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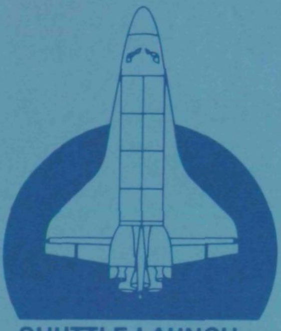
A Continuing Bibliography with Indexes

NASA SP-7037 (132)
February 1981



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STAR (N-10000 Series)	N81-10001 – N81-12010
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NASA SP-7037(132)

AERONAUTICAL ENGINEERING

A Continuing Bibliography

Supplement 132

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 January 1981 in

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- *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. Since that time, monthly supplements have been issued.

This supplement to *Aeronautical Engineering -- A Continuing Bibliography* (NASA SP-7037) lists 342 reports, journal articles, and other documents originally announced in January 1981 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).*

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

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

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

An annual cumulative index will be published.

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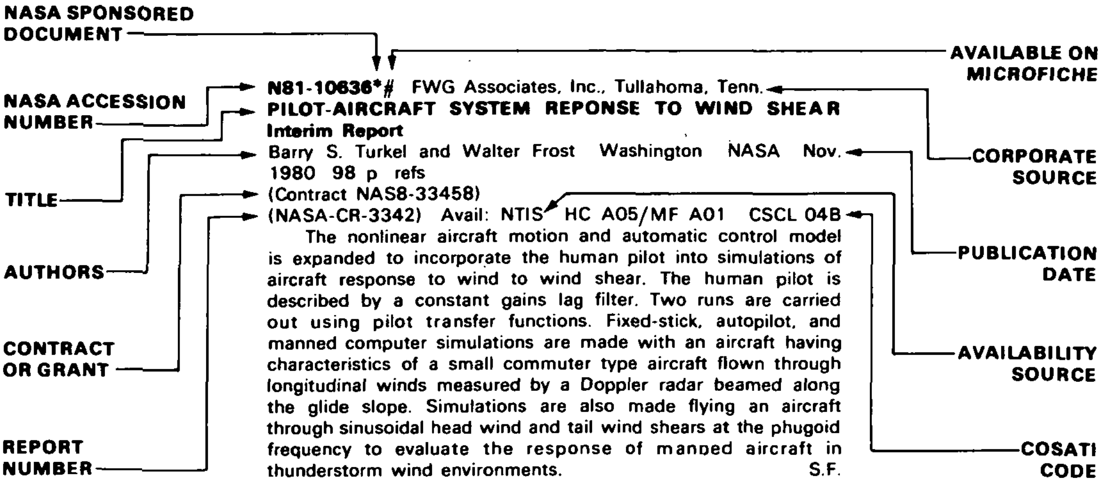
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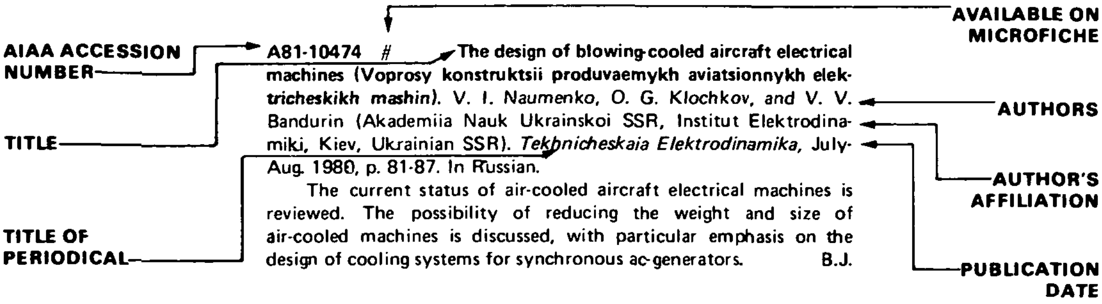
N81-10636*# FWG Associates, Inc., Tullahoma, Tenn.
PILOT-AIRCRAFT SYSTEM REPONSE TO WIND SHEAR
Interim Report
Barry S. Turkel and Walter Frost Washington NASA Nov. 1980 98 p refs
(Contract NAS8-33458)
(NASA-CR-3342) Avail: NTIS HC A05/MF A01 CSCL 04B

The nonlinear aircraft motion and automatic control model is expanded to incorporate the human pilot into simulations of aircraft response to wind to wind shear. The human pilot is described by a constant gains lag filter. Two runs are carried out using pilot transfer functions. Fixed-stick, autopilot, and manned computer simulations are made with an aircraft having characteristics of a small commuter type aircraft flown through longitudinal winds measured by a Doppler radar beamed along the glide slope. Simulations are also made flying an aircraft through sinusoidal head wind and tail wind shears at the phugoid frequency to evaluate the response of manned aircraft in thunderstorm wind environments. S.F.

TYPICAL CITATION AND ABSTRACT FROM *IAA*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A81-10474 # **The design of blowing-cooled aircraft electrical machines (Voprosy konstruktsii produvaemykh aviatsionnykh elektricheskikh mashin).** V. I. Naumenko, O. G. Klochkov, and V. V. Bandurin (Akademiia Nauk Ukrainskoi SSR, Institut Elektrodinamiki, Kiev, Ukrainian SSR). *Tekhnicheskaia Elektrodinamika,* July-Aug. 1980, p. 81-87. In Russian.

The current status of air-cooled aircraft electrical machines is reviewed. The possibility of reducing the weight and size of air-cooled machines is discussed, with particular emphasis on the design of cooling systems for synchronous ac-generators. B.J.

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 132)

FEBRUARY 1981

IAA ENTRIES

A81-10045 # **Reliability and engineering-economic characteristics of aircraft engines (Naderzhnost' i tekhniko-ekonomicheskie kharakteristiki aviatsionnykh dvigatelei).** K. P. Alekseev. Moscow, Izdatel'stvo Transport, 1980. 103 p. 18 refs. In Russian.

The book deals with methods of evaluating the operational reliability and the safety, regularity, and economy characteristics of aircraft engines. A function defining the generalized reliability index of an engine is introduced, and a formula for calculating this index is proposed. The influence of the operational conditions on the reliability, safety, and economy of an engine is examined, and maintenance trends for modern transport-aircraft engines are discussed. V.P.

A81-10096 **Design of airfoils in incompressible viscous flows by numerical optimization.** H. N. V. Dutt and A. K. Sreekanth (Indian Institute of Technology, Madras, India). *Computer Methods in Applied Mechanics and Engineering,* vol. 23, Sept. 1980, p. 355-368. 10 refs.

A method is outlined for the design of airfoils in incompressible viscous flows by numerical optimization wherein a reduced number of design coordinates are used to define the airfoil shape. The optimization problem is formulated as a nongradient search in a finite constrained parameter space. The approach is to define the airfoil as a linear combination of basic shapes which may be analytically or numerically defined. The design problem is to determine the participation of each of these basic shapes in defining the optimum airfoil. The aerodynamic analysis program is specially developed to fit the requirements of the optimization program and is based on the vortex singularity method for inviscid flow analysis and the momentum integral method for boundary layer analysis. Four examples have been worked out to illustrate the proposed design method. In these, modifications to four different airfoil geometries are made to achieve either a minimum drag coefficient or a minimum pitching moment coefficient under prescribed constraints. The results show that significant drag or pitching moment reduction is possible through shape manipulation alone. (Author)

A81-10162 **Comparative performance of two centrifugal fan impellers differing in blade section.** M. R. Shaalan and A. M. Shibl (Riyadh, University, Riyadh, Saudi Arabia). In: Heat Transfer and Fluid Mechanics Institute, Meeting, 27th, Los Angeles, Calif., June 23-25, 1980, Proceedings. Stanford, Calif., Stanford University Press, 1980, p. 53-63. 6 refs.

Two centrifugal fan impellers, each with backward-curved blading and constant width, have been tested for overall and for detailed performance. The two impellers were designed for the same conditions but differ only in the blade section configuration. In one impeller, the blade is of constant small thickness, which is the common practice in centrifugal fan construction. The other impeller has airfoil blading constructed from the standard C4 profile which is commonly used in axial compressors. Results indicate that the characteristics of the airfoil-bladed impellers at design velocity are significantly different when compared with other impellers. Detailed flow measurements were carried out at impeller periphery using a hot-wire anemometer and conventional instruments. (Author)

A81-10272 **Acoustic structures.** C. E. Kimball (Boeing Military Airplane Co., Wichita, Kan.). *(American Welding Society and Welding Research Council, International Brazing Conference, 11th, Los Angeles, Calif., Apr. 15-17, 1980.) Welding Journal,* vol. 59, Oct. 1980, p. 26-30.

The paper discusses a titanium brazing method for producing honeycomb acoustic cylinders. Brazing was performed with a 3003 aluminum filler metal, using an improved vacuum pumping system and argon purging. A mandrel, a rotisserie door assembly, and a brazing retort were placed into an electric furnace which heated the brazement to 1255 F held for a minimum of 2 min during the brazing operation. A 36 in. diameter cylinder was brazed within tolerances of + or - 0.010 in.; the brazements show weight advantages from 20 to 50% over conventional materials. A.T.

A81-10355 **Aspect ratio variability in part-through crack life analysis.** R. J. Engle, Jr. (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio). In: Part-through crack fatigue life prediction. Philadelphia, Pa., American Society for Testing and Materials, 1979, p. 74-88. 7 refs.

Various analytical solutions currently used in part-through crack life prediction are reviewed, including those which account for shape change effects as well as constant shape solutions. Comparisons of these solutions with constant amplitude experimental data are examined. Results are presented for three different materials: 2219-T851 aluminum, 6Al-4-V (beta annealed) titanium, and 9Ni-4Co-0.20C steel. (Author)

A81-10362 **Part-through crack problems in aircraft structures.** J. L. Rudd, H. A. Wood (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio), and T. M. Hsu (Lockheed-Georgia Co., Marietta, Ga.). In: Part-through crack fatigue life prediction. Philadelphia, Pa., American Society for Testing and Materials, 1979, p. 168-194. 15 refs.

The most common types of flaws which exist in aircraft structures and the test data and analytical criteria needed to predict their growth are discussed. A number of special analytical and structural considerations are discussed such as small flaws, cold-worked holes, plasticity effects, failure criteria, and multiple flaw sites. The analytical crack growth and residual strength requirements which must be met as well as the initial flaw sizes and shapes which must be assumed in the Air Force damage tolerance design *requirements (MIL-A-83444) are presented. Recently developed* stress intensity factor solutions for quarter elliptical corner cracks emanating from various types of fastener holes are presented. Predictions using these current solutions are correlated with other approximate solutions as well as experimental test data. (Author)

A81-10439 # **Forced vibrations of a nonlinear system excited by a centrifugal oscillator with a sloping engine characteristic (O vynuzhdennykh kolebaniiakh nelineinoi sistemy, vozbuzhdaemoi tsentrobezhnym vibratorom, imeiushchim pologuiu kharakteristiku dvigatelia).** N. P. Plakhtienko and N. V. Lysak (Akademiia Nauk Ukrainskoi SSR, Institut Mekhaniki, Kiev, Ukrainian SSR). *Prikladnaia Mekhanika,* vol. 16, Sept. 1980, p. 110-114. 7 refs. In Russian.

Centrifugal oscillators, of the type used in dynamic analyses of mechanical systems, are powered by low-power engines. Mounted on elastic structures, such engines may give rise to interactions between the translational and rotational motions of the vibrator elements, which lead to unsteady mode shapes of vibration and hinder transition through resonance. In the present paper, these and some other associated phenomena are analyzed. V.P.

A81-10468 # **Brushless cryogenic ac motors (Beskontaktnye kriogennye elektricheskie mashiny peremennogo toka).** Z. K. Sika (Akademiia Nauk Latviiskoi SSR, Fiziko-Energeticheskii Institut, Riga, Latvian SSR). *Akademiia Nauk Latviiskoi SSR, Izvestiia, Seriia Fizicheskikh i Tekhnicheskikh Nauk,* no. 4, 1980, p. 68-79. 26 refs. In Russian.

Basic types of brushless cryogenic equipment and their classification system are presented. Development of motors is described, including rotor designs without windings, ferromagnetic rotors without windings, and a cascade type cryogenic machine with a synchronous motor with windings. A.T.

A81-10474 # **The design of blowing-cooled aircraft electrical machines (Voprosy konstruktsii produvaemykh aviatsionnykh elektricheskikh mashin).** V. I. Naumenko, O. G. Klochkov, and V. V. Bandurin (Akademiia Nauk Ukrainskoi SSR, Institut Elektrodinamiki, Kiev, Ukrainian SSR). *Tekhnicheskaia Elektrodinamika,* July-Aug. 1980, p. 81-87. In Russian.

The current status of air-cooled aircraft electrical machines is reviewed. The possibility of reducing the weight and size of air-cooled machines is discussed, with particular emphasis on the design of cooling systems for synchronous ac-generators. B.J.

A81-10499 # **The aircraft in the stratosphere (L'avion dans la stratosphère).** M. Nicolet. *Académie Royale de Belgique, Classe des Sciences, Bulletin,* vol. 65, no. 12, 1979, p. 681-686. In French.

The effect of combustion gases from supersonic flights upon the ozone layer has been a major concern since the discovery that skin cancer is induced by ultraviolet radiation. An equation for the photochemical equilibrium of oxygen within the ozone layer is presented showing that several processes involving hydrogen, nitrogen, and halogen oxides are significant in the region's equilibrium. From 25 km and under, a positive effect of NO2 dissociation which provides oxygen atoms occurs more often than the direct dissociation of O2, while for the region above 25 km (above the maximum concentration of ozone) the NO2 dissociation is less significant than the photodissociation of O2. Therefore, it is believed that supersonic flights, such as the Concorde, above 25 km could, in sufficient numbers, directly affect the equilibrium of the stratospheric ozone layer. However, flights below 25 km will not destroy the ozone, but rather increase the production of the stratospheric ozone. A.C.W.

A81-10575 **NASA presses fighter gains.** C. Covault. *Aviation Week and Space Technology,* vol. 113, Oct. 27, 1980, p. 16-18.

NASA planned contracts early next year on long-range, supersonic cruise aircraft in order to gain a new technology base are *described. Attention is given to two performance concepts which will* be studied: one for a European-based figher and the other for a Middle-East-based fighter. It is shown that emphasis in NASA's 'supercruise' fighter study will be to obtain industry concepts of tactical aircraft possessing two or three times the supersonic cruise ranges of existing fighters, allowing the supercruise vehicles to fly efficiently most, if not all, of their takeoff-to-landing mission profiles at about Mach 2. Consideration is given to the primary new technologies to be evaluated, such as variable cycle engines and dry turbojets, low-aspect-ratio arrow wings, composite materials, and active controls with digital avionics. M.E.P.

A81-10632 # **The performance of slotted blades in cascade.** H. Matsumiya (Mechanical Engineering Laboratory, Sakura, Ibaraki, Japan) and M. Shirakura (Tokyo, University, Tokyo, Japan). *JSME, Bulletin,* vol. 23, Aug. 1980, p. 1320-1334. 18 refs.

A precise solution of the problem of determining a two-dimensional potential flow of incompressible fluid around arbitrary shaped slotted blades in cascade was obtained by conformal mapping. This solution facilitates precise evaluation of the extremely complicated calculations around the slot even if the slot and the main aerofoil are approximated close to each other. Utilization of a modified Milne-Thomson's circle theorem together with Milne-Thomson's circle theorem, as a means of analysis, gives simple expressions of mapping function and complex potential function, suitable for electronic computer calculations. Wind tunnel tests, with comparison between slotted and unslotted cascades, were also conducted. Slight slot effect was obtained in both outer regions of flow inlet angle. However, in the middle region of inlet angle, slot effect was insufficient due to the divergent shape of slot employed. (Author)

A81-10633 # **Discrete frequency noise due to irregularity in blade row of axial fan rotor.** T. Fukano, Y. Kodama, and Y. Takamatsu (Kyushu University, Fukuoka, Japan). *JSME, Bulletin,* vol. 23, Aug. 1980, p. 1335-1343. 12 refs.

It is experimentally made clear in this paper that discrete tones appear in the frequency band lower than the blade passing frequency when a rotor has manufacturing errors of stagger angle, pitch, camber or chord length, which result is at variance with the general understanding that the frequency of discrete noise corresponds to the blade passing frequency and its harmonics. The relations between the magnitude of the deviation of the blading parameter from a design value and the induced sound pressure level of discrete tone and the resulting change of fluid dynamic characteristics of the fan are also examined. Analytic considerations of measured wave patterns of pressure fluctuation indicate that this type of discrete noise originates in a distortion of the circumferential distribution of mean flow rates through the rotor from the uniform distribution and the consequent circumferential variation of mean pressure level, arising from the unequal blade loading of each blade of a rotor due to the errors in manufacturing. (Author)

A81-10708 # **Application of the laser velocimetry technique to Langley's 0.3-meter Cryogenic Wind Tunnel.** L. R. Gartrell, P. B. Goodrum, W. W. Hunter, Jr., and J. F. Meyers. *Supersonic Tunnel Association, Semiannual Meeting, 54th, New York, N.Y., Oct. 9, 10, 1980, Paper.* 33 p. 6 refs.

A limited series of laser velocimeter tests were conducted in the Langley 0.3-m Transonic Cryogenic Tunnel. The results demonstrated that the laser velocimeter technique could be applied to the facility to obtain velocity measurements over a 51-235 m/sec range with at least + or - 1% accuracy. No seeding material was injected during these tests to augment existing Mie scattering material. It is postulated that the scattering material in these tests was liquid nitrogen normally injected to control the tunnel conditions. Signal levels obtained during the tests indicated that the average particulate size was greater than desired, more than 1.0 micron in diameter.

Tunnel vibrations were considered a potential problem before the test but no detrimental effects on the optical system were noted. It is concluded that the laser velocimeter technique is a viable method for measuring velocity in the 0.3-m Transonic Cryogenic Tunnel. The most significant problem is the reduction and control of the size of existing scattering particulates. (Author)

A81-10709 * # **A numerical study of candidate transverse fuel injector configurations in the Langley scramjet engine.** J. P. Drummond (NASA, Langley Research Center, Hampton, Va.). *Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee, Combustion Meeting, 17th, Hampton, Va., Sept. 22-26, 1980, Paper.* 27 p. 11 refs.

