuter's resources are the two major issues involved. It appears that the best option for the commuter operator would be to have the hub operations performed under contract with one of the major national carriers serving the hub. However, good communications must be maintained so that the commuter passengers retain the perception that they are receiving the personal attention they have come to expect from a local airline. G R

A83-33358#
CRAF TODAY - AN AIRLINE PERSPECTIVE

H K HOWARD (Transamerica Airlines, Inc., Oakland, CA) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 4 p (AIAA PAPER 83-1589)

The experience of World War II, the Berlin Airlift, and the Korean conflict proved the extreme importance of the use of US civil carriers' aircraft during wartime or in emergency situations. It was recognized that a preplanned use of civil air carrier assets for future contingencies would be a helpful supplement to the overall US Air Force airlift capability. In this connection, the Civil Reserve Air Fleet (CRAF) program was formally established in 1952. A strategic mobility capability can be of critical importance. There are two options to provide it. According to one, vast amounts of money must be spent to provide a massive fleet for transport aircraft for the military. In connection with the second option, a mix is to be provided of organic military airlift capability and civil carrier capability. G R

A83-33359#
ADVANCED CIVIL MILITARY AIRCRAFT - TECHNICAL FEASIBILITY ASSESSMENT

S L BROWN and G T ESTILL (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 9 p (AIAA PAPER 83-1592)

Designs proposed for a large cargo aircraft (the Advanced Civil Military Aircraft or ACMA) for USAF and commercial use are evaluated in terms of technology and cost-effectiveness. Military requirements are determined by minimum payload size, by fueling restrictions for NATO, general-long-range, and emergency-deployment missions, and by economy of peacetime subcapacity operation. Commercial viability is dependent on shorter-distance fuel economy and on maintenance costs. Commercial acceptance of the ACMA is considered essential to ensure a sufficiently large Civil Reserve Air Fleet. From the analysis of current and prospective technological options in terms of these requirements, an optimal design is selected: a standard-configuration aircraft of about the same size and payload as the current C-5A but utilizing low-risk advanced technology in

the areas of structural materials, engine thrust, and supercritical aerodynamics to decrease gross weight and increase range by almost one third. It is predicted that such a design for ACMA could be operational by 1995. T K

A83-33360*# Massachusetts Inst. of Tech., Cambridge
THE FUTURE OF THE U.S. AVIATION SYSTEM

R A AUSROTAS (MIT, Cambridge, MA) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 9 p refs (Contract NAS1-15268) (AIAA PAPER 83-1594)

The growth of the aviation system of the US over the last twenty years is described. Long-term and short-term causes of air travel are analyzed, showing the interaction of economic activity, airline yields and quality of service. Future trends in general aviation, aircraft technology, and telecommunications are described. Potential future scenarios for the airline industry are presented. Author

A83-33366*# National Aeronautics and Space Administration
 Langley Research Center, Hampton, Va
NASA TECHNOLOGY PROGRAM FOR FUTURE CIVIL AIR TRANSPORTS

H T WRIGHT (NASA, Langley Research Center, Hampton, VA) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 10 p refs (AIAA PAPER 83-1603)

An assessment is undertaken of the development status of technology, applicable to future civil air transport design, which is currently undergoing conceptual study or testing at NASA facilities. The NASA civil air transport effort emphasizes advanced aerodynamic computational capabilities, fuel-efficient engines, advanced turboprops, composite primary structure materials, advanced aerodynamic concepts in boundary layer laminarization and aircraft configuration, refined control, guidance and flight management systems, and the integration of all these design elements into optimal systems. Attention is given to such novel transport aircraft design concepts as forward swept wings, twin fuselages, sandwich composite structures, and swept blade propfans. O C

A83-33368#
SHORT HAUL TECHNOLOGY - REFINING THE TURBOPROP

M C W DAVY (DeHavilland Aircraft of Canada, Ltd., Downsview, Ontario, Canada) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 4 p (AIAA PAPER 83-1606)

The DASH 8 aircraft, which has evolved from its four-engine predecessor the DASH 7, is used as a baseline in connection with an attempt to forecast developments with respect to future turboprop refinement. By comparison with an equivalent jet the turboprop is slower, a disadvantage which is compensated by a markedly superior fuel economy. The escalation in fuel prices brought added value to the turboprop and provided motivation for introducing refinements with the objective to exploit its advantage to the maximum. A reduction of fuel prices, on the other hand, promotes refinements aimed at reducing the gap in cruising speed which the jet employs. It is concluded that the future of the advanced turboprop appears to be assured in connection with the combined forces of deregulation and fuel price increase. Modern turboprop engines and advanced propellers are available to permit efficient reengineering of and growth of existing small transport to meet immediate operator needs. Larger turboprop engines are planned. G R

03 AIR TRANSPORTATION AND SAFETY

A83-33369#

OVERVIEW OF THE AIR CARGO INDUSTRY

M K GAMBLE (U S Congress, Office of Technology Assessment, Washington, DC) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 4 p refs
(AIAA PAPER 83-1607)

This paper reviews how three major aspects of the air cargo industry have changed since deregulation. First, deregulation freed carriers from rate and route regulation. Distinctions which regulation maintained between different classes of service providers have begun to disappear. There has been a trend toward multi-modal integration. Second, the rate structure has changed, with carriers and forwarders offering consumers a wider variety of price-service combinations. At the same time, price competition, some would even say price warfare, is keeping earnings low. Finally, since deregulation there have been some changes in route structures, including a trend toward developing hub and spoke networks with centralized sorting hubs. Author

A83-33370#

AIRCRAFT DESIGN TRENDS FOR CARGO COMPATIBILITY

H F MORRISON, JR (Douglas Aircraft Co., Long Beach, CA) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 9 p refs
(AIAA PAPER 83-1609)

An evaluation is conducted of commercial transport aircraft with respect to design trends which might enhance their cargo compatibility. This is done by examining the primary cargo-related requirements against which cargo aircraft are evaluated, determining the degree of aircraft and cargo compatibility, and determining whether there are design trends which might enhance or detract from cargo compatibility. Air cargo characteristics are considered along with unit load device characteristics, loaded density characteristics, and cargo aircraft characteristics. On the basis of the evaluation it is concluded that it is not very likely that this century will see the operation of giant commercial cargo carriers airlifting million-pound payloads. It is rather to be expected that 747 freighters or further derivatives of them will meet the heavy lift requirements, while narrow-body derivative freighters will satisfy the low lift requirements. G R

A83-33371#

AIRPORT - AIR CARGO COMPATIBILITY

L D COX (Memphis-Shelby County Airport Authority, Memphis, TN) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 5 p
(AIAA PAPER 83-1610)

A review is conducted regarding the compatibility of air cargo operations from the viewpoint of an airport operator. The development of air cargo facilities on airports is considered, giving particular attention to the Memphis International Airport in Memphis, Tennessee. It is pointed out that Memphis is unique in that it is the headquarters and operations hub for Federal Express, the airline which has done more to change the air cargo business than any other carrier in the last ten years. An attempt is made to explain Federal Express operations at the Memphis airport in some detail, and some of the resulting compatibility problems and opportunities are discussed. G R

N83-23281*# Toledo Univ., Ohio Dept of Chemical Engineering

NUMERICAL SIMULATION OF AN ELECTROTHERMAL DEICER PAD M.S. Thesis. Final Report

J J MARANO Mar 1983 113 p refs
(Contract NAG3-72)

(NASA-CR-168097, NAS 1 26 168097) Avail NTIS HC A06/MF A01 CSCL 01C

A numerical simulation is developed to investigate the removal of ice from composite aircraft blades by means of electrothermal deicing. The model considers one dimensional, unsteady state

heat transfer in the composite blade-ice body. The heat conduction equations are approximated by using the Crank-Nicolson finite difference scheme, and the phase change in the ice layer is handled using the Enthalpy method. To solve the system of equations which result, Gauss-Seidel iteration is used. The simulation computes the temperature profile in the composite blade-ice body, as well as the movement of the ice-water interface, as a function of time. This information can be used to evaluate deicer performance. The simulation can also be used to solve a variety of other heat conduction problems involving composite bodies. Author

N83-23282# Radio Technical Commission for Aeronautics, Washington, D C

EMERGENCY LOCATOR TRANSMITTER (ELT) EQUIPMENT INSTALLATION AND PERFORMANCE

Nov 1982 154 p refs

(RTCA/DO-182) Avail NTIS HC A08/MFA01, Also available from Radio Technical Commission for Aeronautics Secretariat, One McPherson Square, Suite 500, 1425 K Street, N W, Washington, D C 20005 at \$16 00 per copy

Analysis of field data on emergency locator transmitter (ELT) performance, including false alarms, ELT deactivation and post-crash evaluation of ELT effectiveness, ELT placement, which includes mounting and activation studies, and ELT system performance, which includes the crash force sensor, batteries, electronics, antenna and the performance of the search aircraft's receiver are investigated. Author

N83-23283# Duesseldorf Univ (West Germany) Geographischen Inst

THE FLOW OF AIR-PASSENGER TRAFFIC IN THE FEDERAL REPUBLIC OF GERMANY WITH EMPHASIS ON AIRPORTS AND THEIR HINTERLAND

J E SIEBECK Jun 1981 238 p refs /n GERMAN, ENGLISH and FRENCH summaries

(GEOGRAPHISCHE-SCHRIFTEN-18) Avail NTIS HC A11/MF A01

The development of the geography of air transport and its evolution from transportation science and analysis of the passenger flows in the Federal Republic of Germany is reviewed. Passenger traffic through airports of origin and destination for the years 1971 and 1977 was calculated. The passenger/population ratios of the rural districts are compared with socioeconomic indicators of the same administrative units by correlation and regression analysis. The mapping of the residuals from the multiple regression shows a strong distance decay influence on the intensity of air traffic. The distribution of the air passengers at the different airports by origin and the number of regional air passengers at the airport for 1971 and 1977 are shown. The catchment areas of airports are the dynamic areal structures dependent on various factors. The evolution of traffic patterns reflects the different areal definitions of the catchment areas of airports. E A K

N83-23284# Magnavox Government and Industrial Electronics Co., Mahwah, N J Electro-Optical Systems

CABLE AVOIDANCE STUDY Final Technical Report, 23 Sep. 1981 - 29 Oct. 1982

R HERMES 29 Oct 1982 39 p

(Contract DAAK70-81-C-0177)

(AD-A122917, EOSR-839) Avail NTIS HC A03/MF A01 CSCL 01D

The problem of real-time wire extraction from video scenes for helicopter navigation is addressed. A combination of semi-linear local line detectors and semi-local line discriminators is developed to optimize detection and false alarm rejection. While the results are quite good, further software development is indicated to improve both detection and noise rejection for pilot displays. Two directions for further development are suggested. A video tape demonstration of the current algorithm applied to scenes containing cables accompanies this report. Author (GRA)

AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

A83-30275**AIR TRAFFIC CONTROL INTO THE 21ST CENTURY**

J L HELMS (FAA, Washington, DC) Aerospace (UK) (ISSN 0305-0831), vol 10, April 1983, p 16-20, 22, 23

The National Airspace System Plan developed by the FAA is described. The plan is designed to accommodate projected growth in US demand for ATC services, place minimum constraints on operators, improve dissemination of weather and traffic information, and increase system productivity. Its major elements, to be phased in by 1993, are discussed in detail: ATC automation including improvements in Conflict Alert IFR/VFR Mode C Intruder, Conflict Resolution Advisories, En Route Metering, and the ARTS terminal automation system, followed by replacement of the computer hardware and software and implementation of Automated En Route ATC, integrated flow management, automation of FSSs, improvements in aircraft separation assurance (Traffic Alert and Collision Avoidance System and Mode S enhancement of the ATC Radar Beacon System), modernization of the weather system (development of Doppler weather radar system and Center Weather Processor), improvements in the communications system (National Airspace Data Interchange Network and Voice Switching and Control System), streamlining of navigation services and assessment of self-continued navigation systems, implementation of Microwave Landing System and improvements in airport capacity utilization

T K

N83-23287# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France)

AUTOMATIC LANDING IN BAD WEATHER CONDITIONS

Y NEGRE 1982 26 p

(SNIAS-822-111-106) Avail NTIS HC A03/MF A01

The use of automatic landing has developed considerably, with the objective of reducing meteorological minima in order to increase flight regularity. At the present time, most systems are limited to values of mean wind announced by the control tower, which does not allow the system to be used in very rough weather, the pilot thus has to manage by himself. An interesting course is to promote automatic landing in all weather conditions, including very high wind. This course was opened up by Lockheed on the L 1011 which is equipped with a system called direct lift control which acts directly on the lifting surfaces and enables the aircraft to contend with turbulence and windshear far more efficiently.

Author

N83-23288# Federal Aviation Administration, Washington, D C Systems Research and Development Service

THE 3RD TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS) SYMPOSIUM

1982 313 p Symp held in Washington, D C, 12-13 Oct 1982

(AD-A123037, DOT/FAA/RD-82/75) Avail NTIS HC A14/MF A01 CSCL 17G

The Federal Aviation Administration held its third symposium on Traffic Alert and Collision Avoidance System (TCAS) in Washington, D C, October 12-13, 1982, which was attended by representatives of organizations and airlines. This report contains twelve technical presentations describing the progress of the TCAS program. The TCAS will provide a range of capabilities and costs which will meet the requirements of all airspace users.

Author (GRA)

N83-23285# Air Force Systems Command, Eglin AFB, Fla. Test Track Div

EJECTION SEAT TESTING FOR FEMALES Final Report, Nov. 1981 - Mar. 1982

C D GRAGG, C B EVANS, and W L GILLIAM 1 Nov. 1982 23 p refs

(Contract AF PROJ 9993)

(AD-A122870, AD-TR-82-68) Avail NTIS HC A02/MF A01

CSCL 01C

Anthropometric data from a recent survey of female pilots was analyzed and compared with available DoD anthropometric surveys. The comparison showed the two populations to be of different distributions, pointing out the deficiency in using the DoD survey in designing escape system tests covering female aviators. Further, analysis of two existing anthropometric surveys of male aviators taken in 1950 & 1967 found a considerable change in seventeen years, indicating a need for a new survey of the contemporary population. Recommendations were made to change Military Standards and Specifications on ejection system and ejection systems testing to reflect inclusion of female aviators.

Author (GRA)

N83-24488*# Lockheed-California Co., Burbank

ANALYTICAL MODELING OF TRANSPORT AIRCRAFT CRASH SCENARIOS TO OBTAIN FLOOR PULSES Technical Report, Nov. 1981 - Jul. 1982

G WITTLIN and D LACKEY Apr 1983 196 p refs

(Contract NAS1-16083)

(NASA-CR-166089, NAS 1 26 166089, FAA-CT-83-23, LR-30141)

Avail. NTIS HC A10/MF A01 CSCL 01C

The KRAS program was used to analyze transport aircraft candidate crash scenarios. Aircraft floor pulses and seat/occupant responses are presented. Results show that (1) longitudinal only pulses can be represented by equivalent step inputs and/or static requirements, (2) the L1649 crash test floor longitudinal pulse for the aft direction (forward inertia) is less than 9g static or an equivalent 5g pulse, aft inertia accelerations are extremely small ((ch76) 3g) for representative crash scenarios, (3) a viable procedure to relate crash scenario floor pulses to standard laboratory dynamic and static test data using state of the art analysis and test procedures was demonstrated, and (4) floor pulse magnitudes are expected to be lower for wide body aircraft than for smaller narrow body aircraft.

A R H

N83-24489# Civil Aeromedical Inst., Oklahoma City, Okla
CRASH INJURY PROTECTION IN SURVIVABLE AIR TRANSPORT ACCIDENTS: UNITED STATES CIVIL AIRCRAFT EXPERIENCE FROM 1970 THROUGH 1978 (INCOMPLETE) Final Report

R. F CHANDLER, D W POLLARD, L. M NERI, and C A CAIAFA Atlantic City Mar 1983 133 p refs

(FAA-CT-82-118) Avail NTIS HC A07/MF A01

Twenty-seven survivable ground accidents and 3 inflight accidents occurring from 1970 through 1978 were reviewed. Twenty-five of the ground accidents and all of the inflight accidents involved reports of seat or restraint performance. Comparisons of injury and fatality rates are made with studies involving earlier model aircraft accidents.

Author

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

N83-23289# Naval Research Lab, Washington, D C Radar Analysis Branch
CRAB ANGLE ESTIMATION WITH TWO DIMENSIONAL CROSS CORRELATIONS AND CENTROIDS Final Report
W B GORDON 14 Dec 1982 19 p refs
(AD-A122872, AD-E000517, NRL-MR-4986) Avail NTIS HC A02/MF A01 CSCL 171

This study is concerned with a high range resolution radar system for measuring the crab angle of landing aircraft Previous attempts to measure the crab angle by means of one dimensional cross correlation techniques had proved to be unsuccessful, and the data from flight tests was examined to determine whether accurate estimates could be obtained by using two dimensional cross correlation techniques and centroids Hundreds of different types of estimators were examined, each one corresponding to different possibilities for data smoothing, data weighting, thresholding, and outlier removal, however, none of these methods produced satisfactory results The probable cause for the poor performance was determined to be a lack of similarity in the returns from the two radars used in the system The dissimilarity between the two returns was apparently caused by range differentials, aircraft roll, as well as the crab angle itself GRA

N83-23290# Aeronautical Research Labs, Melbourne (Australia) Systems Dept
AN ANALYTICAL EVALUATION OF THREE VISUAL APPROACH SLOPE INDICATORS Interim Report
J MILLAR Oct 1982 17 p refs
(AD-A122973, ARL/SYS-TM-65) Avail NTIS HC A02/MF A01 CSCL 01E

This memorandum is intended as a concise summary of the major findings of an analytical review of published literature about three Visual Approach Slope Indicators, T-VASIS, Red-White VASIS and PAPI Performance data, ergonomics of the designs and operational requirements of the landing aids are considered This memorandum and the fuller report, currently in the process of publication, are part of an ARL series on related topics GRA

N83-24490*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
A SIMULATION STUDY OF CREW PERFORMANCE IN OPERATING AN ADVANCED TRANSPORT AIRCRAFT IN AN AUTOMATED TERMINAL AREA ENVIRONMENT
J A HOUCK May 1983 67 p refs
(NASA-TM-84610, L-15486, NAS 1 15 84610) Avail NTIS HC A04/MF A01 CSCL 17G

A simulation study assessing crew performance operating an advanced transport aircraft in an automated terminal area environment is described The linking together of the Langley Advanced Transport Operating Systems Aft Flight Deck Simulator with the Terminal Area Air Traffic Model Simulation was required The realism of an air traffic control (ATC) environment with audio controller instructions for the flight crews and the capability of inserting a live aircraft into the terminal area model to interact with computer generated aircraft was provided Crew performance using the advanced displays and two separate control systems (automatic and manual) in flying area navigation routes in the automated ATC environment was assessed Although the crews did not perform as well using the manual control system, their performances were within acceptable operational limits with little increase in workload The crews favored using the manual control system and felt they were more alert and aware of their environment when using it B G

N83-24492# Pailen-Johnson Associates, Inc, McLean, Va
FAILURE MODES, EFFECTS AND CRITICALITY ANALYSIS (FMECA) OF TYPE AN/GRN-27 (V) INSTRUMENT LANDING SYSTEM WITH TRAVELING-WAVE LOCALIZER ANTENNA Final Report
G PAPPAS and R PENDLETON Washington FAA Feb. 1983 142 p refs
(Contract DTFA01-82-Y-10537)
(DOT/FAA/PM-83/18) Avail NTIS HC A07/MF A01

A Failure Modes, Effects and Criticality Analysis (FMECA) is used to determine, for the AN/GRN-27(V), the probability of radiation of a hazardous signal and the probability of a loss of signal This analysis is based on the FMECA performed on the Texas instruments, incorporated Mark III ILS (Report No FAA-RD-73-111), modified to reflect the differences between the Mark III and the GRN-27 The methodology considers the effects of all failures of functionally distinct circuits which can result in potentially hazardous failure modes Possible modifications to operating procedures and equipment are considered with respect to meeting the proposed Level 3 and Level 4 reliability levels The reliability resulting from such improvements is calculated and description of recommended improvements is included Facility Maintenance Logs for the calendar year 1981 from GRN-27 facilities are analyzed and correlated with the theoretical calculations

Author

N83-24493# Federal Aviation Administration, Washington, D C Advanced Automation Program Office
ADVANCED AUTOMATION SYSTEM (AAS) TRANSITION STRATEGY
A G ZELLWEGER Apr 1983 40 p refs
(FAA-AP-83-1) Avail NTIS HC A03/MF A01

The Advanced Automation System comprises all of the automation equipment required for Air Traffic Control at the Area Control Facilities and Air Traffic Control Towers to accommodate the ATC evolution of the 1990 - 2010 era The strategy and supporting rationale for transitioning from today's automation system to the Advanced Automation System is described The approach presented here forms the basis for much of the Advanced Automation Program planning and is reflected in the detailed transition, facility modernization, test, training and budget planning S L

N83-24494# Burroughs Corp, Paoli, Pa Federal and Special Systems Group
SYSTEM DESCRIPTION FOR AUTOMATED RADAR TERMINAL AIR TRAFFIC CONTROL SYSTEM, ARTS 2 ENHANCEMENTS, REVISION A Final Report
Washington FAA 15 Oct 1982 64 p refs
(Contract DTFA01-82-C-10008)
(FAA-PM-83-19-REV-A) Avail NTIS HC A04/MF A01

A system description of the ARTS IIA hardware and software is provided The ARTS IIA is an expansion of the existing Automated Radar Terminal System (ARTS II) The expansion provides a safety package that includes beacon target tracking, minimum safe altitude warning and aircraft conflict alert The warning and alert functions include the addition of an aural alarm and additional display data An integrated target generator was added to provide test and training modes of operation Data extraction and reduction functions were included to aid in the development testing To provide for increased performance and memory capacity, the computer was upgraded and software developed Except for the processor, all ARTS II hardware were retained Brief descriptions of this hardware and the aural alarm unit are included A description of the existing, modified and software functions and the system performance requirements are also presented S L

N83-24495# Federal Aviation Administration, Atlantic City, N J Technical Center.

EVALUATION OF PRECISION APPROACH PATH INDICATOR (PAPI) Final Report, Jan. 1980 - Sep. 1982

B CASTLE Apr 1983 80 p refs
(FAA-CT-82-153, FAA-RD-82-85) Avail NTIS HC A05/MF A01

This report describes the evaluation of the Precision Approach Path Indicator (PAPI) to determine whether the PAPI provides sufficient advantages over the current standard red/white Visual Approach Slope Indicator (VASI) to warrant recommending it as the United States standard visual glidepath indicator. This process covered photometric testing, environmental testing, and flight evaluation. Various flight evaluations were accomplished at the FAA Technical Center (ACY), Newark Airport, New Jersey (EWR), Teterboro Airport, New Jersey (TEB), and at Bader Field in Atlantic City, New Jersey (AIY). The results indicate that PAPI was preferred over the standard red/white VASI system. In general, United States pilots find very little fault with the standard red/white VASI system, and the PAPI is preferred mainly because it gives more rate and position information and because of its quick transitions from one color to the other. It is a passive system (no moving parts to wear out), meeting all of the operational requirements of a glide slope system, and requires less equipment and real estate than the standard VASI.

Author

N83-24499# Trans Systems Corp, Vienna, Va
AN ANALYSIS OF REPORTS OF OPERATIONAL ERRORS Report, Jan. - Aug. 1982

M ARJUNAN, E J LONGSTREET, and J C H WOO Aug 1982 88 p

(Contract DTFA01-82-Y-30523)
(AD-A123416, TS-126, FAA-ASF-200-83-1) Avail NTIS HC A05/MF A01 CSCL 12A

The findings of the statistical analyses used to determine whether the level of safety performance within the air traffic control system was affected by the air traffic controllers' strike of August 1981 are presented. The analysis of the operational errors reported during specified periods before and after the August 3, 1981, strike provided statistical confirmation regarding the lack of degradation of national airway safety after the strike. The post-strike operational errors normalized to the volume of operations are shown to be lower than the normalized operational errors reported in the period prior to the strike.

Author (GRA)

A83-30162#

DETERMINATION OF HORIZONTAL TAIL LOAD AND HINGE MOMENT CHARACTERISTICS FROM FLIGHT DATA

G D PARK and M H ABLA (Gates Learjet Corp, Wichita, KS)
Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol 6, May-June, p 170-175. refs

Previously cited in issue 06, p 810, Accession no A82-17827

A83-30163#

TEST DEMONSTRATION OF DIGITAL CONTROL OF WING/STORE FLUTTER

E H JOHNSON, C HWANG, W S PI, D F KESLER, D S JOSHI (Northrop Corp, Aircraft Div, Hawthorne, CA), and C A HARVEY (Honeywell, Inc, Minneapolis, MN) (Structures, Structural Dynamics and Materials Conference, 23rd, New Orleans, LA, May 10-12, 1982, Collection of Technical Papers Part 2, p 102-110)
Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol 6, May-June 1983, p 176-181 refs
(Contract F33615-80-C-3217)

Previously cited in issue 13, p 2021, Accession no A82-30141

A83-30511

DEVELOPMENT OF STRUCTURAL MATERIALS FOR THE NEW GENERATION OF AIRCRAFT [VYVOJ KONSTRUKCNIHO MATERIALU PRO NOVE GENERACE LETADEL]

V NEJEDLY and J BEHAL Zpravodaj VZLU (ISSN 0044-5355), no 5, 1982, p 161-176 In Czech refs

The development of airframe materials for the new generation of aircraft in Czechoslovakia is examined. The main factors affecting the strength and fatigue reliability of airframes are considered. Particular emphasis is placed on the improvement of airframe reliability by the enhancement of the properties of the construction materials, and on the application of fracture mechanics methods to develop fail-safe aircraft structures.

B J

A83-30513

MEASURING AND PROCESSING OF UNDERCARRIAGE LOADING SPECTRA OF THE L-39 AIRCRAFT [MERENI A ZPRACOVANI SPEKTER ZATIZENI PODVOZKU L-39]

V SKOKANEK Zpravodaj VZLU (ISSN 0044-5355), no 6, 1982, p 211-214 In Czech

The present investigation is concerned with the measurement of undercarriage loading spectra, taking into account the L-39 aircraft. In connection with the measurement procedure, the analog signals from nine strain gages are transmitted to an analog-to-digital converter. The obtained digital signals are processed with the aid of a computer. A processing approach based on the method of complete cycles is employed.

G R

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology

A83-30143#

LANDING GEAR DESIGN HANDBOOK

N S CURREY (Lockheed-Georgia Co, Advanced Design Div., Manetta, GA) Manetta, GA, Lockheed-Georgia Co 1982, 837 p refs

The design of landing gear is treated in detail, emphasizing graphics. The subjects considered include initial layout, requirements, design considerations, parametric analysis, shock absorber design, tires, wheels and brakes, airfield considerations, kinematics, locks, steering and crosswind positioning, air cushion landing gears, weight, basic data, and detail design. Most of the design philosophy is backed up with sample calculations.