A computer program has been developed that numerically solves the two-dimensional Navier-Stokes and species equations near one or more transverse hydrogen fuel injectors in a scramjet engine. The program currently computes the turbulent mixing and reaction of hydrogen fuel and air, and allows the study of separated regions of the flow immediately preceding and following the injectors. The complex shock-expansion structure produced by the injectors in this region of the engine can also be represented. Results are presented that describe the flow field near two opposing transverse fuel injectors and two opposing staged (multiple) injectors, and comparisons between the two configurations are made to assess their mixing and flameholding qualities. (Author)

A81-10711 * # **Flameholding characteristics of a swept-strut H2 fuel-injector for scramjet applications.** G. B. Northam, C. A. Trexler, and C. R. McClinton (NASA, Langley Research Center, Hampton, Va.). *Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee, Combustion Meeting, 17th, Hampton, Va., Sept. 22-26, 1980, Paper.* 20 p. 12 refs.

A series of direct-connect tests are conducted which simulate the flow around the center swept-strut fuel-injector of a scramjet engine module. The experimental geometry includes both perpendicular and parallel fuel injectors which are swept with respect to the upstream flow direction in a manner simulating the flow geometry in the combustion region of the scramjet module. Seven different strut injector geometries are evaluated for their performance, flameholding, and inlet-combustor interaction characteristics. The most efficient combustion process is exhibited by the configuration having the deepest step with perpendicular injector orifices located 3.5 to 4.5 step heights downstream from the step. However, long centerbody and staged injection configurations perform as equally well as the deep step configuration when evaluating only the amount of perpendicular fuel injection. Since the staged injection configuration exhibits the lowest ignition and flameholding limit, it is suggested that the optimum injection configuration should incorporate a deep step with staged injection in order to improve the low temperature autoignition-flameholding characteristics. A.L.W.

A81-10718 **Airfield pavement demonstration-validation study.** D. M. Arntzen (Department of Public Works, Chicago, Ill.), E. J. Barenberg (Illinois, University, Urbana, Ill.), and R. J. Krause (Wiss, Janney, Elstner and Associates, Inc., Northbrook, Ill.). *ASCE, Transportation Engineering Journal,* vol. 106, Nov. 1980, p. 721-730.

An instrumentation and testing program is presented which has been designed to provide realistic data for pavement designs and to validate results from a finite element program developed specifically to analyze jointed concrete pavements. Preliminary results of design and validation tests are briefly discussed. V.L.

A81-10719 **Atlanta's new central passenger terminal complex.** J. F. Kortan (Stevens and Wilkinson Architects, Engineers, Planners, Inc., Atlanta, Ga.). *(American Society of Civil Engineers, Annual Convention and Exposition, Atlanta, Ga., Oct. 22-26, 1979.) ASCE, Transportation Engineering Journal,* vol. 106, Nov. 1980, p.765-774.

Atlanta's new airport, to be opened in September 1980, will include a 500,000-sq ft two-level terminal linked underground to a satellite complex of four concourses and three runways; a fourth runway is scheduled to be added in the early 1980s. Parking will accommodate 11,500 cars. The airport design features a column-leveling system to compensate for unequal soils conditions, a unique split-complex plan dictated by the high passenger transfer rate, and the latest available people-mover system with moving sidewalk redundancy. V.L.

A81-10747 **Fatigue damage mechanisms in composite materials - A review.** W. W. Stinchcomb and K. L. Reifsnider (Virginia Polytechnic Institute and State University, Blacksburg, Va.). In: Fatigue mechanisms. Philadelphia, Pa., American Society for Testing and Materials, 1979, p. 762-781; Discussion, p. 782-787. 57 refs.

A review is presented of the current knowledge of fatigue damage mechanisms in fiber-reinforced composite materials covering damage modes, their interactions, and effects on engineering properties. The damage state occurs by various combinations of fiber, matrix, and interfacial processes; it was shown that damage is strongly dependent on the material, laminate configuration, geometry, stress state, load history, and environment. The mechanisms which cause dispersed damage result in higher notch growth resistance, while localized damage leads to shorter life and lower residual strength. It was concluded that compression can cause local buckling and delamination, producing larger degradation than a tensile stress of equal magnitude. A.T.

A81-10749 **On understanding environment-enhanced fatigue crack growth - A fundamental approach.** R. P. Wei (Lehigh University, Bethlehem, Pa.). In: Fatigue mechanisms. Philadelphia, Pa., American Society for Testing and Materials, 1979, p. 816-831; Discussion, p. 831-840. 52 refs. Contract No. N00014-75-C-0543. NR Project 036-097.

A review of fundamentals of environment-enhanced fatigue crack growth is presented. Corrosion fatigue is taken into consideration in aircraft and offshore structures, highway bridges, transmission lines, and coal conversion systems. Fracture mechanics technology, modern surface analysis, and metallurgical techniques such as Auger electron spectroscopy and low energy electron diffraction analysis made it possible to quantify environmental fatigue cracking. Types of fatigue crack behavior and sequential processes involved in embrittlement by gaseous environments are discussed; crack growth rates in AISI 4340 steel in aqueous media are analyzed. A.T.

A81-10767 **Piloted simulation studies of helicopter agility.** B. N. Tomlinson and G. D. Padfield (Royal Aircraft Establishment, Bedford, England). *Vertica,* vol. 4, no. 2-4, 1980, p. 79-106. 17 refs.

The need for helicopters to operate close to the ground and near obstacles has prompted a critical look at design features which affect performance and handling qualities in this environment. Some experiments using a ground-based flight simulator have been conducted to investigate this subject and to obtain data on helicopter agility. These experiments required the development of a general mathematical model capable of representing helicopter flight, including gross maneuvers, from hover to cruise and validation by comparison with flight tests. An exacting low level flying course was created on a model ground terrain and formed the primary task for the six pilots involved in the experiments. A set of rotors were represented which differed in blade flapping stiffness and inertia (Lock number). The paper describes these aspects and then goes on to describe how the simulated helicopter was flown over the agility course with each rotor to investigate the effects of rotor design. Some of the theoretical consequences of these variations are outlined and the results of piloted flights in the simulator described. (Author)

A81-10768 **Helicopter tail configurations to survive tail rotor loss.** A. Brocklehurst (Westland Helicopters, Ltd., Yeovil, Somerset, England) and P. Taylor (Southampton, University, Southampton, England). *Vertica,* vol. 4, no. 2-4, 1980, p. 107-119. 5 refs. Research supported by the Westland Helicopters.

Recently the US Army have specified that a helicopter must be capable of returning from its mission after suffering a tail rotor loss. The helicopter should possess sufficient directional stability to fly at the minimum power speed with a sideslip angle of not more than 20 deg. A simple theory, describing the yawing oscillation of a helicopter, has been applied to a typical helicopter in order to identify the stability implications on the aerodynamic design of meeting the above tail rotor loss criterion. The fin area required, for a fin and single tail rotor configuration, to meet both the above criterion and to ensure adequate lateral stability characteristics was large even if camber and incidence were used. The same helicopter but with twin tail rotors and no fin was investigated. This configuration has additional advantages including the unique ability to land in confined places after the loss of a tail rotor. (Author)

A81-10769 **The aerodynamic characteristics of some new RAE blade sections, and their potential influence on rotor performance.** P. G. Wilby (Royal Aircraft Establishment, Farnborough, Hants., England). *Vertica,* vol. 4, no. 2-4, 1980, p. 121-133.

The values of maximum lift coefficient and pitching moment coefficient at zero lift, and the drag characteristics, are given for several new RAE profiles and NACA 0012, as measured in steady conditions. Results from oscillatory tests are then presented for RAE 9647 (one of the new sections) and NACA 0012. These show that at M = 0.3, the gain in maximum lift coefficient for the new section relative to NACA 0012 is considerably greater in dynamic conditions than in steady conditions. Dynamic tests are seen to be necessary for the full assessment of new profiles. The effect of section characteristics on rotor performance is evaluated by means of a rotor performance calculation that incorporates a model of dynamic stall; the predicted onset of blade stall providing a criterion for determining the rotor thrust limits. The new sections are seen to offer a 35% increase in rotor thrust capability, relative to rotors with the NACA 0012 section. (Author)

A81-10770 **Experimental application of a vibration reduction technique.** W. R. Walker (Royal Aircraft Establishment, Structures Dept., Farnborough, Hants., England). *Vertica,* vol. 4, no. 2-4, 1980, p. 135-146.

Attention is drawn to a method of reducing the vibration at specific points of a structure by means of a relatively simple experimental technique. The method relies on the measurement of transfer functions, which are used to predict changes in vibratory response as structural parameters are altered. Of particular concern in this paper are the practical difficulties involved in ensuring a reasonable level of accuracy in the response predictions. This is examined by applying the technique to a helicopter tail cone. (Author)

A81-10839 **An analytical method to calculate misalignment in the journal bearing of a planetary gear system.** P. K. Das and S. S. Gupta (Pratt and Whitney Aircraft of Canada, Ltd., Longueuil, Quebec, Canada). *Wear,* vol. 61, June 2, 1980, p. 143-156. 7 refs.

A computerized method of calculating misalignments in hydrodynamic bearings of a planetary gearbox was developed. The program was applied to the misalignment in the bearing of a reduction gearbox in a 850 hp turboprop engine. Carrier rotational stiffness had the strongest effect on the misalignment; the rotational stiffnesses of the ring and the sun gears have a limited influence, but the misalignment can be reduced by flexible ring and sun gears. The effects of misalignment on planet bearings was not significant until the second stage, during which the peak pressure increased by 85% and the minimum film thickness decreased by 53%. A.T.

A81-10840 **An experimental and theoretical investigation of pressures in four-lobe bearings.** R. D. Flack, M. E. Leader, and P. E. Allaire (Virginia, University, Charlottesville, Va.). *Wear,* vol. 61, June 16, 1980, p. 233-242. 13 refs. Research supported by the Engineering Foundation; Contract No. EF-76-5-01-2479.

A four-lobe bearing 25.4 mm in diameter was tested with the load vector 'on pad' and 'off pad'. Static pressures were measured on the center line of the bearing and these experimental data are compared with two sets of theoretical results. The half-Sommerfeld and Reynolds boundary conditions were each used in the theoretical predictions. Of particular significance is the fact that the experimental data correlate best with the half-Sommerfeld solution. Differences between the data and the theoretical solution of the order of 10-35% and 15-100% are realized for the half-Sommerfeld and Reynolds boundary conditions, respectively. Moreover, the trends of pressure versus rotational speed for the experimental data and the theoretical solution are the same for the half-Sommerfeld condition but sometimes differ for the Reynolds condition. (Author)

A81-10913 **Investigation of lateral forces and moments in the case of asymmetric gas flows in nozzles.** G. Z. Nikulin, L. V. Pchelkina, U. G. Pirumov, and G. S. Rosliakov. *(Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza,* vol. 15, Mar.-Apr. 1980, p. 70-85.) *Fluid Dynamics,* vol. 15, no. 2, Sept. 1980, p. 231-244. 19 refs. Translation.

Three-dimensional supersonic nozzle flows are analyzed, using an approach which combines experimental studies with numerical calculations carried out by the small perturbation and finite-difference methods. Particular attention is given to lateral forces and moments, generated by asymmetries of the contour of conical or shaped nozzles. It is shown how the small perturbation method can be used to greatly simplify the analysis without impairing accuracy. V.P.

A81-10916 **Flow past a slender profile in a channel with permeable walls.** N. A. Marevtseva. *(Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza,* vol. 15, Mar.-Apr. 1980, p. 111-117.) *Fluid Dynamics,* vol. 15, no. 2, Sept. 1980, p. 265-270. 11 refs. Translation.

An exact solution is obtained to the boundary interference problem for the potential flow of an ideal incompressible fluid past a slender wing profile in a channel with slit-shaped perforations transverse to the flow. The degree of perforation of the upper and lower walls is assumed to be identical. The wind tunnel is assumed to be situated in a constant-pressure chamber, the pressure being equal to that of the unperturbed flow. Use is made of the condition of proportionality of the longitudinal and normal perturbed-velocity components. It is shown that under such conditions, transverse ventilation leads to an increase in wall interference. V.P.

A81-10919 **Asymmetric flow of subsonic and sonic jets over an infinite wedge.** N. A. Podsypanina and E. G. Shifrin. *(Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza,* vol. 15, Mar.-Apr. 1980, p. 137-141.) *Fluid Dynamics,* vol. 15, no. 2, Sept. 1980, p. 286-289. 6 refs. Translation.

The analysis deals with the subsonic or transonic flow past an infinite wedge, in the case where the critical line of flow branches at the apex of the wedge. A flow of this type can arise only at a quite specific relationship of the geometrical parameters. The problem is solved in the hodograph plane by a numerical method proposed by Podsypanina (1975) for profiling Laval nozzles. V.P.

A81-10920 **Two methods for calculating the load on the surface of a slender body executing axisymmetric vibrations in a sonic gas flow.** V. Iu. Ol'shanskii. *(Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza,* vol. 15, Mar.-Apr. 1980, p. 151-154.) *Fluid Dynamics,* vol. 15, no. 2, Sept. 1980, p. 300-302. Translation.

In the present paper, the low-frequency axisymmetric vibrations of the surface of a slender body situated in sonic flow are analyzed under the assumption of a linear velocity distribution along the body. A nonlinear equation with variable coefficients derived for the nonstationary portion of the velocity potential, is solved, first, by separation of variables and then by the method of superposition of sources. The obtained expressions for the nonstationary portion of the velocity potential are shown to be well suited for calculating unsteady surface loads for a slender body of revolution in a sonic gas flow. V.P.

A81-11157 **High-density avionic power supply.** K. K. Hedel (General Electric Co., Aircraft Equipment Div., Utica, N.Y.). *IEEE Transactions on Aerospace and Electronic Systems,* vol. 16, Sept. 1980, p. 615-619.

The development of a standard 3/4 ATR 5-V, 60-A power supply is described. This novel converter circuit allows packaging a 300-W logic supply at a density of 5.7 W/cu in., thereby taking only two slots or 10% of the available volume. B.J.

A81-11158 **Radar target detection and map-matching algorithm studies.** L. M. Novak (MIT, Lexington, Mass.). *IEEE Transactions on Aerospace and Electronic Systems,* vol. 16, Sept. 1980, p. 620-625. 11 refs. USAF-Army-DARPA-sponsored research.

Results of a study of adaptive threshold target detection and map-matching algorithms are presented. Log threshold processing is shown to be preferred over linear threshold processing when the clutter data surrounding the target cell is contaminated by other targets, decoy corner reflectors, or bright clutter cells. Whereas previous studies have resorted to extensive Monte-Carlo simulations of log threshold algorithms, the results were obtained using a novel analytical approach based upon Parseval's theorem. (Author)

A81-11242 # **The 767's flight-management system - A new generation of airborne avionics.** R. A. Peal (Boeing Commercial Airplane Co., Renton, Wash.). *Astronautics and Aeronautics,* vol. 18, Nov. 1980, p. 37-39.

The procurement specifications for the 767 avionics were necessarily different from those for previous aircraft because the 767 flight management system uses not a single off-the-shelf item of equipment. Therefore this digital technology system has presented a great challenge to the design product engineers guiding it toward certification. This paper describes such developments as the new interface data base, software configuration control, the applied technology, the primary flight instruments, and the flight-management digital computer system. B.J.

A81-11244 # **F/A-18's landing, launch and recovery system.** D. L. Bourisaw and C. F. Brandenberg (McDonnell Aircraft Co., St. Louis, Mo.). *Astronautics and Aeronautics,* vol. 18, Nov. 1980, p. 48-52, 63.

The F/A-18 Hornet is a carrier-based fighter and attack aircraft designed to eventually replace both the F-4 and the A-7 for the U.S. Navy and Marines. It was determined that the landing gear delivery leadtimes would be among the longest for any of the procured equipment. Furthermore, design definition efforts for a carrier-suitable landing gear that would satisfy the many operational, structural, and geometric requirements, while still fitting into the small dense airframe, added to the already strained schedule span time. This paper describes the way in which these procurement difficulties were overcome. B.J.

A81-11245 # **Add fluorescent minitufts to the aerodynamicist's bag of tricks.** J. P. Crowder (Boeing Commercial Airplane Co., Renton, Wash.). *Astronautics and Aeronautics,* vol. 18, Nov. 1980, p. 54-56.

Recent experience has demonstrated the feasibility of routinely using fluorescent minitufts to visualize low-speed and transonic flows. This extension of the traditional yarn technique permits large numbers of minitufts to be applied to the surfaces of a wind tunnel model, yet produces negligible interference with the flow. Extremely thin fluorescent nylon monofilament (diameter as small as 0.0007 in.) forms the tufts. Small drops of lacquer-type adhesive attach the tufts to the model. Fluorescence photography records the visual data. B.J.

A81-11302 **An experimental investigation of jet screech by air jet impingement on solid boundaries.** A. M. Petrie (Paisley College of Technology, Paisley, Scotland). *Applied Scientific Research,* vol. 36, no. 2, 1980, p. 93-108. 25 refs.

An experimental investigation has been completed to study several methods of avoiding the jet screech phenomenon due to air jet impingement on solid boundaries. Measurements were completed in the Mach number region of M = 0.5 using a 25 mm diameter nozzle with the air jet impinging on flat, concave and convex boundaries. Sound pressure levels were recorded in the plane of the nozzle outlet at a distance of 1.46 m from the jet axis. With the air jet impinging on the flat board normal to its surface a maximum sound pressure occurred at a spacing of approximately two nozzle diameters producing a distinct screech at a sound level of 20 dB above that of the free jet. Three methods of preventing this screech were studied: (1) inserting disturbances into the shear layer at the nozzle exit; (2) changing the geometry of the boundary shape to improve the jet stability in the impingement region; and (3) introducing disturbances at the stagnation region which had the effect of displacing the distinct screech to another frequency range. (Author)

A81-11320 # **Head-up displays. III (Elektroniczno-optyczne systemy wskazan projekcyjnych /HUD/. III).** E. Malinski (Instytut Lotnictwa, Warsaw, Poland). *Technika Lotnicza i Astronautyczna,* vol. 35, Aug.-Sept. 1980, p. 17-21. 10 refs. In Polish.