C D

A83-30829#

FIRST DESIGN DETAILS OF THE ALL-COMPOSITE LEAR FAN

B FRISCH and V WIGOTSKY (Astronautics and Aeronautics (ISSN 0004-6213), vol 21, May 1983, p 30-34, 38)

The Lear Fan 2100 is the first civil aircraft to extensively use advanced composites in its primary structure. Graphite/epoxy and Kevlar epoxy laminates comprise 70 percent of the aircraft's structural weight. The fuselage construction method involves the adhesive bonding of the fuselage shell, and high load-carrying members such as the windshield and door frames, and the pressure bulkheads, are both bonded and fastened. The three-spar wing structure is continuous from tip to tip, where the wing skins are fabric-and-tape buildups over the spar channels that carry bending loads. The aircraft's tail cone terminates in a forged titanium transmission mount which distributes loads from the transmission housing to the graphite-epoxy fuselage structure. Rudder, elevators, flaps and ailerons use Kevlar-epoxy sandwich skins with Nomex cores.

O C

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

A83-30875

THE DASH 8 - DESIGN CONSIDERATIONS

G R JACKSON (De Havilland Aircraft of Canada, Ltd., Malton, Ontario, Canada) Society of Automotive Engineers, Commuter Aircraft and Airline Operations Meeting, Savannah, GA, May 24-26, 1982 10 p
(SAE PAPER 820728)

The Dash 8 is a new 36-passenger airliner designed to fulfill a broad range of Regional Transport applications beginning in 1984. This paper describes some of the factors which have directed the basic configuration and the design objectives chosen for the Dash 8 development program. Author

A83-30924#

THE PRINCIPLES OF AERODYNAMIC AIRCRAFT DESIGN [OSNOVI AERODINAMICKOG OBLIKOVANJA VAZDUKHOPLOVA]

S PIVKO Srpska Akademija Nauka i Umetnosti, Posebna Izdanja, no 544, Odeljenje Tehnichkih Nauka, no 23, 1982, 104 p. In Serbo-Croatian

After discussing the influence of aerodynamic design on aircraft performance, the fundamental principles of aerodynamics are reviewed. Particular attention is given to the methods of singularities and conformal mapping, which are used in theoretical determinations of the flow field around bodies of various forms. The effect of supersonic and higher subsonic speeds on aerodynamic properties is also discussed. Using the basic assumptions of slender body theory, the aerodynamics of slender bodies of revolution, slender wings, and slender bodies of revolution with cruciform wings is considered. The way that modern aircraft propulsion devices affect aerodynamic design is assessed. C R

A83-30944

CHEMICAL DEFENSE, ENVIRONMENTAL CONTROL SYSTEMS STUDY

F H MILLER and P O PAXSON (Rockwell International Corp., North American Aircraft Operations, El Segundo, CA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 12th, San Diego, CA, July 19-21, 1982 7 p refs
(SAE PAPER 820866)

A test and analysis program was conducted to establish cockpit agent concentration histories when air from an airfield contaminated with persistent Chemical Warfare (CW) agents enters aircraft cockpits through the engine and ECS. The program, which utilized a CW agent simulant, consisted of aircraft field tests with F-4 and F-111 aircraft, laboratory tests using ECS and cockpit simulators, and development of a computer program to predict cockpit agent concentrations of aircraft operating in CW environments. The results demonstrated that cockpit contamination will occur for all conditions evaluated. However, filters can effectively be used to counteract the agent. Author

A83-31051

X-29 - ADVANCED TECHNOLOGY DEMONSTRATOR

R L ROEMER (Grumman Corp., Bethpage, NY) Grumman Aerospace Horizons (ISSN 0095-7615), vol 19, no 1, 1983, p 10-12, 14-19

A discussion is presented concerning the aerodynamic phenomena exploited and the design and manufacturing problems posed by the Forward-Swept Wing (FSW) of the X-29 advanced technology demonstration fighter aircraft. The design incorporates 'all-moving' canards, a single turbojet powerplant, thin, supercritical airfoil profiles, and a digital fly-by-wire control system. The FSW structure's resistance to divergence under high bending loads is due to the use of graphite fiber-reinforced polymer composites. The X-29 is currently under construction and will begin flight tests in early 1984. In addition to exceptional maneuverability, the X-29 is expected to demonstrate STOL characteristics. O C

A83-31172#

STABILITY STUDY OF A TILT-ROTOR AIRCRAFT MODEL

J J COSTES, J NICOLAS, and D PETOT (ONERA, Chatillon-sous-Bagneux, Hauts-de-Seine, France) La Recherche Aerospaciale (English Edition) (ISSN 0379-380X), no 6, 1982, p 33-60 refs

An attempt is made to test the validity of the whirl flutter theory for the case of a tilt rotor aircraft model that is compared with results from highly instrumented wind tunnel tests on the tilt rotor blades. Agreement is obtained between theory and experiment with respect to the nacelle pitch and yaw mode frequencies, the blade deformation first mode frequency, and the damping of the yaw mode, which the theory predicts will become negative at a velocity greater than those of the range presently investigated. It is noted that while the damping of the nacelle pitch mode is underestimated by the experiment for the case of increasing velocity, the accuracy of the measurement decreases with increasing damping and its value is underestimated in the presence of a relatively large background noise. O C

A83-31495

ANALYSIS OF MISSILE RESPONSE TO GUNFIRE ENVIRONMENT

S N TANNER and R G MERRITT (U S Naval Weapons Center, China Lake, CA) IN Environmental stress impact and environmental engineering methods, Proceedings of the Twenty-seventh Annual Technical Meeting on Emerging Environmental Solutions for the Eighties, Los Angeles, CA, May 5-7, 1981, Volume 1 Mt Prospect, IL, Institute of Environmental Sciences, 1981, p 154-164

Missile response measurements have been made on a missile exposed to pressure pulses from a gun mounted adjacent to a missile in aircraft captive carry configuration. The flight measurement system consisting of an instrumented round configured for on-board recording is described in some detail. The mode of data collection and the aircraft-missile-gun configuration are summarized. The flight configuration is briefly considered, and an overview of the collected data is presented. The environments are analyzed as short term, high level stationary events at each of the missile measurement locations. A basic nonstationary analysis is performed on the measured information, including an analysis of variance of short sections of the measured time history records to examine homogeneity of response. C D

A83-31587#

ESCAPE LOW AND HOT

A J ARONNE and J P MURRAY (Grumman Aerospace Corp., Bethpage, NY) Mechanical Engineering (ISSN 0025-6501), vol 105, May 1983, p 30-38

Design and performance features of the candidate F-14A ejection seat, which permits crew ejection as low as 70 ft altitude, are described. The seat contains a microwave radiometer and microprocessor to sense the 'up' direction for inverted ejection conditions. A rocket which burns for 1.3 sec orients the crew member in an upright direction under the control of the microprocessor by means of thrust vector positioning subsystems. Single-chip computers were selected for the controller, together with either a gas generator or thermal battery as the power supply. Pitch and roll control is included, together with fluidic servoactuators and a warm-gas propulsion system. Further studies are necessary on performance at different flight velocities, in varying aircraft attitudes, and to determine the sink rate. M S K

A83-31805

ADVANCED TECHNOLOGY FOR SAAB-FAIRCHILD 340 AIRCRAFT

R J SANATOR and G HONCZARENKO (Fairchild Republic Co., Farmingdale, NY) Society of Automotive Engineers, Commuter Aircraft and Airline Operations Meeting, Savannah, GA, May 24-26, 1982 11 p
(SAE PAPER 820729)

The advanced technologies introduced in the design and manufacture of the SAAB-Fairchild 340 aircraft are discussed,

including those in its aerodynamics, propulsion system, structural concept, materials, avionics, and passenger seat. For the airfoil, the effect of thickness ratio on section maximum lift coefficient and on lift/drag ratio are discussed and aerodynamic characteristics are compared with those of conventional airfoils. The passenger seat makes extensive use of lightweight composite materials, the state of the art avionics of the cockpit are described. The structures and materials used in the aircraft are discussed for the various sections of the structure, and diagrams are shown for the flap structure and the engine nacelle C.D.

A83-31806**THE CAC-100 - DESIGN FEATURES**

L PAZMANY (Commuter Aircraft Corp., San Diego, CA) Society of Automotive Engineers, Commuter Aircraft and Airline Operations Meeting, Savannah, GA, May 24-26, 1982 15 p (SAE PAPER 820730)

The design of the CAC-100, a fifty-passenger commuter transport aircraft for use in a competitive short haul passenger market, is discussed from a design point of view. The various design plans that were considered are depicted, and the weight savings of the aircraft are shown. The aerodynamics is addressed, and the goals of planned wind tunnel tests are listed. Various CAC-100 systems and functions are described, showing diagrams. These include overall structural design, wing design and structure, fuselage design, interior sound suppression, passenger cabin and flight deck design, the airstair, surfaces of the horizontal and vertical tail, the nose and main landing gear, tire/wheel accommodation, power plant, and flight control systems. The latter include the ailerons, spoilers, flaps, elevators, and rudder. More cursory treatment is given to the hydraulics, electrical system, oxygen system, avionics, and furnishing. Block diagrams of the power and hydraulic systems are presented C.D.

A83-31812#**THE HELICOPTER PRELIMINARY DESIGN PROCESS**

L G KNAPP (United Technologies Corp., Sikorsky Aircraft Div., Stratford, CT) American Helicopter Society and Helicopter Association International, Commercial Users Design Conference, Houston, TX, Nov 4, 5, 1982, Paper 6 p

It is pointed out that the helicopter conceptual design process balances user's needs and desires against practical capabilities in an attempt to derive an end product acceptable to a broad spectrum of customers and profitable to the manufacturer. This design process involves the consideration of trades of aircraft attributes and features to determine both their impact on mission effectiveness in the anticipated applications and their effect on cost and operating cost. The concept of the 'anticipated applications' is a crucial factor. The manufacturer must decide which markets he seeks, and the final design will be influenced by these applications. The investigation has the objective to provide some information regarding the approaches employed by the industry in connection with the design of a helicopter G.R.

A83-31821**NEW AIRCRAFT. I [NOUVEAUTES EN MATIERE D'AERONEFS. I]**

L ROSENTHAL L'Aeronautique et l'Astronautique (ISSN 0001-9275), no 98, 1983, p 3-12 In French

Various new aircraft, designs, and structural materials displayed at Hanover and Farnborough in 1982 are reviewed. The B-1B bomber will have radar-absorbant leading edges, empennages, and wing-fuselage junctions. Composite materials are also incorporated into experimental fighters such as the P 106 and P 1214 being tested in the UK. The Alpha jet, T-46A, and the MBB Fantrainer 600 trainer aircraft were also exhibited. Details of the top speeds, masses, take-off weights, cruise speeds, ascent speeds, take-off distances, maximum ranges, and engines for each of the aircraft are reported. The military helicopters UTTAS, UH-60A Black Hawk, and the AH-64A Apache were displayed, all of which were capable of carrying Hellfire missiles. The passenger helicopter, the EH-101 (30 passengers), had a military version, the IH-101, which is intended for ant submarine warfare. Experimental helicopters

included the XH-59A with two contrarotating rotors and the XH-59B, which is powered by two J60 turbojets, and has a maximum airspeed of 460 km/hr M.S.K.

A83-31822**COMPOSITE MATERIALS APPLICATIONS IN THE MANUFACTURE OF HELICOPTERS - DESIGN AND PROBLEMS OF HELICOPTERS [LES APPLICATIONS DES MATERIAUX COMPOSITES DANS LA CONSTRUCTION DES HELICOPTERES]**

G BEZIAC (Societe Nationale Industrielle Aerospatiale, Division Helicopteres, Margnane, Bouches-du-Rhone, France) L'Aeronautique et l'Astronautique (ISSN 0001-9275), no 98, 1983, p 21-40 In French refs

The areas of applications, types of fibers, and future uses of composite materials for helicopter components are discussed, together with design requirements for introducing the parts into helicopter structures. Composite materials offer high mechanical resistance to fatigue stresses, lighter weight, a flexibility of structural forms, and ease of maintenance. Various applications for Kevlar, carbon, and glass fiber composite materials are outlined in terms of their appropriateness for each use, e.g., hubs and blades. The chronology of the increasing use of composite materials is traced. Composites are noted to offer one-piece construction for many structures, thus lowering the total number and cost of parts required. Attention is given to characteristics of thermoplastic reinforced composites and metallic matrix composites, which will extend the total percentage of structural components to around 22 percent of the entire helicopter M.S.K.

A83-31939**APACHE ON THE WAR PATH - THE HUGHES AH-64 IN PRODUCTION AT LAST**

M LAMBERT Interavia (ISSN 0020-5168), vol 38, May 1983, p 436-438

An assessment is presented of the system features and maintenance-related development achievements of the AH-64 attack helicopter. Although the antiarmor role is the AH-64's primary design objective, it is also able to operate against light armor and troops, as well as provide escort and fire support for helicopter-borne infantry. The most unique achievement of this weapon system is the Hellfire missile it deploys. Targets are laser-designated by a Target Acquisition and Designation System carried in the helicopter's nose turret. The operating gunner can choose high or low trajectories when firing with remote designation. The Hellfire missiles can be simultaneously fired against several, separately laser-designated targets. A mean time between failures of 21.1 hr has been achieved in the course of flight testing, by comparison with the stipulated 17 hr, with a mere 5.65 maintenance man-hours/flight hour O.C.

A83-31940**AM-X - THE EXPORT CHALLENGER WITH A FOOT IN TWO CONTINENTS**

B WANSTALL Interavia (ISSN 0020-5168), vol 38, May 1983, p 447-449

A development status report is presented for the joint Italian/Brazilian light fighter aircraft, designated AM-X, which is intended not only to fulfil the Italian and Brazilian air forces' requirements for a subsonic aircraft capable of close air support, interdiction and strike roles, but also those of other air forces seeking replacements for A-4s, MiGs and early Mirage variants. The single-seat, single-engine fighter is designed to absorb battle damage, and incorporates, in addition to an M61A1 20 mm cannon and Sidewinder missiles, a suite of active and passive ECM devices. Bombs, rocket pods and air-to-ground missiles weighing a total of up to 3800 kg can also be carried O.C.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

A83-31941

THE B-1 GETS AIRBORNE AGAIN

M LAMBERT Interavia (ISSN 0020-5168), vol 38, May 1983, p 455-458

A discussion is presented of the B-1 strategic bomber design features modified in the course of a development to produce the B-1B 'long range combat aircraft' variant. The baseline specification of the B-1B calls for its delivery of the nuclear Short Range Attack Missile, the Air Launched Cruise Missile, two types of free-falling nuclear bombs, and the Mk 82 iron bomb or the Mk 36 sea mine. Attention is given to defensive and offensive avionics, of which the latter has undergone significant modification from the B-1A prototype and flight test aircraft. The principal innovation incorporated by the offensive avionics system is a forward-looking radar, which employs a phased array antenna. Modifications encouraged by earlier flight testing include nonlinear flight control gearing for better handling during in-flight refueling, and a hinge moment limiter for the elevator. O C

A83-32398

NEW LIFE FOR THE DRAGON LADY

B SWEETMAN Flight International (ISSN 0015-3710), vol 123, May 7, 1983, p 1219-1222

A development history is presented for the U-2 series aircraft, whose most significant milestones include the addition of the powerful J75 engine to the U-2C design, a 65 percent wing area increase and fuselage stretch for the U-2R, and most recently the TR-1, which is 40 percent larger than the original U-2A. Attention is given to the structural and systems design features of the TR-1, whose airframe weighs less than 10,000 lbs as a result of the use of both primary and secondary structure sheet metal thicknesses significantly smaller than those typical of more conventional aircraft designs. All but a 6 ft outboard portion of the TR-1's wings contains fuel tankage. Both the U-2R and TR-1 are qualified for aircraft carrier landing and takeoff. TR-1 performance is claimed to include cruise altitudes above 70,000 ft and ranges of more than 3000 miles. O C

A83-32475

FLIGHT TESTS VERIFY PREDICTIONS FOR F-20

R R ROPELEWSKI Aviation Week and Space Technology (ISSN 0005-2175), vol 118, May 9, 1983, p 65-67

Flight-test results for the F-20 (Tigershark) fighter aircraft are presented. In 240 test flights carried out from August 1982 through April 1983, a maximum speed of 550 kt below 36,000 ft, Mach 1.9 above 36,000 ft, maximum altitude of 50,000 ft, turns of up to 7.2 g and a 35-deg angle of attack below 70 kt were achieved. Climb performance, acceleration, and fuel endurance were found to be better than predicted. The F404-100 engine being developed for the F-20 is seen as the main factor in increasing reliability and maintainability, which exceed specifications so far, the importance of a reliability-engineering program for main contractor and subcontractors is stressed. T K

A83-32576#

ALL-ELECTRIC VS CONVENTIONAL AIRCRAFT - THE PRODUCTION/OPERATIONAL ASPECTS

M J CRONIN (Lockheed-California Co., Burbank, CA) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 481-486

Previously cited in issue 14, p 2298, Accession no A81-32909

A83-32577*# AeroVironment, Inc., Pasadena, Calif

SUN-POWERED AIRCRAFT DESIGNS

P B MACCREADY, P B S LISSAMAN, W R MORGAN (AeroVironment, Inc., Pasadena and Sun Valley, CA), and J D BURKE (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 487-493

Previously cited in issue 14, p 2298, Accession no A81-32932

A83-32579*# Texas A&M Univ., College Station

NEW THERMAL AND TRAJECTORY MODEL FOR HIGH-ALTITUDE BALLOONS

L A CARLSON and W J HORN (Texas A & M University, College Station, TX) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 500-507 refs

(Contract NAS6-3072)

Previously cited in issue 01, p 10, Accession no A82-10411

A83-32580#

TYPE A V/STOL - ONE AIRCRAFT FOR ALL SUPPORT MISSIONS?

W H ADEL (McDonnell Aircraft Co., St Louis, MO) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 508-515

Previously cited in issue 05, p 654, Accession no A82-16917

A83-32581*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va

LABORATORY STUDY OF ADD-ON TREATMENTS FOR INTERIOR NOISE CONTROL IN LIGHT AIRCRAFT

J S MIXSON, L A ROUSSOS, C K BARTON (NASA, Langley Research Center, Hampton, VA), R VAICAITIS, and M SLAZAK (Columbia University, New York, NY) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 516-522 refs

Previously cited in issue 24, p 4127, Accession no A81-48618

A83-32582*# Lockheed-Georgia Co., Marietta

ADVANCED TURBOPROP CARGO AIRCRAFT SYSTEMS STUDY

J C MUEHLBAUER (Lockheed-Georgia Co., Marietta, Ga) and S J MORRIS (NASA, Langley Research Center, Hampton, VA) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 523-529

Previously cited in issue 20, p 3464, Accession no A81-43156

A83-32588*# National Aeronautics and Space Administration Flight Research Center, Edwards, Calif

UNIQUE FLIGHT CHARACTERISTICS OF THE AD-1 OBLIQUE-WING RESEARCH AIRPLANE

R E CURRY and A G SIM (NASA, Flight Research Center, Aeronautics Branch, Edwards, CA) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 564-568 refs

Previously cited in issue 19, p 2977, Accession no A82-39106

A83-32589#

PERFORMANCE ESTIMATION FOR LIGHT PROPELLER AIRPLANES

E V LAITONE (California, University, Berkeley, CA) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 569-571

The performance equations for a light propeller aircraft pertaining to maximum level flight velocity and maximum rate of climb are simplified by introducing the constant density ratio and using the velocity to simplify the nondimensional equations. The constant density ratio is dependent only on the aircraft geometry and the fixed pitch propeller characteristics at sea level. It is also shown that the best blade angle for a fixed pitch propeller is one that will produce the maximum available power at the maximum possible velocity for steady level flight at sea level. C D

A83-32783#

DYNAMIC TAXI RESPONSE (HAVE BOUNCE) TESTING OF THE C-5A AIRCRAFT

R C KNARR and T G GERARDI (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, Lake Tahoe, NV, May 2-4, 1983 7 p (AIAA PAPER 83-1024)

This paper discusses the dynamic response testing of the Lockheed C-5A Galaxy aircraft. This testing was conducted over a simulated bomb damaged runway repair profile. Data essential for computer model validation were recorded by a portable

'suitcase' instrumentation package The validated computer model will be used to develop surface roughness criteria for this aircraft.
Author

A83-32785#**AEROELASTIC STABILITY OF AN ELASTIC CIRCULATION CONTROL ROTOR BLADE IN HOVER**

I CHOPRA (Maryland, University, College Park, MD) AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, Lake Tahoe, NV, May 2-4, 1983 10 p refs (Contract N00167-82-M-3701) (AIAA PAPER 83-0985)

A finite element method (FEM) is modified to study the aeroelastic stability of a controlled circulation rotor (CCR) blade. Controlled circulation involves venting a thin jet through a slot on the rounded trailing edge in order to energize the boundary layer, create a Coanda effect, and thus delay separation. The FEM formulation consists of division of the blade into discrete beam elements, each with two end nodes and three internal nodes, yielding 15 degrees of freedom. The aerodynamic forces are calculated according to the airfoil characteristics for section lift, drag, and moment at the midchord. An iterative procedure is employed to obtain a nonlinear trim solution, while a flutter solution is calculated by assuming the blade motions to be small perturbations about the steady solution. The mode is used for various proposed CCR blades, showing that, e.g., soft inplane CCR blades have excessive external damping to stabilize the lag mode. Necessary levels of internal structural damping are defined for CCR design configurations. M S K

A83-32929**FLIGHT DEVELOPMENT AND CERTIFICATION - HOW EFFICIENT CAN IT BE?**

W DIJKSHOORN (Fokker, Schiphol, Netherlands) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 4-1 to 4-18

Aspects of airliner model flight testing are discussed, emphasizing cost effectiveness. The process of development of an airliner model is described and discussed, and factors which can reduce costs are mentioned. Variables which affect cost effectiveness of a flight test program are addressed, including total flight hours, flight hour production rate, and resources. The flight test instrumentation and data processing system for the F29 program are described. C.D

A83-32930**FLIGHT TESTING THE HUSTLER 500**

J A GUTHRIE and J B LIGON (Flight Systems, Inc., Mojave, CA) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 6-1 to 6-22

Test techniques and results of an evaluation of the Hustler 500 aircraft are presented. The aircraft itself and its instrumentation is described. The results of takeoff and landing tests, pitot static calibration, and drag polar determination are addressed. Temperature-limited torque values for various altitudes are shown, as are the excess thrust curves, climb performance, and VFR range capabilities. The results for stability and control tests are given, including longitudinal static stability, maneuvering static stability, lateral-directional stability, roll power, Dutch roll, short period, phugoid mode and trim changes. The results for stalls and flutter envelope expansion are also shown. Pilot comments with respect to the cockpit, ground handling, takeoff, and landing are presented, and the conclusions and recommendations of the tester are stated. C D

A83-32931**AIRPEED CALIBRATIONS ON A STRETCH YC-141B AIRCRAFT**

R E HART (USAF, Flight Test Center, Edwards AFB, CA) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 7-1 to 7-10

Improvements on the prototype stretch YC-141B aircraft resulting from the significant shift in static position error found during airspeed calibrations are discussed. An aerodynamically compensated pitot-static probe was designed and subsequently flight tested on the YC-141B. The purpose of this probe in the aircraft, its development, and its flight test results are addressed. The results showed that the position error shifted to where the residual error was negligible in the cruise regime. Therefore, the stretch C-141B fleet of 272 aircraft will be equipped with compensated pitot-static probes. C D

A83-32932**FLIGHT TEST AND PREDICTED PRESSURE DATA COMPARISON ON AIRCRAFT MODIFICATIONS**

M B SKUJINS (USAF, Aero-Mechanical Div., Wright-Patterson AFB, OH) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 11-1 to 11-25

The results of a pressure survey investigation performed on two aircraft modifications, the Advanced Range Instrumentation Aircraft (ARIA) radome on an EC-135N and the Coherent Emitter Location Testbed (CELT) radome on a T-39B, are presented. The objectives of the project were to obtain flight test pressure distribution data on the tested modifications, to compute theoretical pressure distribution data for the modifications using the Hess Panel Method Potential Flow Program, and to compare the flight test and theoretical pressure data to determine the validity of the theoretical prediction technique for aircraft modification analysis. The predicted critical Mach number for CELT did not agree with the flight test value, but did agree well with the test value for ARIA. Predicted pressure values for CELT and ARIA agreed well with flight test values up to the flow separation point for subcritical and critical Mach number conditions. C D

A83-32935**PRINCIPAL SITE TESTING OF THE F/A-18 AT THE NAVAL AIR TEST CENTER**

F C RALEY (U.S. Navy, Naval Air Test Center, Patuxent River, MD) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 16-1 to 16-16

Events to date in the full scale development (FSD) program for the F/A-18 aircraft are addressed. The aircraft itself is described, and the principal site concept is considered, identifying its purpose. Program progress is briefly summarized, and the Navy aircraft development philosophy is stated. The role of the Navy in the FSD program is described, and the nature of the flight support given to the program by its test site is considered. The role of the contractor is described, as well as the initial shipboard trials. The new opportunities provided by the test site for testing the FSD F/A-18 are discussed. The flying qualities and high angle of attack of the F/A-18 are considered, and the testing of systems, of reliability and maintainability, and of missile performance is described. Finally, the test site formal evaluations and the operational test and evaluation are addressed. C D

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

A83-32937

THE UNITED STATES AIR FORCE AND THE USE OF IN-FLIGHT SIMULATION

S R MARKMAN (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 18-1 to 18-21 refs

The development and use of variable stability aircraft for in-flight simulation by the US Air Force is discussed. The function of in-flight simulators is defined, and the engineering of achieving variable stability is considered. In-flight simulation is compared to ground-based simulation, showing the former's advantages. The development of variable stability aircraft is recounted, describing the history of aircraft such as the C-45, the F-94, the B-26, the NT-33A, the X-22A V/STOL, the F-106, and the NC-131H Total In-Flight Simulator or TIFS. The modifications and improvements incorporated into each of these models are described. Prospects for the development of a fighter TIFS are assessed. C D

A83-33098

SMOOTH AND SIMPLE - THE BELL MODEL 680 BEARINGLESS MAIN ROTOR

R METZGER (Bell Helicopter Textron, Fort Worth, TX) Vertiflite (ISSN 0042-4455), vol 29, May-June 1983, p 44-47

The next major step in the development of helicopter main rotor hubs will be the replacement of metal structures, such as those of forged titanium, with structures of advanced composite materials which offer safety improvements and a 10 percent weight reduction. Attention is presently given to the Model 680 advanced composite material bearingless main rotor, which has undergone flight tests that included maneuvers in excess of 2 g at maximum gross weight, and dive airspeeds in excess of 180 knots. An evaluation of load level results, in conjunction with the fatigue test results, indicates that a life in excess of 10,000 hours can be expected for this rotor system. O C

A83-33160

GENERALITIES ON THE PROBLEMS IN INTEGRATION FOR A PROPELLER ON AN AIRFRAME - THE PARTICULAR CASE OF A HIGH-POWERED TWIN TURBOPROP [GENERALITES SUR LES PROBLEMES D'INTEGRATION DE L'HELICE ALA CELLULE - CAS PARTICULIER D'UN BI-TURBOPROPULSEUR FORTEMENT MOTORISE]

R TAISSIRE (Avions Marcel Dassault Breguet Aviation, Vaucresson, Hauts-de-Seine, France) Association Aeronautique et Astronautique de France, Colloque d'Aerodynamique Appliquee, 19th, Marseille, France, Nov 8-10, 1982 26 p In French (AAAF PAPER NT 82-02)

General analytical methods for modeling the performance of turboprops on a specific airframe design are reviewed. The calculations take into account the local aerodynamic effects of the interaction of the wing with the wake of the propeller. The wake, an overspeed, is divided into longitudinal and normal components. Nondimensional aerodynamic coefficients are defined for the particular configuration and the flight regime of the aircraft. The coefficients depend on the angle of attack and the slip. The propeller is divided into sections and performance is calculated for each section. The effect of the wake of the propeller on the behavior of the aircraft are discussed, together with the problem of a minimal control velocity during take-off of a twin-motored aircraft. It is noted that the presence of the wing also has an effect on the performance of the propellers. M S K

A83-33169

THE FENESTRON ON A HELICOPTER [LE FENESTRON SUR HELICOPTERE]

A VUILLET and F MORELLI (Societe Nationale Industrielle Aerospatiale, Division, Helicopteres, Mangnane, Bouches-du-Rhone, France) Association Aeronautique et Astronautique de France, Colloque d'Aerodynamique Appliquee, 19th, Marseille, France, Nov 8-10, 1982 12 p In French refs (AAAF PAPER NT 82-18)

The fenestron, an integrated keeled back rotor for helicopters, was introduced in 1968 to improve near-ground and on-ground safety. The rear rotor is necessary on helicopters to compensate for the coupling induced in monorotor machines. It was found that higher power levels were required to operate the fenestron at the same performance level as the normal rear rotor, so research was carried out to increase the figure of merit by 10 pct and the uncoupling by 30 pct. Earlier studies had led to optimized rotational behavior, cambered profiles, and optimized aperture dimensions. Composite materials permitted a weight reduction through longer but fewer blades. Higher power levels are available from a fenestron when compared to the classic rear rotor. Fundamental studies were performed upstream and downstream of the rotor, and three distinct zones were identified, i.e., viscous areas at the foot and the head of the blades and a steady zone. Further aerodynamic work continues and design variations are being tried, including the installation of a venting device which redirects the output of a rotor mounted internally in the tail and pointing directly backward. M S K

A83-33367#

IMPACT OF NEW TECHNOLOGY ON FUTURE SHORT-HAUL TRANSPORTS

A SIGALLA (Boeing Commercial Airplane Co., Seattle, WA) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 9 p refs (AIAA PAPER 83-1604)

The impact of new technology on a future short-haul transport is discussed. The importance of fuel efficiency and low empty weight is emphasized in light of the peculiar short-haul mission requirements. Potential advanced technology elements are identified and put in general perspective in terms of airplane timing. Aerodynamic design technology, new lighter weight metal alloys, a composite empennage and a new high bypass ratio turbofan engine are seen as nearer term items. An advanced turboprop and an advanced composite wing-box are seen as further possibilities. Author

N83-23294*# Rockwell International Corp., Pittsburgh, Pa HIMAT HIGHLY MANEUVERABLE AIRCRAFT TECHNOLOGY, FLIGHT REPORT

1982 61 p
(NASA-CR-170245, NAS 1 26 170245, H1-9-17) Avail NTIS HC A04/MF A01 CSCL 01C

Flight verification of a primary flight control system, designed to control the unstable HiMAT aircraft is presented. The initial flight demonstration of a maneuver autopilot in the level cruise mode and the gathering of a limited amount of airspeed calibration data. S L

N83-23295*# National Aeronautics and Space Administration, Washington, D C

THE SOLAR AIRCRAFT

Mar 1983 13 p Transl into ENGLISH from Flug Rev Intern (West Germany), no 3, Mar 1981 p 67-69
(Contract NASW-3542)
(NASA-TM-77042, NAS 1 15 77042) Avail NTIS HC A02/MF A01 CSCL 01C

A discussion is given in a popular manner of the solar powered aircraft Solar I. The achievements of the designer are detailed, and trial runs leading up to the first successful flight are given. Technical data of Solar I are listed, and brief news items about it are presented. Author

N83-23296# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany) Helicopter and Transport Div.
DEVELOPMENT OF A PASSIVE ROTOR ISOLATION SYSTEM FOR HELICOPTERS Final Report, Apr. 1982

D BRAUN Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 124 p refs *In* GERMAN, ENGLISH summary
 (BMFT-FB-W-82-026, UD-347/82, ISSN-0170-1339) Avail NTIS HC A06/MF A01, Fachinformationszentrum, Karlsruhe, West Germany DM 26

A passive multi-degree-of-freedom rotor isolation system which essentially consists of five uniaxial antiresonance force isolators was developed. Conventional and novel models of such isolator elements are presented. Sufficiently exact theoretical descriptions are developed for both isolator types. The effectiveness of the force isolators is proved by use of an uniaxial functional model. The function of the total rotor isolation system in the helicopter is tested by a shake test. The helicopter which is suspended by the rotor head is loaded by realistic rotor excitation forces and moments by use of suitably arranged electrodynamic shakers. The vibration isolation system is tested in flight. An excellent isolation efficiency is obtained. Author

N83-23297# National Aerospace Lab., Amsterdam (Netherlands) Structures and Materials Div

SOME METHODS FOR THE DERIVATION OF TAXIING LOADS FOR UNDERCARRIAGES WITH LINEAR OR NONLINEAR PROPERTIES

R NOBACK 22 Sep 1980 54 p refs
 (Contract NIVR-1947)

(NLR-TR-81110-U) Avail NTIS HC A04/MF A01

Methods that are used for the establishment of taxiing loads are presented and discussed. The methods are straightforward for undercarriages with linear properties. For undercarriages with nonlinear properties methods based on the use of equivalent gains are promising, but still have to be verified. Author

N83-23298# National Aerospace Lab., Amsterdam (Netherlands) Structures and Materials Div

VERTICAL ACCELERATIONS OF A LARGE AIRCRAFT DURING LANDING AND TAXIING

R. NOBACK 4 Jan 1982 22 p refs
 (Contract NIVR-1947)

(NLR-TR-82001-U) Avail NTIS HC A02/MF A01

Vertical accelerations during landing and taxiing were extracted from the AIDS system, used by KSSU-Boeing 747 operators. Results are presented and compared with similar data from other sources. Author

N83-23299# Societe Nationale Industrielle Aerospatiale, Toulouse (France)

PROPELLER MEAN SLIPSTREAM COMPUTATION. SLIPSTREAM INFLUENCE ON AIRCRAFT PERFORMANCES

C KIRRMANN (Office National d'Etudes et de Recherches Aerospatiales, Leclerc, France), A ROUSSEAU (Societe Bertin et Cie, Plasir, France), and M YERMIA 1982 46 p Presented at 19th Colloq d'Aerodyn Appl, Marseille, 8-10 Nov 1982 Sponsored by Association Aeronautique et Astronautique de France *In* FRENCH, ENGLISH summary
 (SNIAS-822-111-104) Avail NTIS HC A03/MF A01

The mean slipstream of a propeller was modeled by a potential flow panel method. The model was integrated into a complete 3D potential flow method program, which was used to evaluate the propeller slipstream effects on the performances of a commuter aircraft. S L

N83-23300# System Planning Corp., Arlington, Va
AERONAUTICAL STRUCTURES TECHNOLOGY STUDY: ANNOTATED BRIEFING REPORT

R B BAIRD and J C FISH Sep 1982 86 p refs
 (Contract MDA903-82-C-0246; ARPA ORDER 3723)
 (AD-A123064; SPC-850) Avail: NTIS HC A05/MF A01 CSCL 01C

This document reports on quantitative and qualitative measures of benefit that were developed for use in determining the significance of aeronautical structures technology programs. The measures of benefit were developed for four categories: structures/materials, manufacturing, ownership, and operational, which represent the total life of an aircraft structure from initial design to final operation and ownership. The study also reports on two conceptual weapon systems, the Advanced Tactical Fighter and the Advanced Concepts Flight Vehicle, their operational and technical characteristics were determined for use in the subsequent analysis. The document includes recommendations on new structures technology initiatives that should be pursued for the conceptual weapon systems. Author (GRA)

N83-23301# Royal Aircraft Establishment, Farnborough (England)

A COMPUTER-BASED SIMULATION OF A SIMPLE AIRCRAFT-TYPE FUEL SYSTEM. PART 1: NORMAL TRANSFER

M A BEENY Mar 1982 71 p refs

(AD-A123007, RAE-TM-FS(F)-466, DRIC-BR-84222) Avail NTIS HC A04/MF A01 CSCL 09B

A computer based model of a simple aircraft-type fuel system has been developed in Engineering Physics and latterly Flight Systems Department, Farnborough, RAE as a background activity over several years. This work was undertaken to furnish an emulation which could be useful for aircraft systems integration studies, to explore fuel management techniques and to furnish programming and documentation experience in an area which had previously relied upon conventional dc and ac signaling techniques. GRA

N83-24500*# Analytical Mechanics Associates, Inc., Mountain View, Calif

COMPUTER PROGRAMS FOR GENERATION AND EVALUATION OF NEAR-OPTIMUM VERTICAL FLIGHT PROFILES Final Report

J A SORENSEN, M H WATERS, and L C PATMORE
 Washington NASA May 1983 147 p refs
 (Contract NAS1-15497)

(NASA-CR-3688, NAS 1 26 3688, AMA-82-39) Avail NTIS HC A07/MF A01 CSCL 01C

Two extensive computer programs were developed. The first, called OPTIM, generates a reference near-optimum vertical profile, and it contains control options so that the effects of various flight constraints on cost performance can be examined. The second, called TRAGEN, is used to simulate an aircraft flying along an optimum or any other vertical reference profile. TRAGEN is used to verify OPTIM's output, examine the effects of uncertainty in the values of parameters (such as prevailing wind) which govern the optimum profile, or compare the cost performance of profiles generated by different techniques. A general description of these programs, the efforts to add special features to them, and sample results of their usage are presented. Author

N83-24501# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France) Div Avions

THE RETURN OF THE PROPELLER AIRPLANE [LE RETOUR DE L'AVION A HELICE]

D BERGER and P JACQUET 1982 29 p *In* FRENCH Presented 12th Salon Aeron et Spatial de Toulouse "Journées d'Aeronautiques 1982", Toulouse, 15-19 Jun 1982 Sponsored by Assoc Aeron et Astronautique de France
 (SNIAS-822-111-102) Avail NTIS HC A03/MF A01

The cost of fuel, the properties of propellers, U S deregulation of domestic airlines, and the market for commuter and short-haul

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aircraft are reasons for renewed interest in propellers. The evolution of turbopropulsion technologies (propellers, gas generators, and soundproofing of fuselages) are increasing passenger comfort and reducing noise levels as well as fuel and maintenance costs. The results of research and studies by propeller, aircraft, and engine designers are manifested in new aircraft programs, in the American advanced turboprop project (propfan) financed by NASA, and in the French propellers for fast aircraft program. Transl by A R H

N83-24502# Ballistic Research Labs, Aberdeen Proving Ground, Md

A CRITIQUE OF THE BELL HELICOPTER TEXTRON COBRA 2.75 INCH ROCKET BALLISTIC ALGORITHM

H J BREAUX Jan 1983 33 p refs

(Contract DA PROJ 1H4-64202-DL-62)

(AD-A123703, ARBRL-TR-02463) Avail NTIS HC A03/MF A01 CSCL 12A

The ballistic algorithm currently implemented on the AH-1S (Modernized) Cobra Helicopter for the 2.75-inch MK 40 rocket system is of interest due to ongoing efforts involving the Mk 66 rocket system. Additional interest arises due to past unresolved controversies centering on the issue of the adequacy and correctness of the mathematical formulation. The question is examined by comparison of the Bell Helicopter Textron (BHT) algorithm with a simple free flight model derived from basic ballistic equations. The analysis indicated the omission of a significant drag effect in the elevation equation and the lack of any compensation for wind effects in free flight. The BHT algorithms is shown to be deficient in the formulation of a component term which compensates for the ballistic influence of helicopter velocity normal to the line of site. The general inaccuracy of the 2.75-inch rocket has previously masked any chance of detection of a systematic bias that might be due to a poor ballistic algorithm. The insight provided by this critique leads one to focus on hover firings where analysis predicts a bias should be more clearly evident. The test data provides a dramatic confirmation of the theoretical inferences which imply a 60 mil elevation error bias at maximum range. Author (GRA)

N83-24503# Aerospace Medical Research Labs, Wright-Patterson AFB, Ohio

VISUAL JUDGMENTS OF OPTICAL DISTORTIONS IN AIRCRAFT WINDSCREENS Technical Report, 6 Oct. 1976 - 18 Jan. 1981

H C SELF Oct 1982 35 p

(Contract AF PROJ 7184)

(AD-A124307, AFAMRL-TR-81-24) Avail NTIS HC A03/MF A01 CSCL 01C

Observer ratings of optical distortion in eleven F-111 Aircraft windscreens were examined using six factory production line visual quality inspectors, six Air Force pilots, all with years of flying experience, and two observers familiar with aircraft windscreen problems. Observers looked through the windscreens at large gridboards having thin white lines on a black background. Each windscreen was rated for effect of distortion on flying performance (yes-no), acceptability (yes-no), and for position on a 0-5 distortion scale for eight optical distortion variables: line splitting, line bending, line banding, shimmer, magnification, other distortions, and overall distortion. High correlations were found between types of distortion. Ratings on either banding or line bending, could be used to efficiently predict overall optical distortion. Pilots and visual quality inspectors were quite close in judgments of overall optical distortion and on specific types of distortion. Pilots rated distortions very slightly worse (higher), but were appreciably more likely to rate a windscreen as influencing pilot performance. Neither lens factor nor displacement grade, alone, were significantly related to acceptability or performance effects judgments. Author (GRA)

06

AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices, and flight instruments

A83-30159#

DEVELOPMENT AND TEST OF AN INTEGRATED SENSORY SYSTEM FOR ADVANCED AIRCRAFT

W K TOOLAN and A M ZISLIN (Grumman Aerospace Corp., Bethpage, NY) (Digital Avionics Systems Conference, 4th, St Louis, MO, November 17-19, 1981, Collection of Technical Papers, p 392-399) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol 6, May-June 1983, p 150-155 refs (Contract N62269-79-C-0206)

Previously cited in issue 03, p 319, Accession no A82-13504

A83-30161*# Analytical Mechanics Associates, Inc., Mountain View, Calif

ANALYSIS OF IN-TRAIL FOLLOWING DYNAMICS OF CDTI-EQUIPPED AIRCRAFT

J A SORENSEN and T GOKA (Analytical Mechanics Associates, Inc., Mountain View, CA) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol 6, May-June 1983, p 162-169 refs

(Contract NAS1-16135)

Previously cited in issue 19, p 2975, Accession no A82-39107

A83-30174

ROTORSHAFT TORQUEMETER

R B BOSSLER, JR (Kaman Aerospace Corp., Bloomfield, CT) American Helicopter Society, Journal (ISSN 0002-8711), vol 28, April 1983, p 3-8 refs

This paper discusses the performance benefits and limitations of a rotorshaft torque meter, surveys some methods of measuring rotorshaft torque and presents some thoughts on using the rotorshaft torque measurement. The performance benefits follow from removing the power penalty imposed by using engine torque measurement to limit rotor torque. Engine torque measurement provides no information on power diversion to accessories or the tail rotor. The greatest performance benefits occur during high-power high-gross-weight hover situations, such as pickup and delivery of heavy sling loads. Four currently-used methods of torque measurement in helicopters are reviewed including hydraulic pressure, toothed wheel phase displacement, material property change and telemetered strain gage systems. The pilots' workload and skill requirement can be reduced by using a rotorshaft torque meter to produce an audible warning signal, to provide maximum continuous power to the rotor, to accumulate torque/time events and to limit the maximum torque that can be applied.

Author

N83-23302# Ohio Univ., Athens Dept of Electrical Engineering

AN EXPERIMENTAL INVESTIGATION OF THE EFFICACY OF AUTOMATED WEATHER DATA TRANSMISSION TO AIRCRAFT IN FLIGHT Final Report

R H MCFARLAND Washington FAA Dec 1982 59 p refs

(FAA/PM-83/11, OU/AEC/EER-54-3) Avail NTIS HC A04/MF A01

Results of a flight evaluation of a cockpit weather data device operating with actual weather are reported which indicate that valuable and useful weather information can be given automatically to the pilot in flight to aid his decision making. Both text and graphics were investigated and found to have the potential of increasing aircraft safety. Author

N83-23304# AOA Apparatebau Gauting G m b H. (West Germany).

DIGITAL PRESSURE SENSOR FOR ALTIMETERS, RATE-OF-CLIMB AND AIR SPEED INDICATORS IN AIRCRAFTS Final Report, Dec. 1981

A THOMA Bonn Bundesministerium fuer Forschung und Technologie Dec 1982 111 p refs /n GERMAN, ENGLISH summary

(BMFT-FB-W-82-033, ISSN-0170-1339) Avail NTIS HC A06/MF A01, Fachinformationszentrum, Karlsruhe, West Ger. DM 23,50

A wave which is forced to be stationary in an acoustical resonator by two electroacoustic transducers and one PLL regenerative loop, shifts its resonance frequency when gas pressure is changed This principle is used for the design of an analog as well as a digital operating altimeter and rate of climb indicator with a pressure altitude conversion integrated in the measuring principle When the altitude changes by 9 km a change of the resonance frequency of 6,5 kHz with a linearity of 1,5% can be achieved In a theoretical differentiation of the measuring effect, considering also the change of sound velocity and vibration absorption as well as the phase rotation of the electroacoustic transducer, influences such as the nature of gas and gas temperature are discussed SL

N83-24504*# Honeywell, Inc., Minneapolis, Minn Avionics Div **DEMONSTRATION ADVANCED AVIONICS SYSTEM (DAAS). PHASE 1 REPORT Final Report**

30 Apr 1981 160 p refs

(Contract NAS2-10021)

(NASA-CR-170317, NAS 1 26 170317, N-151871) Avail NTIS HC A08/MF A01

An integrated avionics system which provides expanded functional capabilities that significantly enhance the utility and safety of general aviation at a cost commensurate with the general aviation market is discussed Displays and control were designed so that the pilot can use the system after minimum training Functional and hardware descriptions, operational evaluation and failure modes effects analysis are included SL

07

AIRCRAFT PROPULSION AND POWER

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

A83-30073

MAINTENANCE OF LARGE ENGINES CF6S FOR THE AIRBUS A310

D SEIDL Interavia (ISSN 0020-5168), vol 38, April 1983, p 305-308.

Attention is given to proprietary maintenance procedures developed in order to eliminate breakdowns in flight, avoid excessive fuel consumption due to faulty operation, and lower maintenance costs Attention is given to the case of the CF6 engine used by the A310 airliner Since the end of the 1960s, there has been a movement away from the principle of engine overhauls at regular, fixed periods, since it has been established that many faults bear no direct relationship with the number of hours of engine operation and substantial achievements had been made in in-flight engine monitoring by means of Aircraft-Integrated Data Systems Note is taken of the Gas Path Analysis diagnostic procedure, which is able to determine the specific engine module in which faults are to be found The complex software used is based on an imaginary, 'perfect' reference engine OC

A83-30158#

PMUX - THE INTERFACE FOR ENGINE DATA TO AIDS

J A BLUISH and W LORENZ (Bendix Corp., Energy Controls Div., South Bend, IN) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol 6, May-June 1983, p 143-149 refs

Previously cited in issue 17, p 2668, Accession no A82-35022

A83-30175

MINIMUM CONTACT MAGNETIC SENSING OF TURBINE BLADE SPEED

J D RICKMAN, JR (RCA, Automated Systems, Burlington, MA) American Helicopter Society, Journal (ISSN 0002-8711), vol. 28, April 1983, p 55, 56

The rotational frequency of turbine and compressor blades in helicopter gas turbine engines can be monitored by magnetic search coil 'pick-ups' mounted outside the tachometer housings Tachometer rotors consisting of a permanent magnetic material induce a voltage in the externally mounted pick-up coil that can be processed to reveal the tachometer rotational frequency The method is illustrated by measurements made on an Allison 250 gas turbine engine Author

A83-30190#

FUEL CHARACTER EFFECTS ON THE TF41 ENGINE COMBUSTION SYSTEM

R E VOGEL and D L TROTH (General Motors Corp., Indianapolis, IN) Journal of Energy (ISSN 0146-0412), vol 7, May-June 1983, p 218-225 USAF-supported research

Previously cited in issue 19, p 3265, Accession no A81-40858

A83-30874

MODERN PROPELLERS FOR COMMUTER AIRLINES

J G RUSSELL (Dowty Rotol, Ltd., Gloucester, England) Society of Automotive Engineers, Commuter Aircraft and Airline Operations Meeting, Savannah, GA, May 24-26, 1982 14 p refs (SAE PAPER 820719)

Development histories are given for aspects of commuter airliner propeller blade aerodynamics, hub structure, retention, pitch control and composite construction which have cumulatively yielded designs that are lower in weight, noise generation levels, and complexity, than the blade technology common during the 1950s and 1960s Attention is given to wind tunnel testing of blade airfoil aerodynamics, blade structure strike damage, and blade material lightning damage Maintenance and noise level improvements are noted as being of special significance for further development Graphite fiber-reinforced plastic composite blade structures are featured as the design state-of-the-art OC

A83-31493

INSTITUTE OF ENVIRONMENTAL SCIENCES AIRCRAFT ENGINE COMBUSTOR CASING LIFE SIMULATION FOR INCREASED RELIABILITY

S A CIMORELLI, S M EL-SOUDANI, and W J OLIPHANT (General Electric Co., Aircraft Engine Business Group, Lynn, MA and Evendale, OH) IN Environmental stress impact and environmental engineering methods, Proceedings of the Twenty-seventh Annual Technical Meeting on Emerging Environmental Solutions for the Eighties, Los Angeles, CA, May 5-7, 1981 Volume 1 Mt Prospect, IL, Institute of Environmental Sciences, 1981, p 134-141 refs

A cyclic pressure test of an aircraft engine combustor casing was performed at room temperature and peak load levels were calculated in order to simulate the component service life capability at an operating temperature of 920 F A special technique was used to grow a casing crack by fatigue to a near-critical length Growth rates as well as the initial phase of fatigue crack propagation life were determined from strain spacing data generated by transmission microscopy The through-thickness phase of fatigue crack growth was monitored using surface crack length measurements It was found that adding the initial phase of growth to the final growth phase predicted lives in excellent agreement

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with the total life based on the number of cyclic pressure load applications. A repair weld shrinkage defect was found by fractography to be the major fatigue crack nucleus, rendering the total component life of nearly 100 percent fatigue crack propagation CD

A83-31802

DESIGN FEATURES OF A NEW COMMUTER TURBOPROP ENGINE

M D STOTEN (Pratt and Whitney Aircraft of Canada, Ltd, Mississauga, Ontario, Canada) Society of Automotive Engineers, Commuter Aircraft and Airline Operations Meetings, Savannah, GA, May 24-26, 1982 7 p (SAE PAPER 820717)

The requirements for a short range aircraft turbopropeller engine suitable to present day market conditions of high fuel costs and deregulation are reviewed. The choice of engine size defines the engine power and the selection of operational economics defines the design priorities. A new aircraft engine family, the PW100 series, is used to illustrate these choices. The technology involved in this series is discussed. The prospects of the turboprop class are assessed, including changes in power plant which will become necessary CD

A83-31803

ADVANCED PROPELLER TECHNOLOGY FOR NEW COMMUTER AIRCRAFT

R G DAIGNEAULT (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and D G HALL Society of Automotive Engineers, Commuter Aircraft and Airline Operations Meeting, Savannah, GA, May 24-26, 1982, 15 p (SAE PAPER 820720)

Propeller technological advances as applied to commuter aircraft are discussed in detail. The effects of new advanced airfoils on aerodynamics are examined, showing test results for the HS-1 airfoil family and the performance of this configuration in aircraft with heavily and lightly loaded propellers. The effects of synchrophasing, which is the automatic control of the propellers such that a predetermined phase relationship between the circumferential blade locations of the propellers is maintained constant, on the cabin noise level is discussed. Measures which have been taken to increase maintainability, reliability, and safety are described, including modular design, spar shell blade design, inclusion of an active pitch lock, and on-condition maintenance. Finally, potential advances deemed appropriate for future turboprop aircraft are discussed, including the use of proplets and synchrophasing CD

A83-32587#

DEVELOPMENT OF COUNTER-ROTATING INTERSHAFT SUPPORT BEARING TECHNOLOGY

W L GAMBLE (United Technologies Corp., Government Products Div., West Palm Beach, FL) and R VALORI (U S Naval Air Propulsion Test Center, Trenton, NJ) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 557-563

Previously cited in issue 18, p 2848, Accession no A82-37679

A83-32787*# Rensselaer Polytechnic Inst., Troy, N Y STRUCTURAL DYNAMICS STUDIES OF ROTATING BLADED-DISK ASSEMBLIES COUPLED WITH FLEXIBLE SHAFT MOTIONS

R G LOEWY (Rensselaer Polytechnic Institute, Troy, NY) and N KHADER AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, Lake Tahoe, NV, May 2-4, 1983 10 p refs (Contract NAG3-37) (AIAA PAPER 83-0919)

In order to analyze the dynamic behavior of the first stage compressor/fan of the 'E3' turbofan engine, a classical structural dynamics approach is employed to couple the motions of a flexible bladed disk to a rotating flexible shaft. The analysis accounts for flexible disk displacements which are transverse to the plane of

rotation, and radial as well as tangential, and also accounts for rigid disk translations along, and rotations about, axes normal to the undeformed shaft axes. In the case of a wide range of E3 engine shaft flexibilities and speeds, some of the one-diameter node frequencies are shown to be affected by shaft degrees of freedom whose stiffness values are in general range of design practice. Conolis forces are also found to significantly affect natural frequencies where strong coupling between certain modes is present OC

A83-32791*# Carnegie-Mellon Univ., Pittsburgh, Pa.