The development and applications of head-up displays are reviewed with emphasis on operational functions for typical ground and air attack missions. Attention is given to systems with electronic mixing of symbols and video images which project the terrain or external surroundings and the symbolic data display on a common screen. B.J.

A81-11321 # **Reduction of energy consumption in the vibrational shot peening of axial compressor vanes (Obnizenie energochlonnosci wibrokulowania lopatek sprezarki osiowej).** M. Marciniak (Warszawa, Politechnika, Warsaw, Poland). *Technika Lotnicza i Astronautyczna,* vol. 35, Aug.-Sept. 1980, p. 23, 24. In Polish.

A system for vibrational shot peening is described and the shot peening process is analyzed. A method for reducing the energy consumption in the vibrational shot peening of axial compressor vanes is presented. B.J.

A81-11322 # **Methods of fuel conservation in civil aviation. I (Metody oszczedzania paliwa w lotnictwie komunikacyjnym. I).** M. Kawczynski. *Technika Lotnicza i Astronautyczna,* vol. 35, Aug.-Sept. 1980, p. 36-38. In Polish.

Several methods for saving fuel in civil aviation are described. These methods include modifications in aircraft design, operational methods, and aircraft balancing during flight. B.J.

A81-11324 # **Impact damage of aircraft gas turbine engines with axial compressors (Uszkodzenie udarowe w lotniczych silnikach turbinowych ze sprezarka osiowa).** M. Ostapkowicz. *Technika Lotnicza i Astronautyczna,* vol. 35, Aug.-Sept. 1980, p. 45-47. In Polish.

Data on the foreign object damage (FOD) of axial compressors of gas turbine engines are reviewed. Methods for improving the FOD reliability of axial compressors are discussed. B.J.

A81-11338 **Design and fabrication of stabilized organic matrix composites.** J. A. Suarez (Grumman Aerospace Corp., Bethpage, N.Y.). *(American Ceramic Society, Annual Conferences on Composites and Advanced Materials, 2nd and 3rd, Cocoa Beach, Fla., Jan. 22-25, 1978 and Jan. 21-24, 1979.) Ceramic Engineering and Science Proceedings,* vol. 1, July-Aug. 1980, p. 370-385. Contract No. F33615-76-C-5311.

Integrally-stiffened graphite/epoxy compression panels representative of secondary aircraft structure were designed and fabricated. A thermal pressure forming process was developed to manufacture various panels which were designed for compression loading and analyzed using existing analytical techniques. A structural efficiency comparison of the integrally-stiffened graphite/epoxy compression panels and a baseline sandwich panel with graphite/epoxy skins and aluminum honeycomb core was performed. (Author)

A81-11339 **Design and test of a graphite-epoxy composite A-10 slat.** J. Clarke (Fairchild Republic Co., Farmingdale, N.Y.). *(American Ceramic Society, Annual Conferences on Composites and Advanced Materials, 2nd and 3rd, Cocoa Beach, Fla., Jan. 22-25, 1978 and Jan. 21-24, 1979.) Ceramic Engineering and Science Proceedings,* vol. 1, July-Aug. 1980, p. 386-397.

A composite slat has been developed which has a constant cross section and consists of a lightweight full-depth corrosion-resistant aluminum honeycomb core covered with AS/3501-5 graphite epoxy skins. Design policy, materials and process development, and programs of structural testing and nondestructive evaluation are reviewed. It is shown that advance composites can be cost competitive with metals and used on aircraft to achieve low weight and low cost if applied carefully. V.L.

A81-11441 **The aerodynamics of pure subsonic flow /4th revised edition/ (Aerodynamik der reinen Unterschallströmung /4th revised edition/).** F. Dubs. Basel, Birkhäuser Verlag (Flugtechnische Reihe. Volume 1), 1979. 323 p. 131 refs. In German. $15.30.

Fundamentals in the aerodynamics of pure subsonic flow are investigated. Aircraft wing design is examined with emphasis on achieving lift with a minimum of resistance. The production of wing profiles is considered including the determination of profiles based on potential pressure distribution and boundary layer theory. The function of the propeller in propulsion and as an aerodynamic brake is discussed along with the use of tow channels and wind channels in aerodynamics investigations. R.C.

A81-11475 **Subsequent proof of damage tolerance for a landing gear component after numerous takeoffs and landings (Nachträglicher Schadenstoleranzbeweis eines Flugzeug-Fahrwerksteiles nach zahlreichen Starts und Landungen).** E. A. B. de Graaf, P. de Rijk (National Luchtvaartlaboratorium, Emmeloord, Netherlands), and G. F. J. A. van Gestel (Van Doorne's Automobielfabriek, Eindhoven, Netherlands). *(Deutsche Gesellschaft für Zerstörungsfreie Prüfung, Jahrestagung, Göttingen, West Germany, May 12-14, 1980.) Materialprüfung,* vol. 22, Sept. 1980, p. 369-372. In German.

Design philosophies based on the safe-life, fail-safety, and damage-tolerance concepts are examined, along with the respective inspection intervals and regulations. Four different nondestructive tests with a landing gear component prepared on AISI 4340, low-alloy high-strength steels, are described, which revealed the 'subsequent' damage tolerance of the component, in the sense that by the time the tolerance proof became available, the component had been replaced by a new one. V.P.

A81-11602 **How to improve the performance of transport aircraft by variation of wing aspect-ratio and twist /12th Daniel and Florence Guggenheim International Memorial Lecture/.** E. Truckenbrodt (München, Technische Universität, Munich, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 1-17. 15 refs.

The lecture deals with the influence of the wing aspect-ratio and twist on the induced drag of transport aircraft. Whereas the taper-ratio and the sweep of the wing are given, the aspect-ratio and twist are the two variable parameters. With respect to the critical transonic Mach-number a swept-forward wing has similar qualities as a swept-back wing, both at the same angle of sweep. The spanwise lift distribution will be discussed with regard to two aspects: elliptic lift distribution for the design lift coefficient and lift distribution for high lift coefficient in the vicinity of stalling. The investigation of induced drag leads to the result that a twisted swept-forward wing is equivalent to a twisted swept-back wing with an enlarged aspect-ratio. (Author)

A81-11603 **The analysis of fatigue failures.** C. J. Peel and P. J. E. Forsyth (Royal Aircraft Establishment, Farnborough, Hants., England). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 18-29. 31 refs.

The post-failure analysis of fatigue cracking has developed during the last decade into a quantitative technique vital to both aircraft structural testing and accident investigations. The quantitative techniques used retrospectively to determine fatigue crack growth rates are explained and compared with complementary predictions based upon linear elastic fracture mechanics taking account of the limitations to both techniques. Examples include detailed analyses of fatigue cracking in undercarriages during structural testing, cracking from fastener holes in the wing of a military aircraft undergoing testing and the in-service failure of the tail-plane of a transport aircraft. The analyses consider in particular the causes of premature and unexpected fatigue failures with reference to current airworthiness philosophies. (Author)

A81-11604 * **Numerical optimization - An assessment of its role in transport aircraft aerodynamic design through a case study.** M. E. Lores, P. R. Smith (Lockheed-Georgia Co., Marietta, Ga.), and R. A. Large (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 41-52. 22 refs. NASA-supported research; Contract No. F33615-78-C-3014.

An efficient transonic wing design procedure based upon numerical optimization together with three-dimensional transonic methods has been developed and used to design an advanced transport wing. The method development included an examination of the use of both full potential and extended small disturbance analysis codes and demonstrated that the former formulation was more reliable. In either case, the design procedure is economical and easy to use. Design verification in a unique semi-span test arrangement demonstrated that the design method produced a wing which satisfied the study design requirements. However, aeroelastic deformation of the wing occurred during the wind tunnel test. The computational methods used in the design procedure were employed to assess the effect of the aeroelastic deformation. The paper concludes with an evaluation of the design procedure and recommendation for its improvement. (Author)

A81-11605 **The relevance of the Flex-Hub Prop-Fan for fuel-efficient airliners.** K. W. Sambell. In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 53-62. 11 refs.

The Flex-Hub Prop-Fan, a variant of the rigid-hub prop-fan, is predicted to have improved performance and control characteristics for twin-engine M 0.8 airliners. In the one-engine inoperative case at take-off, the Flex-Hub Prop-Fan will have a more even thrust distribution in its tip-path plane and will develop higher propulsive efficiency and greater propulsive lift. A preliminary analysis, with a fixed engine core-size, compares payload capability of three aircraft: powered by fan-jets, rigid-hub prop-fans, and flex-hub prop-fans. The respective design gross weights were 300,000 lbs., 320,000 lbs., and 342,000 lbs. At a range of 2,000 n.m., the passengers carried were 232, 255 and 280. The fuel economy (seat-statute miles per U.S. gallon) was 68.7, 76.5 and 79.5. Other unique characteristics of the Flex-Hub Prop-Fan are discussed, including cross-wind control, blade de-icing, and wing trailing-vortex interaction. (Author)

A81-11606 **New concepts for design of fully-optimized configurations for future supersonic aircraft.** A. Nastase (Aachen, Rheinisch-Westfälische Technische Hochschule, Aachen, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 63-74. 22 refs.

The drag of a supersonic aircraft can be decreased by replacing its conventional wing with a design whose geometrical characteristics are optimized for minimum drag. A graphic-analytical method for solving a variational problem for the drag-functional which contains the wing surface as the unknown and the shape of the wing projection as the unknown boundary is presented. The method was used for designing of an optimized delta wing model and the construction of the wing for the Concorde aircraft. A.T.

A81-11607 **Possibilities for the valuation of different combat aircraft configurations with respect to flight mechanics.** P. Mangold and H. Wünnenberg (Dornier GmbH, Friedrichshafen, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 75-81. 5 refs.

Evaluation of various configurations during early design stages of aircraft is discussed. The weighted sum of all single valuations produces the most promising configuration, which is based on criteria for control about the pitch-, roll-, and yaw axis, stability behavior, center of gravity range, and sensitivity to gusts. The critical spin tendency is important in the high angle of attack flight regime of modern fighter aircraft; post-stall control is achieved by enlargement of the horizontal tail or by variations of the center of gravity position. It is concluded that the summarizing process described here produces a nearly objective numerical design. A.T.

A81-11608 **Advanced combat aircraft wing design.** B. Probert (British Aerospace Aircraft Group, Preston, Lancs., England) and D. R. Holt (British Aerospace, Aircraft Group, Brough, Humberside, England). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 82-96. Research supported by the Ministry of Defence.

The paper considers various means of achieving a typical set of design requirements for a combat aircraft, ranging from variable sweep options to a fixed wing configuration. It is shown that with the aid of transonic theoretical methods designs can be achieved which give good (L/D) values over a wide range of Mach number and lift coefficients. Use of variable sweep is a powerful means of achieving a wide range of requirements whilst use of variable camber devices has a strong influence on reconciling, often conflicting, geometric requirements especially when aeroelastic effects are taken into account. Further improvements at high lift can be achieved with slotted devices. High incidence penetration can be aided with the use of strakes and these can be designed to have only a small drag penalty at low lift coefficients. These points are illustrated by describing the design of a variable sweep and fixed wing configuration and results are described and discussed for both. (Author)

A81-11609 **Some experiences with numerical optimisation in aircraft specification and preliminary design studies.** D. A. Lovell (Royal Aircraft Establishment, Aerodynamics Dept., Farnborough, Hants., England). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 97-111. 20 refs.

The development of preliminary design methods to find the best configuration is discussed historically. A method for synthesizing a combat aircraft using a large number of design variables, and the associated analysis procedures, is summarized. This is combined with a numerical optimization method to obtain the minimum value of a nonlinear objective function subject to many nonlinear constraints defined in the design synthesis. Applications of this multivariate optimization method are described to illustrate the effects of varying performance requirements and incorporating technological advances in the design. The dependency of the optimum configuration on the particular requirements specified and the need for a thorough investigation of the characteristics of the mathematical model that lead to the optimum configuration are emphasized. It is concluded that effort should be made to increase the acceptability of the multivariate optimization techniques in the pre-feasibility stage of design as it offers a potentially valuable guide in selecting configurations for more detailed consideration. (Author)

A81-11610 **DRAPO - Computer-assisted design and manufacturing system.** F. Bernard (Avions Marcel Dassault-Bréguet Aviation, Saint-Cloud, Hauts-de-Seine, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 112-122.

The 'DRAPO' design and manufacturing system uses computerized aerodynamic and structural analysis with teleprocessing of aircraft component geometries to manufacturing plants. Manual engineering drawing has been replaced by direct design of frames, wings, and the ribs in three dimensions using an interactive graphic console. The graphic console is also used to describe the paths of machining equipment and monitor their accuracy; applications in designing the main frame of a military aircraft and its electrical circuitry are presented. A.T.

A81-11611 **Computer aided compilation of an electrical drawing file.** J.-P. Pauzat (Société Nationale Industrielle Aérospatiale, Blagnac, Haute-Garonne, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 123-128.

A general computer design system called GICE is being set up to draw and manage all the documents of an aircraft electrical drawing file. This system enables optimization of the design-to-cost of all the definitions of this drawing file, from the conception of the electrical data in the design office to its utilization by the production and product support departments. B.J.

A81-11612 * **Advanced fuel system technology for utilizing broadened property aircraft fuels.** G. M. Reck (NASA, Lewis Research Center, Cleveland, Ohio). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 129-143. 28 refs.

Factors which will determine the future supply and cost of aviation turbine fuels are discussed. The most significant fuel properties of volatility, fluidity, composition, and thermal stability are discussed along with the boiling ranges of gasoline, naphtha jet fuels, kerosene, and diesel oil. Tests were made to simulate the low temperature of an aircraft fuel tank to determine fuel tank temperatures for a 9100-km flight with and without fuel heating; the effect of N content in oil-shale derived fuels on the Jet Fuel Thermal Oxidation Tester breakpoint temperature was measured. Finally, compatibility of non-metallic gaskets, sealants, and coatings with increased aromatic content jet fuels was examined. A.T.

A81-11613 **Calculation of the flow field around engine-wing-configurations.** C. Haberland, G. Sauer (Berlin Technische Universität, Berlin, West Germany), and E. Göde (Gebr. Sulzer AG, Zurich, Switzerland). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 144-157. 35 refs. Research supported by the Deutsche Forschungsgemeinschaft.

A panel method for the determination of the flow field around high bypass engines without limitations with respect to geometry, speed and mass flow rate is presented. Within this computation method any flow inside the engine contour causing an error in mass flow rate and pressure distribution has been eliminated by developing a mathematical model which represents the real physical flow by introducing a controlled distribution of singularities on the surface combined with suitable boundary conditions. Hence, this modified panel method allows to provide an arbitrary mass flow rate independent of the onset flow velocity satisfying the continuity of the inlet flow. Checking the computation model for several axisymmetric inlets and engine contours, it turns out that the calculated velocities are physically accurate in the far field as well as near the engine and compare well with experimental results. To determine the spanwise and chordwise interference effects for typical engine positions the axisymmetric engine model as a first step is combined with an infinite unswept wing. (Author)

A81-11614 **Engine air intake design support by use of computational methods and comparison of theoretically derived pressure distributions with experimental data.** A. Eberle and D. M. Schmitz (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 158-172. 9 refs.

Two methods based on potential theory and Euler's equations have been used for inviscid flow simulation which can be a useful tool for the evaluation of the pressure distribution along the air intake walls. The following features of the methods are emphasized: the use of a conservative artificial density scheme for the potential variational principle, semiorthogonal grid generation, and the use of a characteristic boundary algorithm for Euler's equations. The elements of the computer program can be extended to three-dimensional flows and viscid interaction. V.L.

A81-11615 **A study of the air inlet efficiency of a combat aircraft concept with dorsal inlet.** K. Widing (Flygtekniska Forsoksanstalten, Bromma, Sweden). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 173-182. Research sponsored by the Forsvarets Materielverk.

An experimental investigation has been carried out to increase the knowledge of the combined effects of the favorable wing flow and the disturbances from the forebody on the performance of a dorsal inlet concept at take off and landing conditions. Wind tunnel tests were performed with a 1:5 model in FFA's low speed wind tunnel. At the engine face station, both steady state and fluctuating pressure measurements were carried out to establish the inlet performance. A number of distortion indices for different engines have been calculated. Results are presented which indicate that both total pressure losses and distortion indices considered are relatively low and remain low up to moderate angles of attack and side-slip. (Author)

A81-11616 **On screeching jets exhausting from an axisymmetric supersonic nozzle.** G. M. Carlomagno, C. Lanniello, and P. Vigo (Napoli, Università, Naples, Italy). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 183-188. 14 refs. Research sponsored by the Consiglio Nazionale delle Ricerche.

The behavior of screeching jets exhausting from an axisymmetric convergent-divergent nozzle was studied experimentally for several nozzle configurations. Sound peaks behaving as screeches were detected in the weakly overexpanded and underexpanded regimes. The external nozzle configuration had a marked effect on the screech intensity, but did not influence the screech frequency. In the weakly overexpanded regime, two different screech frequencies were found for a given stagnation pressure; the frequencies were not simultaneously present, which indicated an instability in the jet structure. B.J.

A81-11617 **The all-electric aircraft.** D. K. Bird (USAF Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 189-201. 21 refs.

A review of information on all-electrical aircraft is presented. Combining power-by-wire (electrical actuation) and fly-by-wire (electrical signal transmission) will unify the secondary power and the flight control systems under a single electrical medium. This will eliminate the troublesome hydraulic to electrical interface and problems of hydraulic fluid equipment; electromechanical actuation is achieved by using rare earth samarium-cobalt permanent magnets. A.T.

A81-11618 **Flying qualities criteria for advanced control technology transports.** H. A. Mooij (Nationaal Lucht- en Ruimtevaartlaboratorium, Amsterdam, Netherlands). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 202-208. 8 refs.

The background behind expected developments concerning primary flight control systems of future active control technology transports is indicated. A survey of research performed by the National Aerospace Laboratory to generate the necessary information to formulate low-speed flying qualities criteria for future transport aircraft employing a certain class of active control technology is presented. As tools, research flight simulators and research aircraft have been used. All evaluations have been performed using a deflection-type side-stick controller. The acceptability of neutral stick force stability for attitude stabilized aircraft is dealt with followed by a comprehensive treatment of criteria for longitudinal and lateral-directional maneuvering characteristics. (Author)

A81-11619 **Improved flight control performance and failure tolerance using modern control techniques.** H. Berman (Grumman Aerospace Corp., Bethpage, N.Y.). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 209-218. 15 refs.