EFFECTS OF FRICTION DAMPERS ON AERODYNAMICALLY UNSTABLE ROTOR STAGES

J H GRIFFIN (Carnegie-Mellon University, Pittsburgh, PA) and A SINHA AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, Lake Tahoe, NV, May 2-4, 1983 12 p refs (Contract NAG3-231) (AIAA PAPER 83-0848)

Attention is given to the physical concepts and mathematical techniques useful in the analysis of the stabilizing effect of friction on aerodynamically unstable rotor stages. Results are presented for three-, four-, and five-bladed disks. In the present multidegree-of-freedom model of an aerodynamically unstable rotor stage, a harmonic steady state solution due to the friction dampers may be either a stability limit, a stable cycle limit, or neither. A criterion is established in the form of an energy function which determines whether the solution is a stability limit. In the event that the initial displacement and velocity exceed those associated with the steady state solution corresponding to a stability limit, the response becomes unbounded OC

A83-32792#

CLASSICAL FLUTTER STABILITY OF SWEEPED PROPELLERS

J E TURNBERG (United Technologies Corp., Hamilton Standard, Windsor Locks, CT) AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, Lake Tahoe, NV, May 2-4, 1983 8 p refs (AIAA PAPER 83-0847)

A method has been developed to determine the classical flutter stability of propellers with swept blades in a high subsonic flow environment using a modal approach and the p-k flutter solution method. The analysis was developed to meet current demands in the growing technology of a high speed, quiet, fuel-efficient propeller or Prop-Fan. Analytical results are compared to experimental results of a model Prop-Fan that experienced flutter in a NASA Lewis Research Center wind tunnel. The analytical results show reasonable correlation to the experimental data and identify the flutter mode and the mechanism causing the instability Author

A83-33159

TOWARDS A RENEWAL OF THE PROPELLER IN AERONAUTICS [VERS UN RENOUVEAU DE L'HELICE EN AERONAUTIQUE]

D BERGER and P JACQUET (Societe Nationale Industrielle Aerospatiale, Division Avions, Paris, France) Association Aeronautique et Astronautique de France, Colloque d'Aerodynamique Appliquee, 19th, Marseille, France, Nov 8-10, 1982 30 p In French (AAAF PAPER NT 82-01)

The reasons for reconsidering the propeller for aircraft propulsion, the areas of application, and necessary developments are considered. Rising fuel costs and an increasing theoretical and experimental data base for turboprop engines have demonstrated that significant cost savings can be realized by the use of propellers. Propellers are well-suited to powering aircraft travelling at speeds up to Mach 0.65. Work is progressing on the development of a 150 seat aircraft which has a cruise speed of Mach 0.8, powered by a turboprop attached to an engine of 15,000 shp. Aeroelasticity analyses are necessary in order to characterize the behavior of thin profile propfan blades, particularly to predict the oscillations through the entire functional range. High-power

reducers must be developed, and the level of cabin noise must be controlled to less than 90 dB Commercial applications are predicted for turboprops in specific instances M.S.K

A83-33167

THE INTEGRATION OF INTERNAL COMBUSTION ENGINES OF THE GENERAL AVIATION - PROBLEMS RAISED BY VENTILATION AND EXHAUST [INTEGRATION DES MOTEURS A EXPLOSION DE L'AVIATION GENERALE PROBLEMES POSES PAR LA VENTILATION ET L'ECHAPPEMENT]

J P VAUNOIS (Toulouse, Centre d'Essais Aeronautique, Toulouse, France) Association Aeronautique et Astronautique de France, Colloque d'Aerodynamique Appliquee, 19th, Marseille, France, Nov 8-10, 1982 23 p In French. refs (AAAF PAPER NT 82-16)

Results of wind tunnel and performance tests of internal combustion engines for general aviation aircraft are reported The trials were performed to optimize the air intake and exhaust manifold shapes to minimize drag effects The NACA 43012 and 43015 profiles were a suitable compromise in the latter regard An oversized cowling was selected to minimize the effect of the presence of cylinders inside, to lower the necessary intake stress in cruise conditions, and to ease the recovery of dynamic pressure for the propellers Different shapes of the intake holes in the cone and the flow paths through and under the engine were examined Flow measurements were performed, as were measurements of the dynamic pressures around the propellers Disparties of up to 30 C in the temperatures of the engine heads were observed with the various intakes examined A reduction in the amount of air intake was found to offer a more homogeneous carburation and thus to lower the fuel consumption Finally, examples of the dramatic effects that the length of the exhaust channel can have on the performance of the engines are noted, noting the necessity of symmetrization of the exhaust before tuning the intake and carburation M.S.K

N83-23305*# Notre Dame Univ, Ind Dept of Electrical Engineering

ALTERNATIVES FOR JET ENGINE CONTROL Semiannual Status Report, 1 Oct. 1982 - 31 Mar. 1983

M K SAIN Apr 1983 102 p refs (Contract NSG-3048) (NASA-CR-170233, NAS 1 26 170233) Avail NTIS HC A06/MF A01 CSCL 21E

Tensor model order reduction, recursive tensor model identification, input design for tensor model identification, software development for nonlinear feedback control laws based upon tensors, and development of the CATNAP software package for tensor modeling, identification and simulation were studied The last of these are discussed Author

N83-23306*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

DESIGN ANALYSIS OF A SELF-ACTING SPIRAL-GROOVE RING SEAL FOR COUNTER-ROTATING SHAFTS

E DIRUSSO 1983 12 p refs Presented at the 19th Joint Propulsion Conf and Tech Display, Seattle, 27-29 Jun 1983 (NASA-TM-83346, E-1253, NAS 1 15.83346) Avail. NTIS HC A02/MF A01 CSCL 21E

A self-acting spiral groove inter-shaft ring seal of nominal 16.33 cm (6.43 in) diameter for sealing fan bleed air between counter rotating shafts in advanced turbofan engines was analyzed. The analysis focused on the lift force characteristics of the spiral grooves A NASA Lewis developed computer program for predicting the performance of gas lubricated face seals was used to optimize the spiral groove geometry to produce maximum lift force Load capacity curves (lift force as function of film thickness) were generated for four advanced turbofan engine operating conditions at relative seal speeds ranging from 17,850 to 29,800 rpm, sealed air pressures from 6 to 42 N/sq cm (9 to 60 psi) absolute and temperatures from 95 to 327 C (203 to 620 F) The relative seal sliding speed range was 152 to 255 m/sec (500 to 836 ft/sec) The analysis showed that the spiral grooves are capable of

producing sufficient lift force such that the ring seal will operate in a noncontacting mode over the operating range of typical advanced turbofan engines. Author

N83-23307# Aeronautical Research Labs, Melbourne (Australia)

PROPELLER POWER EFFECTS WITH WING FLAPS DEFLECTED

C A MARTIN Oct 1982 20 p refs (ARL-AERO-NOTE-413, AR-002-916) Avail NTIS HC A02/MF A01

A model of the dynamic motion of a single engine propeller driven aircraft was used to illustrate a longitudinal stability problem caused by the effects of power In a recent general study on the effects of power the problem was shown to be due to changes in propeller slipstream dynamic head acting on a tailplane carrying a download The problem is here studied in closer detail using the methods developed in the general study A notable feature of the destabilizing effect is that it increases as c.g moves forward and so opposes the conventional stabilizing effects associated with forward c.g movement Author

N83-23308# Michigan Univ, Ann Arbor Dept of Mechanical Engineering

EFFECT OF VOLATILITY ON AIR-FUEL RATION DISTRIBUTION AND TORQUE OUTPUT OF A CARBURETED LIGHT AIRCRAFT PISTON ENGINE Final Report

N W SUNG, K MORRISON, and D J PATTERSON Atlantic City, NJ FAA Mar 1982 36 p refs (Contract DOT-FA79NA-6083) (FAA-CT-82-117) Avail NTIS HC A03/MF A01

A comprehensive sea level static test cell data collection and evaluation effort to review operational characteristics of a carbureted light aircraft piston engine as related to fuel volatility and air fuel ratio distribution to cylinders Presented herein are results, data, and conclusions drawn from test cell engine operation on 100LL aviation grade fuel and various blends of automotive grade fuel Sea level static test cell engine operations were conducted utilizing an AVCO Lycoming O-320 engine connected to an eddy current dynamometer which facilitated data collection under various engine load conditions Test cell instrumentation was utilized to obtain operational data (temperatures, pressures, flow rates, torque, horsepower, exhaust emissions, etc) from idle through cruise to maximum power with fuel grades having Reid vapor pressure of 6.7, 11.7 and 14.0 The primary purpose of test cell engine operation was to observe real time performance characteristics associated with automotive grade fuel utilized by piston powered light general aviation aircraft. Author

N83-23310*# National Aeronautics and Space Administration, Washington, D C

A SIMPLE PROPULSION SYSTEM MODEL FOR THE SIMULATION OF NONLINEAR DYNAMIC THRUST RESPONSE

G SCHAENZER and P KRAUSPE Mar 1983 11 p refs Transl into ENGLISH from Z fuer Flugwiss und Weltraumforschung (West Germany), v 2, no 3, May - Jun 1978 p 195-198

(Contract NASW-3542) (NASA-TM-77053, NAS 1 15 77053) Avail NTIS HC A02/MF A01 CSCL 21E

A simple mathematical jet engine description is presented where the measured transition functions of the engine thrust can be simulated in a quasi-stationary operation as well as in acceleration or deceleration schedules Because of its simplicity and high fidelity, it is especially suited for representing jet engines in digital simulation programs Author

07 AIRCRAFT PROPULSION AND POWER

N83-23311# Motoren- und Turbinen-Union Muenchen G m b H (West Germany)

ADVANCED COMPRESSOR COMPONENTS FOR AERO ENGINES. PHASE 2 (1980-1981) Final Report, May 1982
W WEILER, H JACKWERTH, P SCHUSTER, and H MERZ
Bonn Bundesministerium fuer Forschung und Technologie Dec 1982 223 p refs /n GERMAN, ENGLISH summary (BMFT-FB-W-82-022, TECH-BEREICHT-82/013, ISSN-0170-1339) Avail NTIS HC A11/MF A01, Fachinformationszentrum, Karlsruhe, West Germany DM 40

Axial-centrifugal compressor, supercritical profiles for axial compressors, and high strength materials for compressors are discussed Author

N83-23312# Detroit Diesel Allison, Indianapolis, Ind
INFLUENCE OF BLADE TIP CLEARANCE ON AERODYNAMICALLY INDUCED VIBRATION Final Report, 31 Aug. 1981 - 30 Sep. 1982

J L BETTNER Oct 1982 67 p refs
(Contract F49620-80-C-0078, AF PROJ 2307)
(AD-A123125, DDA-EDR-11257, AFOSR-82-1086TR) Avail NTIS HC A04/MF A01 CSCL 21E

An experimental investigation, whose objective was to demonstrate the influence of rotor blade tip clearance effects on the dynamic pressure induced on a downstream vane, was conducted in a large, low speed, single-stage research compressor. The blade tip clearance was 0.48% span. The rig was heavily instrumented with dynamic pressure gages on the vane hub, mean, and tip section suction and pressure surfaces Author (GRA)

N83-23313# Air Force Inst of Tech, Wright-Patterson AFB, Ohio School of Systems and Logistics
COST ANALYSIS OF TURBINE ENGINE WARRANTIES M.S. Thesis

G T HELLESTO and M G OLIVERSON Sep 1982 193 p refs
(AD-A123034, AFIT-LSSR-85-82) Avail NTIS HC A09/MF A01 CSCL 21E

In the past, the commercial use of warranties for the purchase of turbine engines has proven cost effective. The use of warranties is now viewed by the Air Force as a viable procurement option for future Air Force turbine engine procurement. The Propulsion System Program Office (SPO) has investigated the use of warranties and recognizes the need for a system that can analyze the life cycle cost of an engine under warranty. This thesis shows the development of a decision support system in a computer model that assesses the turbine engine life cycle cost under warranty. Two versions of the warranty model were developed to provide short and long term warranty analysis and both systems were integrated into the total decision support system designed to assist SPO analysts and contract specialists to evaluate the cost effectiveness of a turbine engine warranty Author (GRA)

N83-23314# Garrett Turbine Engine Co, Phoenix, Ariz
TPE331/T76 TURBOPROP PROPULSION ENGINE DURABILITY Final Technical Report

L P WYNN Wright-Patterson AFB, Ohio AFWAL Aug 1982 176 p
(Contract F33615-81-C-5016, AF PROJ 2303)
(AD-A122962, GARRETT-21-3640(22), AFWAL-TR-82-4069)
Avail: NTIS HC A09/MF A01 CSCL 21E

This report on retirement-for-cause is based on the Garrett TPE331/T76 turboprop engine second-stage turbine wheel. This second-stage turbine wheel is an integrally bladed wheel with continuous rim slots between each blade at the rim. The slot is ended with a circular hole. The slot and hole reduce thermal and centrifugal stresses existing at the heated outer rim and extend turbine low-cycle-fatigue life. This program was planned to develop criteria from examination and analysis of field service wheels that would allow the Air Force to define how much life remained in the wheel with an observed crack. The investigated wheel displayed significant scatter in cycles to initiate a given crack size. This scatter was traceable to the large variation in grain size at the rim

of these cast integrally bladed wheels. Crack propagation analysis was able to predict the observed crack-growth rate. However, no correlation between crack initiation and usage could be identified during this program that would aid implementation of retirement-for-cause GRA

N83-23315# Stanford Univ, Calif
TRANSITORY STALL IN DIFFUSERS Final Report, 1 Mar. 1979 - 30 Sep. 1982

J P JOHNSTON 30 Dec 1982 5 p refs
(Contract N00014-79-C-0255, PROJ SQUID)
(AD-A122953) Avail NTIS HC A02/MF A01 CSCL 21E

Diffusers have wide application as components of engines for flight vehicles, e.g., airbreathing engine inlets, compressor diffusers, transfer and interstage ducting and combustor inlet diffusers. Their function is to convert the kinetic energy in a high speed stream into static pressure rise with the least possible loss of energy, a process called recovery. Diffusers designed for high pressure recovery are generally close to a state of flow separation, or they already have some intermittent separation occurring in their boundary layers GRA

N83-24505*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
EFFECTS OF INTERSTAGE DIFFUSER FLOW DISTORTION ON THE PERFORMANCE OF A 15.41-CENTIMETER TIP DIAMETER AXIAL POWER TURBINE Final Report

K L MCLALLIN, M G KOFKEY, and K C CIVINSKAS (Army Research and Technology Labs, Cleveland, Ohio) 1983 22 p refs
Proposed for presentation at the 19th Joint Propulsion Conf., Seattle, 27-29 Jun 1983, sponsored by AIAA, SAE, and ASME
(Contract DE-AI01-77CS-51040)
(NASA-TM-83359, DOE/NASA/51040-46, E-1621, NAS 1 15 83359, AVRADCOM-TR-83-C-2, AIAA-83-1179) Avail NTIS HC A02/MF A01 CSCL 21E

The performance of a variable-area stator, axial flow power turbine was determined in a cold-air component research rig for two inlet duct configurations. The two ducts were an interstage diffuser duct and an accelerated-flow inlet duct which produced stator inlet boundary layer flow blockages of 11 percent and 3 percent, respectively. Turbine blade total efficiency at design point was measured to be 5.3 percent greater with the accelerated-flow inlet duct installed due to the reduction in inlet blockage. Blade component measurements show that of this performance improvement, 35 percent occurred in the stator and 65 percent occurred in the rotor. Analysis of inlet duct internal flow using an Axisymmetric Diffuser Duct Code (ADD Code) were in substantial agreement with the test data Author

N83-24506*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
OPPORTUNITIES FOR RESEARCH IN AEROTHERMODYNAMICS

R W GRAHAM 1983 25 p refs
Presented at the Meeting of the Thermosci Affiliates of Stanford Univ, Stanford, Calif, 24 Jan 1983
(NASA-TM-83348, E-1605, NAS 1 15 83348) Avail NTIS HC A02/MF A01 CSCL 21E

'Aerothermodynamics' involves the disciplines of chemistry, thermodynamics, fluid mechanics and heat transfer which have collaborative importance in propulsion systems. There are growing opportunities for the further application of these disciplines to improve the methodology for the design of advanced gas turbines, particularly, the combustor and turbine. Design procedures follow empirical or cut and try guidelines. The tremendous advances in computational analysis and in instrumentation techniques hold promise for research answers to complex physical processes that are currently not well understood. The transfer of basic research understanding to engineering design should result in shorter, less expensive development commitments for engines. The status and anticipated opportunities in research topics relevant to combustors and turbines is reviewed S L

N83-24507*# Texas A&M Univ, College Station. Turbomachinery Labs.

DEFINITION OF FORCES ON TURBOMACHINERY ROTORS. TASK B REPORT: DYNAMIC ANALYSIS OF ROTORS

D W CHILDS 1 May 1983 105 p refs

(Contract NAS8-34505)

(NASA-CR-170763, NAS 1 26 170763, RD-2-83) Avail NTIS HC A06/MF A01 CSCL 21E

The rotordynamic characteristics of turbomachinery are known to depend on the forces developed due to relative motion between the rotor and the housing. For example, the critical speed locations generally depend on the bearing stiffnesses, seal damping influences rotor stability and bearing reaction amplitudes near critical speeds, etc. A systematic examination of the influence of changes in the forces acting on rotors is studied. More specifically, the sensitivity of the rotordynamic characteristics to changes in rotor forces is analyzed. Rotordynamic characteristics of the HPOTP (High Pressure Oxygen Turbopump) and HPFTP (High Pressure Fuel Turbopump) of the SSME (Space Shuttle Main Engine) are investigated. Because of their markedly different rotordynamic characteristics, these units are considered to be representative of a range of possible future liquid rocket engine turbomachinery. Author

N83-24508# National Aerospace Lab, Tokyo (Japan). **RESEARCH AND DEVELOPMENT OF THE TURBOFAN ENGINE (THE 2ND PHASE, FJR 710)**

1982 82 p /n JAPANESE, ENGLISH summary

(NAL-TR-741, ISSN-0389-4010) Avail NTIS HC A05/MF A01

A 5 ton thrust class turbofan engine, the prototype FJR 710/600 turbofan engine was developed. Details on individual component tests and engine test runs are provided. S L

N83-24509*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

PARTICLE SIZING BY MEASUREMENT OF FORWARD-SCATTERED LIGHT AT TWO ANGLES

D R BUCHELE May 1983 25 p refs

(NASA-TP-2156, E-1179, NAS 1 60 2156) Avail NTIS HC A02/MF A01 CSCL 20F

Fundamental and practical limitations to particle sizing by measurement of forward scattered light are presented. Methods to minimize the limitations are described. Two types of instruments are compared. Author

N83-24510# Dayton Univ, Ohio **PROCEEDINGS: EJECTOR WORKSHOP FOR AEROSPACE APPLICATIONS Final Technical Report, Aug. 1981 - Jan. 1982**

R P BRADEN, R S NAGARAJA, and H J P VONCHAIN Wright-Patterson AFB, Ohio AFWAL Jun. 1982 1050 p refs Workshop held in Dayton, Ohio, 2-5 Aug 1981

(Contract F33615-81-K-3032, AF PROJ 2307)

(AD-A124264, UDR-TR-82-64, AFWAL-TR-82-3059) Avail NTIS HC A99/MF A01 CSCL 21E

These are the Proceedings of the Ejector Workshop for Aerospace Applications, which was conducted 2-5 August 1981 at the Bergamo Conference Center, Dayton, Ohio. The Workshop was hosted by the Air Force Office of Scientific Research and the Flight Dynamics and Aeropropulsion Laboratories of the Air Force Wright Aeronautical Laboratories. GRA

N83-24511# Air Force Inst of Tech, Wright-Patterson AFB, Ohio School of Engineering

ROUGHNESS EFFECTS ON COMPRESSOR OUTLET GUIDE VANES AT HIGH REYNOLDS NUMBER AND HIGH TURNING ANGLE M.S. Thesis

D T GENOVESE Nov 1982 95 p refs

(AD-A124688, AFIT/GAE/AA/82D-11) Avail: NTIS HC A05/MF A01 CSCL 21E

An experimental investigation of the effects of surface roughness on flow at high Reynolds number over compressor outlet guide vanes at high turning angle in a 2-D cascade was conducted. Two models of roughness were tested: one smoother

and one rougher than actual compressor vanes. Four configurations of roughness were evaluated: pressure and suction sides smooth, pressure and suction sides rough, pressure side rough with the suction side smooth and suction side rough with the pressure side smooth. GRA

08

AIRCRAFT STABILITY AND CONTROL

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

A83-30171#

EXCESSIVE ROLL DAMPING CAN CAUSE ROLL RATCHET

C R CHALK (Arvin/Calspan Corp, Buffalo, NY) (Guidance and Control Conference, San Diego, CA, August 9-11, 1982, Collection of Technical Papers, p 556-560) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol 6, May-June 1983, p 218, 219 refs

Previously cited in issue 19, p 2981, Accession no A82-38986

A83-32425

GLOBALLY STABLE NONLINEAR FLIGHT CONTROL SYSTEM

D MCLEAN (Loughborough University of Technology, Loughborough, Leics, England) IEE Proceedings, Part D - Control Theory and Applications (ISSN 0143-7054), vol 130, pt D, no 3, May 1983, p 93-102 refs

In the design of an automatic flight control system (AFCS) for aircraft, it has been customary to regard the mathematical representation of the aircraft dynamics and its associated control law as comprising a linear feedback system. Despite some disadvantages, linear state-variable feedback (LSVF), obtained as a result of solving the linear quadratic problem (LQP) of modern control theory, has been widely applied. From 1977, a series of new concepts involving nonlinear control policies was proposed by Gill (1979, 1980). Gill's work has left open the question of whether such policies could assure global closed-loop stability. The present investigation provides an heuristic proof that for one particular example of an AFCS, a pitch-rate maneuver-demand system, global stability is guaranteed when two of the new methods proposed by Gill are employed simultaneously. G R

A83-32578#

THE DEFINITION OF SHORT-PERIOD FLYING QUALITIES CHARACTERISTICS VIA EQUIVALENT SYSTEMS

D E BISCHOFF (U S Naval Material Command, Naval Air Development Center, Warminster, PA) (Guidance and Control Conference, Albuquerque, NM, August 19-21, 1981, Collection of Technical Papers, p 153-161) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 494-499 refs

Previously cited in issue 21, p 3624, Accession no A81-44094

A83-32933

IN-FLIGHT SIMULATION OF A DIGITALLY IMPLEMENTED DIRECT FORCE MODE

R F WHITBECK (Systems Technology, Inc, Hawthorne, CA), G K HELLMAN, and W A BALLENGER, JR (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 13-1 to 13-11

Preliminary results of an in-flight simulation study of digital flight control algorithms using Princeton University's VRA Navion are presented. A description of the wings-level turn mode analog test is given, including the air-to-air tracking task, the development and in-flight identification of test configurations, and in-flight vehicle identification. Some of the issues which pertain to digital controller

08 AIRCRAFT STABILITY AND CONTROL

tests are briefly discussed. It is concluded that in-flight simulations of direct force modes which are to be implemented digitally require a simulation aircraft which has the capability to operate, in a parallel manner, an analog as well as a digital fly-by-wire control system. C D

A83-32934

SIDESTICK CONTROLLER DESIGN REQUIREMENTS

T J CORD (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 14-1 to 14-10 refs

A series of flight tests performed in order to generate a data base for the development of design criteria for sidestick controllers is discussed. The experiments utilized two flight phases up and away and landing approach. Preassigned maneuvers were performed by the pilots and their ratings and comments were solicited. The design parameters are defined as those which affect the 'feel' of the controller and those which define the dynamics of the aircraft. The current design specification is identified, and examples of flight test summaries are shown and briefly discussed. Recommendations for a sidestick controller design for a fighter aircraft are stated, with comments. C D

A83-33008

DYNAMIC STABILITY OF A FLIGHT VEHICLE NEAR A PERTURBED SURFACE [DINAMICHESKAIA USTOICHIVOST' LETATEL'NOGO APPARATA VBLIZI VZVOLNOVANNOI POVERKHNOSTI]

V V OLKOV and I N GUSEV IN Perturbation methods in mechanics. Novosibirsk, Izdatel'stvo Nauka, 1982, p 105-111. In Russian refs

The problem of the dynamic stability of a flight vehicle near a perturbed surface is reduced to an analysis of the Mathieu equation and dynamic stability regions. Transient processes are plotted for the most dangerous regimes, and frequency ranges of the external wave perturbations leading to parametric resonances are determined. V L

A83-33009

A STUDY OF THE STATISTICAL DYNAMICS OF FLIGHT VEHICLES [ISSLEDOVANIIE STATISTICHESKOI DINAMIKI LETATEL'NYKH APPARATOV]

G M KUZHNIKOV and V V SURZHIK IN Perturbation methods in mechanics. Novosibirsk, Izdatel'stvo Nauka, 1982, p 112-125. In Russian refs

The statistical dynamics of flight vehicles is investigated on the basis of the Fokker-Planck-Kolmogorov equation. The algorithms that are used for solving this equation are also used to solve a system of differential equations describing the nonstationary motion of a flight vehicle. Stability conditions for the flight vehicle are derived by analyzing the relaxation time and attenuation decrement of the transients. V L

A83-33096

HIGHER HARMONIC CONTROL FOR THE JET SMOOTH RIDE

E R WOOD (Hughes Helicopters, Inc., Aeromechanics Section, Culver City, CA) Vertiflite (ISSN 0042-4455), vol 29, May-June 1983, p 28-32

Higher harmonic control (HHC) is an active control concept, in contrast to the conventional, passive means of vibration control which include vibration absorbers and isolators and nodal beam suspension. HHC alters the vibratory aerodynamic forces which cause helicopter airframe vibration at their source, which is the rotor system, by means of a computer-controlled vibration suppression system which senses and cancels airframe vibrations through the inducement of high frequency pitch motions of the rotor blades at angles of less than 1 deg. Attention is given to the open- and closed-control loop flight tests of the HHC system aboard an OH-6A helicopter. A reduced effectiveness of the HHC system at higher airspeeds, perhaps due to system nonlinearities, is noted. O C

A83-33166

THE CORKSCREW PHENOMENON ON THE PROTOTYPE OF THE EPSILON [LE PHENOMENE TIRE-BOUCHON SUR LE PROTOTYPE DE L'EPSILON]

J IRVOAS (Societe Nationale Industrielle Aerospatiale, Toulouse, France) Association Aeronautique et Astronautique de France, Colloque d'Aerodynamique Appliquee, 19th, Marseille, France, Nov 8-10, 1982. 32 p. In French (AAAF PAPER NT-82-15)

Initial flight trials with the Epsilon high-powered propeller-driven trainer revealed the presence of coupling of longitudinal and lateral oscillations during strong sideslip conditions. The problem induced a dutch roll, and consisted of a quasi-circular motion by the nose of the aircraft. An analysis of the aerodynamics disclosed an angle of attack effect on the torque of the loop, producing a stabilized slip. Opposed to a weathervane effect, the augmented slip initiated a nose-dive and a reduction of the angle of attack. A Nyquist diagram demonstrated that coupling of the longitudinal and lateral oscillations initiated a divergent mode, with sideslip and the angle of attack in quadrature. Tests with a model and calculations led to the development of a new surface and stretch of the aircraft, as well as a lowering of the tail assembly. The increased stability of the model was verified in the wind tunnel, and the changes will be incorporated into the production versions of the aircraft. M S K

N83-23316*# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
NASA/RAE COLLABORATION ON NONLINEAR CONTROL USING THE F-8C DIGITAL FLY-BY-WIRE AIRCRAFT Final Report

G F BUTLER (RAE), M J CORBIN (RAE), S MEPHAM (RAE), J F STEWART, and R R LARSON Feb 1983. 20 p. refs (NASA-TM-84296, A-9076, NAS 1 15 84296) Avail NTIS HC A02/MF A01 CSCL 01C

Design procedures are reviewed for variable integral control to optimize response (VICTOR) algorithms and results of preliminary flight tests are presented. The F-8C aircraft is operated in the remotely augmented vehicle (RAV) mode, with the control laws implemented as FORTRAN programs on a ground-based computer. Pilot commands and sensor information are telemetered to the ground, where the data are processed to form surface commands which are then telemetered back to the aircraft. The RAV mode represents a singlestring (simplex) system and is therefore vulnerable to a hardover since comparison monitoring is not possible. Hence, extensive error checking is conducted on both the ground and airborne computers to prevent the development of potentially hazardous situations. Experience with the RAV monitoring and validation procedures is described. A R H

N83-23317*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va

STABILITY AND CONTROL OF A SUPERSONIC TRANSPORT AIRPLANE DURING LANDING APPROACH

W I OEHRMAN Apr 1983. 32 p. refs (NASA-TM-84659, NAS 1 15 84659) Avail NTIS HC A03/MF A01 CSCL 01C

Modal control theory was applied to determine feedback gains that provide desirable stability characteristics and satisfactory transient response to aileron deflection input. However, the peak value of lateral acceleration at the pilot's station does not satisfy a proposed criterion during a rolling maneuver. Optimal regulator theory does not provide a significant reduction of the peak lateral acceleration. The weighting matrices in the performance index were given an extreme variation, but the effect on lateral acceleration remained insignificant. Open loop control provided the desired bank angle (30 deg) with the desired roll rate (10 deg/sec), and provided a satisfactory level of lateral acceleration. However, a large adverse sideslip angle was required. In addition, the yawing velocity was negative for about two seconds and lateral acceleration changed sign during the maneuver. The problem persists and perhaps relaxed criteria must be proposed. The criteria could allow any combination of a lower average rolling velocity, a larger adverse

sideslip angle excursion, and a higher peak lateral acceleration at the pilot's station. S L

N83-23318*# Systems Technology, Inc., Mountain View, Calif
NON-INTRUSIVE PARAMETER IDENTIFICATION PROCEDURE USER'S GUIDE Final Report, Feb. - Jun. 1982
 G D HANSON and W F JEWELL Apr 1983 138 p refs
 (Contract NAS4-2941)
 (NASA-CR-170398, NAS 1 26 170398, TR-1188-1) Avail NTIS HC A07/MF A01 CSCL 01C

Written in standard FORTRAN, NAS is capable of identifying linear as well as nonlinear relations between input and output parameters, the only restriction is that the input/output relation be linear with respect to the unknown coefficients of the estimation equations. The output of the identification algorithm can be specified to be in either the time domain (i.e., the estimation equation coefficients) or in the frequency domain (i.e., a frequency response of the estimation equation). The frame length ('window') over which the identification procedure is to take place can be specified to be any portion of the input time history, thereby allowing the freedom to start and stop the identification procedure within a time history. There also is an option which allows a sliding window, which gives a moving average over the time history. The NAS software also includes the ability to identify several assumed solutions simultaneously for the same or different input data.

A R H

N83-23319# Dornier-Werke GmbH, Friedrichshafen (West Germany)
THE OPEN LOOP GUST ALLEVIATION SYSTEM: OLGA Final Report, Dec. 1981
 H BOEHRET, U NORTMANN, M VONSARNOWSKI, W WAGNER, and H WUENNENBERG Bonn Bundesministerium fuer Forschung und Technologie Dec 1982 86 p refs /n GERMAN, ENGLISH summary
 (BMFT-FB-W-82-030; ISSN-0170-1339) Avail NTIS HC A05/MF A01, Fachinformationszentrum, Karlsruhe, West Ger DM 18

The application of a gust alleviation system on low wing loading aircraft, the open loop gust alleviation (OLGA) was examined. In the open loop principle the gust angle is calculated from the sensor signals and fed to the actuators which control the symmetric aileron and the elevator trim. The equipment sensors, processors, actuators are specified and tested in a comprehensive hardware simulation. The acceptance test is accomplished by this hardware simulation. The good performance of all systems with respect to their specification are demonstrated. E A K

N83-24512*# Kansas Univ Center for Research, Inc., Lawrence Flight Research Lab
RIDE QUALITY SYSTEMS FOR COMMUTER AIRCRAFT Final Report
 D R DOWNING, T A HAMMOND, and S P AMIN Hampton, Va NASA Langley Research Center May 1983 92 p refs
 (Contract NAG1-282)
 (NASA-CR-166118; NAS 1 26 166118, KU-FRL-582-1) Avail NTIS HC A05/MF A01 CSCL 01C

The state-of-the-art in Active Ride Augmentation, specifically in terms of its feasibility for commuter aircraft applications. A literature survey was done, and the principal results are presented here through discussion of different Ride Quality Augmentation System (RQAS) designs and advances in related technologies. Recommended follow-on research areas are discussed, and a preliminary RQAS configuration for detailed design and development is proposed. Author

N83-24513*# Calspan Advanced Technology Center, Buffalo, NY
APPLICATION OF CALSPAN PITCH RATE CONTROL SYSTEM TO THE SPACE SHUTTLE FOR APPROACH AND LANDING Final Report

N C WEINGARTEN and C R CHALK May 1983 145 p refs
 (Contract NAS4-2995)
 (NASA-CR-170402, NAS 1 26 170402, REPT-7102-F-1) Avail NTIS HC A07/MF A01 CSCL 01C

A pitch rate control system designed for use in the shuttle during approach and landing was analyzed and compared with a revised control system developed by NASA and the existing OFT control system. The design concept control system uses filtered pitch rate feedback with proportional plus integral paths in the forward loop. Control system parameters were designed as a function of flight configuration. Analysis included time and frequency domain techniques. Results indicate that both the Calspan and NASA systems significantly improve the flying qualities of the shuttle over the OFT. Better attitude and flight path control and less time delay are the primary reasons. The Calspan system is preferred because of reduced time delay and simpler mechanization. Further testing of the improved flight control systems in an in-flight simulator is recommended. A R H

N83-24514# National Aerospace Lab, Tokyo (Japan)
REAL TIME DIGITAL INTERGRATION AND INTEGRAL STEP SIZE FOR FLIGHT CONTROL AND FLIGHT SIMULATION
 A WATANABE 1982 45 p refs /n JAPANESE, ENGLISH summary
 (NAL-TR-743, ISSN-0389-4010) Avail NTIS HC A03/MF A01

Digital computers were adopted for aircraft inner loop control functions and for flight simulators used in aircraft design, analysis and training. In these systems, digital computers are used in most cases as a device for executing real time calculations. A digital computer has the following merits: it can easily execute most calculations including nonlinearities, it is easy to improve the computational accuracy, it has reproducibility, and it has good ability of memory. For a real time execution using digital computers, the fundamental problem is one of numerical integration. Many methods and techniques for performing these integrations were revised. Various integration methods which are effective for real time calculations are compared. It is further pointed out that in actual execution, it is important to choose an integral step size (or sampling rate) that the system can accommodate. Then, in the last section sampling rate selection methods are discussed. Author

N83-24515*# Lockheed-Georgia Co., Marietta
INTEGRATED ASSURANCE ASSESSMENT OF A RECONFIGURABLE DIGITAL FLIGHT CONTROL SYSTEM Final Report, Feb. - Oct. 1982
 W G NESS, R M DAVIS, J W BENSON, M K SMITH, and D ELDREDGE Washington FAA Apr 1983 125 p refs
 (Contract NAS2-11179, DOT-FA77WAI-738)
 (NASA-CR-170281, NAS 1 26 170281) Avail NTIS HC A06/MF A01 CSCL 01C

The integrated application of reliability, failure effects and system simulator methods in establishing the airworthiness of a flight critical digital flight control system (DFCS) is demonstrated. The emphasis was on the mutual reinforcement of the methods in demonstrating the system safety. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

09

RESEARCH AND SUPPORT FACILITIES (AIR)

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

A83-30514

EXPERIMENTAL VERIFICATION OF PROPERTIES OF S-N FATIGUE LIFE GAGES FOR THE PURPOSE OF A USE OF THE GAGES AS INDICATORS OF THE RELATIVE SEVERITY OF OPERATING CONDITIONS [EXPERIMENTALNI OVERENI VLASTNOSTI S/N SNIMACU S CILEM JEJICH VYUZITI JAKO INDIKATORU RELATIVNI TVRDOSTI PROVOZNIH PODMINEK CVICNYCH LETOUNU]

Z KLIMA and P KUCHARSKY Zpravodaj VZLU (ISSN 0044-5355), no 6, 1982, p 215-225 In Czech refs

A study was conducted to verify the basic characteristics of S-N fatigue life gages. One part of the performed experiments involved the placement of fatigue life gages on test specimens. In another part of the study, the gages were positioned on the structure of a trainer aircraft which was tested in a laboratory. The obtained results are summarized and evaluated. The study included the testing of modern S-N fatigue life gages with multipliers of deformation and built-in strain gages, taking into account monotonic loading conditions. Attention is also given to matching problems in the case of parts subjected to transient loading.

G R

A83-32175*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
CRYOGENIC WIND TUNNELS FOR HIGH REYNOLDS NUMBER TESTING

R A KILGORE, D A DRESS, and P D MCGUIRE (NASA, Langley Research Center, Hampton, VA) Short Course on Aerospace Ground Test Facilities and Flight Testing, University of Tennessee, Tullahoma, TN, Apr 26, 1983, Paper 49 p

The present investigation has the objective to provide an overview of the development of cryogenic wind tunnels and their application to high Reynolds number testing. The current need for wind tunnels reflects the fact that many complex three-dimensional flows cannot yet be adequately dealt with analytically. Imperfections of wind tunnels are partly related to the fact that for most wind tunnel tests the Reynolds number is much too low. The best solution to this problem appears to be an operation of the tunnel at cryogenic temperatures (arbitrarily defined as temperatures of 150 K or less). In addition to decreasing the temperature, there are three other approaches for increasing the Reynolds number. These approaches include the use of a heavy gas, an increase in the model size, and an increase in pressure. Attention is given to the variable density tunnel concept, problems with high dynamic pressures, low-speed cryogenic tunnel results, transonic cryogenic tunnel tests, and the injection of liquid nitrogen into the tunnel.

G R

A83-32585*# National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
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) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p 543-551 refs

Previously cited in issue 10, p 1554, Accession no A82-24677

A83-32927

A COST EFFECTIVE QUICK-RESPONSE TEST STATION

D L WHITE (McDonnell Aircraft Co., St Louis, MO) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 2-1 to 2-13

The McDonnell Aircraft Company has recently developed a mobile ground station that can be trucked to a remote test site to provide the following support during flight testing: (1) a communications link with the test pilot, (2) display of real-time telemetry data, and (3) post-flight display of on-board tape recordings. This Company-funded station has been in operation since 1 October 1979. It has been deployed off-site several times in support of the YAV-8B V/STOL Flight Test Program, and has demonstrated the ability to meet test objectives at reasonable cost. It can also support the F-15 and the F-18 aircraft. Author

A83-32928

REDUCING THE COST FOR AIRBORNE INSTRUMENTATION HARDWARE TESTING

G W SANDERSON (McDonnell Aircraft Co., St Louis, MO) IN Society of Flight Test Engineers, Annual Symposium, 12th, Dayton, OH, September 16-18, 1981, Proceedings Lancaster, CA, Society of Flight Test Engineers, 1981, p 3-1 to 3-15

A microcomputer-based Centralized Automated Test Station (CATS), which reduces the cost of airborne hardware testing, has been developed by McDonnell Aircraft Company. The system supports a variety of functions, thereby minimizing a duplication of hardware. Versatility is achieved through software control of the hardware, which includes standard laboratory equipment, cathode ray tube terminal, line printer, off-the-shelf circuit cards, and custom-interface circuit cards. The software includes a Disk Operating System, utility programs, a debug program, an assembler, a Fortran IV compiler, and developed programs. This paper discusses the advantages of the CATS approach and provides a cost comparison with conventional test equipment. Author

A83-33351#

IMPACT OF STRETCHING WIDE-BODIED AIRCRAFT ON EXISTING AIRPORT FACILITIES

F X MCKELVEY (Michigan State University, East Lansing, MI) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 7 p refs

(AIAA PAPER 83-1578)

An examination of the impacts of stretched and double-deck wide-bodied aircraft on the physical facilities of existing airports is discussed. Based upon aircraft size trend data and aircraft development studies, the effect of the geometry of such aircraft on the planning and design criteria of airports is examined. The potential effects on existing runway, taxiway, and apron area separations of introducing such aircraft into John F. Kennedy International Airport are discussed. Comparisons are made between existing wide-bodied aircraft and the potential aircraft on the ability of processing facilities to handle the increased passenger and baggage demand. Author

A83-33353#

LAND DEVELOPMENT, TALL BUILDINGS AND AIRPORT OPERATIONS

F R MADGWICK (Howard Needles Tammen and Bergendoff, Alexandria, VA) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 9 p refs

(AIAA PAPER 83-1581)

Criteria for tighter restriction of tall-building construction and other intensive use of land near airports are discussed in terms of air safety, the safety of ground workers and residents, and the integrity of electronic navigational systems. Navigable-airspace requirements can better be met if Parts 25 and 121 of the Federal Aviation Regulations and the provisions of the FAA Terminal Instrument Procedures are incorporated into airport zoning regulations. Data on the location of airport-vicinity accidents are

surveyed to determine zones in which large aggregations of people should be avoided. It is determined that VHF and ILS blockage or reflection by tall buildings is easily corrected, but that radar-shielding correction by multiple radar systems can be difficult or expensive, so that effective planning and the definition of critical radar sectors where no new obstructions should be allowed are desirable. The adoption of stricter standards is seen as necessary if present airports are to handle increasing traffic loads safely. T K

A83-33354#
IDENTIFYING AIRCRAFT AND AIRPORT COMPATIBILITY - A STRAIGHTFORWARD APPROACH TO COMPLEXITY

C N SWANSON (Western Michigan University, Kalamazoo, MI) and A R KUHLTHAU (Virginia, University, Charlottesville, VA) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 10 p refs (AIAA PAPER 83-1582)

A methodology is described for relating airport and aircraft characteristics in such a way that when physical or operational changes occur in one, the impact on the physical or operational properties of the other can be accurately and comprehensively anticipated. The program elements and procedures are discussed in some detail. Its implementation is illustrated and its relationship to other airport models is discussed. The present state of the development of the methodology is summarized and the necessary steps to make its use effective and efficient throughout the industry are discussed. Author

A83-33356#
PLANNING INTRA-AIRPORT TRANSPORTATION - A FRAMEWORK FOR DECISION MAKING

L A MCCOOMB (Transport Canada, Transportation Development Centre, Montreal, Canada) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 11 p (AIAA PAPER 83-1585)

The smooth flow of people between activity centers is critical to the efficient operation of large airports. This paper presents a two stage framework for analyzing the wide range of ground transportation options (i.e., moving sidewalks, shuttle buses, automated people mover, etc.) available to airport planners. The technique presented is designed to highlight the critical tradeoffs that must be made in choosing a future course for ground transportation development. It has also been structured to fully integrate into the larger airport operating policy and land use planning process. The analytic process is illustrated through its application at Toronto International Airport. Author

A83-33361#
THERMAL PROPERTIES OF SOME ASPHALTIC CONCRETE MIXES

W H HIGHTER (Tennessee, University, Knoxville, TN) and D J WALL AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 11 p refs (Contract AF-AFOSR-82-0250) (AIAA PAPER 83-1598)

With the motivation of an increased understanding of heat transfer in asphaltic concrete recycling processes that employ heat, laboratory tests were carried out on 4 asphaltic concrete mixes (3 having limestone aggregate, 1 with expanded shale lightweight aggregate) to determine thermal properties. It was found that the thermal conductivity of the 3 limestone mixes depended on asphalt content and aggregate gradation but that the conductivity of the lightweight aggregate mixes varied little as the asphalt content was increased for 3.5 percent to 6.5 percent. The specific heat and diffusivity of the mixes varied with mineralogy and gradation but changed little with asphalt content. Author

A83-33362#
EVALUATION OF PROPERTIES OF RECYCLED ASPHALT CONCRETE HOT MIX

E R BROWN (U.S. Army, Corps of Engineers, Vicksburg, MS) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 8 p (AIAA PAPER 83-1599)

Asphalt pavement recycling became popular in the mid-1970's. The price of asphalt binder and high-quality aggregate has continued to rise, making recycling an economical approach to pavement rehabilitation. The present study is concerned with the testing and evaluation of hot recycled mixtures. Since hot mix recycling has only been used for a few years, field performance data are limited. Hot mix recycling is presently used on many paving jobs, and a need exists, therefore to be able to predict the performance of these hot recycled mixtures. The basic plan of the investigation included a comparison of the laboratory properties of hot recycled mixtures to those of conventional mixtures with emphasis placed on fatigue characteristics. Samples of in-place aged asphalt concrete were obtained from pavements at three locations which were intended to be recycled. Results of tests indicated that recovered asphalt binders blended with the recycling agent used in the study tend to undergo greater changes in properties upon heating than the new asphalt binders. G R

A83-33363#
AIRPORT PAVEMENT MANAGEMENT - A TOTAL SYSTEM

M Y SHAHIN (U.S. Army Construction Engineering Research Laboratory, Champaign, IL) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 12 p refs (AIAA PAPER 83-1600)

Airport pavements must be monitored carefully to ensure safe aircraft operations. The U.S. Army Construction Engineering Research Laboratory (CERL) has, therefore, developed a comprehensive airport pavement management system. The airport system has been incorporated into a computerized roads and parking lots management system under the name Paver. The present investigation is concerned with the Paver features pertaining to airports. The system consists of procedures for dividing the airport pavement into manageable sections, data collection, data storage and retrieval, network management, project management, and budget optimization. Attention is given to pavement condition rating, pavement nondestructive testing, budget optimization, life cycle costing, and a benefit analysis. G R

A83-33364#
NONDESTRUCTIVE AIRFIELD PAVEMENT TESTING USING LASER TECHNOLOGY

A J BUSH, III, J W HALL, JR (U.S. Army, Corps of Engineers, Vicksburg, MS), and M E HARR (Purdue University, Lafayette, IN) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 5 p (AIAA PAPER 83-1601)

The deflection of the pavement surface of an airfield or a road under an applied load is one of the best indicators for the structural quality of the pavement. A system which can be employed to measure both roughness and deflection under a moving load represents a significant advance in the state-of-the-art of pavement evaluation. A high-speed profilometer, developed in England, uses 4 lasers mounted on a 2-wheel trailer coupled to a towing vehicle. The present study is concerned with laser devices which operate perpendicular to the pavement surface and require no contact with the surface. The infrared light source is projected through a lens to the pavement surface. A portion of the light is scattered and received through another lens on a strip of photosensitive material. The laser system has been demonstrated over profiles of conventional asphalt pavement, asphalt porous friction courses, and portland cement concrete pavements. G R

09 RESEARCH AND SUPPORT FACILITIES (AIR)

A83-33365#

STANDARDIZED PAVEMENT STRENGTH REPORTING SYSTEM - ACN/PCN

J L RICE (FAA, Washington, DC) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 6 p (AIAA PAPER 83-1602)

In 1977 the International Civil Aviation Organization (ICAO) established a special task group to develop a standardized method of reporting airport pavement strength. The study group developed a reporting system known as the Aircraft Classification Number/Pavement Classification Number (ACN/PCN). ICAO adopted the reporting system in 1981. Member countries are to report pavement strength using the ACN/PCN system as soon as practical. The ACN/PCN system of reporting pavement strength is based on describing the flotation (pavement requirements) of aircraft (ACN) and describing the load carrying capacity of pavements (PCN) in terms of the same standard single wheel load. G R

N83-23320 Flughafen, Frankfurt am Main (West Germany) Abt Oeffentlichkeitsarbeit und Marktforschung RUNWAY 18 WEST UNDER DISCUSSION. ON ICY WINDS IN THE AIRPORT CONTROVERSY [FLUGHAFENAUSBAU. STARTBAHN 18 WEST IN DER DISKUSSION. IM FLUGHAFENSTREI T WEHT EIN EISIGER WIND]

E ERNST Jan 1982 22 p refs In GERMAN (FACHTHEMEN-1) Avail Issuing Activity

The ecological-economical controversy in the planning of the runway west (18-W) at the Rhine-Main Airport is discussed. The planning includes the construction of a 4,000 m long, 45 m wide third runway, which includes the sacrifice of 350 ha (3.5 km²) of forest. The 18-W will cause an increase of noise for over 15,000 residents, who are living south of the airport, while it will relieve another 100,000 residents of noise. Opposing considerations related to the construction are outlined. On one hand, a 25% capacity increase and greater accuracy in air traffic, and on the other hand the stabilization of the Frankfurt airport as the third large employer in Hessen. Causes and development are outlined and the planned construction steps are evaluated.

Transl by E A K

N83-23321 Flughafen, Frankfurt am Main (West Germany) Abt Oeffentlichkeitsarbeit und Marktforschung QUESTIONS AND ANSWERS CONCERNING RUNWAY 18 WEST [FRAGEN UND ANTWORTEN ZUR STARTBAHN 18 WEST]

20 Feb 1982 13 p In GERMAN

(FACHTHEMEN-2) Avail Issuing Activity

The reasons for planning runway 18 west (18-W) at the Frankfurt/Main Airport are discussed. The German Federal Republic is dependent on its export industry and the Frankfurt Airport is the gate to the world. It is located in the center of Europe, which makes it one of the most important airports in world air traffic. As a passenger transport airport it ranks 13th in the world and fourth in cargo transport. For many years the airport is not able to fulfill its task adequately while the capacity of the available runways is run down. The 18-W runway was planned at the beginning of the 1960's. Opposing economical and ecological points of view are expressed and plans, claims and ideas concerning the construction of 18-W are outlined.

Transl by E A K

N83-23322 Flughafen, Frankfurt am Main (West Germany) Abt Oeffentlichkeitsarbeit und Marktforschung THE RUNWAYS OF THE FRANKFURT MAIN AIRPORT: AIR TRAFFIC LIFELINES [DIE START- UND LANDEBAHNEN DES FLUGHAFENS FRANKFURT MAIN: LEBENSADERN DES LUFTVERKEHRS]

W OBERLIST Jul 1982 30 p refs In GERMAN

(FACHTHEMEN-3) Avail Issuing Activity

The history of the Rhine-Main Frankfurt/Main airport is reviewed. The historical development of the landing strips and runways at the Rhine-Main airport is described. It is argued that an airport is

never finished and the continuous need for maintenance and expansion of runways to fulfill the needs for modern air traffic are outlined. Transl by E A K

N83-23323 Flughafen, Frankfurt am Main (West Germany) Abt Oeffentlichkeitsarbeit und Marktforschung MULTIPLICATION EFFECTS DUE TO WAGES, SALARIES AND COMMISSIONS PAID AT THE AIRPORT [MULTIPLIKATOREFFEKTE DURCH AM FLUGHAFEN AUSGEZAHLTE LOEHNE, GENAELTER UND AUFTRAGSSUMMEN]

Feb 1982 26 p refs In GERMAN

(FACHTHEMEN-4) Avail Issuing Activity

The effects of capacity problems, traffic improvements, ratio of airline companies and the regional economy were considered for expansion plans of the Frankfurt/Main airport. Economic factors of the Frankfurt/Main airport were studied. It is shown that the regional economic multiplication effects of the airport can only be indicated by a mathematical mode. Transl by E A K

N83-23324*# National Aeronautics and Space Administration, Washington, D C

A SURVEY OF THE THREE-DIMENSIONAL HIGH REYNOLDS NUMBER TRANSONIC WIND TUNNEL

K TAKASHIMA, H SAWADA, and T AOKI Jun 1982 88 p refs Transl into ENGLISH of "Koku Uchi Gijutsu Kenkyujo Shiryo" rept NAL-TM-440, Aug 1981 38 p

(Contract NASW-3541)

(NASA-TM-76931, NAS 1 15 76931, NAL-TM-440) Avail NTIS HC A05/MF A01 CSCL 14B

The facilities for aerodynamic testing of airplane models at transonic speeds and high Reynolds numbers are surveyed. The need for high Reynolds number testing is reviewed, using some experimental results. Some approaches to high Reynolds number testing such as the cryogenic wind tunnel, the induction driven wind tunnel, the Ludwig tube, the Evans clean tunnel and the hydraulic driven wind tunnel are described. The level of development of high Reynolds number testing facilities in Japan is discussed. Author

N83-23325# Purdue Univ, Lafayette, Ind School of Civil Engineering

NON-CONTACT, NON-DESTRUCTIVE AIRPORT PAVEMENT PROFILE AND DEFLECTION MEASUREMENTS Final Report

M E HARR and D J ELTON Washington, D C FAA Jan 1983 176 p refs

(FAA-PM-83-14) Avail NTIS HC A09/MF A01

A noncontact, nondestructive method is described that allows the user to measure pavement texture and loaded and unloaded profiles from a moving vehicle. The device uses laser distance measuring gages. The gages are arranged such that their readings can be interpreted to give the loaded and unloaded pavement profiles and a measure of its texture. Four gages are mounted on a rigid beam that, in turn, is mounted on the side of a load vehicle. The gages read the distance to the pavement. Three of the gages are located outside the range of influence of the load wheel, and hence the pavement below these gages is undeflected. One of the gages is adjacent to the load wheel to measure the induced deflection. An algorithm is presented that relates all measurements to a common datum. The three gages yield readings that are interpreted to give the profile (do the surveying). The gages make so many readings and so quickly, that the standard deviation of the readings, taken over a short time period, gives a measure of the texture. A prototype device was constructed and tested. Author

N83-23326*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
DESIGN AND CONSTRUCTION OF 2 TRANSONIC AIRFOIL MODELS FOR TESTS IN THE NASA LANGLEY C.3-M TCT
 G SCHAECHTERLE (DFVLR-AVA Goettingen), K H LUDEWIG (DFVLR-AVA Goettingen), E STANEWSKY (DFVLR-AVA Goettingen), and E J RAY 1982 28 p
 (NASA-TM-85325, NAS 1 15 85325) Avail NTIS HC A03/MF A01 CSCL 14B

As part of a NASA/DFVLR cooperation program two transonic airfoils were tested in the NASA Langley 0.3-m TCT Model design and construction was carried out by DFVLR The models designed and constructed performed extremely well under cryogenic conditions Essentially no permanent changes in surface quality and geometric dimensions occurred during the tests The aerodynamic results from the TCT tests which demonstrate the large sensitivity of the airfoil CAST 10-Z/DOAZ to Reynolds number changes compared well with results from other facilities at ambient temperatures. Author

N83-23327# Aeronautical Research Labs, Melbourne (Australia)
THE ARL TRANSONIC WIND TUNNEL
 J B WILLIS Sep 1982 36 p refs
 (ARL-AERO-NOTE-412, AR-002-905) Avail NTIS HC A03/MF A01

The ARL transonic wind tunnel is described Originally built as a conventional subsonic highspeed tunnel it was converted in 1957 to transonic operation, and has been in operation since that time It is a continuous flow, closed circuit tunnel with an electric drive system whose maximum power input is 2050 kw The test section is 0 to 81 m high and 0 to 53 m wide It is fitted with slotted walls and uses diffuser suction, covering a Mach number range of 0 to 4 to 1 to 4 Author

N83-23328*# National Aeronautics and Space Administration, Washington, D C
TRANSONIC CRYOGENIC TEST SECTION FOR THE GOETTINGEN TUBE FACILITY
 H HORNUNG, G HEFER, P KROGMANN, and E STANEWSKY Mar 1983 19 p refs Transl into ENGLISH of "Transsonische Kryomesstrecke fuer den Goettinger rohrwindkanal" rept IB-222-82A19, 3 May 1982 19 p
 (Contract NASW-3541)
 (NASA-TM-77050, NAS 1 15 77050, IB-222-82A119) Avail NTIS HC A02/MF A01 CSCL 14B

The design of modern aircraft requires the solution of problems related to transonic flow at high Reynolds numbers. To investigate these problems experimentally, it is proposed to extend the Ludwig tube facility in Gottingen by adding a transonic cryogenic test section After stating the requirements for such a test section, the technical concept is briefly explained and a preliminary estimate of concept is briefly explained and a preliminary estimate of the costs is given Author

N83-23329# Toronto Univ (Ontario) Inst for Aerospace Studies
A PILOTED FLIGHT SIMULATOR STUDY OF CONFLICT OF INTEREST WIND MODELLING TECHNIQUES
 R B MACKENZIE Nov 1982 90 p refs
 (UTIAS-TN-238, ISSN-0082-5263) Avail. NTIS HC A05/MF A01

Hazardous wind models synthesized using techniques based on differential games theory formalization of the conflict of interest between the wind and an aircraft on landing approach were implemented and evaluated on a fixed base flight simulator. This approach yields wind inputs that are dependent upon the aircraft state vector Four wind models, formulated using two distinct techniques arising from the theory, were tested in a series of steep ILS approaches flown by two pilots Evaluations were made of pilot performance and the severity and realism of the generated winds, then compared to results obtained in the presence of two reference wind profiles Author