Modern control techniques, including linear optimal control and estimation theory, have been under investigation for many years. However, application to the control of aircraft has been limited. The advent of practical digital flight control systems in recent years gives new impetus to the use of these techniques - particularly with the rapid increase in computational capability of flight-type hardware. This paper outlines an organized computer-aided procedure using modern control techniques to design digital Fly-By-Wire flight control systems. The design procedure combines a methodology for determining sampling requirements, with a direct digital design procedure for control law synthesis, with stochastic estimation as a means for sensor analytic redundancy. Applying the procedure results in facilitating the synthesis step, enhancing control performance, and increasing sensor system reliability and failure tolerance. This paper describes the theoretical basis of the techniques and their application to advanced aircraft designs. (Author)

A81-11620 **OLGA, a gust alleviation system for improvement of passenger comfort of general aviation aircraft.** B. Krag, D. Rohlf (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmechanik, Braunschweig, West Germany), and H. Wünnenberg (Dornier GmbH, Friedrichshafen, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 219-231. 8 refs.

A remotely controlled wind tunnel model and computer simulations have been used to test an open-loop gust alleviation system (OLGA) for a small civil transport aircraft. The discussion concentrates on the dynamic response of the model and the effects of measuring accuracy, gust sensor position, control surface rate limitation, and the dynamic characteristics of the sensors on the performance of the gust alleviation system and the handling qualities of the model. V.L.

A81-11621 Active flutter suppression design and test - A joint U.S.-F.R.G. program. T. Noll (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio), H. Hönlinger, O. Sensburg (Messerschmitt-Bölkow-Blohm GmbH, Ottobrunn, West Germany), and K. Schmidt (Bundeswehr, Manching, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 232-241. 10 refs.

A wing/store active flutter suppression system was designed, fabricated and installed on the F-4F aircraft to demonstrate and evaluate the concept in flight. The design used the existing autopilot and trailing edge ailerons with improved high-gain actuators. The feedback system used outboard wing accelerometers combined in a manner defined by optimal control theory. The external stores were internally modified and were used as a flutter stopper for flight safety during the tests. Identification problems attributed to structural nonlinearities in the wing pylon-store system were encountered during the ground and flight tests. As a result, high speed flights with the active flutter suppression system operating have not yet been accomplished. To describe the tests completed, open loop diagrams as well as damping curves for important elastic modes are presented. In addition, recent results of an active flutter suppression design analysis and a transonic wind tunnel test of a lightweight fighter aircraft configuration with a wing mounted external store are presented. Good correlation between the analyses and test data is shown. Based on these and other investigations, active flutter suppression is now a feasible concept. Following more extensive design and testing experience in the area of safety and adaptive control, active flutter suppression can be made operational and included in the design of future tactical aircraft. (Author)

A81-11622 A stability augmentation system which covers the complete flight envelope for a F-4c aircraft without gain scheduling. G. Kreisselmeier and R. Steinhauser (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Dynamik der Flugsysteme, Oberpfaffenhofen, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 242-246. 12 refs.

For a McDonnell-Douglas F-4c aircraft a robust, fixed gain controller is designed, which provides satisfying handling qualities of the longitudinal motion of the aircraft over the complete flight range without gain scheduling. Robustness is achieved in the sense of covering large parameter variations and providing good gain and phase margins. Only low control rates and low feedback gains are involved. The results are obtained by application of a performance vector optimization design method which allows to take care of a great many of different design objectives simultaneously and in a highly systematic fashion. (Author)

A81-11623 Multivariable aircraft control by manoeuvre commands - An application to air-to-ground gunnery. Mr. Dang Vu Binh (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 247-256. 8 refs. (ONERA, TP no. 1980-127)

This paper describes a concept of aircraft control in which the pilot commands are variables directly related to the aircraft motion and not to deflexion angles of control surfaces. It is the airborne computer which synthesizes and coordinates the commands for the various control surfaces, so that the aircraft reaches the maneuver goa set by the pilot. Two examples of maneuver commands have been considered: The first example corresponds to a common mode of aircraft control whereby the pilot sets the sideslip, roll rate, and pitch rate; the control law is briefly described and then evaluated by digital simulation in the final phase of an air-to-ground gunfiring; the second example is specific to the air-to-ground gunnery; an approach to designing an Integrated Flight and Fire Control System is presented whereby the pilot's task is reduced to target designation. The design of both control systems is based on linear optimal control theory with model-following improvement. (Author)

A81-11624 Dynamic stability parameters at high angles of attack. K. J. Orlik-Rückemann and E. S. Hanff (National Aeronautical Establishment, Unsteady Aerodynamics Laboratory, Ottawa, Canada). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 265-277. 21 refs.

A review is presented of some of the fluid dynamics phenomena that are associated with oscillatory flight at high angles of attack, with particular emphasis on asymmetric shedding of forebody vortices, asymmetric breakdown of leading edge vortices, the oscillatory motion of such vortices, and the time lag between the vortex motion and the causative motion of the aircraft. These phenomena cause a number of important effects on the dynamic stability parameters at high alpha, such as strong non-linearities with alpha, significant static and dynamic aerodynamic cross coupling, large time-dependent effects and a strong configuration dependence. New wind tunnel testing techniques to determine all the required direct, cross and cross-coupling moment derivatives due to oscillation in pitch, yaw and roll as well as in vertical and lateral translation are briefly described. (Author)

A81-11625 Investigation of high-manoeuvrability flight vehicle dynamics. M. E. Beyers (South African Council for Scientific and Industrial Research, Flight Mechanics Div., Pretoria, Republic of South Africa). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 278-292. 22 refs.

The potential role of wind tunnel free-flight experiments in the flight dynamic analysis of high-performance aircraft and missiles is examined. The usefulness of the approach is seen to be not only contingent on the ability to extract aerodynamic derivatives, but also lies in the broader objective of aerodynamic data/mathematical model validation. Experimental and analytical techniques were developed to study the generic nonoscillatory motion of high-manoeuvrability vehicles in free flight and subsequently investigated in depth. The stability derivatives of a destabilized, air-to-air missile configuration were determined in free flight at Mach 0.7, revealing highly nonlinear behavior and, in particular, a discontinuous dynamic stability characteristic at medium angles of attack. The feasibility of aircraft model free-flight tests is demonstrated on the basis of simulations and a trajectory validation scheme proposed for the corroboration of free-flight and captive-model dynamic data. (Author)

A81-11626 Longitudinal motion of low-flying vehicles in nonlinear flowfields. R. Staufenbiel and G. Kleineidam (Aachen, Rheinisch-Westfälische Technische Hochschule, Aachen, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 293-308. 8 refs.

The relationship between aerodynamic configuration and longitudinal stability in ground effect is investigated. It is shown that longitudinal stability is an important factor affecting the design of wing-in-ground (WIG) vehicles. Airfoil characteristics and wing shapes are analyzed under static and dynamic height stability, and configurations suitable for the design of stable WIGs are proposed. A comparison between a conventional configuration and a WIG configuration is made by simulating flare maneuvers. V.L.

A81-11627 **Identification of longitudinal flying characteristics of an aeroplane and the effect of nonstationary aerodynamics.** V. Kocka (Vyzkumny a Zkusebni Letecky Ustav, Prague, Czechoslovakia). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 309-323. 15 refs.

Identification of aircraft longitudinal flying characteristics and its mathematical and physical variants was analyzed from a gnoseological viewpoint. A classification of nonstationary aerodynamics is presented to facilitate aerodynamic model analysis and to distinguish between the 'path' and 'attitude' changes in the angle of attack. Comparable expressions were derived for aerodynamic frequency transfers of entire aircraft, comprising normalized dimensionless transfers of the wing, the tailplane, and the interaction of the wing and the tailplane. The Strouhal number effect on complex aerodynamic derivatives was determined; the corresponding weight functions were computed by the frequency spectrum of elevator deflection and by frequency transfers for responses of the aircraft. A.T.

A81-11630 **The future cockpit of the next generation of civil aircraft.** J. P. Laborie (Société Nationale Industrielle Aérospatiale, Division Avions, Toulouse, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 347-352.

The next generation of civil aircraft will be equipped with completely new digital systems. The cockpit itself will be fitted with new equipment which improves the man/machine interface. The information will be displayed to the crew on cathode ray tubes which have a full color capacity. The design of the complete cockpit is also new and is conceived in a totally integrated concept. This paper describes the cockpit of a future aircraft: the Airbus A.310. (Author)

A81-11631 **A theoretical and practical design investigation of the future military cockpit.** J. W. Lyons (British Aerospace, Aircraft Group, Brough, Humberside, England). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 353-359. 6 refs.

Trends in the design of future military cockpits are examined with emphasis on ergonomic and mechanical aspects. Specific problems discussed include seat design, the use of electronic displays, ejection techniques, and conditioning systems producing low-noise environments. V.L.

A81-11633 **Development and application of a moving base visual flight simulator including the design of hydraulic actuators with hydrostatic bearings.** T. J. Viersma and M. Baarspul (Delft, Technische Hogeschool, Delft, Netherlands). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 371-384. 20 refs.

A survey of current manned flight simulation research at the Department of Aerospace Engineering at Delft University of Technology is presented with emphasis given to the assessment of the dynamic characteristics of flight simulator motion systems, resulting in a uniform measurement and analysis method. The design of hydraulic actuators with hydrostatic bearings for flight simulator motion systems are also discussed. A performance diagram illustrates the connection between specifications, such as maximum excursion, maximum velocity, maximum acceleration, bandwidth, and the design parameters. It is shown that in order to eliminate Coulomb-friction which results in reversal bump, hydrostatic bearings providing a permanent oilfilm between the sliding surfaces inside the actuator are applied. A.C.W.

A81-11634 **Reduction of the take-off ground run distance to a given set of atmospheric condition.** D. Ionescu (Institutul National Pentru Creatie Stiintifica si Tehnica, Bucharest, Rumania). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 385-390.

A method which permits to determine the take-off ground run distance for any atmospheric conditions, if the value of this distance is available from direct measurement during a single take-off in known atmospheric conditions, is presented. Based on classical equations which define the movement of the aircraft on the ground, the effects of the atmospheric factors (pressure and temperature) on the take-off velocity and on the thrust of the engines are analyzed and finally, a formula allowing to pass from a known distance to another one obtained under different atmospheric conditions is established. The method may be useful to personnel acting in the field of flight tests to determine the take-off ground run distance variations produced by changes in atmospheric conditions or by changes of the airport's height where the aircraft operates. (Author)

A81-11635 **The role of flight simulation in the design and development of the Sea Harrier Nav-Attack System.** H. J. Allen (British Aerospace, Flight Simulation, Hatfield, Herts., England) and P. R. Walwyn. In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 391-400. 6 refs.

The introduction of more complex avionic systems into the single seat Harrier aircraft posed several problems, not the least of which was the question of whether the pilot workload would be acceptable. To determine this, and to obtain more detailed information on system integration and performance, well in advance of flight testing, a maths model was developed on the existing BAe Hatfield flight simulator. The paper includes a brief description of the facility and of the Sea Harrier model in particular. Numerous investigations were carried out and a pragmatic system of testing and reporting was used to ensure the results were incorporated at an early stage. The areas of study are mentioned and, to illustrate the central theme of the paper, the development of the air-to-air interception display is described fully. The simulation, used at an early stage, has been an extremely cost effective tool in eliminating faults in design conception and developing new ideas. It has a continuing support role during flight testing and future planning, and is being used as a training aid for the first squadron pilots. (Author)

A81-11636 **Low-speed airfoil section research at Delft University of Technology.** J. L. van Ingen, L. M. M. Boermans, and J. J. H. Blom (Delft, Technische Hogeschool, Delft, Netherlands). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 401-416. 49 refs.

A review is given of some theoretical and experimental research on the aerodynamic characteristics of airfoil sections for low speed flows. Computer programs have been developed which combine potential flow calculations with other computational methods to predict the development of the laminar boundary layer, the occurrence and possibly bursting of laminar separation bubbles, the position of transition and the development of the turbulent boundary layer. Special attention has been given to theoretical and experimental research on the subjects of laminar separation bubbles and transition. The paper will review the main results of this research. Capabilities of the resulting computer programs will be illustrated through comparison with experimental results for some airfoils. (Author)

A81-11638 **Design and tests of an helicopter rotor blade with evolutive profile.** J. J. Thibert (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) and J. M. Pouradier (Société Nationale Industrielle Aérospatiale, Division Hélicoptères, Marignane, Bouches-du-Rhône, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 429-443. (ONERA, TP no. 1980-125)

In 1974 ONERA and Aerospatiale undertook jointly a research program to improve helicopter rotor aerodynamics and particularly to design optimized blades for future machines. This paper is a synthesis of the results obtained during the design process of a blade with evolutive profile. The design methodology of a new family of airfoil sections covering a range of thickness to chord ratios from 6 to 13 percent is presented and the performances of these airfoils deduced from tests in the S3 Modane wind tunnel are compared with those of other known airfoils. The results obtained on model rotors and in flight on a SA365 Dauphin helicopter will be presented and analyzed. The use of the OA family gives an improvement of the rotor performances in hover and advancing flight and a reduction of the pitch control loads. The flight envelope has also been increased with these new airfoils. All these results will help in the setting up of the specifications of the future airfoil generation. (Author)

A81-11639 **Review of numerical methods for the problem of the supersonic flow around bodies at angle of attack.** P. I. Chushkin (Akademiia Nauk SSSR, Vychislitel'nyi Tsentr, Moscow, USSR) and G. P. Voskresensky (Akademiia Nauk SSSR, Institut Prikladnoi Matematiki, Moscow, USSR). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 444-454. 70 refs.

Numerical methods for three-dimensional steady supersonic inviscid flow around bodies modelling vehicles and their separate parts are reviewed. Three main groups of methods are considered: finite-difference net methods, method of characteristics, method of integral relations (including method of lines). A number of different examples with numerical results concerning flow structure and aerodynamic properties under various flight conditions are discussed. In some cases nonequilibrium processes in the air are taken into account. (Author)

A81-11640 **Research on transonic wings at the National Aerospace Laboratory, Japan.** N. Kamiya and N. Hirose (National Aerospace Laboratory, Tokyo, Japan). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 455-469. 41 refs.

A brief review is made of the recent research on transonic wings being conducted at the NAL in Japan with the aim of improving transonic performance of aircraft. It consists of two parts. One is the research on transonic aerodynamics and the other is the research on the optimization of transonic wings using such aerodynamics as a tool. Firstly, research on aerodynamics is described, which includes design of shock free airfoils using the hodograph method; numerical design of shock free airfoils using the method of artificial gas; numerical design of airfoils with a shock wave by use of the relaxation method; two kinds of numerical analyses of unsteady flow around airfoils, one using Euler equations and the other using full potential equations; and analysis of flow around three dimensional wings by use of integral equations. Some remarks are also made about the viscous effect evaluation. Secondly, research on optimization of transonic airfoils is described. The evaluation of the airfoil analysis code is also described. Finally, a brief review is made of two kinds of facilities; one is the two-dimensional high Reynolds number wind tunnel, and the other is a numerical simulation project. (Author)

A81-11641 **Flow computation around multi-element airfoils in viscous transonic flow.** H. Rosch and K. D. Klevenhusen (Vereinigte Flugtechnische Werke GmbH, Bremen, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 470-479. 22 refs.

A new singularity method is applied to multi-element airfoils in the physical plane for calculating both, the incompressible velocities and the incompressible potential- and streamfunction along the contour of each element. The values of the preceding computation are used to build an orthogonal grid in which the airfoil is mapped to a line in the streamline plane. The computational domain is this streamline plane wherein the full transonic potential equation is solved using a finite difference method. The great influence of viscous effects has been incorporated using the so-called surface transpiration concept. The representation of the displacement effect of the boundary layer and wakes is based on the well-known integral method and a trailing edge flow concept, which includes normal pressure gradients and wake curvature effects. Comparisons of the theory with high Reynolds number experiments show the good agreement for pressure distribution and lift. (Author)

A81-11642 **High lift research and its application to aircraft design.** J. R. Wedderspoon (British Aerospace, Aircraft Group, Weybridge, Surrey, England). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 480-493. 8 refs.

The aerodynamic research and development procedures used by the Weybridge-Bristol Division of British Aerospace to design efficient high lift devices for advanced civil transport aircraft are described, stressing the importance of achieving the correct balance between theory and experiment. The theoretical methods used are reviewed, and the design of a rigid Kruger slat is discussed. The main experimental techniques are described and the importance of the large body of data obtained during a major U.K. research programme the 'National High Lift Programme' is assessed. Some interesting results from this programme are quoted including the effect of supercritical section profiles on high lift performance. (Author)

A81-11643 **High-lift investigations on some small aspect ratio wings.** H. Körner (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Entwurfs-Aerodynamik, Braunschweig, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 501-512. 19 refs.

An experimental investigation of the flow on some unconventional small aspect ratio wings at high angle of attack is given. The investigation comprises force and flow field measurements as well as flow visualization by oil-flow, wool tuft in the wake and smoke injections on backward and forward swept and hybrid wings. The study shows that a stable flow behavior can be generated for a number of different planforms. For these cases aerodynamic coefficients C(L), C(D), and C(M) are presented. The flow visualization gives a deeper insight into the phenomenology of the flow. (Author)

A81-11644 **Optimizing the fixed leading edge shape of a transonic wing to suit the landing high-lift requirements.** M. Ingelman-Sundberg and L.-E. Eriksson (Flygtekniska Forsoksanstalten, Bromma, Sweden). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 513-521. 6 refs. Research supported by the Forsvarets Materielverk.

The paper reports the results of low-speed tests conducted as part of a larger program to optimize a transonic aircraft wing for three flight phases: transonic cruise at M = 0.85, maneuvering at M = 0.5, and landing. The low-speed part of the program was limited to droop variations for the leading edge of a basic wing with planform, thickness, and twist distribution determined by transonic considerations, the objective was to find out if it could be possible to avoid movable leading edge flaps. The requirement for sufficient Reynolds numbers in tests of this kind is emphasized. V.L.