N83-23330# Logistics Management Inst., Washington, D C
AH4 AUTOMATIC TEST EQUIPMENT REQUIREMENTS
 F NAUTA Nov 1982 91 p refs
 (Contract MDA903-81-C-0166)
 (AD-A122879, LMI-ML213-1) Avail NTIS HC A05/MF A01 CSCL 01C

The Army's new advanced helicopter, AH-64 relies on automatic test equipment (ATE) at aviation intermediate maintenance (AVIM) units for testing and diagnosis of faulty components removed from the aircraft The Army is planning to provide one ATE station to each division and corps aviation brigade AVIM unit that supports the AH-64 Our independent analysis indicates that one ATE per AVIM may be sufficient only if the mean time between removal of AH-64 line replaceable units is 6 to 8 flying hours or greater, a figure that, though perhaps achievable, is twice that demonstrated so far in operational testing GRA

N83-23331# Air Force Inst of Tech, Wright-Patterson AFB, Ohio School of Systems and Logistics
A PROTOTYPE MODEL FOR THE DEVELOPMENT OF TRAINING SYSTEMS AND THE ACQUISITION OF AIRCREW TRAINING DEVICES FOR DEVELOPING WEAPON SYSTEMS M.S. Thesis
 W L GOETZ and N O PEREZ-OTERO Sep 1982 162 p refs
 (AD-A123041, AFIT-LSSR-18-82) Avail NTIS HC A08/MF A01 CSCL 05I

The authors review the current method used by the Air Force to develop Training Systems and to acquire Aircrew Training Devices (ATDs), and they identify six limitations or problem areas A review of Army and Navy ATD acquisition systems, as well as current literature, found no existing system which addressed all problems in existing systems The authors develop a prototype system model for training and ATD development with proposed changes in four areas management and personnel which includes centralization of decision making, development and retention of training development expertise, team concept, and collocation, information availability which includes access to prime contractor information and Generic Data Base (GDB) technology, contracting and delivery strategies which include scenario development, Pre-Planned Product Improvement, and using actual equipment or reduced fidelity ATDs for early training, Training System (TS)/ATD Development Model which includes a graphic representation of the process to develop TS and ATD requirements The authors validate the system model via expert opinion Five of the six limitation areas were judged to be significantly improved by the system model Author (GRA)

N83-23332# Associated Architects of Crested Butte, Colo
GUNNISON COUNTY AIRPORT TERMINAL Final Report
 L H WALLER and J F KREIDER (Kreider (Jan F) and Associates, Inc.) 30 Nov 1982 129 p refs
 (Contract DE-FC02-80CS-30339, PROJ 339)
 (DE83-004512, DOE/CS-30339/T1) Avail NTIS HC A07/MF A01

The Gunnison Airport includes a number of solar and energy conservation features south reflective surface for improved winter solar gain, Trombe wall, night setback, summer vent system, clerestory, high heat recovery ducts, task lighting, high levels of wall insulation, direct gain system and slab storage, operable windows, and airlock entries After a summary of weather data collected in Gunnison, Colorado, the building performance is presented The nature and magnitude of all connected loads at the airport are described, and the magnitude of solar contribution is evaluated and discussed using measured weather data Performance prediction methods used during design are evaluated relative to their accuracy Owner's and designers perspectives are presented, and information dissemination efforts are described DOE

09 RESEARCH AND SUPPORT FACILITIES (AIR)

N83-24518# Messerschmitt-Boelkow-Blohm G m b H , Munich (West Germany) Unternehmensbereich Flugzeuge
PARAMETER AND DESIGN STUDIES FOR THE USE OF WIND TUNNEL MODELS IN THE ETW

A ZACHARIAS Sep 1982 13 p refs Presented at the ETW Cryogenic Rev Meeting, Amsterdam, 15-17 Sep 1982 (MBB/FE123/S/PUB/83) Avail NTIS HC A02/MF A01

The boundary conditions and the design criteria for cryogenic wind tunnel models were analysed for a Tornado model in terms of their experimental and design problems. Some fundamental relationships concerning fluid mechanics for cryogenic wind tunnels, as well as several experimental and model related considerations were summarized as formulae. Author

N83-24519# National Aerospace Lab , Amsterdam (Netherlands)

PEANUTS - THE PETW DATA SYSTEM

P H FUIJKSCHOT Sep 1982 14 p Presented at the ETW Cryogenic Technol Rev Meeting, Amsterdam, 15-17 Sep 1982 (MAW-82-009-U) Avail NTIS HC A02/MF A01

PEANUTS is centered around an HP-1000 computer system with 128 k words of RAM and 20 Mbyte of disc storage. The National Aerospace Laboratory (NLR) designed front end equipment includes a digital 10 bus interface, 16 low level channels using 'Conditioning Units', an operator control panel, a Scanivalve controller and a 50 channel relay scanner. For temperature measurements with type T thermocouples a high precision unit with 60 Peltier cooled ice point reference junctions is available. The software for data acquisition is a proven NLR package with provisions for a monitoring loop and real time display of computed values. Measured data are stored in well defined files, while the subsequent processing is primarily the responsibility of TG-ETW (Technical Group-European Transonic Wind Tunnel). Author

N83-24520# National Aerospace Lab , Amsterdam (Netherlands) Technical Services Div

DEVELOPMENT OF A NON-INSULATED CRYOGENIC STRAIN-GAUGE BALANCE

T J SCHOENMAKERS 1982 26 p Presented at the Cryogenic Technol Rev Meeting of ETW, 15-17 Sep 1982, Amsterdam (M-TP-82-006-U) Avail NTIS HC A03/MF A01

Measurement of aerodynamic forces in the European Transonic Wind tunnel (ETW) is done with strain gage balances. The low and transient temperatures in this wind tunnel necessitate either to keep the balances at room temperature (heating and insulation) or to develop special balances for cryogenic circumstances (noninsulated). Experiments leading to the development of a three component cryogenic strain gage balance is reviewed discussed briefly. Author

N83-24521# Federal Aviation Administration, Washington, D C
NATIONAL AIRSPACE SYSTEM PLAN, FACILITIES, EQUIPMENT AND ASSOCIATED DEVELOPMENT

Dec 1981 449 p
Avail NTIS HC A19/MF A01

After an intensive 10-month review of the National Airspace System, the Federal Aviation Administration has charted a comprehensive plan for modernizing and improving air traffic control and airway facilities services from now to the year 2000. The plan addresses the compelling problems of how best to accommodate spiraling demands for aviation services, constrain costs, recast the required technical framework, and deal with aging facilities. Author

N83-24522# Messerschmitt-Boelkow-Blohm G m b H , Ottobrunn (West Germany) Unternehmensbereich Flugzeuge
BASIC INVESTIGATIONS FOR THE USE OF WIND TUNNEL MODELS IN THE ETW Final Report, Sep. 1981

H HOENLINGER, S LUCK, and D SCHIMANSKI Bonn Bundesministerium fuer Forschung und Technologie Dec 1982 49 p refs

(BMFT-FB-W-82-023, MBB/FE123/S/STY/0042, ISSN-0170-1339) Avail NTIS HC A03/MF A01, Fachinformationszentrum, Karlsruhe, West Germany DM 10,50

The use of wind tunnel models at cryogenic temperatures places new demands on the equipment, instruments and methods of construction applied hitherto. Their suitability is examined and recommendations are derived which should be observed in building and instrumenting wind tunnel models for cryogenic testing. In addition, methods are pointed out which allow, with some degree of convenience, an economical test procedure suited to the ETW. The report is divided into three main subjects. Author

N83-24523# Denver Research Inst , Colo Social Systems Research and Evaluation Div

RELATIVE COST AND TRAINING EFFECTIVENESS OF THE 6883 F-111 CONVERTER/FLIGHT CONTROL SYSTEM SIMULATORS AS COMPARED TO ACTUAL EQUIPMENT Final Report

L F CICCHINELLI, K R HARMON, and R A KELLER Lowry AFB, Colo Air Force Human Resources Lab Dec 1982 125 p refs

(Contract F33615-78-C-0018, AF PROJ 2361) (AD-A123534, AFHRL-TR-82-30) Avail NTIS HC A06/MF A01 CSCL 09B

The objective of this study was to design and implement a comprehensive comparative cost and training effectiveness evaluation of (a) a Converter/Flight Control (6883) three dimensional simulator, (b) a 6883 two dimensional simulator, and (c) an actual 6883 test station. In addition, the broader issues of training objectives, role(s) of the simulators in training, user acceptance, and the training environment were investigated as related to the expanded simulators for delivering maintenance training in the Air Force. Author (GRA)

N83-24524# Air Force Inst of Tech , Wright-Patterson AFB, Ohio School of Systems and Logistics

AN EVALUATION OF THE PAVEMENT CONDITION INDEX PREDICTION MODEL FOR RIGID AIRFIELD PAVEMENTS M.S. Thesis

W L GOETZ and N O PEREZ-OTERO Sep 1982 209 p refs

(AD-A123002, AFIT-LSSR-64-82) Avail NTIS HC A10/MF A01 CSCL 13B

The United States Army Corps of Engineers, Construction Engineering Research Laboratory (CERL) has been working for several years on the development of an airfield pavement maintenance management system. As an integral element to this system, Pavement Condition Index (PCI) prediction models have been formulated for rigid flexible pavements. The purpose of this thesis was to evaluate the PCI prediction model for rigid Air Force airfield pavements. The model was tested using a new data base, from which it was determined that the predicted PCI values correlated fairly closely with the actual measured PCI values. The model was determined to be a reasonable predictor of the condition of rigid airfield pavements. GRA

CHEMISTRY AND MATERIALS

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

A83-32077**JET FUELS BASED ON WEST SIBERIAN OILS [REAKTIVNYE TOPLIVA IZ ZAPADNOSIBIRSKIKH NEFTEI]**

A F. GORENKOV, I G. KLIUIKO, T A. LIFANOVA, and A I. KUPREEV *Khimia i Tekhnologia Topliv i Masel* (ISSN 0023-1169), no. 4, 1983, p 9-11 In Russian

The physicochemical properties and the composition of jet fuel fractions with the final boiling points 250, 260, and 280 C which have been distilled from a mixture of West Siberian oils are presented. An analysis of these data indicates that West Siberian oils can be used for producing a jet fuel with an initial crystallization temperature of -50 C which satisfies the requirement of GOST 10227-62 standard for the T-1 fuel. The yield of this fuel is 16 percent higher than that of a fuel with an initial crystallization temperature of -60 C. The results of this study can be useful in optimizing the quality of jet fuels produced from West Siberian oils. V.L.

A83-32340**ENGINEERING PROPERTY COMPARISONS OF 7050-T73651, 7010-T7651 AND 7010-T73651 ALUMINIUM ALLOY PLATE**

L. SCHRA and W G J T HART (Nationaal Lucht- en Ruimtevaartlaboratorium, Amsterdam, Netherlands) *Engineering Fracture Mechanics* (ISSN 0013-7944), vol 17, no. 6, 1983, p 493-507. Research supported by the Nederlands Instituut voor Vliegtuigontwikkeling en Ruimtevaart refs

A comparison of some engineering properties of 7050-T73651, 7010-T7651 and 7010-T73651 plate has been made. The properties investigated were strength, stress corrosion resistance, fracture toughness and fatigue crack propagation resistance under flight simulation loading. It was found that both 7050 and 7010 are high strength deep hardenable alloys with only minor differences in crack tolerance properties. The fracture toughness of both alloys is equivalent, while 7050 possesses slightly better resistances to stress corrosion cracking and fatigue crack propagation under flight simulation loading. Author

A83-32599**POWDER METALLURGY OF TITANIUM ALLOYS**

F H. FROES, ED (USAF, Materials Laboratory, Wright-Patterson AFB, OH) and J E. SMUGERESKY (Sandia National Laboratory, Livermore, CA) *Warrendale, PA, Metallurgical Society of AIME*, 1980, 319 p

The state-of-the-art in powder metallurgy processing of titanium alloys to manufacture contamination-free aerospace structural components that are cost and performance competitive with wrought articles made of other materials is assessed. Particular attention is focused on high performance military aircraft. Powder metallurgy offers a processing alternative that uses less material and produces parts in near-net shapes, thereby bypassing costly machining efforts that increase the parts costs. Six techniques for pre-alloy powder production are described and the properties of hot isostatically pressed pre-alloyed titanium powder are explored, with attention given to the blended elemental powder approach. Reviews of fatigue crack initiation, fracture topography, and the effects of the powder particle size are presented, together with the heat treatment response and techniques for welding sintered parts. Finally, the applications of powder metallurgy technologies to the manufacture of specific aircraft parts are discussed. M S K

A83-32790#**CONTROL OF THE MATERIAL PROPERTIES AND STRUCTURAL APPLICATION OF CARBON FIBRE REINFORCED PLASTICS**

R G. WHITE and T A. PALMER (Southampton, University, Southampton, England) *AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, Lake Tahoe, NV, May 2-4, 1983* 10 p refs (AIAA PAPER 83-0859)

This paper describes methods for measuring and controlling the elastic and loss properties of composite materials in the form of carbon fiber reinforced plastics. The influences of fiber length and matrix properties are examined and it is shown how a compromise between high stiffness to weight ratio and internal damping may be sought. Experimental data may be used in anisotropic theory for predicting the free vibration characteristics of plates, the case of a panel with static in-plane compression is investigated. General comments are made concerning the applicability of simple 'Engineering' procedures for predicting the dynamic strain response of panel-type structures to random acoustic loading and the effects of nonlinear behavior are discussed. Author

A83-33122**EFFECTS OF EXTREME AIRCRAFT STORAGE AND FLIGHT ENVIRONMENTS ON GRAPHITE/EPOXY**

P. SHYPRYKEVICH and W. WOLTER (Grumman Aerospace Corp., Bethpage, NY) *IN Composites for extreme environments Philadelphia, PA, American Society for Testing and Materials, 1982, p 118-134* refs (Contract F33615-76-C-5234)

A specially developed apparatus was used in testing graphite/epoxy composite specimens for the case of a thermal cycle involving both high humidity exposure (representative of runway storage conditions) and long duration, 127 C excursions (representative of supersonic flights). After various intervals of exposure, weight data were gathered and residual static tests were performed at both room temperature and 127 C. Test results indicate that the moisture gains of the extreme environment specimens are much greater than has been considered possible for this resin, with an accordingly greater loss of compressive strength than expected. Such fiber-dominated properties as residual static tensile strength, however, were not reduced. O C

N83-23363# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France)

COMPOSITE MATERIALS ON A COMMUTER AIRCRAFT: THE ATR. 42

J P. PETETIN 1982 17 p Presented at the Tech Symp on the Design and Use of KEVLAR in Aircraft, Geneva, Oct 1982 (SNIAS-822-111-105) Avail NTIS HC A02/MF A01

Composite materials of carbon and KEVLAR aramid fiber designed by AEROSPATIALE for components used in the ATR 42 are presented. Author

N83-23421# National Aerospace Lab, Amsterdam (Netherlands) Structures and Materials Div

THE EFFECT OF SHEET THICKNESS AND LAMINATING ON THE FATIGUE RESISTANCE OF THE ALUMINIUM ALLOY AL 7010 - T 73651

W. VANDERHOEVEN and L. SCHRA Mar 1981 50 p refs (Contract NIVR-1867)

(NLR-TR-81056-U) Avail NTIS HC A03/MF A01

The influence of sheet thickness (2 mm and 10 mm) and the influence of laminating (5 x 2 mm) on the fatigue crack growth properties of the aluminium alloy AL 7010-T 73651 were investigated. Both constant amplitude loading and flight simulation loading were applied. All 2 mm and 10 mm thick sheets were machined from a 150 mm thick plate, i.e. there were no differences in production history between those sheets. Only for flight simulation testing a pronounced thickness effect was observed with the thinner sheet (2 mm) showing a superior behavior. It was concluded that this thickness effect is most probably the result of

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differences in the state of stress and is not caused by differences in production history For flight simulation loading the fatigue resistance of the laminates was found comparable to that of the monolithic 10 mm thick sheets. For constant amplitude loading the fatigue resistance of the laminates was even lower than that of the monolithic 10 mm sheets Author

N83-23422# National Aerospace Lab , Amsterdam (Netherlands) Structures and Materials Div
COARSENING AND SOLUTIONING OF PRECIPITATES IN SUPERALLOYS

H J KOLKMAN Sep 1981 28 p refs
(NLR-TR-81114-U) Avail NTIS HC A03/MF A01

Coarsening and solutioning of the main strengthening phase for the majority of superalloys, the gamma prime phase, are discussed A general prediction of coarsening rates and solutioning temperatures is possible Author

N83-23423# Societe Nationale Industrielle Aerospatiale, Paris (France)
PROPERTIES OF THICK SHEETS OF 2124 T351 ALLOY [PROPRIETES DES TOLES EPAISSES EN ALLIAGE 2124 T351]

A FERRAN 1982 25 p In FRENCH Presented at Franco-Sovietique Symp Groupe de Travail (SNIAS-822-111-109) Avail NTIS HC A02/MF A01

The 2124 T351 alloy is an optimization of 2024 T351 In relation to the base alloy, it so offers better assurance of ductility particularly in the short crosswise direction The properties presented for this material denote a very satisfactory behavior as regards fatigue and damage tolerance In structural applications, however, it is advisable to take into account the mediocre behavior of this type of material in stress corrosion Transl by A R H

N83-23426# Battelle Columbus Labs , Ohio
EFFECTS OF MANUFACTURING PROCESSES ON STRUCTURAL ALLOWABLES Final Technical Report, Sep. 1980 - Jul. 1982

D J JONES and S C FORD Wright-Patterson AFB, Ohio AFWAL Nov 1982 168 p
(Contract F33615-80-C-5168)
(AD-A122963, AFWAL-TR-82-4136) Avail NTIS HC A07/MF A01 CSCL 11F

The major objective of this program was to evaluate the effect that newly established manufacturing techniques will have on the handbook properties of structural materials which have a possible use in Air Force systems Data sheet-type presentations of engineering properties were prepared for each material

Author (GRA)

N83-23464*# General Electric Co , Lynn, Mass Aircraft Engine Business Group
ANALYTICAL FUEL PROPERTY EFFECTS, SMALL COMBUSTORS, PHASE 1 Final Report

J D COHEN Apr 1983 32 p
(Contract NAS3-22829)
(NASA-CR-168138, NAS 1 26 168138, R82AEB078) Avail NTIS HC A03/MF A01 CSCL 21D

The effects of nonstandard aviation fuels on a typical small gas turbine combustor was analyzed The T700/CT7 engine family was chosen as being representative of the class of aircraft power plants desired Fuel properties, as specified by NASA, are characterized by low hydrogen content and high aromatics levels Higher than normal smoke output and flame radiation intensity for the current T700 combustor which serves as a baseline were anticipated It is, therefore, predicted that out of specification smoke visibility and higher than normal shell temperatures will exist when using NASA ERBS fuels with a consequence of severe reduction in cyclic life Three new designs are proposed to compensate for the deficiencies expected with the existing design They have emerged as the best of the eight originally proposed redesigns or combinations thereof After the five choices that were originally made by NASA on the basis of competing performance factors,

General Electric narrowed the field to the three proposed

Author

N83-23466# Douglas Aircraft Co , Inc , Long Beach, Calif
COMPATIBILITY STUDY OF ANTIMISTING KEROSENE AND THE DC/KC-10 FUEL SYSTEM Final Report, Mar. 1981 - Apr. 1982

F Y CHING and A T PEACOCK Atlantic City FAA Mar 1983 111 p refs

(Contract F33700-81-C-0057)

(FAA-CT-82-116) Avail NTIS HC A06/MF A01

The compatibility of antimisting kerosene (AMK) with a contemporary fuel system was evaluated AMK made with the FM-9 additive to the base fuel was used throughout the program Tests were conducted to determine AMK effects on components and system performance, and component and system effects on the fuel Some DC-10/KC-10 systems are incompatible with the AMK fuel Systems and/or procedural revisions to accommodate the AMK do not appear to present technically insurmountable problems AMK reduces the performance of some systems (e.g., jet pump transfer, gravity transfer, and suction feed) below normally accepted levels Extensive study and testing will be required to certify the aircraft fuel system for use with the FM-9 AMK

Author

N83-23469# Air Force Wright Aeronautical Labs , Wright-Patterson AFB, Ohio Fuels and Lubrication Div
THE CHEMICAL AND PHYSICAL PROPERTIES OF JP-4 FOR 1980 - 1981 Final Technical Report, Jul. 1980 - Jun. 1981

W E HARRISON, III Jun 1982 163 p refs

(Contract AF PROJ 3048)

(AD-A122965, AFWAL-TR-82-2052) Avail NTIS HC A08/MF A01 CSCL 21D

This report analyzes the chemical and physical properties of JP-4 purchased worldwide by the Defense Fuel Supply Center (DFSC) for the Air Force during the period July 1980 to June 1981 Data from 2122 Turbine Fuel Test reports were analyzed and summarized in the form of histograms Summaries include historical trends, current data sorted into districts and states, and a worldwide summary

Author (GRA)

N83-23478# Department of Energy, Bartlesville, Okla Energy Technology Center
AVIATION TURBINE FUELS, 1981

E M SHELTON Apr 1982 14 p refs

(DE82-015870, DOE/BETC-PPS-82/2) Avail NTIS HC A02/MF A01

Properties of some aviation turbine fuels marketed in the United States during 1981 are presented The samples represented are typical 1981 production and were analyzed in the laboratories of 15 manufacturers of aviation turbine (jet) fuels Results for the properties of 95 samples of aviation turbine fuels are included for military grades JP-4 and JP-5, and commercial type Jet A Vapor pressure, acidity, moisture content, and thermal stability were among the properties measured DOE

N83-24711*# Jet Propulsion Lab , California Inst of Tech , Pasadena

INFLUENCE OF LIQUID WATER AND WATER VAPOR ON ANTIMISTING KEROSENE (AMK) Final Report, Aug. 1980 - Sep. 1981

A H YAVROUIAN, M SAROLOUKI, and V SAROHIA Feb 1983 79 p refs

(Contract DTFA03-80-A-00215)

(NASA-CR-170280, JPL-PUBL-82-80, NAS 1 26 170280) Avail NTIS HC A05/MF A01

Experiments have been performed to evaluate the compatibility of liquid water and water vapor with antimisting kerosenes (AMK) containing polymer additive FM-9 developed by Imperial Chemical Industries This effort consists of the determination of water solubility in AMK, influence of water on restoration (degradation) of AMK, and effect of water on standard AMK quality control methods The principal conclusions of this investigation are (1)

the uptake of water in AMK critically depends upon the degree of agitation and can be as high as 1300 ppm at 20 C, (2) more than 250 to 300 ppm of water in AMK causes an insoluble second phase to form. The amount of this second phase depends on fuel temperature, agitation, degree of restoration (degradation) and the water content of the fuel, (3) laboratory scale experiments indicate precipitate formation when water vapor comes in contact with cold fuel surfaces at a much lower level of water (125 to 150 ppm), (4) precipitate formation is very pronounced in these experiments where humid air is percolated through a cold fuel (-20 C), (5) laboratory tests further indicate that water droplet settling time is markedly reduced in AMK as compared to jet A, (6) limited low temperature testing down to -30 C under laboratory conditions indicates the formation of stable, transparent gels

S L

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ENGINEERING

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

A83-30310

AN ANALYSIS OF THE NATURAL VIBRATIONS OF THE ROTORS OF CENTRIFUGAL COMPRESSOR MACHINES [RASCHET SOBSTVENNYKH KOLEBANII RABOCHIKH KOLES TSENTROBEZHNYKH KOMPRESSORNYKH MASHIN]

S I BOGOMOLOV and A N NATSVIN *Dinamika i Prochnost' Mashin*, no 35, 1982, p 82-86 In Russian

A new method combining the finite element method with cyclic symmetry has been developed for analyzing the natural vibrations of the rotors of centrifugal compressor machines. The method is applicable to all rotors that belong to the class of cyclically symmetric structures. The finite-element approximation of a rotor employs a triangular plane element of linearly varying thickness with six degrees of freedom at each node. The method is illustrated by an example

V L

A83-30731

PROBABILISTIC ESTIMATION OF THE EFFICIENCY OF RADIO SYSTEMS IN THE PRESENCE OF INTERFERENCE [VEROIATNOSTNAIA OTSENKA EFFEKTIVNOSTI RADIOTEKHNIЧЕСКИХ СИСТЕМ ПРИ НАЛИЧИИ МЕСHAУСЧИХ СИГНАЛОВ]

M A IVANOV and B I MAKARENKO *Radiotekhnika (Kharkov)* (ISSN 0485-8972), no 63, 1982, p 70-74 In Russian

A method is proposed for the probabilistic analysis of the efficiency of a broad class of radio systems. The method makes it possible to investigate the effect of interference on efficiency with allowance for the nonlinearity of receiver characteristics. A quantitative analysis of the efficiency of a class of radar systems in a typical external electromagnetic situation is presented

B J

A83-30856

DESIGN FOR RANDOM - AN EXAMPLE

G K HOBBS (Tustin Institute of Technology, Inc., Santa Barbara, CA) IN *Designing electronic equipment for random vibration environments*; Proceedings of the Meeting, Los Angeles, CA, March 25, 26, 1982 Mount Prospect, IL, Institute of Environmental Sciences, 1982, p 17, 18

The investigation is concerned with the case in which a power supply for a drone aircraft was subjected to a random vibration test, which it failed to pass. The test was terminated after 15 minutes of vibration. Attention is given to the failures observed to have occurred and also those deemed certain to occur if the test were to be completed, taking into account the design changes

implemented to prevent the failure. Many fasteners were found to be loose. Since positive verification of locking is essential, spot bond on all fasteners was used and all lock washer type devices were deleted. Several wires had been broken at the point of soldering to a circuit board or to a separate device. Circuit boards were found to be too thin for the supported weight and span between supports. Several components were observed to have fallen off. After the completion of appropriate changes, the qualification tests could be passed without any anomalies

G R

A83-31052

HIGH-TECHNOLOGY FACTORY OF THE FUTURE

C MICILLO (Grumman Corp., Bethpage, NY) *Grumman Aerospace Horizons* (ISSN 0095-7615), vol 19, no 1, 1983, p 20-25

Consideration is given to an aircraft manufacturer's progressively greater integration of computer-aided design and manufacturing (CADAM) operations. The proprietary systems discussed include the novel Computer-Aided Three-dimensional Interactive Applications (CATIA) system. CATIA will interface with CADAM to provide three-dimensional interactive graphics able to guide numerically controlled production systems in the manufacture of parts with complex curved contours. Attention is given to the automation of the production of such composite structures as the boron-epoxy horizontal stabilizer of the F-14 fighter, and the numerically controlled routing and drilling of metallic aircraft structures

O C

A83-31481

BENEFITS OF MISSION PROFILE TESTING

J F WAGNER, III (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) and A H BURKHARD (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN *Environmental stress impact and environmental engineering methods*, Proceedings of the Twenty-seventh Annual Technical Meeting on Emerging Environmental Solutions for the Eighties, Los Angeles, CA, May 5-7, 1981 Volume 1 Mt Prospect, IL, Institute of Environmental Sciences, 1981, p 26-31 refs

Tangible and intangible benefits of combined environment reliability testing (CERT) are described in terms of the perspective of the acquirer, logistician, and user of avionics equipment. Both cost saving benefits and operational effectiveness impacts are discussed. When used as a test-analyze-fix growth test program in the acquisition process, CERT benefits all the decision makers in the equipment's life cycle. This benefit is obtained without significant adverse impact on performance as measured against established performance factors used by decision makers. Total acquisition cost comparisons are shown

C D

A83-31489

LOW COST RANDOM VIBRATION TESTING

W TUSTIN (Tustin Institute of Technology, Santa Barbara, CA) IN *Environmental stress impact and environmental engineering methods*, Proceedings of the Twenty-seventh Annual Technical Meeting on Emerging Environmental Solutions for the Eighties, Los Angeles, CA, May 5-7, 1981 Volume 1 Mt Prospect, IL, Institute of Environmental Sciences, 1981, p 108-113 refs

Low-cost alternatives to the usual random vibration tests are discussed, examining the tradeoffs, relative advantages, and possible hidden costs involved. Mechanical, electrohydraulic, and electromagnetic shakers are discussed, describing their mode of operation. The costs associated with all-test-frequencies-simultaneously random vibration testing is emphasized, and methods of reducing those costs are addressed. The cost savings and corresponding drawbacks of choosing manual analog controls or taped controls over digital controls are pointed out. The use of multiaxis air-driven vibrators operating off shop air supply is considered, describing the operational limitations of these devices

C D

A83-31499

THE SIGNIFICANT ELEMENTS OF THE RELIABILITY AND MAINTAINABILITY PROGRAMS FOR THE MODERNIZED COBRA HELICOPTER WEAPONS/WEAPONS CONTROL SYSTEMS

J H RINGGOLD, D W MATTHEWS, and R B PATTEN (Bell Helicopter Textron, Fort Worth, TX) IN Environmental stress impact and environmental engineering methods, Proceedings of the Twenty-seventh Annual Technical Meeting on Emerging Environmental Solutions for the Eighties, Los Angeles, CA, May 5-7, 1981 Volume 1 Mt Prospect, IL, Institute of Environmental Sciences, 1981, p 193-201

A83-32075

THE RESIDUAL STRENGTH OF PREFABRICATED STRUCTURES MADE OF PRESSED PANELS OF D16CHT ALLOY AND ITS MODIFICATIONS [OSTATOCHNAIA PROCHNOST' SBORNO-MONOLITNYKH KONSTRUKTSII IZ PRESSOVANNYKH PANELEI SPLAVA D16CHT I EGO MODIFIKATSII]

A G VOVNIANKO and A I SEMENETS Fiziko-Khimicheskaja Mekhanika Materialov (ISSN 0430-6252), vol 19, Mar-Apr 1983, p 88-92 In Russian

The alloys D16T and D16chT, which are characterized by low crack growth rates and high fracture toughness, have been traditionally used for the manufacture of the most critical wing structures of commercial aircraft Recently, modifications of these alloys, 1163 and 1161, have been developed which contain smaller amounts of the principal alloying elements and are highly pure with respect to iron (0.1 percent) and silicon (0.15) The fatigue lives of these alloys are higher than the fatigue life of D16chT by 1.2-1.5 times for 1163 and 2-2.5 times for 1161 The residual strength characteristics of prefabricated thin-walled ribbed wing structures made of pressed panels of 1163 and 1161 alloys are discussed

V L

A83-32387

THE FATIGUE STRENGTH OF COMPRESSOR DISKS [SOPROTIVLENIE USTALOSTI DISKOV KOMPRESSOROV]

A N PETUKHOV and A M VAKHROMEEV (Tsentral'nyi Nauchno-Issledovatel'skii Institut Aviatcionnogo Motorostroenia, Moscow, USSR) Problemy prochnosti (ISSN 0556-171X), April 1983, p 84-87 In Russian refs

A stress analysis is performed for the rim of a compressor disk using a model made of St 3 The calculated values of the stress intensity factors in the vicinity of the groove fillet are found to be in good agreement with experimental data Based on the results of fatigue tests on the rim of a VT3-1 disk, coefficients are obtained which account for the effects of the shape, surface treatment, and size These can be used for estimating the load-bearing capacity of the rim of a disk under variable stresses

V L

A83-32449

LIDAR SYSTEM FOR VISIBILITY MONITORING

F CASTAGNOLI, M MORANDI, I PIPPI, and B RADICATI (CNR, Istituto di Ricerca sulle Onde Elettromagnetiche, Florence, Italy) Optical and Quantum Electronics (ISSN 0306-8919), vol 15, May 1983, p 261-268 Research supported by the Consiglio Nazionale delle Ricerche refs

A lidar (light detection and ranging) system is described It allows high-speed data acquisition of lidar signals and meteorological parameters by means of standard instrumentation The lidar, controlled by a computer, utilized two laser sources (Nd YAG and ruby), a modified Richey-Chretien telescope and signal detection, storage and real-time monitoring equipment The whole system was installed in a container for field experiments

Author

A83-32586#

COMPARISON OF PROPERTIES OF JOINTS PREPARED BY ULTRASONIC WELDING AND OTHER MEANS

T RENSHAW, K WONGWIAT, and A SARRANTONIO (Fairchild Republic Co, Farmingdale, NY) (Structures, Structural Dynamics and Materials Conference, 23rd, New Orleans, LA, May 10-12, 1982, Collection of Technical Papers Part 1, p. 137-144) Journal of Aircraft (ISSN 0021-8669), vol 20, June 1983, p. 552-556

Previously cited in issue 13, p 2106, Accession no A82-30091

A83-32651

ON THE QUESTION OF CALCULATING THE PRESSURIZATION START-UP REGIMES OF A GAS-TURBINE PLANT [K VOPROSU RASCHETA REZHIMOV PUSKA GAZOTURBINNOI USTANOVKI NADDUVOM]

I SLOBODIANIUK and V I DAINEKO (Sevastopol'skii Priborostroitel'nyi Institut, Sevastopol, Ukrainian SSR) Energetika (ISSN 0579-2983), April 1983, p 53-57 In Russian refs

The start-up of gas turbines through pressurization makes it possible to achieve quick acceleration to the required rpm and to increase the reliability and the life of the turbines by lowering the inlet gas temperature and increasing the gas-dynamic stability of the compressor during start-up However, the energy consumption associated with pressurization is higher than in the case of an electric starter Here, a procedure for calculating the parameters of pressurization during start-up is presented It is shown that pressurization start-up is efficient in the case of self-contained high-power gas turbines An excess air pressure of 0.015-0.025 MPa at the compressor inlet is sufficient, the total amount of compressed air required for start-up is approximately equal to 1.1-1.5 of the amount consumed by the turbine in one second during steady operation at its rated capacity

V L

A83-32788#

STRUCTURAL ANALYSIS OF SHUTTLE ORBITER PENETRATION TILES

J ROWE (Rockwell International Corp, Space Transportation and Systems Group, Downey, CA) AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, Lake Tahoe, NV, May 2-4, 1983 7 p (AIAA PAPER 83-0914)

Space Shuttle Thermal Protection System (TPS) penetration tiles have often required special analytical treatment because of their unsymmetrical shapes, loading modes, and low strength properties Since the system's analysts were not often able to vary such tile design characteristics as size, shape, density, and strain isolator pad footprint, rigorous analytical methods had to be developed and applied The finite element method and computer programs employed in the analysis put special emphasis on the number of tiles of a given area and the length of time required for their thorough analysis Realistic results were found to be obtainable through the application of low strength ceramic material engineering principles

O C

A83-32797*# Boeing Commercial Airplane Co, Seattle, Wash A THREE DEGREE-OF-FREEDOM, TYPICAL SECTION FLUTTER ANALYSIS USING HARMONIC TRANSONIC AIR FORCES

W H WEATHERILL (Boeing Commercial Airplane Co, Seattle, WA) and F E EHLERS (Boeing Computer Services, Inc, Seattle, WA) AIAA, ASME, ASCE, and AHS, Structures, Structural Dynamics and Materials Conference, Lake Tahoe, NV, May 2-4, 1983 8 p Research supported by the Boeing Commercial Airplane Co and NASA refs (AIAA PAPER 83-0960)

Typical section flutter solutions are obtained using generalized air forces calculated with OPTRAN2, a program based on the transonic small perturbation potential equation, which uses potentials from a nonlinear solution to the steady flow to obtain linear unsteady air forces Flutter results are calculated with a conventional, linear V-g type solution Results are presented for a NACA 64A010 airfoil oscillating in plunge and pitch, and with a quarter-chord control surface in the Mach number range of 0.80

to 0.90 The flutter boundary shows a significant 'transonic' bucket, together with changes in flutter mode as, with increasing Mach numbers, a shock appears on the airfoil and then moves aft. Single degree-of-freedom instabilities associated with both the pitch and the control surface motions are identified. Author

A83-32961

PARAMETRICALLY EXCITED VIBRATIONS IN THEORY AND PRACTICE [PARAMETERERREGTE SCHWINGUNGEN IN THEORIE UND PRAXIS]

N. EICHER, ED. Berlin, Technische Universität Berlin (Tub - Dokumentation Weiterbildung, No. 6), 1982, 191 p. In German.

Aspects of parametrically excited vibrations are discussed. The topics addressed include phenomena and analysis of parametrically excited vibration systems, parametrically excited vibrations in rotors, wheel/rail systems, cam gears with balancers, vibrational behavior of wind power devices with double blade rotors, the dynamic behavior of one-step toothed-wheel gears. Also considered are torsional vibrations in shafts with Cardan joint gears, a compensation procedure for active vibration isolation of unstable parametrically excited vibrations, stability studies on parametrically excited systems using one-step toothed-wheel gears. C. D.

A83-32967#

DETERMINATION OF THE THEORETICAL PROFILE OF THE ELECTRODE TOOL IN THE ELECTROCHEMICAL PROCESSING OF PARTS OF COMPLEX SHAPE [DETERMINAREA PROFILULUI TEORETIC AL ELECTRODULUI SCULA LA PRELUCRAREA ELECTROCHIMICA A PIESELOR DE CONFIGURATIE COMPLEXA]

V. CHIUIJDEA (Comitetul de Stat pentru Energia Nucleara, Bucharest, Rumania) and I. ROSU (Institutul de Fizica si Tehnologia Materialelor, Bucharest, Rumania). Studii si Cercetari de Mecanica Aplicata (ISSN 0039-4017), vol. 41, Sept-Oct 1982, p. 578-594. In Romanian.

A83-33149

INVESTIGATION OF THE COMBINED REGULATION OF THE INTERMEDIATE STAGE OF A CENTRIFUGAL COMPRESSOR BY AN AXIAL REGULATING APPARATUS AND A TWO-ROW DIFFUSER [ISSLEDOVANIIE KOMBINIROVANNOGO REGULIROVANNIA PROMEZHUTOCHNOI STUPENI TSENTROBEZHNOGO KOMPRESSORA OSEVYM REGULIRUIUSHCHIM APPARATOM I DVIKHRIADNYM DIFFUZOROM]

V. N. DOBZHENKO and V. I. ZYKOV (Leningradskii Politehnicheskii Institut, Leningrad, USSR). Energetika (ISSN 0579-2983), March 1983, p. 85-89. In Russian.

N83-23523# Societe Nationale Industrielle Aérospatiale, Les Mureaux (France)

REPLACEMENT OF ELECTROMECHANICAL DEVICES BY CATHODE RAY TUBES

J. P. LABORIE and J. LANGLET (Thomson-CSF) 1982 35 p refs

(SNIAS-822-111-110) Avail NTIS HC A03/MF A01

The use of cathode ray tubes for civil or military aircraft is discussed. The basic technology is described including multichromatic phosphors. Specific features used for aeronautical application include high brightness, high tolerance to temperature and vibration, resistance to rapid depressurization of the aircraft, and protection against electromagnetic interference. S. L.

N83-23595# Naval Postgraduate School, Monterey, Calif.

FLOW CONTROL ABOUT AN AIRBORNE LASER TURRET M.S. Thesis

L. E. PENIX Jun 1982 60 p refs

(Contract MIPR-28-MP-075, AF PROJ 6231)

(AD-A123056; NPS-67-82-007) Avail NTIS HC A04/MF A01

CSCS 20N

This thesis project is the latest in a series of experiments conducted at the Naval Postgraduate School to improve the air

flow in which a laser beam propagates. The particular turret to be studied is currently employed on Airborne Laser Laboratory which is aboard the NKC-135 aircraft, a one-third scale model was constructed in the 5 x 5 foot wind tunnel. The objective is to decrease the optical path distortion and jitter resulting from turbulent flow in the aft hemisphere of the turret that houses the laser telescope. GRA

N83-24732# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab

EVALUATION OF THREE STATE-OF-THE-ART WATER-JET SYSTEMS FOR CUTTING/REMOVING CONCRETE Final Report

C. E. PACE Sep 1982 21 p

(AD-A123579, WES/MP/SL-82-15) Avail NTIS HC A02/MF

A01 CSCS 11H

This report documents a demonstration project to evaluate the capability of three waterjet systems for cutting or removing concrete or both. The Corps of Engineers is interested in the potential of this technology for such applications as rapid cutting of bomb-damaged sections of airfield pavement and removing of deteriorated sections of concrete structures at Civil Works projects. Because water-jet systems are capable of transmitting, without mechanical constraint, all of the available horsepower of their power sources into the concrete cutting/removing operation, they may prove to be an extremely efficient means of conducting such operations. The low-pressure water jets were able to cut a 6-in slot in the concrete for a distance of 1-1/2 ft in a period of 24 minutes (a rate of 6.4 ft per hour). The relatively high-pressure water jet cut at rates of 9.6 ft per hour for shallow cuts (less than 5 in) and 3 ft per hour for deeper cuts (greater than 5 in). In addition, one of the low-pressure systems was used to remove some surface concrete. The results of this evaluation indicate that, although these water-jet systems did not demonstrate a capability for efficiently cutting concrete airfield pavements, the technology has potential. The low-pressure system demonstrated a capability for removing surface concrete efficiently. GRA

N83-24742# Contel Information Systems, Fairfax, Va
COMPUTER B (NATIONAL AIRSPACE SYSTEM - AUTOMATED RADAR TERMINAL SYSTEMS) COMMUNICATIONS SUPPORT Final Report, 1985 - 1988

E. HEILBERG Washington Federal Aviation Administration Mar 1983 137 p refs

(Contract DOT-FA79WA-4355)

(FAA-PM-83-16, FR 341 03 0181) Avail NTIS HC A07/MF A01

Determination of the most cost/beneficial approach to the support of Computer B (NAS-ARTS) communication in the period from 1985-1988 was performed. The identified approach would multiplex NAS-ARTS, FDI0, and possibly other communications between ARTCCs and terminal areas, such as Mode S data link traffic, onto voice grade leased line trunks. This approach would provide significant cost savings, increase NAS-ARTS throughput potential, and improve system flexibility. Author

N83-24764*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

ADVANCED ELECTRICAL POWER SYSTEM TECHNOLOGY FOR THE ALL ELECTRIC AIRCRAFT

R. C. FINKE and G. R. SUNDBERG 1983 15 p refs Presented at the 35th Ann Natl Aerospace and Electron Conf (NAECON '83), Dayton, Ohio, 17-19 May 1983

(NASA-TM-83390, E-1667, NAS 1 15 83390) Avail NTIS HC

A02/MF A01 CSCS 09C

The application of advanced electric power system technology to an all electric airplane results in an estimated reduction of the total takeoff gross weight of over 23,000 pounds for a large airplane. This will result in a 5 to 10 percent reduction in direct operating costs (DOC). Critical to this savings is the basic electrical power system component technology. These advanced electrical power components will provide a solid foundation for the materials, devices, circuits, and subsystems needed to satisfy the unique requirements of advanced all electric aircraft power systems. The

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program for the development of advanced electrical power component technology is described. The program is divided into five generic areas: semiconductor devices (transistors, thyristors, and diodes), conductors (materials and transmission lines), dielectrics, magnetic devices, and load management devices. Examples of progress in each of the five areas are discussed. Bipolar power transistors up to 1000 V at 100 A with a gain of 10 and a 0.5 microsec rise and fall time are presented. A class of semiconductor devices with a possibility of switching up to 100 kV is described. Solid state power controllers for load management at 120 to 1000 V and power levels to 25 kW were developed along with a 25 kW, 20 kHz transformer weighing only 3.2 kg.

S L

N83-24796*# Kansas Univ Center for Research, Inc., Lawrence Flight Research Lab

CALCULATION OF WING RESPONSE TO GUSTS AND BLAST WAVES WITH VORTEX LIFT EFFECT

D C CHAO and C E LAN Apr 1983 67 p refs

(Contract NAG1-75)

(NASA-CR-170340, NAS 1 26 170340, TR-CRINC-FRL-467-1)

Avail NTIS HC A04/MF A01 CSCL 20D

A numerical study of the response of aircraft wings to atmospheric gusts and to nuclear explosions when flying at subsonic speeds is presented. The method is based upon unsteady quasi-vortex lattice method, unsteady suction analogy and Pade approximant. The calculated results, showing vortex lag effect, yield reasonable agreement with experimental data for incremental lift on wings in gust penetration and due to nuclear blast waves.

Author

N83-24829*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

ANALYSIS OF STRAIN GAGE RELIABILITY IN F-100 JET ENGINE TESTING AT NASA LEWIS RESEARCH CENTER

R HOLANDA Mar 1983 12 p refs

(NAS 1 15 83325, NASA-TM-83325) Avail NTIS HC A03/MF

A01 CSCL 14B

A reliability analysis was performed on 64 strain gage systems mounted on the 3 rotor stages of the fan of a YF-100 engine. The strain gages were used in a 65 hour fan flutter research program which included about 5 hours of blade flutter. The analysis was part of a reliability improvement program. Eighty-four percent of the strain gages survived the test and performed satisfactorily. A post test analysis determined most failure causes. Five failures were caused by open circuits, three failed gages showed elevated circuit resistance, and one gage circuit was grounded. One failure was undetermined.

Author

N83-24858*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

NASA TRANSMISSION RESEARCH AND ITS PROBABLE EFFECTS ON HELICOPTER TRANSMISSION DESIGN

E V ZARETSKY, J J COY (Army Research and Technology Labs., Cleveland, Ohio), and D P TOWNSEND 1983 20 p refs Presented at the 39th Ann Forum of the Am Helicopter Soc, St Louis, 9-11 May 1983

(NASA-TM-83389, E-1601, NAS 1 15 83389,

AVRADCOM-TR-83-C-3) Avail NTIS HC A02/MF A01 CSCL

01C

Transmissions studied for application to helicopters in addition to the more conventional geared transmissions include hybrid (traction/gear), bearingless planetary, and split torque transmissions. Research is being performed to establish the validity of analysis and computer codes developed to predict the performance, efficiency, life, and reliability of these transmissions. Results of this research should provide the transmission designer with analytical tools to design for minimum weight and noise with maximum life and efficiency. In addition, the advantages and limitations of drive systems as well as the more conventional systems will be defined.

S L

N83-24876*# Grumman Aircraft Engineering Corp., Bethpage, N Y

DESIGN AND FABRICATION OF REALISTIC ADHESIVELY BONDED JOINTS

P SHYPRYKEVICH May 1983 32 p refs

(Contract NAS1-16952)

(NASA-CR-166099, NAS 1 26 166099) Avail NTIS HC A03/MF

A01 CSCL 20K

Eighteen bonded joint test specimens representing three different designs of a composite wing chordwise bonded splice were designed and fabricated using current aircraft industry practices. Three types of joints (full wing laminate penetration, two side stepped, midthickness penetration, one side stepped, and partial penetration, scarfed) were analyzed using state of the art elastic joint analysis modified for plastic behavior of the adhesive. The static tensile fail load at room temperature was predicted to be (1) 1026 kN/m (5860 lb/in) for the two side stepped joint, (2) 925 kN/m (5287 lb/in) for the one side stepped joint, and (3) 1330 kN/m (7600 lb/in) for the scarfed joint. All joints were designed to fail in the adhesive.

Author

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GEOSCIENCES

Includes geosciences (general), earth resources, energy production and conversion, environment pollution, geophysics, meteorology and climatology, and oceanography.

A83-30548

THE CWSU - A RENEWED EFFORT TO AID IFR PILOTS

E A MORSE (NOAA, National Weather Service, Salt Lake City, UT) IN Conference on Weather Forecasting and Analysis, 9th, Seattle, WA, June 28-July 1, 1982, Preprints Boston, MA, American Meteorological Society, 1982, p 105-110

The functions, equipment, and future operations of Center Weather Service Unit (CWSU) meteorologists are described. The CWSU provide forecasts for airline and high-flying private jet pilots. Two forecasts are routinely issued daily, in addition to on demand weather briefings to FAA personnel. General advisories for conditions affecting aviation are released, as are Center Weather advisories, which are on-line delivered to FAA installations. Weather training for AFCs are performed at CWSUs, and CWSU meteorologists are specifically trained for each area of the country and type of terrain they cover, e.g., mountains, coastal areas, etc. The CWSU meteorologist is particularly concerned with weather that will affect instrument flight rule (IFR) traffic, such as the location and direction of the jet stream and estimations of aircraft positions. CWSU personnel may in the future aid in developing efficient means of assimilating and disbursing pilot weather reports.

M S K

A83-30561

APPLICATION OF VAS MULTISPECTRAL IMAGERY TO AVIATION FORECASTING

R K ANDERSON, J J GURKA, and S J STEINMETZ (NOAA, National Earth Satellite Service, Washington, DC) IN Conference on Weather Forecasting and Analysis, 9th, Seattle, WA, June 28-July 1, 1982, Preprints Boston, MA, American Meteorological Society, 1982, p 227-234 refs

Current and projected applications of data available with the 11 additional IR bands featured on the GOES-4 satellite visible-IR spin-scan radiometer (VISSR) atmospheric sounder (VAR) are discussed. A total of 12 spectral bands are now contained on the spacecraft. The spectral selection is obtained with a filter wheel in front of the detector. Upper tropospheric flow is monitored with a 6.7 micron band, which augments existing 11.5 micron IR imagery. The 14.5 micron IR channel has been found to be too noisy and to have insufficient thermal resolution for characterizing thermal gradients in stratospheric air, compared to the results yielded with

the TIROS vertical sounder instrument. The GOES data is noted to be well-suited to aviation forecasts when updated half-hourly and in animated form. M S K

A83-30567**SHORT-RANGE PREDICTION OF MESOSCALE WINDFIELDS**

G. L. ACHTEMEIER (Illinois State Water Survey, Champaign, IL) IN Conference on Weather Forecasting and Analysis, 9th, Seattle, WA, June 28-July 1, 1982, Preprints Boston, MA, American Meteorological Society, 1982, p 271-276. refs

A numerical model for predicting mesoscale wind disturbances on interactive computers using in situ and remotely sensed data is detailed. The model was developed under the criteria of easy initialization, asymptotical updating, man-machine interactive, moderate computer memory, applicability to 10,000 sq km areas, and independence from other models sensitive to initialization. Temperature and height in the outflow layer are represented three-dimensionally, while the wind field receives a two-dimensional treatment. A semi-Lagrangian approach serves for the integration, and the governing equations include expressions for momentum, state, continuity, and temperature profiles. The solutions comprise the W-E and S-N wind components, the depth of the outflow layer, the pressure disturbance, and the temperature perturbation between the outflow and the environment. The model is useful for predicting gust fronts, shear zones, and turbulent windshifts hazardous to moving vehicles and which might also alter the path of released particulates. M S K

A83-33352#**AIRCRAFT NOISE AND THE AIRPORT COMMUNITY**

R N TEDRICK and R B HIXSON (FAA, Washington, DC) AIAA, ASCE, TRB, ATRIF, and CASI, International Air Transportation Conference, Montreal, Canada, June 1-3, 1983 10 p refs (AIAA PAPER 83-1580)

The aircraft noise issue became increasingly apparent in the early 1960's with the advent of jet aircraft. From a meeting of the International Civil Aviation Organization (ICAO) in September and October 1970 sprang ICAO's Annex 16 which provides a common international basis for aircraft noise standards. In the U.S., the noise certification requirements are in Part 36 of the Federal Aviation Regulations. One step in the source noise control program was a regulation requiring compliance with noise standards by jet aircraft already in the fleet by January 1, 1985. Aspects of airport noise abatement are discussed, taking into account economic impact and curfews. Attention is given to a balanced noise compatibility program, the measurement and the evaluation of noise impacts, and questions of federal funding. It is pointed out that the U.S. has now available a complete set of 'tools' for actually accomplishing a realistic degree of airport noise compatibility. G R

N83-23664# National Transportation Safety Board, Washington, D C Bureau of Safety Programs

ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA, US AIR CARRIERS, CALENDAR YEAR 1980

14 Jan 1983 104 p

(NTSB-ARC-83-01) Avail NTIS HC A06/MF A01

The record of aviation accidents involving revenue operations of U.S. Air Carriers for calendar year 1980 is presented. Accidents involving Commuter Air Carriers and On Demand Air Taxis are reported. Tables are presented to describe the losses and characteristics of 1980 accidents and to enable comparison with prior years. Author

N83-23670*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md

MIZEX-WEST NASA CV-990 FLIGHT REPORT

D. J. CAVALIERI and P. GLOERSEN Apr 1983 62 p (NASA-TM-85020, NAS 1 15 85020) Avail NTIS HC A04/MF A01 CSCL 08L

As part of the Bering Sea marginal ice zone winter experiment (MIZEX-WEST), the CV-990 airborne laboratory was flown to assess the potential of using an extended range of wavelengths for

improving passive microwave sea ice observations from spacecraft and second to provide an overview of the MIZ for large-scale processes studies. The aircraft was equipped with both imaging and fixed-beam, dual-polarized passive microwave radiometers ranging from 15 millimeter to 3 centimeter wavelengths. Visual, photographic, and thermal (10.7 micron) infrared surface observations were also made from the aircraft to complement the microwave measurements. The flight operations and in-flight observations are discussed and each flight is summarized including flight objective and instrument status. Preliminary mosaic images obtained with the ESMR imager, Nimbus-7 orbits over the Bering Sea, ice observations obtained by an ice observer on board, and composite maps of the general ice conditions for the month of February are also presented. A R H

N83-23732# Aerospace Systems, Inc, Burlington, Mass.