A81-11645 **Winglets development at Israel Aircraft Industries.** I. Darel, Y. Eliraz, and Y. Barnett (Israel Aircraft Industries, Ltd., Lod, Israel). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 522-529.

The first wind tunnel tests for the development of winglets at IAI were conducted on the ARAVA STOL transport aircraft in late 1974. On this aircraft the aim of the design was to improve the take off weight limitations with one engine inoperative, without compromising cruise performance. The flight tests confirmed the wind tunnel results at the design point and a substantial increase in the permissable take off weight was achieved. The overall cruise performance was improved as well. Following the successful winglet development on the ARAVA, a new program was started in 1978 on the IAI Westwind business jet. This design was special in that the winglets were installed on wing tip tanks. The design aim for the Westwind was greater fuel efficiency, and take off weight limitations gains were a secondary objective. As a result, a new Westwind 2 was tested and received certification, with greater fuel efficiency. This paper presents details of winglet geometry, wind tunnel and flight tests and performance improvements due to installation of winglets. (Author)

A81-11646 * **Optimum subsonic, high-angle-of-attack nacelles.** R. W. Luidens, N. O. Stockman, and J. H. Diedrich (NASA, Lewis Research Center, Cleveland, Ohio). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 530-541. 16 refs.

Many proposed advanced aircraft - but especially tilt-nacelle, subsonic-cruise, V/STOL aircraft - require nacelles that operate over a wide range of aerodynamic conditions. The optimum design of such nacelles and their inlets is described, including how the inlet low-speed design conditions are selected, the conditions for which the various regions of the inlet are designed, and appropriate criteria of merit. For low-speed operation the optimum internal surface velocity distributions and skin friction distributions are described for three categories of inlets: those without boundary-layer control (BLC), those with BLC, and those with blow-in door slots and retractable slats. Experimental results are presented that show the performance of the various types of inlets. At cruise speed the effect of factors that reduce the nacelle external surface area and the local skin friction is illustrated. These factors are cruise Mach number, inlet throat size, fan-face Mach number, and nacelle contour. The interrelation of these cruise-speed factors with the design requirements for good low-speed performance is discussed. Finally an inlet design without BLC and an optimized inlet design with slots and slats are compared to illustrate the possible reductions in nacelle size. (Author)

A81-11647 **Vortex drag reduction by aft-mounted diffusing vanes.** J. E. Hackett (Lockheed-Georgia Co., Marietta, Ga.). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 542-553. 22 refs.

A systematic experimental program is described which has lead to a patented vortex diffuser device for drag reduction. This consists of a winglet-like vane mounted from a boom which trails a wing tip. Under C(L)-limited conditions on the vanes, it is claimed that the use of an aft location yields greater drag reduction per square foot of vane area and larger-span vanes may be used effectively. There is little interference with the wing tip and adverse effects, such as loss of aileron power after winglet stall, are avoided. It is pointed out that a strong coupling exists between induced drag and wing root bending for near-planar wings. This coupling can be reduced significantly by employing nonplanar tips and design flexibility benefits. (Author)

A81-11648 * **Leading-edge 'Vortex Flaps' for enhanced subsonic aerodynamics of slender wings.** D. M. Rao (Vigyan Research Associates, Inc., Hampton, Va.). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 554-562. NASA-supported research.

The 'Vortex Flap' is a novel concept aimed at reducing the lift-dependent drag due to leading-edge flow separation on highly swept, slender wings at high angles of attack. The suction effect of coiled vortices generated via controlled separation over leading-edge flap surfaces is utilized to produce an aerodynamic thrust component. This principle was verified through wind-tunnel experiments on 74-deg and 60-deg delta wings and a supersonic-cruise slender wing aircraft configuration. Adaptation of the vortex-flap for augmentation of roll-control on the 74-deg delta at high angles of attack also was demonstrated. Selected results are presented in this paper to indicate the potential of the vortex flap concept to enhance the low-speed performance, stability and control of slender wing aircraft. (Author)

A81-11649 **An experimental investigation of the interaction between a glancing shock wave and a turbulent boundary layer.** H. Kubota and J. L. Stollery (Cranfield Institute of Technology, Cranfield, Beds., England). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 563-574. 14 refs. USAF-supported research.

A variable incidence wedge, mounted from the side of a supersonic tunnel, has been used to study 3-D glancing interaction. A wedge-generated oblique shock-wave interacts with the thick turbulent boundary layer growing along the tunnel side wall. Two related test programs have been completed using a 6 x 6 cm intermittent tunnel and a 23 x 23 cm continuous tunnel, both operating at a Mach number of approximately 2.5. The experimental results include oil-flow pictures, vapor-screen and smoke photographs, surface pressure distributions, local heat transfer, liquid crystal pictures of surface temperature and viscous layer surveys. The test data show that the interaction is complex, with an induced layer which originates near the root of the wedge, spreading and crossing the path of the side wall boundary layer. Separation is defined by the appearance of a complete convergence line in the surface-oil-flow pictures. No separation occurs as long as the surface stream lines are pliable enough to be bent along the edge of the induced layer, even when the surface flow deflection exceeds the shock angle. However, separation does take place when the induced layer forces the surface stream lines to deflect beyond a maximum permissible angle. A correlation of incipient separation data is given. (Author)

A81-11650 **Weight optimization of wing structures according to the gradient method.** D. W. Mathias, H. Röhrle, and J. Artmann (Dornier GmbH, Friedrichshafen, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 575-582. Research supported by the Bundesministerium der Verteidigung.

For the design of wing structures with optimal weight the gradient method is applied due to the different constraints (stresses, flutter speed). The theory and the computer program are described. As an example, an idealized wing consisting of bending/torsion bar elements is presented for which the stresses as well as the flutter speed are active restrictions. (Author)

A81-11651 **Structural optimization of advanced aircraft structures.** G. Schneider, H. Gödel, and O. Sensburg (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings.
New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 583-595. 13 refs.

The application of a structure optimization program is demonstrated for several design studies, including a simplified structure to show the capabilities of the system, aeroelastic efficiency calculations for fin and rudder, and structural layout of a carbon fiber composite delta wing. The program merges several disciplines, such as static loads, stress and strain calculations by finite elements, unsteady aerodynamics, flutter calculations, static aeroelastics, and weights, which can be used separately and independently. V.L.

A81-11652 **Application of weldbonding to A-10 production aircraft.** A. Shames, R. Rupp, and J. Clarke (Fairchild Republic Co., Farmingdale, N.Y.). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 596-603. 5 refs.

The Al weldbonding process combines techniques of adhesive bonding and resistance welding for the production nacelle cowls, beaded panels, flaps, and fins in A-10 aircraft. The manufacturing method consisting of phosphoric acid anodizing, application of the weldbond adhesive, and microprocessor controlled resistance welding are described; after welding, the components are cured at 121 C for 3 hrs. 7075 and 2024 aluminum alloys were bonded and tested in an environmental chamber simulating ambient and altitude conditions at 35,000 ft; in addition, X-ray and Fokker-bond testers were used to detect delamination, lap-shear tests measured the shear strengths, and static and spectrum fatigue analyses were performed. A.T.

A81-11653 **Development of the A300 fin in modern composite fibre construction.** D. Schulz (Messerschmitt-Bölkow-Blohm, GmbH, Hamburg, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 604-618.

On the basis of a research program sponsored by the German government development was started on the Airbus fin box in fiber-reinforced plastics in 1978. In 1984 one fin shall be certificated for airworthiness and be tested in airline service. In this paper, program and design aims are set up. Main results achieved during the first development phases are reported. Environmental conditions to be considered permit the use of 120 C-resin systems. As the result of analytical and experimental investigations with respect to weight, production costs, maintenance and reliability, a structure was chosen which is primarily reinforced by open-section stringers. By using a low-cost production concept the increased composite material cost can be offset. (Author)

A81-11654 **Nondestructive evaluation of composite structures (Controle non destructif des pieces en materiaux composites).** M. Tréca and J. Odorico (Société Nationale Industrielle Aérospatiale, Laboratoire Central, Suresnes, Hauts-de-Seine, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings.
New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 619-625. In French.

Methods for evaluating carbon fiber composite structures are reviewed including both industrial and research methods. Consideration is given to transmission-ultrasonic testing (e.g., C-Scan), reflection-ultrasonic testing, the eddy current technique, radiography, and holography. The evaluation method which works best for each type of structure, such as sandwich structures with a Nomex honeycomb core and carbon cladding, or adhesive bonded metal joints is examined. A.C.W.

A81-11655 **Holographic non-destructive testing of materials using pulsed lasers.** H. Fagot, F. Albe, P. Smigielski (Institut Franco-Allemand de Recherches, Saint-Louis, Haut-Rhin, France), and J. L. Arnaud (Société Nationale Industrielle Aérospatiale, Laboratoire Central, Suresnes, Hauts-de-Seine, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings.
New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 626-633. Research supported by the Direction des Recherches, Etudes et Techniques.

The results of in situ and laboratory nondestructive testing experiments are reported in which double exposure holography with two pulsed ruby lasers is used to detect various defects in aircraft structures. It is shown that the method is particularly suitable for detecting defective bonding during maintenance or fabrication and for detecting cracks during fatigue testing. V.L.

A81-11656 **Structural flight load testing, calibration and analysis.** E. Rauscher (Vereinigte Flugtechnische Werke-Fokker GmbH, Bremen, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 634-644. 11 refs.

In this paper structural flight load testing is reported. The calibration procedure including strain gauge bridge selection to obtain flight loads is described. There are several evaluation methods for short and long flight periods to check design loads for static and fatigue criteria. The maximum likelihood method is used to investigate aerodynamic coefficients. Counting procedures are used for statistical purposes. (Author)

A81-11657 **Flight simulation environmental fatigue crack propagation in 2024-T3 and 7475-T761 aluminium.** R. J. H. Wanhill (Nationaal Lucht- en Ruimtevaartlaboratorium, Amsterdam, Netherlands). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 645-651. 26 refs.

Flight simulation fatigue crack propagation tests on 2024-T3 and 7475-T761 aluminum alloy sheet were carried out using a gust spectrum representative of the load history of an under wing skin in a transport aircraft. The investigation included tests at several design stress levels and in environments of laboratory air and air plus water spray. The results are discussed with respect to the choice of structural concepts using 7475 alloy and evaluation of the fatigue properties of such concepts. (Author)

A81-11659 **A practical method for predicting flight-by-flight crack growth in fighter type aircraft for damage tolerance assessment.** M. Levy, A. S. Kuo, and K. P. Grube (Fairchild Republic Co., Farmingdale, N.Y.). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 666-675. 23 refs.

It has been experimentally observed that the flight-by-flight crack growth rate, da/dF, under fighter type spectra, can be uniquely related to the stress intensity factor per unit stress, alpha, for various forms of 2024-T3 type aluminum alloys. The crack growth analysis method based on this observation is shown to be more effective in terms of accuracy and computer time than the standard cycle-by-cycle integration method. This experimental approach was extended to include spectrum variation, stress level differences, various initial flaw and geometry configuration, and load transfer effects. In selected cases, the technique of developing experimental crack growth curves derived directly from fractographic analysis of specimens tested with periodic marker sequence loadings is discussed. The expansion of the da/dF vs. alpha method is shown as a useful and viable tool in performing the fatigue crack growth analyses in support of the A-10A damage tolerance reassessment task. (Author)

A81-11662 **Operational durability of airframe structures.** R. J. Schliekelmann (Fokker-VFW, Schiphol, Netherlands). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 702-712. 19 refs.

The concept of the durability of airframe structures and methods of design for durability are discussed together with the relationship between the operational economy of an aircraft and the structural characteristics of the airframe. It is shown that sufficient resistance of airframe structures to working loads and environmental factors can be achieved only by a systematic approach which includes the following phases: definition of structural concepts, selection of primary structural materials and means of their protection against environmental effects, definition of joining methods, and integration. V.L.

A81-11665 **Investigation of the stalling characteristics of a general aviation aircraft.** R. F. Stengel and W. B. Nixon (Princeton University, Princeton, N.J.). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 729-743. 32 refs. Research supported by the Schultz Foundation.

Analytical and numerical estimates of the stalling characteristics of a small, single-engine aircraft are compared with flight test results. Analyses include nonlinear simulation and linear stability-and-control evaluation using aerodynamic and thrust characteristics obtained from a full-scale test in the NASA Langley Research Center 30 x 60 ft Wind Tunnel as well as subscale model test data. Flight tests include prestall calibration runs, symmetric gradual stalls, and mildly accelerated stalls in the vertical plane. These tests tend to confirm predictions based upon wind tunnel results, and they indicate areas in which special care must be taken in collecting data for aerodynamic parameter identification. (Author)

A81-11666 **Procedures to improve flight safety in wind shear conditions.** R. König and P. Krauspe (Braunschweig, Technische Universität, Braunschweig, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 744-757. 14 refs. Research supported by the Deutsche Forschungsgemeinschaft.

Wind shear on take-off and landing may crucially restrict flight safety. After a short description of the meteorological weather phenomena most closely associated with wind shear, reasons are given for the existing hazards to aircraft operations with the use of conventional cockpit instruments. Different methods to compensate for wind shear effects are evaluated (open loop wind shear elimination/total energy display/management of specific energy rate) including today's state of the art as well as an outlook on future instrumentation corresponding to the problem and a comment on groundbased wind shear warning systems. (Author)

A81-11667 **Aircraft performance optimization by forced singular perturbation.** J. Shinar (Technion - Israel Institute of Technology, Haifa, Israel) and A. Merari. In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 758-772. 35 refs.

Forced singular perturbation technique (FSPT), based on artificial insertion of a 'small' parameter into the equations of motion, has been used to generate approximate feedback solutions in several aircraft performance optimization problems. This approach has some inherent limitations, not being exposed in previous works. The paper presents and discusses such limitations revealed by a recent investigation. In spite of the restrictions FSPT provides an attractive methodology for a large class of properly formulated problems. This potential is demonstrated by two examples of air combat performance optimization. (Author)

A81-11668 **Optimal flight vehicle design and linear vector spaces.** S. M. Ramachandra (Alfateh University, Tripoli, Libya). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 773-777. 12 refs.

A linear vector space approach to the design and optimization of flight vehicles is presented. The design space can be explored to obtain the best performance with the current or anticipated technology, and to obtain performance approaching customer desired specifications. The sensitivity coefficient is defined for perturbations in the design vector. Parameter uncertainties, especially at the beginning of the design process, are handled with probability measures or through membership functions of the theory of fuzzy sets. The flight vehicle design of civil and multiple-role military aircraft is considered. R.C.

A81-11669 **Three years of operation of the ONERA pressurized subsonic wind tunnel.** J.-M. Carrara and A. Masson (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 778-792. 5 refs. (ONERA, TP no. 1980-129)

Three years after the entry into service of the pressurized subsonic wind tunnel F1 of ONERA at Le Fauga-Mauzac a first survey of its utilization was presented. After a brief description of the wind tunnel and its instrumentation, the paper describes aerodynamic characteristics and performance of the tunnel. The testing devices of the wind tunnel and some original testing techniques are presented. The variety of the tests performed is illustrated by typical examples. A comparison with flight results of those obtained on a model of Mercure makes it possible to globally validate the quality of the wind tunnel. (Author)

A81-11670 **DFVLR-dynamic model testing in wind tunnels for active controls research.** K. Wilhelm and B. Gmelin (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmechanik, Braunschweig, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 793-807. 39 refs.

Application of the concepts of Active Control Technology to the design of aircraft is discussed with reference to two wind tunnel facilities for dynamic model testing: (1) Installation for Dynamic Simulation in Wind Tunnels for investigations in the field of fixed-wing aircraft, and (2) Rotor Test Stand for investigations in the field of rotary-wing aircraft. Problems of transferability of measurement data from model to full-scale aircraft are discussed and test results are presented. V.L.

A81-11671 **Adaptable wind tunnel walls for 2D and 3D model tests.** U. Ganzer (Berlin, Technische Universität, Berlin, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 808-816. 13 refs. Research supported by the Bundesministerium für Forschung und Technologie and Deutsche Forschungsgemeinschaft.

Two-dimensional model tests were made in a test section with flexible top and bottom wall. A conventional NACA 0012 aerofoil and a supercritical CAST 7 aerofoil were used with a tunnel height to chord ratio of 1.5. It was shown that wall interference effects can be reduced by wall shaping and that transonic blockage can be avoided. The same test section was used for 3-component force-measurement of a simple swept-wing-body-combination to demonstrate convergence of the adaption process for 3D model tests. (Author)

A81-11672 * **A system for model access in tunnels with an unbreathable test medium.** R. R. Howel and S. D. Joplin (NASA, Langley Research Center, Hampton, Va.). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 817-822. 7 refs.

In many specialty wind tunnels, test gases other than ambient air are used to meet special testing requirements. A typical example is the use of freon as the test gas to achieve a realistic density ratio between gas and model for exploring flutter stability boundaries. Another example is the use of pressurized air to elevate the stream density and enhance Reynolds number or dynamic pressure simulation. Such specialty tunnels require a system of access to the model which will allow services and changes to the model without exposing personnel to the unnatural and perhaps hostile environment or requiring the venting and purging of the entire tunnel circuit. This paper will describe the plenum and model access systems for the forthcoming U.S. National Transonic facility where gaseous nitrogen (N2) at temperatures between 338 and 78 K and at pressures to 9 bars is used as the test medium. The operation at cold temperatures imposes some additional requirements which make the access systems more difficult to design and time consuming to operate than for conventional wind tunnels. (Author)

A81-11673 **Wind tunnel wall interference in a test section with ventilated walls.** H. Sawada (National Aerospace Laboratory, Tokyo, Japan). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 823-836. 18 refs.

An approach to the ventilated wind tunnel wall interference problem is proposed in which velocity components of flow near the walls inside a test section are used as boundary conditions for solving a boundary value problem of the flow field. The wall interference on a wing model installed in a test section is estimated, since various quantities related to wall interference can be estimated with sufficient accuracy if only transversal lower harmonics of the streamwise distributions are available. The effect of suction from the side walls in a two-dimensional wind tunnel is investigated in detail. The proposed method for calculating blockage and lift interference corrections is applied to a two-dimensional test section configuration of a 2m x 2m transonic wind tunnel. The blockage factor ratio and lift interference parameters are shown to be dependent upon the lift coefficient but not significantly sensitive to either uniform Mach numbers between 0.6 and 0.8, or to the difference in the tested airfoil sections. Therefore, it becomes possible by the use of these characteristics to make corrections without measuring the pressure distributions near the walls each time. A.C.W.

A81-11674 **Ground testing of aircraft antistatic protection.** J. Taillet (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 837-846. 14 refs. (ONERA, TP no. 1980-126)

The phenomena of electrostatic charging of aircraft and the consequent problem of interference with navigation and communication systems are considered in view of the development of a standard ground testing procedure for eliminating static charging hazards. It is proposed that a standard procedure for testing aircraft charging phenomena and various protections, in the laboratory, in the factory, and on the field can be realized by efficient and economical ground test simulations. The test method includes the verification of bonding between metallic surfaces, surface resistance measurements, the simulation of tribo-electric charging, and the verification of minimal coupling between dischargers and antennas. The application of the procedure can be achieved with the use of specific instruments which have been designed and implemented at ONERA, and marketed in France. The performance and application of a bonding verification device as well as an instrument which injects charged particles for the simulation are discussed in conjunction with the proposed test procedure. A.C.W.

A81-11675 **Wind shear detection from PCM-recorded MLS-flight data.** P. Vörsmann and M. Swolinsky (Braunschweig, Technische Universität, Braunschweig, West Germany). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 847-855. 9 refs. Research supported by the Deutsche Forschungsgemeinschaft.

During the test phase of the SETAC microwave landing system, flight tests were performed for wind determination along the flight path. Approach profiles were curved in elevation and azimuth. All flight parameters were recorded on board in digital form by a PCM-flight data acquisition system. The evaluation of the recorded flight data on a digital computer showed that some signals contained disturbances resulting from sensor dynamics or digital noise due to numerical differentiation. Nonrecursive digital filters were applied to eliminate undesired signal properties. The longitudinal wind component and its power spectrum were computed. Wind shear was detected by the off-line use of nonrecursive digital filters as well. (Author)

A81-11676 **ECS integration for fuel efficient/low life cycle cost design.** V. K. Rajpaul (Boeing Military Airplane Co., Seattle, Wash.). In: International Council of the Aeronautical Sciences, Congress, 12th, Munich, West Germany, October 12-17, 1980, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1980, p. 856-861.

Current technology environmental control systems (ECS) in aircraft suffer from deficiencies in two major respects: (1) the fuel penalty for engine bleed air extraction and ram air drag is high, and (2) lack of adequate system temperature and moisture controls result in excessively high avionic equipment failure rates, thereby adversely affecting life cycle costs. Studies conducted in development of energy efficient, low life cycle cost ECS are discussed with a tactical mission aircraft used for illustrating problems, new concepts and payoffs. Concepts which significantly reduce fuel consumption, thrust and drag penalties to an aircraft are related to reliability of interfacing systems, in particular the avionics. Relationship to life cycle cost of ECS/avionic systems is discussed. (Author)

A81-11722 **The vibration of a multi-bearing rotor.** J. L. Nikolajsen and R. Holmes (Sussex, University, Brighton, England). *Journal of Sound and Vibration,* vol. 72, Oct. 8, 1980, p. 343-350. Research supported by the Science Research Council and Ministry of Defence (Procurement Executive).

A numerical method based on the use of influence coefficients is described for the free and forced vibration analysis of a general rotor/bearing system. The method is found to combine the numerical speed of the transfer matrix method with the accuracy and versatility of the finite element method. The paper describes the prediction of the vibration performance of a four-bearing rotor with which experimental results compare satisfactorily. (Author)

A81-11723 **Some thoughts on the effects of flight on jet noise as observed in actual flight and in wind tunnels.** R. G. Hoch (SNECMA, Centre d'Essais de Villaroche, Moissy-Cramayel, Seine-et-Marne, France). *Journal of Sound and Vibration,* vol. 72, Oct. 8, 1980, p. 379-389. 17 refs.

Evidence on differences between flight effects on jet noise as observed in flight tests and in tests with model jets in anechoic wind tunnels is briefly reviewed and discussed. The effects on noise of single stream jets is distinguished from those on noise of coaxial jets. A way of explaining the differences, both between model and engine jets and single stream and coaxial jets is proposed, which involves ideas drawn from Ribner's self-noise/shear-noise model, recent results on noise amplification of excited jets, and new lines of research. (Author)

A81-11724 **Experiments on effective source locations and velocity dependence of the broad band noise from a rotating rod.** U. R. Kristiansen (Trondheim, Universitetet, Trondheim, Norway). *Journal of Sound and Vibration,* vol. 72, Oct. 8, 1980, p. 403-413. 7 refs.

Effective acoustic source positions (observed from the far field) have been located for the broad band noise from a cylindrical rod rotated about its mid-point by measuring the cross spectral density function of two microphone signals on the axis of rotation. Local source position Strouhal numbers could thereby be calculated. On the basis of acoustic power measurements it was demonstrated that the noise may be normalized on a rod tip Strouhal number basis, and that the velocity exponent is nearly constant when plotted against this parameter. The results indicate that vortex shedding like that for stationary cylinders in a cross flow (occurring along the outer 1/3 of the rod for a rotational speed of 1000 rpm) is responsible for the high levels of broad band noise in a major peak region. Sources influenced by harmonics of the rod passing frequency were found for frequencies lower than the vortex shedding ones. At higher frequencies broad band noise was found to be emitted from the rod tip area. (Author)

A81-11751 **Hydrogen - Its technology and implications. Volume 4 - Utilization of hydrogen.** Edited by K. E. Cox and K. D. Williamson, Jr. (California, University, Los Alamos, N. Mex.). Boca Raton, Fla., CRC Press, Inc., 1979. 252 p. $59.95.

This compilation focused on hydrogen fueled surface transportation, hydrogen-fueled aircraft, domestic uses of hydrogen, industrial applications, and safety in the handling of H. The volume includes numerous references on H properties, materials of construction for its containment, and the design of H equipment; physical properties of H and its compounds are tabulated. A.T.

A81-11753 **Hydrogen-fueled aircraft.** G. D. Brewer (Lockheed-California Co., Burbank, Calif.). In: Hydrogen: Its technology and implications. Volume 4. Boca Raton, Fla., CRC Press, Inc., 1979, p. 79-148. 27 refs.

A review is presented of applications of hydrogen in aircraft and aerospace. The costs of LH2 as fuel in commercial transport aircraft are outweighed by the low energy requirements of LH2 powered vehicles in performing long range missions; a H powered SST can save more than 25% of fuel at speeds of Mach 2.7. The NASA flight research program and the CL-400 aircraft project are described along with turbojet engine development and hypersonic aircraft studies. Transport aircraft designs including supersonic transport fuels system, engine characteristics, environmental factors, and aircraft performance are discussed. A.T.

A81-11777 **Simplified vortex models for slender lifting surfaces with leading edge separation (Vereinfachte Wirbelmodelle für schlanke Tragflächen mit Vorderkantenablösung).** B. Wagner (Dornier GmbH, Friedrichshafen, West Germany). *Zeitschrift für Flugwissenschaften und Weltraumforschung,* vol. 4, Sept-Oct. 1980, p. 267-279. 16 refs. In German. Bundesministerium für Verteidigung Contract No. T/RF-41/80030/81429.

Flat free vortex sheets are introduced near the edges beside the vortex cores above the wing. The flowfield is assumed to be conical and flow is permitted through the free sheets. Instead of applying the usual boundary conditions on free vortex sheets an attempt is made to fulfill the suction analogy by prescribing normal force coefficients and taking account of the condition that the whole free vortex system should be force-free. This procedure leads to satisfactory results for the pressure distributions with small total vortex strength within the free vortex sheets, but for small angle of attack the normal forces according to Smith's method have to be used instead of those according to leading edge suction analogy. (Author)

A81-11778 **Calibration of the high speed wind tunnel TVM 150 in the supersonic range (Eichung des Hochgeschwindigkeitswindkanals TVM 150 im Überschallbereich).** W. Weinert (Darmstadt, Technische Hochschule, Darmstadt, West Germany). *Zeitschrift für Flugwissenschaften und Weltraumforschung,* vol. 4, Sept.-Oct. 1980, p. 280-289. 20 refs. In German.

The Laval nozzle calibration and its flow quality in the test-section of the high speed wind tunnel TVM 150 at the Aeronautical Institute of the Technical University Darmstadt are presented. Investigations of Mach number and flow-angle distributions at supersonic Mach numbers were carried out with conventional pitot rakes and a combined calibration rake for measuring flow angularity. The relative maximum Mach number error increases with a decreasing Mach number and increasing radius of nozzle range. While the flow-angle of attack is directed with increasing distance from the tunnel axis against the top and bottom wall, the flow in the plane of the sideslip angle is directed against the nozzle axis. Both flow-angle errors show the same Mach number dependent tendency within the 0.1-degree-range. Along the tunnel axis there are no mentioned deviations in the test rhombus. (Author)

A81-11779 **Calculation of plane transonic flows using the integral equation method and shock fitting (Berechnung ebener transsonischer Strömungen nach der Integralgleichungsmethode mit Stossanpassung).** R. Voss (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Aeroelastik, Göttingen, West Germany). *Zeitschrift für Flugwissenschaften und Weltraumforschung,* vol. 4, Sept.-Oct. 1980, p. 289-295. 23 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

The present work uses the integral equation method to compute approximately two dimensional steady transonic flows with shocks around airfoils at freestream Mach numbers less than 1. Potential flow and small disturbances are assumed. In contrast to other methods, integrals over the pressure jump along the shocks are explicitly calculated during the iterative solution of the integral equation. Shocks are fitted to the flow field at each iteration step. Shock position and shock strength are calculated by combining the normal shock conditions and the condition that shock induced profile drag and drag from entropy rise across the shock are equal. (Author)

A81-11780 **Local properties of three-dimensional separation lines.** E. H. Hirschel (Messerschmitt-Bölkow-Blohm, GmbH, Munich, West Germany) and W. Kordulla (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Theoretische Strömungsmechanik, Göttingen, West Germany). *(Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium über Strömungen mit Ablösung, Munich, West Germany, Sept. 19, 20, 1979, Paper 79-063.) Zeitschrift für Flugwissenschaften und Weltraumforschung,* vol. 4, Sept.-Oct. 1980, p. 295-307. 23 refs.

Series expansions are used to examine the local properties of flow in the vicinity of steady vortex-layer separation lines. The absolute value for the tau-minimum line and the line of points of inflection are assumed to be close to the separation line. Experimental and computed boundary layers on ellipsoids and wings yield a separation criterion for three dimensional shear flow. The distribution of shear stress components in chordwise direction on a swept tapered wing is discussed along with the compressible turbulent boundary layer on a swept tapered wing with a break in the trailing edge. R.C.

A81-11782 **Initial experience with methods to evaluate flight test characteristics with operational flight maneuvers (Erste Erfahrungen mit Methoden zur Bewertung von Flugeigenschaften im Flugversuch mit operationellen Flugmanövern).** E. Buchacker (Bundesamt für Wehrtechnik und Beschaffung, Manching, West Germany). *Zeitschrift für Flugwissenschaften und Weltraumforschung,* vol. 4, Sept.-Oct. 1980, p. 318-321. 9 refs. In German.

A method for evaluating flight test characteristics is presented that utilizes operational maneuvers to obtain quantitative and qualitative statements. Frequency and systems analysis are used as quantitative methods, including power density spectra of control column movement and of aircraft normal acceleration. Bode diagrams of the transfer function between normal acceleration and control column movement are also presented. Clear and repeatable qualitative analyses require that test exercises are well-defined by the test engineer and reviewed with the pilot prior to flight. R.C.

A81-11797 **New BBC high-efficiency gas turbines (Neue BBC-Gasturbinen grosser Leistung).** E.-O. Müller and F. Pötz. *Energiewirtschaftliche Tagesfragen,* vol. 30, Oct. 1980, p. 775-781. In German.

BBC has designed and built more than 450 single-shaft gas turbines of various types and has developed a program for further developing and improving compressors, combustion chambers, and turbines. The present paper deals with two latest developments - the 13E gas turbine and Turbine-17, of 120 MW and 210 MW, respectively, and an efficiency of 0.32 and inlet temperature of 1000 C, each. A distinctive feature of these turbines is the ability to operate with low quality fuels, such as crude oils and lean gases. V.P.

A81-11818 **Noise control design problems on air cushion vehicles and surface effect ships.** M. E. Dvornak (Bell Aerospace Textron, New Orleans, La.). *Noise Control Engineering,* vol. 14, Jan.-Feb. 1980, p. 12-23. 13 refs.

The acoustic design features, noise criteria, noise source-path-receiver interdependencies, and design approaches to noise control in surface effect ships are reviewed. Specific noise control design approaches include low-frequency soft mounts, gas turbine/lift fan silencers, air propeller shrouds and special propeller designs, acoustic transmission loss and absorptive materials, and grouping of noise sources and compartment relocation. V.L.

A81-11820 **Prediction of changes in aircraft noise exposure.** D. K. Holger (Iowa State University of Science and Technology, Ames, Iowa). *Noise Control Engineering,* vol. 14, May-June 1980, p. 119-126. 10 refs. Grant No. AF-AFOSR-77-3308.

The NOISEMAP computer program of the United States Air Force for generating contours of noise exposure measured by the day-night equivalent sound level (DNL) is briefly discussed. A method is proposed for approximate manual calculation of changes in contours resulting from changes in operational data. The method is limited to cases in which the general shape of the DNL contours at a base does not change. For cases involving significant changes in flight paths or aircraft types, a full-scale base resimulation is recommended. V.L.

A81-11821 **Community response to noise from a general aviation airport.** S. E. Birnie, F. L. Hall, and S. M. Taylor (McMaster University, Hamilton, Ontario, Canada). *Noise Control Engineering,* vol. 15, July-Aug. 1980, p. 37-45. 6 refs.

The paper provides relationships between noise level and response variables through an analysis of social survey and physical data collected around a small general aviation airport. The responses investigated included annoyance, activity interference, health effects, and non-noise effects of general aviation traffic, such as fear of crashes, air pollution, aircraft lights, house vibration, and television interference. Results indicate a much higher response than that predicted by Schultz (1978), e.g., at 30 NEF, Schultz predicts approximately 15% highly annoyed, compared with 28% in this study. V.L.

A81-11822 * **Status of knowledge of sonic booms.** D. J. Maglieri, H. W. Carlson, and H. H. Hubbard (NASA, Langley Research Center, Hampton, Va.). *Noise Control Engineering,* vol. 15, Sept.-Oct. 1980, p. 57-64. 137 refs.

The effects of primary and secondary sonic boom carpets are reviewed with reference to waveform characteristics and audibility, role of the atmosphere, source characteristics, carpet measurements and predictions, effects of aircraft maneuvers, and sonic boom minimization. It is shown that primary booms which involve only propagation in the lower atmosphere are well predicted by means of current methods and are amendable to minimization. V.L.

A81-11900 # **Civil aviation safety. III - Prospects of improvement.** W. Tye. *Aircraft Engineering,* vol. 52, Oct. 1980, p. 2-4.

The constraints on the improvement of aircraft safety levels are of two kinds, technological capability and cost. Both are temporary and tend to limit the rate at which safety improves rather than to set any barrier. It is noted that the greatest good comes from applying safety efforts to newer aircraft or to aircraft in the design stage, as they will carry a increasing proportion of the traffic. B.J.

A81-11920 # **Calculation of separated viscous flows on wing profiles by a coupling approach (Calcul d'écoulements visqueux décollés sur profils d'ailes par une approche de couplage).** J. C. Le Balleur and M. Neron (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). *(NATO, AGARD, Symposium on Computation of Viscous-Inviscid Interactions, Colorado Springs, Colo., Sept. 29-Oct. 1, 1980.) ONERA, TP* no. 1980-122, 1980. 16 p. 18 refs. In French. Research supported by the Direction des Recherches, Etudes et Techniques.

The computation of viscous incompressible flows over single or multiple airfoils, with or without separation, is achieved using on the one hand an inviscid flow calculation, with modified boundary conditions, and on the other hand a method providing calculation and coupling for boundary layers and wakes, within conditions of strong viscous interaction. The inviscid flow is calculated with a method of singularities, the numerics of which has been improved by using both source and vortex distributions over profiles, associated with regularity conditions for the fictitious flows inside of the airfoils. The viscous calculation estimates the difference between viscous flow and inviscid interacting flow with a direct or inverse integral method, laminar or turbulent, with or without reverse flow. The numerical method for coupling determines iteratively the boundary conditions for the inviscid flow. For attached viscous layer regions an underrelaxation is locally calculated to insure stability. For separated or separating regions, a special semi-inverse algorithm is used. Comparisons with experiments are presented. (Author)

A81-11956 # **Finite element analysis of natural and forced flexural vibrations of rotor systems.** Z. Dzygadlo. *Journal of Technical Physics,* vol. 21, no. 1, 1980, p. 63-75. 15 refs.

The finite element technique is applied to analyze flexural vibrations, critical speeds, and forced vibrations of rotors on flexible supports. The equations of dynamic equilibrium of a deformable rotor element are derived, and the influence of the shear forces, the rotation of the element and the gyroscopic moments are taken into account. Conditions relating the motion of a rigid element to a deformable one are determined. An algorithm is presented for a numerical analysis of vibration frequencies and modes, critical speeds and resonance characteristics. S.S.

A81-12024 # **Gyrostabilizers for inertial control systems (Girostabilizatory inertsial'nykh sistem upravleniia).** L. A. Severov. Leningrad, Izdatel'stvo Leningradskogo Universiteta, 1979. 152 p. 80 refs. In Russian.

The book deals with gyrostabilizers for noncompensating inertial control systems of unmanned flight vehicles. Particular attention is given to the analysis and synthesis of the platform stabilization circuit and to the kinematic and dynamic description of

gyrostabilizers with various platform suspension systems and various gyroscope and stabilizing-engine arrangements. An analytical-design solution is obtained for optimal gyrostabilizer regulators. The possibility of using large amplification factors in the stabilizing circuit is analyzed both from the viewpoint of the structural stability conditions linear multivariate systems and from the viewpoint of the absolute stability conditions of systems with nonlinear elements.
V.P.