EFFECTS OF DYNAMIC STALL ON SWECS

R B NOLL and N D HAM (MIT) In Midwest Research Inst Proc Small Wind Turbine Systems, 1981 p 171-183 1981 refs

Avail NTIS HC A19/MF A01

A study of dynamic stall is presented in order to define its influence on the airfoil force and moment coefficients so that these effects can be included in the calculation of small wind energy conversion system (SWECS) loads and responses. A review of past work indicates that semiempirical methods are best suited to SWECS requirements. A definition of a dynamic stall theory is made for use in SWECS design, and the theory is implemented in SWECS loads and dynamic response analyses. Sample calculations are made for a representative vertical-axis machine. It is shown that loads and moments on the blades may be underestimated if dynamic stall is not considered. Author

N83-24048*# Control Data Corp, Minneapolis, Minn

FLIGHT SUMMARIES AND TEMPERATURE CLIMATOLOGY AT AIRLINER CRUISE ALTITUDES FROM GASP (GLOBAL ATMOSPHERIC SAMPLING PROGRAM) DATA Final Report

G D NASTROM and W H JASPERSON Mar 1983 369 p refs

(Contract NAS3-21249)

(NASA-CR-168106; NAS 1 26 168106) Avail NTIS HC A16/MF A01 CSCL 04B

Temperature data obtained by the Global Atmospheric Sampling Program (GASP) during the period March 1975 to July 1979 are compiled to form flight summaries of static air temperature and a geographic temperature climatology. The flight summaries include the height and location of the coldest observed temperature and the mean flight level, temperature and the standard deviation of temperature for each flight as well as for flight segments. These summaries are ordered by route and month. The temperature climatology was computed for all statistically independent temperature data for each flight. The grid used consists of 5 deg latitude, 30 deg longitude and 2000 feet vertical resolution from FL270 to FL430 for each month of the year. The number of statistically independent observations, their mean, standard deviation and the empirical 98, 50, 16, 2 and 3 probability percentiles are presented. Author

N83-24073# Army Cold Regions Research and Engineering Lab, Hanover, N H

SUPPRESSION OF ICE FOG FROM THE FORT WAINWRIGHT, ALASKA, COOLING POND

K E WALKER and W BRUNNER Oct 1982 39 p refs (AD-A123069, CRREL-SR-82-22) Avail NTIS HC A03/MF A01 CSCL 13B

Ice fog near the Ft. Wainwright cooling pond creates a visibility hazard. Observations show a substantial reduction in visibility along both private and public roadways in the path of the cooling pond's ice fog plume. This reduction in visibility increases as the ambient air temperature decreases. Visibility was less than 215 m (700 ft) on the Richardson Highway on the average of 8 days for each of the 3 data years. Data collected during the winters of 1979-80, 1980-81 and 1981-82 statistically show that use of a

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monomolecular film evaporation suppressant, hexadecanol (C16H33OH), on the pond to reduce ice fog is ineffective There is an immediate need for a driver warning system when visibility is affected by the ice fog Author (GRA)

N83-25226# Sandra Labs, Albuquerque, N Mex
MODULAR AIRBORNE REMOTE SAMPLING AND SENSING SYSTEM (MARSSS)

R O WOODS 1982 20 p Presented at the Specialty Conf on In-situ Air Quality Monitoring from Moving Platforms, San Diego, Calif, 18 Jan 1982
(Contract DE-AC04-76DP-00789)
(DE82-005691, SAND-81-1522C, CONF-820117-2) Avail NTIS HC A02/MF A01

The modular airborne instrumentation system being developed will allow flexibility in the choice of instruments by standardizing mountings, power supplies, and sampling modes The objective is to make it possible to perform aerial surveys from chartered aircraft that were not adapted in a more than superficial manner It will also allow the experimenter to tailor his choice of instruments to the specific problem Since the equipment will have a stand-alone capability, it can be applied to other problems such as long-term unattended use at remote locations or in toxic or otherwise hazardous environments A description of the system is given

DOE

N83-25232# Los Alamos Scientific Lab, N Mex
DIFFERENTIAL-ABSORPTION LIDAR TECHNOLOGY FOR LIGHT TWIN-ENGINE AIRCRAFT OPERATION Final Report

R KARL and H ARGO Nov 1982 26 p refs
(Contract W-7405-ENG-36)
(DE83-003888, LA-9568-MS) Avail NTIS HC A03/MF A01

A survey of all relevant, gas phase, environmentally important pollutants was performed to identify every accessible spectroscopic feature for differential absorption LIDAR (light detection and ranging) probing In addition, a comparison was made between all laser types for their ability to deliver sufficient energy at the appropriate wavelength to provide adequate signal to noise of the return for accurate range resolved concentration measurements Special consideration was given to all of the features necessary for operation of such a system in a light twin-engine aircraft This highly mobile system requires reliability, light-weight compact size, constant laser output for flight sampling period, and an unambiguous analysis method from the chosen detector system Such a system will allow fast and accurate remote sensing of emissions or ambient levels for research or monitoring

DOE

N83-25265*# National Aeronautics and Space Administration
Marshall Space Flight Center, Huntsville, Ala

SUMMARY PROCEEDINGS OF A WIND SHEAR WORKSHOP
J H ENDERS (Flight Safety Foundation, Arlington, Va), W W MELVIN (Air Line Pilots Assoc, Denison, Tex), W FROST (Tennessee Univ Space Inst, Tullahoma, Tenn), and D W CAMP Apr 1983 20 p Workshop Held at Tennessee Univ Space Inst, Tullahoma, Tenn, 25 Oct 1982
(NASA-CP-2270, NAS 1 55 2270) Avail NTIS HC A02/MF A01 CSCL 04B

A number of recent program results and current issues were addressed the data collection phase of the highly successful Joint Airport Weather Study (JAWS) Project and the NASA-B57B Gust Gradient Program, the use of these data for flight crew training through educational programs (e.g., films) and with manned flight training simulators, methods for post-accident determination of wind conditions from flight data recorders, the microburst wind shear phenomenon which was positively measured and described the ring vortex as a possible generating mechanism, the optimum flight procedure for use during an unexpected wind shear encounter, evaluation of the low-level wind shear alert system (LLWSAS), and assessment of the demonstrated and viable application of Doppler radar as an operational wind shear warning and detection system

Author

N83-25268*# National Aeronautics and Space Administration
Marshall Space Flight Center, Huntsville, Ala
SIGNIFICANT EVENTS IN LOW-LEVEL FLOW CONDITIONS HAZARDOUS TO AIRCRAFT

M B ALEXANDER and D W CAMP Jan 1983 39 p refs
(NASA-TM-82522, NAS 1 15 82522) Avail NTIS HC A03/MF A01 CSCL 04B

Atmospheric parameters recorded during high surface winds are analyzed to determine magnitude, frequency, duration, and simultaneity of occurrence of low level flow conditions known to be hazardous to the ascent and descent of conventional aircraft and the space shuttle Graphic and tabular presentations of mean and extreme values and simultaneous occurrences of turbulence (gustiness and a gust factor), wind shear (speed and direction), and vertical motion (updrafts and downdrafts), along with associated temperature inversions are included as function of tower height, layer and/or distance for six 5 sec intervals (one interval every 100 sec) of parameters sampled simultaneously at the rate of 10 speeds, directions and temperatures per second during an approximately 10 min period

S L

N83-25315*# National Aeronautics and Space Administration
Goddard Space Flight Center, Greenbelt, Md
ADAPTIVELY POINTING SPACEBORNE RADAR FOR PRECIPITATION MEASUREMENTS

D ATLAS *In its* Precipitation Meas from Space 9 p Oct 1981 refs Previously announced as A82-32773
Avail NTIS HC A19/MF A01 CSCL 04B

An auxiliary concept of adaptive pointing applicable to meteorological radar is discussed This control technique would resolve the conflicts among speed of scan or scan width, resolution, and dwell time per resolution element At T1 (orbital position) a passive infrared radiometer imager scans a swath ahead of the spacecraft, an appropriate algorithm indicates which clouds are probably producing precipitation These locations are then used by the on-board antenna controller to program the antenna scan so that the radar samples clouds A and B at times T2 and T3 respectively

R J F

N83-25316*# National Aeronautics and Space Administration
Goddard Space Flight Center, Greenbelt, Md
THE OUTLOOK FOR PRECIPITATION MEASUREMENTS FROM SPACE

D ATLAS, J ECKERMAN, and R MENEHINI *In its* Precipitation Meas from Space 9 p Oct 1981 refs
Avail NTIS HC A19/MF A01 CSCL 04B

The outlook for providing precipitation measurements of useful accuracy and or precision from space is discussed Visible and infrared techniques, microwave radiometers, spaceborne radar, and altimeters are discussed Key obstacles are identified

R J F

N83-25327# HSS, Inc, Bedford, Mass
DEVELOPMENT OF AN AIRBORNE VISIBILITY METER Final Report, 20 Feb. 1981 - 30 Sep. 1982

D F HANSEN 15 Nov 1982 170 p refs
(Contract F19628-81-C-0005)
(AD-A124276, HSS-B-092, AFGL-TR-82-0328) Avail NTIS HC A08/MF A01 CSCL 01C

A light-weight, compact nephelometer for the detection of cloud presence and the estimation of visual range was designed, fabricated, and tested The device is intended for airborne deployment for use in a tactical weather observation system and in support of precision guided munition missions The sensor is a fixed angle nephelometer utilizing an infrared diode at 0.88 micrometers and a silicon photovoltaic detector The sensor was calibrated in an environmental fog chamber over a wide range of fog and haze conditions The sensor was found to have a very wide dynamic range of sensitivity (over the decades of attenuation coefficient) and, within operational requirements for accuracy, its performance can be described by a universal algorithm The nephelometer was field tested at AFGL's Weather Test Facility at Otis AFB, high correlations were observed with transmissometers and other forward-scatter meters

GRA

15

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general), computer operations and hardware, computer programming and software, computer systems, cybernetics, numerical analysis, statistics and probability, systems analysis, and theoretical mathematics

N83-24184*# Michigan Univ, Ann Arbor Dept. of Electrical and Computer Engineering
MODELS AND TECHNIQUES FOR EVALUATING THE EFFECTIVENESS OF AIRCRAFT COMPUTING SYSTEMS Final Report, 1 May 1976 - 30 Jun. 1982

J F MEYER Jul 1982 25 p refs
 (Contract NSG-1306)

(NASA-CR-170229, NAS 1 26 170229, REPT-014524-21-T, SEL-170) Avail NTIS HC A02/MF A01 CSCL 09B

Models, measures, and techniques for evaluating the effectiveness of aircraft computing systems were developed. By 'effectiveness' in this context we mean the extent to which the user, i.e., a commercial air carrier, may expect to benefit from the computational tasks accomplished by a computing system in the environment of an advanced commercial aircraft. Thus, the concept of effectiveness involves aspects of system performance, reliability, and worth (value, benefit) which are appropriately integrated in the process of evaluating system effectiveness. Specifically, the primary objectives are the development of system models that provide a basis for the formulation and evaluation of aircraft computer system effectiveness, the formulation of quantitative measures of system effectiveness, and the development of analytic and simulation techniques for evaluating the effectiveness of a proposed or existing aircraft computer. Author

N83-24194*# SoHaR, Inc, Los Angeles, Calif
TRENDS IN SOFTWARE RELIABILITY FOR DIGITAL FLIGHT CONTROL

H HECHT and M HECHT Apr 1983 23 p refs
 (Contract NASA ORDER A-93024-B)

(NASA-CR-166456, NAS 1 26 166456) Avail NTIS HC A02/MF A01 CSCL 09B

Software error data of major recent Digital Flight Control Systems Development Programs. The report summarizes the data, compares these data with similar data from previous surveys and identifies trends and disciplines to improve software reliability. Author

N83-24212*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
DIGITAL SYSTEM UPSET. THE EFFECTS OF SIMULATED LIGHTNING-INDUCED TRANSIENTS ON A GENERAL-PURPOSE MICROPROCESSOR

C. M BELCASTRO Apr 1983 33 p refs

(NASA-TM-84652; NAS 1 15:84652) Avail NTIS HC A03/MF A01 CSCL 12A

Flight critical computer based control systems designed for advanced aircraft must exhibit ultrareliable performance in lightning charged environments. Digital system upset can occur as a result of lightning induced electrical transients, and a methodology was developed to test specific digital systems for upset susceptibility. Initial upset data indicates that there are several distinct upset modes and that the occurrence of upset is related to the relative synchronization of the transient input with the processing state of the digital system. A large upset test data base will aid in the formulation and verification of analytical upset reliability modeling techniques which are being developed. Author

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PHYSICS

Includes physics (general), acoustics, atomic and molecular physics; nuclear and high-energy physics, optics, plasma physics, solid-state physics, and thermodynamics and statistical physics

A83-31325*# Syracuse Univ, N Y
AEROACOUSTICS OF SUPERSONIC POROUS PLUG-NOZZLE FLOWS

D S DOSANJH (Syracuse University, Syracuse, NY), I DAS, and T J MATAMBO American Institute of Aeronautics and Astronautics, Aeroacoustics Conference, 8th, Atlanta, GA, Apr 11-13, 1983 26 p refs

(Contract NAG1-129)
 (AIAA PAPER 83-0775)

The effects of porosity on attenuation of noise from short plug-nozzle flows have been studied. Porosity of 10 percent distributed over the whole surface and porosity of 4 percent distributed over the middle-third surface of the conical plug have been investigated. The porosity results in favorable modifications of the repetitive shock structures as revealed by the shadowgraphs of the flow. The acoustic data indicate a reduction of noise intensity levels up to 4 dB for the porous plugs as compared to the solid conical plug. The locally distributed holes (4 percent porosity) are found to give aeroacoustic performance comparable to those with holes distributed over the whole surface (10 percent porosity). Also, the solid conical plug-nozzle is noted to yield noise reductions up to 9 dB when compared to the conical convergent plug-nozzle. A proposed mechanism of shock modification in porous plug-nozzle. A supported by shadowgraphic records. Author

A83-33024
TIME-OF-DAY CORRECTIONS IN MEASURES OF AIRCRAFT NOISE EXPOSURE

R B BULLEN and A J HEDE (National Acoustic Laboratories, Millers Point, New South Wales, Australia) Acoustical Society of America, Journal (ISSN 0001-4966), vol 73, May 1983, p 1624-1630 refs

Results of a socio-acoustic study of human reaction to aircraft noise around Australian airports are described. The relative importance of night, evening, and daytime operations in determining overall reaction is assessed using a correlation analysis procedure. The results indicate that night-time weightings used in most existing noise exposure indices including NEF and DNL, are too large. However, other evidence suggests that both night and evening weightings should be greater than 0 dB. The optimal weightings found were about 3 dB for night-time operations and 9 dB for evening operations. However, other considerations indicate that in a practical noise index it may be more reasonable to apply a weighting of about 6 dB during both night and evening hours. Author

A83-33372#
EFFECT OF SOUND ABSORBING WALL LININGS ON AERODYNAMIC FORCES OF A SUBSONIC VIBRATING CASCADE

M NAMBA (Kyushu University, Fukuoka, Japan) and N YAMASAKI Kyushu University, Faculty of Engineering, Memoirs (ISSN 0023-6160), vol 42, Dec 1982, p 251-278 refs

A method of singularity is developed to predict the effect of sound absorbing wall liners on the unsteady aerodynamic forces for a linear cascade vibrating in a subsonic uniform flow between parallel walls. A side wall of the model is partially composed of a sound absorbing liner with uniform acoustic admittance. The lined section of the wall is confined to the portion swept by blades. Substantial variation of the total aerodynamic work with change in the wall admittance is found to occur only in a confined range of the admittance magnitude. The functional form of the aerodynamic work as a function of the admittance magnitude is heavily

16 PHYSICS

dependent on the admittance phase Absolute value of the total aerodynamic work for zero impedance wall is generally smaller than that for rigid wall except for some cases of translational vibration with the interblade phase angle around 300 deg

Author

N83-24286 Muenchener Rueckversicherungs Gesellschaft, Munich (West Germany)

ULTRA SOUND AND INSURANCE [UEBERSCHALLKNALL UND VERSICHERUNG]

1976 42 p refs Partly in ENGLISH and GERMAN

Avail Issuing Activity

The supersonic boom and its accompanying phenomena in supersonic flight is discussed Various questions are raised concerning supersonic air transport the effects of supersonic boom on humans and their environment, the possibility of keeping the supersonic boom within limits, the operator's responsibility for the damage caused by commercial supersonic aircrafts, the insurability of compensation for damage and claims and its form and conditions The final decisions are only temporarily, since the experience with the regular utilization of commercial supersonic aircrafts is still not sufficient and the creation of international liability agreements are still in the planning stage

Transl by E A K

N83-24287*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

A PRELIMINARY COMPARISON BETWEEN THE SR-6 PROPELLER NOISE IN FLIGHT AND IN A WIND TUNNEL

J H DITTMAR, P L LASAGNA, and K G MACKALL 1983 18 p refs Presented at the 105th Meeting of the Acoustical Soc of Am, Cincinnati, 9-13 May 1983

(NASA-TM-83341, E-1596, NAS 1 15 83341) Avail NTIS HC A02/MF A01 CSCL 20A

High speed turboprops offer an attractive candidate for aircraft because of their high propulsive efficiency However, one of the possible problems associated with these propellers is their high noise level at cruise condition that may create a cabin environment problem Models of these propellers were tested for acoustics in the 8 by 6-foot wind tunnel and on the Jet Star airplane Comparisons between the airplane and wind tunnel data for the SR-6 propeller are shown The comparison of maximum blade passing tone variation with helical tip Mach number between the tunnel and flight data was good when corrected to the same test conditions Directivity comparisons also showed fairly good agreement These good comparisons indicate that the wind tunnel is a viable location for measuring the blade passage tone noise of these propellers.

S L

N83-24289# Aerospace Medical Research Labs, Wright-Patterson AFB, Ohio

FAR-FIELD ACOUSTIC DATA FOR THE TEXAS ASE, INC. HUSH-HOUSE, SUPPLEMENT

R. A LEE Apr 1982 288 p

(Contract AF PROJ 7231)

(AD-A122844, AFAMRL-TR-81-148-SUPPL) Avail NTIS HC A13/MF A01 CSCL 06F

This report supplements AFAMRL-TR-73-110, which describes the data base (NOISEFILE) used in the computer program (NOISEMAP) to predict the community noise exposure resulting from military aircraft operations The results of field test measurements to define the single-event noise produced on the ground by military aircraft/engines operating in the Texas ASE Inc hush-house are presented as a function of angle (0 to 180 from the front of the hush-house) and distance (200 ft to 2500 ft) in various acoustic metrics.

GRA

N83-25496*# Michigan Univ, Ann Arbor Survey Research Center

ESTIMATING REGRESSION COEFFICIENTS FROM CLUSTERED SAMPLES: SAMPLING ERRORS AND OPTIMUM SAMPLE ALLOCATION Final Report

G KALTON Hampton, Va NASA Langley Research Center May 1983 28 p refs

(Contract NAS1-16107)

(NASA-CR-166117, NAS 1 26 166117) Avail NTIS HC A03/MF A01 CSCL 20A

A number of surveys were conducted to study the relationship between the level of aircraft or traffic noise exposure experienced by people living in a particular area and their annoyance with it These surveys generally employ a clustered sample design which affects the precision of the survey estimates Regression analysis of annoyance on noise measures and other variables is often an important component of the survey analysis Formulae are presented for estimating the standard errors of regression coefficients and ratio of regression coefficients that are applicable with a two- or three-stage clustered sample design Using a simple cost function, they also determine the optimum allocation of the sample across the stages of the sample design for the estimation of a regression coefficient

M G

N83-25498*# Bolt, Beranek, and Newman, Inc, Cambridge, Mass

LIMITS ON THE PREDICTION OF HELICOPTER ROTOR NOISE USING THICKNESS AND LOADING SOURCES: VALIDATION OF HELICOPTER NOISE PREDICTION TECHNIQUES Contractor Report, 1981 - 1982

G P SUCCI Apr 1983 93 p refs

(Contract NAS1-16886)

(NASA-CR-166097, NAS 1 26 166097, BBN-5114) Avail NTIS HC A05/MF A01 CSCL 20A

The techniques of helicopter rotor noise prediction attempt to describe precisely the details of the noise field and remove the empiricisms and restrictions inherent in previous methods These techniques require detailed inputs of the rotor geometry, operating conditions, and blade surface pressure distribution The Farassat noise prediction techniques was studied, and high speed helicopter noise prediction using more detailed representations of the thickness and loading noise sources was investigated These predictions were based on the measured blade surface pressures on an AH-1G rotor and compared to the measured sound field Although refinements in the representation of the thickness and loading noise sources improve the calculation, there are still discrepancies between the measured and predicted sound field Analysis of the blade surface pressure data indicates shocks on the blades, which are probably responsible for these discrepancies

S L

N83-25499*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

ACOUSTICAL MODAL ANALYSIS OF THE PRESSURE FIELD IN THE TAILPIPE OF A TURBOFAN ENGINE

E A KREJSA and A M KARCHMER 13 May 1983 32 p refs Presented at 105th Meeting of the Acoust Soc of Am, Cincinnati, 9-13 May 1983

(NASA-TM-83387, E-1665, NAS 1 15 83387) Avail NTIS HC A03/MF A01 CSCL 20A

The results of a modal analysis of the pressure field in the tailpipe of a turbofan engine are presented Modal amplitudes, at the tailpipe inlet and exit, are presented, as a function of frequency, for several operating conditions. The modal amplitudes were obtained using an optimization routine to obtain a best fit between measured cross spectra and an analytical expression for the cross spectra between pressures at circumferentially spaced locations The measured pressure field was decomposed into a set of five modal amplitudes corresponding to the (0,0), (1,0), (2,0), (3,0), and (4,0) modes The analysis was limited to frequencies below 1500 Hz where higher order modes are cutoff The results of the analysis showed that at low frequencies, up to the cutoff frequency of the (1,0) mode, the (0,0) mode (plane wave) dominated the

SOCIAL SCIENCES

Includes social sciences (general); administration and management, documentation and information science, economics and cost analysis, law and political science, and urban technology and transportation

A83-31923

TOWARDS THE STARSHIP ENTERPRISE - ARE THE CURRENT TRENDS IN DEFENCE UNIT COSTS INEXORABLE?

D L KIRKPATRICK and P G PUGH Aerospace (UK) (ISSN 0305-0831), vol 10, May 1983, p. 16-23 refs

The causes and future implications of the steadily increasing unit procurement costs of military aircraft are examined on the basis of U K data from 1910 to the present. The increase in unit cost, presently at a rate of 8.3 percent per annum, is shown to result from a combination of technological advance in competition with adversary nations and inefficiencies inherent in defense-budget mechanisms. Technological cost increases are found to be more rapid whenever the limits of a particular technology are approached, even in the case of improvements intended to reduce operating costs. The relationship of unit cost, unit effectiveness, and overall force effectiveness is explored, and the best aircraft is described as one having a unit effectiveness slightly lower than that of one with the optimum cost/effectiveness ratio. The effect of rising unit costs on procurement policy since World War II is characterized. Aircraft are procured in decreasing numbers, fewer types of aircraft are developed, and periods of service are lengthened. Continuation of these policy trends is seen as militarily questionable. The ability of countermeasures such as allied collaboration, exports, computer-based technology, and value engineering to change the 8-percent-per-annum cost increase is seen as limited, with the result that the next generation of combat aircraft will consist of at most 40 percent as many aircraft as the present one. Reversal of the cost-increase trend is found to be a possible but unlikely alternative.

T K

pressure field. The frequency range from the cuton of the (1,0) mode to the cuton of the (2,0) mode was dominated by the (1,0) mode. The (2,0) mode dominated from its cuton frequency to the upper limit of the analysis, i.e., 1500 Hz. The contribution of modes other than the dominant mode was usually small. S L

N83-25500# Federal Aviation Administration, Washington, D C Office of Environment and Energy
HELICOPTER NOISE EXPOSURE CURVES FOR USE IN ENVIRONMENTAL IMPACT ASSESSMENT Final Report
J S NEWMAN, E J RICKLEY, and T L BLAND Nov 1982 160 p
(AD-A123467; DOT/FAA/EE-82/16) Avail NTIS HC A08/MF A01 CSCL 20A

This report establishes the current (1982) FAA helicopter noise data base for use in environmental impact assessment. The report sets out assumptions, methodologies, and techniques used in arriving at noise-exposure-versus-distance relationships. Noise data are provided for 15 helicopters, including five flight regimes each: takeoff, approach, level flyover, hover in-ground-effect (HIGE) and hover out-of-ground effect (HOGE). When possible, level flyover data are presented for a variety of airspeeds. Sound exposure level (SEL) is provided for all operational modes except hover. In the case of hover operations (both HOGE and HIGE), the maximum A-Weighted Sound Level (LAM) is identified as a function of distance. The report also includes a discussion of helicopter performance characteristics required for full computer modeling of helicopter/heliport noise exposure. Author (GRA)

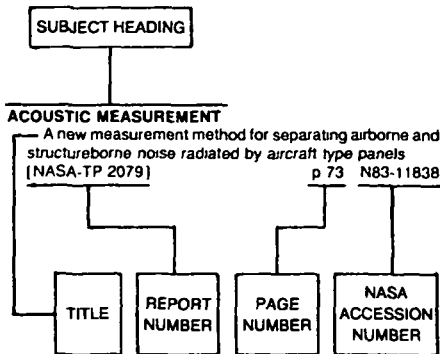
N83-25529# Los Alamos Scientific Lab, N Mex
FLIGHT SYSTEMS SAFETY PROGRAM Progress Report
S E BRONISZ, comp Jul 1982 15 p
(Contract W-7405-ENG-36)
(DE82-021833; LA-9476-PR) Avail NTIS HC A02/MF A01

This technical monthly report covers studies related to the use of PuO₂ (238) in radioisotope power systems carried out for the Office of Coordination and Special Projects of the US Department of Energy by Los Alamos National Laboratory. Most of the studies discussed here are ongoing. Results and conclusions described may change as the work continues. Published reference of the results cited should not be made without the explicit permission of the person in charge of the work. DOE

N83-25539*# National Aeronautics and Space Administration, Langley Research Center, Hampton, Va
MINIATURE ELECTRO-OPTICAL AIR FLOW SENSOR Patent Application
D D KERSHNER, inventor (to NASA) 14 Apr 1983 15 p
(NASA-CASE-LAR-13065-1, US-PATENT-APPL-SN-484745)
Avail NTIS HC A02/MF A01 CSCL 20F

A sensor for measuring flow direction and airspeed is disclosed that is suitable, because of its small size, for rapid instrumentation of research airplanes. A propeller driven sphere rotating at a speed proportional to airspeed presents a reflective target to an electro-optical system. The duty cycle of the resulting electrical output is proportional to yaw angle and the frequency is proportional to airspeed. NASA

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, the title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

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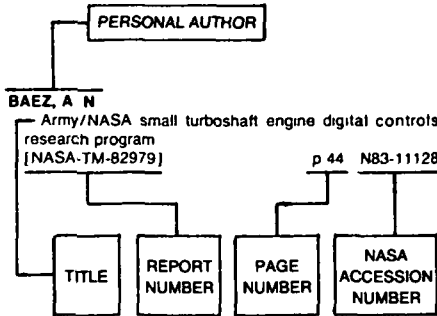
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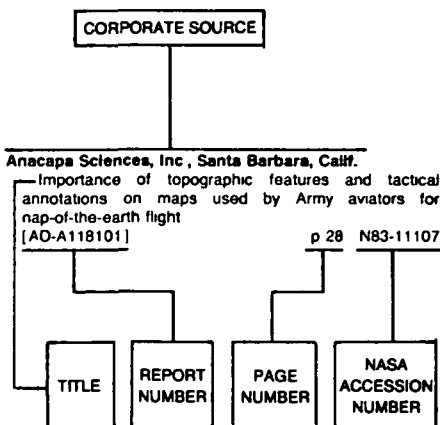
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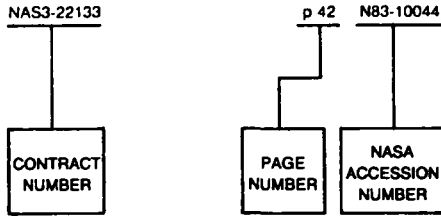
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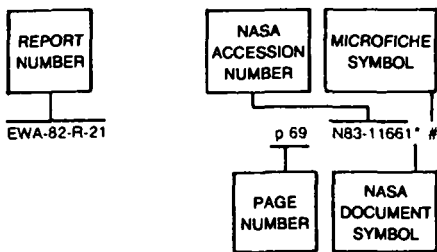


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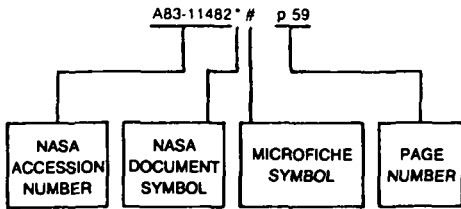
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