A81-12078 **A simple laser interferometer for wind tunnel flow visualisation.** N. Pollock (Department of Defence, Aeronautical Research Laboratories, Melbourne, Australia). *Journal of Physics E - Scientific Instruments,* vol. 13, Oct. 1980, p. 1062-1066. 7 refs.

A simple interferometer design based on a conventional wind tunnel schlieren system is described. This new interferometer arrangement employs a laser light source, a lens which splits off the reference beam after test beam expansion and a lens and Lloyd mirror to recombine the two beams. The reference beam passes through the test section but is contracted to a narrow waist and displaced well away from the model location. The design combines a number of characteristics which render it particularly useful for wind tunnel tests. These characteristics include: simplicity, optical robustness, low vibration sensitivity, modest coherence requirements and ease of interferogram analysis. The main disadvantage is that only half the total field of view can be recorded on a single interferogram. Test results, confirming the above advantages, are presented from an interferometer based on the 406 mm aperture schlieren system fitted to the Aeronautical Research Laboratories transonic wind tunnel.
(Author)

A81-12094 **A method of helicopter low airspeed estimation based on measurement of control parameters.** A. Faulkner and S. Attlfellner (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). *European Rotorcraft and Powered Lift Aircraft Forum, 5th, Amsterdam, Netherlands, Sept. 4-7, 1979, Paper.* 19 p. (MBB-UD-276-79-0)

The pitot-static instrument fails as an indicator of airspeed at low helicopter flight speeds and hover. Airspeed and side-slip indicators would be welcome to the pilot in these modes of flight. In the present paper, an alternative indirect method of airspeed estimation is proposed which, based on measurement of control and some other control-system parameters, is particularly well suited for modern hingeless-rotor helicopters. A simplified mathematical model of the helicopter rotor is discussed. Analytical equations for the longitudinal and transverse aerodynamic velocity components are derived. Some results of a computer simulation are examined. V.P.

A81-12095 **Model tests for an active rotor isolation system.** R. Mehlhose, M. Obermayer ((Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany), and M. Degener (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Aeroelastik, Göttingen, West Germany). *European Rotorcraft and Powered Lift Aircraft Forum, 5th, Amsterdam, Netherlands, Sept. 4-7, 1979, Paper.* 30 p. 12 refs. (MBB-278-79-0)

The paper deals with an approach to the design of active vibration control, where the rotor/transmission system is isolated from the fuselage by special active isolation system with appropriate disturbance rejection controllers: airframe vibration control by notch insulator feedback of the transmitted isolator forces, and gearbox displacement control by integral feedback. In this concept, the isolator units are composed of electrohydraulic actuators and parallel springs for support of the fuselage and as fail safe devices. Tests showed that extremely high vibration reduction can be achieved with this concept.
V.P.

A81-12096 **Development of wind tunnel fan blade made of composite materials.** P. Wackerle and H. Weiss (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). *European Rotorcraft and Powered Lift Aircraft Forum, 5th, Amsterdam, Netherlands, Sept. 4-7, 1979, Paper.* 28 p. (MBB-UD-277-79-0)

The paper deals with the design, manufacture, and acceptance testing of carbon fiber composite fan blades for the German-Dutch wind tunnel. The design, based on well-proven methods used in aircraft and helicopter construction, involves a special blade attachment concept, precise anisotropic-stress and frequency analysis, and thermal computations. The overall static and dynamic behavior is verified by finite element calculations. Some aspects of the manufacturing process are examined. V.P.

A81-12097 **Helicopter flight characteristics improvement through swept-tip rotor blades.** H. Huber (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). *European Rotorcraft and Powered Lift Aircraft Forum, 5th, Amsterdam, Netherlands, Sept. 4-7, 1979, Paper.* 24 p. 13 refs. (MBB-UD-275-79-0)

The paper deals with a theoretical and experimental program aimed at designing, developing, and flight testing two versions of helicopter swept-tip rotor blade, and to verify the theoretically predicted improvements in aerodynamic performance, flight mechanics, and rotor load characteristics. The effect of tip design parameters was studied systematically, using various angles of tip sweep and various center of mass locations. Flight tests with the BO 105 hingeless-rotor helicopter at speeds of 300 km/h and corresponding advancing tip Mach number of 0.90 confirmed the expected potential of swept-tip design. V.P.

A81-12241 **The accident/injury matrix - A tool for aircraft accident investigation.** G. K. Brandon (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 51, Oct. 1980, p. 1147-1149. 9 refs.

An accident/injury matrix developed for use in automobile accidents was modified for use in aviation. The matrix subdivides an accident into three temporal phases: preaccident, accident, and postaccident. Each temporal phase is then further divided into specific factors: human, environmental, aircraft, and life support equipment. This form of analysis will assist in determining the chain of events in an accident and serve as a logical tool for developing future preventive strategies. Use of the matrix is explained and examples are given for each cell produced by the subdivisions.
(Author)

A81-12348 **Airbus Industrie's heavenly twins - A310 and A300-600.** M. Lambert. *Interavia,* vol. 35, Nov. 1980, p. 1001-1006.

In engineering terms, the A310 is to be a 200-seater, preserving the useful features of the A300, but introducing the latest technology in aerodynamics, materials, propulsion, and systems to achieve optimum fuel consumption and minimum operating costs. The A300 fuselage can be relatively simply shortened without losing the wide cabin and the good freight capacity. The brand new wing has sufficiently improved efficiency to justify itself, but has been further refined to produce the present A310 wing. The materials and systems improvements of the A310 are to be transferred back to the A300-600.
V.P.

A81-12349 **Computerized flight management for fuel saving.** C. Bulloch. *Interavia,* vol. 35, Nov. 1980, p. 1010-1012.

The efficient flight of an aircraft involves meticulous balancing of weight (gravity), lift, thrust, and drag. All of these vary according to the density of the air, and in turn the density depends on the local conditions which may change significantly. With the advent of the ultra-compact airborne computer, it became possible to perform the power and indicated airspeed adjustments required by the local conditions and to regulate the thrust settings and the flight control surfaces to ensure the most efficient use of fuel. In the present paper, some representative computerized flight management systems are discussed.
V.P.

A81-12350 **Aerial survey photography.** M. Grangier. *Interavia,* vol. 35, Nov. 1980, p. 1050-1054.

The development of aerial survey photography to its current state is reviewed. The discussion covers such aspects of this field as aircraft, their equipment, flight techniques, data collecting techniques (photographic emulsions, IR thermography, multispectral sensors, etc.), photogrammetric plotting, and orthophotomaps. The uses and perspectives of aerial photography are examined. V.P.

A81-12367 # An example of the transonic flow past a body with a discontinuity in the contour curvature (Primer transzvukovogo obtekaniia tela s razryvom krivizny kontura). V. A. Ivanov and I. A. Chernov. *Prikladnaia Matematika i Mekhanika,* vol. 44, Sept.-Oct. 1980, p. 950-952. 5 refs. In Russian.

The analysis deals with the exact solution of transonic equations, which constitutes a generalization of the well-known self-simulating solution describing the transonic flow past a convex corner. The lines of flow and the velocity field in the transonic flow past a convex corner are identified. V.P.

A81-12476 # The emulsion chamber experiment on supersonic Concorde /Echos/. J. N. Capdevielle (Bordeaux I, Université, Bordeaux, France), J. Iwai (Waseda University, Tokyo, Japan), T. Ogata, S. Toyoda (Tokyo, University, Tokyo, Japan), I. Ohta (Utsunomiya University, Utsunomiya, Japan), F. Fumuro (Kwansei Gakuin University, Nishinomiya, Japan), R. Ihara, Y. Takahashi, and T. Yanagita (Osaka University, Toyonaka, Japan). In: International Cosmic Ray Conference, 16th, Kyoto, Japan, August 6-18, 1979, Conference Papers. Volume 6. Tokyo, University of Tokyo, 1980, p. 324-329. 8 refs.

A supersonic flight experiment to observe the energy spectrum of cosmic-rays not less than TeV and nuclear interactions above 50 TeV has been carried out with an emulsion chamber. By the total integrated exposure of about 200 hours at 15 km - 17 km, more than 400 events (gamma-rays and nucleons) with energies exceeding 700 GeV are observed, in agreement with existing primary spectrum. A preliminary analysis of nuclear events with energies greater than 60 TeV is given. One of them showed high P(T) production with extraordinarily high densities in the forward rapidity space. The possibility of the second violation of scaling is briefly discussed. (Author)

A81-12608 # Optimum design of axial flow gas turbine stage. I - Formulation and analysis of optimization problem. II - Solution of the optimization problem and numerical results. S. S. Rao (Indian Institute of Technology, Kanpur, India) and R. S. Gupta (Punjab Engineering College, Chandigarh, India). *ASME, Transactions, Journal of Engineering for Power,* vol. 102, Oct. 1980, p. 782-797. 29 refs.

An attempt is made to optimize the efficiency and weight of an axial flow gas turbine stage by considering deflection, stress, and vibration aspects along with the aerodynamic requirements. The optimization problem, formulated as a nonlinear programming problem, is solved by using the interior penalty function method in which the Davidon-Fletcher-Powell variable metric unconstrained minimization technique with cubic interpolation method of one dimensional minimization is employed. Numerical solution of the problem is presented along with the results of sensitivity analysis conducted about the optimum point. V.L.

A81-12609 # Variable geometry, lean, premixed, prevaporized fuel combustor conceptual design study. A. J. Fiorentino, W. Greene, J. C. Kim (United Technologies Corp., Commercial Products Div., East Hartford, Conn.), and E. J. Mularz (U.S. Army, Propulsion Laboratory, Cleveland, Ohio). *(American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, New Orleans, La., Mar. 10-13, 1980, Paper 80-GT-16.) ASME, Transactions, Journal of Engineering for Power,* vol. 102, Oct. 1980, p. 896-902. 14 refs.

Four lean premixed prevaporized combustor concepts have been identified which utilize variable geometry and/or other flow modulation techniques to control the equivalence ratio of the initial burning zone. Lean equivalence ratios are maintained at high power engine operating conditions for low NO(x) emissions, while near stoichiometric conditions are maintained at low power for good efficiency and low emissions of carbon monoxide and unburned hydrocarbons. The goal of this program was to obtain a low level of NO(x) emissions at stratospheric cruise conditions; additional goals are to achieve the proposed 1984 EPA emission standards over the landing/take off cycle and performance and operational requirements typical of advanced aircraft engines. (Author)

A81-12619 Excitation of a circular array of cylinders with longitudinal slits. E. I. Veliev and V. P. Shestopalov (Akademiia Nauk Ukrainskoi SSR, Institut Radiofiziki i Elektroniki, Kharkov, Ukrainian SSR). *(Radiofizika,* vol. 23, no. 2, 1980, p. 202-212.) *Radiophysics and Quantum Electronics,* vol. 23, no. 2, Aug. 1980, p. 144-151. 11 refs. Translation.

The paper considers a circular array utilizing hollow circular cylinders with longitudinal slots instead of cylindrical rods. The array is excited by a magnetic current filament. Emphasis is placed on a low-frequency mode of oscillations. Simple equations for the density of a surface current and radiation patterns are derived. V.T.

A81-12703 Linear vortex theories of a profile and wing with air intake. V. M. Shurygin. *(Akademiia Nauk SSSR, Doklady,* vol. 250, no. 4, 1980, p. 829-833.) *Soviet Physics - Doklady,* vol. 25, Feb. 1980, p. 91-93. 5 refs. Translation.

A method previously developed for the construction of a primary vortex sheet in the case of a profile is generalized to the construction of the primary vortex surface for a wing of infinite span (in particular, a wing with an arbitrary intake line). For the construction of the primary vortex surface it is necessary to let the shape of the wing in the planform excise from each source-sink on the intake line a part of the vortex sheet corresponding to the source-sink on a plane, and then to continue the resulting attached sheet from the edges of the wing as free vortex sheets. B.J.

A81-11704 Stable near-resonant states forced by perturbation heating in a simple baroclinic model. J. O. Roads (California, University, La Jolla, Calif.). *Journal of the Atmospheric Sciences,* vol. 37, Sept. 1980, p. 1958-1967. 10 refs. NSF Grants No. ATM-77-20602; No. OCE-74-24592; No. ATM-78-24003; No. OCE-77-2282.

The stationary nonlinear response to perturbation heating is calculated in a highly truncated, two-level baroclinic model. For certain values of the intrinsic parameters and forcing, multiple equilibrium states exist. For a specific zonal and meridional wavelength, three equilibrium states are present: two are near a resonant point and one is near the zonal forcing equilibrium. Only one of these is ever stable, namely, the one where the zonal wind is on the low side of the resonant point; this state has a relatively small zonal wind and relatively large stationary perturbations. The equilibrium point on the high side of resonance is unstable mainly due to resonant instability and the equilibrium point near the forcing equilibrium is unstable mainly due to baroclinic unstability. Different equilibria are obtained for each vector wavenumber because the resonant value of the zonal wind decreases with decreasing wavelength. (Author)

A81-12737 The status of rotor noise technology. R. P. White, Jr. (Systems Research Laboratories, Inc., Newport News, Va.). *American Helicopter Society, Journal,* vol. 25, Jan. 1980, p. 22-29. 55 refs.

The problem of excess noise in rotor noise technology is discussed. Excess noise arises from sources other than loads needed to fly the helicopter. The effect of free-stream turbulence is investigated along with the induced effects of the rotor wakes, lifting surfaces, and fuselages. Data collected by the inflight far-field measurement technique of Schmitz and Boxwell (1976) is presented. The negative pressure spike, due to intense compressibility effects, dominates the noise signature. The Tip Air Mass Injection (TAMI) system and the Ogee tip have shown reasonable success in reducing the impulsive noise due to blade vortex interaction. Results obtained during model tests with these systems are also presented. R.C.

A81-12782 # **Automation of aircraft gas-turbine power plants (Avtomatika aviatsionnykh gazoturbinnykh silovykh ustanovok).** S. A. Gaevskii, F. N. Morozov, and Iu. P. Tikhomirov. Moscow, Voenizdat, 1980. 248 p. 12 refs. In Russian.

In the present book, extensive use of diagrams and illustrations is made to introduce the reader to the various aspects of aircraft gas-turbine engine automatic control. Some representative automatic control systems of such engines are discussed. V.P.

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1980 10 p
(ESDU-80006; ISBN-0-85679-290-X) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161

Drag increment due to rear fuselage upsweep is predicted. The results may be applied to the calculation of cruise drag. The research is relevant to military and civil transport aircraft subcritical Mach numbers. ESDU (GRA)

N81-10004*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ESTIMATION OF WING NONLINEAR AERODYNAMIC CHARACTERISTICS AT SUPERSONIC SPEEDS
Harry W. Carlson and Robert J. Mack Nov. 1980 84 p refs
(NASA-TP-1718; L-13589) Avail: NTIS HC A05/MF A01 CSCL 01A

A computational system for estimation of nonlinear aerodynamic characteristics of wings at supersonic speeds was developed and was incorporated in a computer program. This corrected linearized theory method accounts for nonlinearities in the variation of basic pressure loadings with local surface slopes, predicts the degree of attainment of theoretical leading edge thrust, and provides an estimate of detached leading edge vortex loadings that result when the theoretical thrust forces are not fully realized. T.M.

N81-10005*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A FAN PRESSURE RATIO CORRELATION IN TERMS OF MACH NUMBER AND REYNOLDS NUMBER FOR THE LANGLEY 0.3 METER TRANSONIC CRYOGENIC TUNNEL
Pierce L. Lawing and Charles L. Ladson Nov. 1980 21 p refs
(NASA-TP-1752; L-13713) Avail: NTIS HC A02/MF A01 CSCL 01A

Calibration data for the two dimensional test section of the Langley 0.3 Meter Transonic Cryogenic Tunnel were used to develop a Mach number-Reynolds number correlation for the fan pressure ratio in terms of test section conditions. Well established engineering relationships combined to form an equation which is functionally analogous to the correlation. A geometric loss coefficient which is independent of Reynolds number or Mach number was determined. Present and anticipated uses of this concept include improvement of tunnel control schemes, comparison of efficiencies for operationally similar wind tunnels, prediction of tunnel test conditions and associated energy usage, and determination of Reynolds number scaling laws for similar fluid flow systems. T.M.

N81-10007# Aeronautical Research Labs., Melbourne (Australia).
AN INTRODUCTION TO DYNAMIC DERIVATIVES (3) METHODS OF OSCILLATING MODELS IN PITCH AND YAW IN A 530 BY 810 MILLIMETRE TRANSONIC WIND TUNNEL
G. F. Forsyth Apr. 1979 45 p refs
(ARL/Aero-Note-390; AR-001-724) Avail: NTIS HC A03/MF A01

Mechanisms are considered which allow models to be oscillated in pitch and yaw during wind tunnel tests to measure dynamic derivatives. Types of pivots, motion producing linkages and connecting linkages are described as applicable in a 530 by 810 millimeter transonic tunnel. Author

N81-10008# TRW Systems and Energy, Redondo Beach, Calif. Engineering Sciences Lab.
HOLOGRAPHIC INVESTIGATION OF SLENDER BODY VORTEX WAKES Final Report, 28 Jul. 1978 - 28 Mar. 1980
F. D. Deffenbaugh and J. L. Jacoby Jul. 1980 79 p refs
(Contract F33615-78-C-3028; AF Proj. 2307)
(AD-A089496; TRW-32399-6002-UT-00; AFWAL-TR-80-3061) Avail: NTIS HC A05/MF A01 CSCL 20/4

The three dimensional vortex flow field behind slender missile configurations at high angle of attack was investigated using laser holography. Holographic interferograms of the flow about two ogive cylinder models were recorded for low speed flows, M less than .1, at angles of attack from 20 to 50 degrees. Helium injected into the flow above the model was entrained into the entire vortex structure, and the three dimensional position of the core could not be determined from the interferograms. Dual exposure holograms of the flow field seeded with 40-100 micron glass microballoons were recorded using a pulsed ruby laser. Pairs of particles could not be easily identified in the reconstructed image and the three dimensional velocity field could not be measured. Surface pressures were measured and integrated to provide load distributions, normal and side force coefficients. Roll angle was varied with angle of attack and tunnel conditions constant. Conditions of maximum vortex asymmetry were determined from the measured pressure distributions. GRA

N81-10010# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
AN INVESTIGATION OF SCALE EFFECTS ON THE TRANSONIC FLOW OVER SWEPT WINGS. PART 2: MEASUREMENTS ON A MODEL OF A VARIABLE-SWEEP STRIKE-FIGHTER CONFIGURATION
D. J. Weeks and J. Hodges London Dec. 1977 127 p refs Supersedes RAE-TR-77184; ARC-37815
(ARC-R/M-3842-Pt-2; BR73152; RAE-TR-77184; ARC-37815) Avail: NTIS HC A07/MF A01; HMSO £ 14 PHI

Measurements of forces and wing pressures were made on a wing plus body half-model of a variable sweep strike fighter configuration at Mach numbers between 0.6 to 0.825 and at Reynolds numbers in the range 2.3 X 10 to the 6th power to 19 X 10 to the 6th power. Results were obtained with the wings swept at both 25 deg and 40 deg. The data were analyzed to show the effects of changes in Reynolds number, and in the location of transition, on the transonic flows over the upper surface of the wing at high incidence. For the 25 deg sweep configuration results are described which are consistent with those observed on the transport aircraft wing. The 40 deg sweep configuration gave examples of scale effect which were essentially three dimensional in nature and which persisted up to full scale Reynolds numbers. Author (ESA)

N81-10011# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
ANALYTICAL CHARACTERISTICS METHODS: APPLICATIONS
R. Stuff (DFVLR, Goettingen, West Germany) 1980 57 p refs Presented at Von Karman Inst. Lecture Ser. on Mathematical Methods in Fluid Mech., Rhode Saint Genese, Belgium, 25-29 Feb. 1980 Submitted for publication
(VKI-Preprint-1980-10) Avail: NTIS HC A04/MF A01

The prerequisites for application of the analytical characteristics method include analytical descriptions of the geometry of wave fronts and rays, and analytical solutions of the wave equation of the potential equation for supersonic flow. The latter are applied as initial solutions to the analytical characteristics method. Examples of application range from unsteady subsonic to steady supersonic flow, from theoretical predictions to the evaluation of the flow field from near field wind tunnel test data.
Author (ESA)

N81-10012# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

IN-FLIGHT MEASUREMENT OF AERODYNAMIC LOADS ON CAPTIVE STORES. EQUIPMENT AND RESULTS

G. J. Alders 17 Apr. 1979 12 p refs Presented at AGARD Flight Mech. Panel Symp. on Missile System Flight Dyn., London, 21-24 May 1979
(NLR-MP-79013-U) Avail: NTIS HC A02/MF A01

A force balance store was developed, consisting of a support structure to be mounted on a 14 in. bomb rack, a load measuring balance and a shape representing the store to be analyzed. The shape is replaceable. A series of flight tests with two different force balance store shapes was carried out with an NF-5 aircraft. The store was mounted in the normal captive position as well as 0.15 m below. The results of the measurements are compared with data from other sources, such as wind tunnel results. Predictions, made with the computer model and using the aerodynamic data obtained with the force balance store are compared with actual drop test results. The excellent agreement indicates that in flight measurement of airloads on captive stores is a valuable tool for a better determination of the safe release envelope of external stores. Author (ESA)

N81-10013# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

A COMPREHENSIVE EVALUATION AND ANALYSIS OF TRANSONIC FLOW CALCULATIONS ON THREE RELATED WING-BODY CONFIGURATIONS

Georg Drougge, N. Agrell, and S. Hedman 1979 40 p refs
(Contract FMV-F-K-82223-76-001-21-001)
(FFA-TN-AU-1418-PT-1) Avail: NTIS HC A03/MF A01

The design of a wing-body combination where an inverse procedure analysis based on the transonic small disturbance theory was studied. Features of aerodynamic interest were found. This led to modifications in the use of the numerical method in the wing-body design. The modified wing-body combination was again tested and the results analyzed further. It was concluded that the inverse method can be a powerful design tool and that in any case for moderate aspect ratios the concept of a wing as formed from two dimensional profiles can be replaced by the concept of a wing formed from two surfaces. Author (ESA)

N81-10014# National Aerospace Lab., Amsterdam (Netherlands). Incompressible Aerodynamics Div.

BOUNDARY LAYER MEASUREMENTS ON A TWO-DIMENSIONAL WING WITH FLAP

B. vandenBerg Jan. 1979 110 p refs
(Contract NIVR-1812)
(NLR-TR-79009-U) Avail: NTIS HC A06/MF A01

A wind tunnel experiment was performed on a wing flap configuration designed to prevent flow separations. The measurements comprised surface pressure measurements, boundary layer and wake traverses, and surface flow visualizations. Three angles of attack were applied and two widths of the gap between wing and flap, with mixing of wing wake and flap boundary layer occurring with the smaller gap. The flow phenomena were sufficiently well described by these measurements to make detail comparisons possible with calculation methods for the viscous flow around multielement airfoils. Author (ESA)

N81-10015# Royal Aircraft Establishment, Farnborough (England).

FLOW MEASUREMENTS IN THE WAKE OF A WING FITTED WITH A LEADING-EDGE ROOT EXTENSION (STRAKE)

P. J. Butterworth London HMSO Sep. 1979 40 p refs
(RAE-TR-79120; RAE-Aero-3464; BR72779) Avail: NTIS HC A03/MF A01

In a low-speed wind tunnel, measurements were taken of the velocity vector in the flow field behind the wing of a combat aircraft model. The wing was fitted with a leading-edge root extension (strake) and could have either a plain leading edge or a deployed slat outboard. Four flow investigations were made: at three angles of incidence with the plain leading edge and at one angle of incidence with the slat deployed. The distribution of the total head deficit, the streamwise component of vorticity, and a measure of the circulation distribution in the wake of the wing were computed. Author (ESA)

N81-10016# Royal Aircraft Establishment, Farnborough (England).

THEORETICAL DETERMINATION OF SUBSONIC OSCILLATORY AIRFORCE COEFFICIENTS FOR FIN-TAILPLANE CONFIGURATIONS

D. E. Davies London HMSO Sep. 1979 237 p refs
(RAE-TR-79125; RAE-Struct-BF/B/0794; BR79125) Avail: NTIS HC A11/MF A01

Linearized equations of potential flow are solved numerically for the loadings for oscillation at general frequency in any antisymmetric modes, and the generalized aerodynamic coefficients obtained. Approximation to the loadings are taken as linear combinations of basis functions. The condition satisfied by the loadings at the junction of the fin and half tailplanes is imposed on the approximations and the variational principle of Flax is applied to get the coefficients in the said linear combinations. The procedure is programmed in ICL 1900 FORTRAN. Results obtained using the program on a number of examples are given. Author (ESA)

N81-10017# European Space Agency, Paris (France).

ANALYSIS OF CALCULATED THREE-DIMENSIONAL INVISCID FLOW FIELDS WITH EMBEDDED SHOCK WAVES (PRESENTATION OF A FIELD SOLUTION), PART 1

Claus Weiland and Hans-Juergen Thies Jul. 1979 52 p refs Transl. into ENGLISH of "Anal. Berechneter Dreidimensionaler Reibungsfreier Stroemungsfelder mit Eingebetteten Verichtungsstoessen (Darstellung einer Feldoesung) Teil 1", Rept. DFVLR-FB-78-09 DFVLR, Cologne, Apr. 1978 Original report in GERMAN previously announced as N79-30155
(ESA-TT-558; DFVLR-FB-78-09) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 27,90

Flow fields around a number of different body contours, and calculated by means of a finite difference procedure are analyzed. The investigated fields are three dimensional in general. The analysis is carried out with the air of characteristics, streamlines, lines of constant static pressure and static density, and with the velocity vectors at the gridpoints in planes phi = const. Planes z = const lines of constant cross flow Mach number and the velocity vectors of the crossflow at the gridpoints are presented. The interval of freestream Mach number considered is 1.4 M sub infinity < or = M < or = 3, and the range of angle of attack alpha is up to 20 deg. The quality of the finite difference solution used is demonstrated by comparison with experimental data. The accuracy attained especially for the detection of the position and the contour of embedded shocks is very good. Author (ESA)

N81-10018# European Space Agency, Paris (France).

ANALYTICAL ESTIMATION ON NONLINEAR LONGITUDINAL CHARACTERISTICS OF WINGS WITH SMALL AND MODERATE ASPECT RATIO BY THE VORTEX LATTICE METHOD IN INCOMPRESSIBLE FLOW

Wolfgang Schroeder Jan. 1980 80 p refs Transl. into ENGLISH of 'Berechnung der nichtlinearen Beiwerte von Fluegeln mit kleinem u. mittlerem Seitenverhaeltnis dem Wirdbelleiterverfahren in inkompressibler Stroemung', DFVLR, Brunswick Report DFVLR-FB-78-26, Sept. 1978 Original report in GERMAN previously announced as N79-30161 Original German report available from DFVLR, Cologne DM 31,80
(ESA-TT-585; DFVLR-FB-78-26) Avail: NTIS HC A05/MF A01

A nonlinear vortex-lattice method is described applying a force-free condition to the vortex sheet given the trailing-, side- and leading edges, respectively. In extensive test runs various influences on the numerical stability of the iterative rolling up process were studied such as the force free condition of the wake, the number of horseshoe vortices, the panel distribution along span and chord, the representation of the wakes by chains of straight vortex elements of different length and number, and the introduction of an artificial friction parameters. Because of numerical difficulties the slender delta wing itself could not be treated completely. These numerical difficulties resulting from the singular behavior of line vortices are described and ways of overcoming them are suggested. Author (ESA)

N81-10019*# Human Resources Research Organization, Alexandria, Va.
CIVIL HELICOPTER WIRE STRIKE ASSESSMENT STUDY. VOLUME 2: ACCIDENT ANALYSIS BRIEFS Final Report
Clyde H. Tuomela and Mark F. Brennan Oct. 1980 221 p
(Contract NAS2-10505)
(NASA-CR-152390; FR-MTRD(CA)-80-13-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 01C

A description and analysis of each of the 208 civil helicopter wire strike accidents reported to the National Transportation Safety Board (NTSB) for the ten year period 1970-1979 is given. The accident analysis briefs were based on pilot reports, FAA investigation reports, and such accident photographs as were made available. Briefs were grouped by year and, within year, by NTSB accident report number. T.M.

N81-10020*# Crash Research Inst., Tempe, Ariz.
SYSTEMS ANALYSIS OF THE INSTALLATION, MOUNTING, AND ACTIVATION OF EMERGENCY LOCATOR TRANSMITTERS IN GENERAL AVIATION AIRCRAFT Final Report
David S. Hall 10 Jan. 1980 218 p
(Contract NAS5-25444)
(NASA-CR-160036; CRI-7846-14) Avail: NTIS HC A10/MF A01 CSCL 01C

A development program was developed to design and improve the Emergency Locator Transmitter (ELT) transmitter and to improve the installation in the aircraft and its activation subsystem. There were 1135 general aviation fixed wing aircraft accident files reviewed. A detailed description of the damage to the aircraft was produced. The search aspects of these accidents were studied. As much information as possible about the ELT units in these cases was collected. The data should assist in establishing installation and mounting criteria, better design standards for activation subsystems, and requirements for the new ELT system design in the area of crashworthiness. T.M.

N81-10021*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA AVIATION SAFETY REPORTING SYSTEM Quarterly Report, 1 Jan. - 31 Mar. 1979
Apr. 1980 34 p refs Prepared in cooperation with Battelle Columbus Labs., Mountain View, Calif.
(NASA-TM-81225; A-8311; QR-11) Avail: NTIS HC A03/MF A01 CSCL 01C

A comprehensive study of near midair collisions in terminal airspace, derived from the ASRS database is presented. A selection of controller and pilot reports on airport perimeter security, unauthorized takeoffs and landings, and on winter operations is presented. A sampling of typical Alert Bulletins and their responses is presented. T.M.

N81-10022# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN AIRCRAFT CRASHWORTHINESS
C. A. Caiafa and Lawrence M. Neri Jun. 1980 55 p refs
(AD-A089431; FAA-CT-80-166; FAA-ED-18-6) Avail: NTIS HC A04/MF A01 CSCL 01/2

The Aircraft Crashworthiness Program Plan is designed to reduce or prevent aircraft occupants from incurring serious or fatal injuries in a survivable crash impact accident by incorporating crashworthy design features into the initial stages of fixed-wing and rotary-wing aircraft development. It describes a 5 year development program for both airplanes and rotorcraft. It identifies five major subprogram areas for study and analysis to accomplish the programs goals: (1) Airframes; (2) Cabin safety; (3) Fuel system protection; (4) Emergency evacuation system; and (5) Standards, criteria, and procedures. The plan emphasizes use of available background data, development of analytical techniques, validation of analytical techniques, validation of data to determine feasibility/acceptability and transmittal of appropriate data for consideration as the basis for regulation, standards, etc. The federal aviation administration groups, other government agencies/departments and industry organizations participating in this effort are identified. Program schedule with milestones is presented. Program management and funding requirements are also identified. GRA

N81-10023# Battelle Columbus Labs., Ohio.
EVALUATION OF SAFETY PROGRAMS WITH RESPECT TO THE CAUSES OF GENERAL AVIATION ACCIDENTS. VOLUME 2: APPENDICES
T. M. Connor and C. W. Hamilton May 1980 266 p
(Contract DOT-FA78WA-4159)
(AD-A089181; FAA-ASP-80-2A) Avail: NTIS HC A12/MF A01 CSCL 01/2

The extent to which the Federal Aviation Administration (FAA) safety programs wwere aligned with the causes of general aviation accidents was determined. The data base used consisted of a total of 30,592 general aviation accident records compiled by the National Transportation Safety Board (NTSB) from 1971 through 1977. Analysis of these records was made with respect to NTSB-cited cause/factors. The FAA programs implemented during the study time period and pertaining to safety were also included in this study. R.C.T.

N81-10024# Terrestrial Environmental Specialist, Inc., Phoenix, N.Y.
HANDBOOK ON BIRD MANAGEMENT AND CONTROL Final Report, Aug. 1977 - Feb. 1979
Vincent J. Lucid and Roy S. Slack Mar. 1980 188 p refs
(Contract F08635-77-C-0377)
(AD-A089009; AFESC/ESL-TR-80-1) Avail: NTIS HC A09/MF A01 CSCL 06/6

This handbook was prepared to provide information to Air Force pest managers on hazardous and pest bird control. It discusses bird control in hangars, on airfields, and at other base locations. A systematic approach for surveying and determining control methods for bird problems is provided and legal aspects of bird control are discussed. Chapters two through eight have review questions to help the pest manager evaluate his proficiency in each subject area. A slide/tape presentation was prepared corresponding with information in this handbook. Copies are available for loan from Major Command Entomologists and the Air Force Engineering and Services Center. GRA

N81-10025# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
APPLICATIONS OF PYROTECHNIQUES IN AVIATION [DES APPLICATIONS DE LA PYROTECHNIE DANS LE DOMAINE AERONAUTIQUE]
S. Morlan Paris 1979 6 p In FRENCH Presented at Congr. on Explosifs et Pyrotech.: Appl. Spatiales, Toulouse, 22-25 Oct. 1979
(SNIAS-792-422-103) Avail: NTIS HC A02/MF A01

The cutting of canopies and windows in aircraft to permit abandonment in emergencies is discussed. The advantages of pyrotechnic logic circuits are presented. The use of pyrotechnics for opening cabin windows in a prototype Corvette aircraft is illustrated. Possible applications for assisting in ground evacuations in civilian transport aircraft are mentioned. Author (ESA)

N81-10026# National Technical Information Service, Springfield, Va.
SEARCH AND RESCUE METHODS AND EQUIPMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jun. 1980
Edith Kenton Jul. 1980 269 p Supersedes NTIS/PS-79/0649; NTIS/PS-78/0539
(PB80-812837; NTIS/PS-79/0649; NTIS/PS-78/0539) Avail: NTIS HC $30.00/MF $30.00 CSCL 06G

Maritime and aviation search and rescue are evaluated in approximately 262 abstracts. Search and rescue planning, locating equipment, rescue beacons, communication devices, specialized aircraft and their components, and searching strategies are discussed. GRA

N81-10027# National Technical Information Service, Springfield, Va.
BIRD STRIKES AND AVIATION SAFETY. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jun. 1980
Guy E. Habercom, Jr. Jul. 1980 117 p Supersedes NTIS/PS-79/0753; NTIS/PS-78/0694
(PB80-812944; NTIS/PS-79/0753; NTIS/PS-78/0694) Avail: NTIS HC $30.00/MF $30.00 CSCL 01B

Hazards to aircraft created by engine ingestion or airplane interception of birds are investigated in these Government sponsored research reports. Bird damage assessment, structural strengthening, windshield design, and bird tracking and dispersal methods are studied. This updated bibliography contains 107 citations, 17 of which are new entries to the previous edition. GRA

N81-10028# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA, U.S. GENERAL AVIATION CALENDAR YEAR 1978 Summary Report
20 May 1980 209 p
(PB80-201916; NTSB-ARG-80-1) Avail: NTIS HC A10/MF A01 CSCL 01B

A summary of aircraft accidents which occurred in U.S. general aviation operations during the calendar year 1978 is given. It includes an analysis of accident data providing an overview, types of accidents, accident causal factors, kind of flying, and conclusions; a statistical compilation of accident information presented in the form of accident and rate tables, analytic tables, injury tables and cause/factor tables. In 1978, there were 4,494 total general aviation accidents, 793 of which were fatal. Included in the total number of accidents are 63 collisions between aircraft. GRA

N81-10029# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.
RECOMMENDED SHORT-TERM ATC IMPROVEMENTS FOR HELICOPTERS. VOLUME 2: RECOMMENDED HELICOPTER ATC TRAINING MATERIAL Final Report, Aug. 1979 - Apr. 1980
Tirey K. Vickers and D. J. Freund Nov. 1980 82 p
(Contract DOT-FA79WA-4279)
(AD-A089441; FAA-RD-80-88-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 17/7

The recommended Short Term ATC Improvements for Helicopters are documented in three volumes. This volume provides complete training material for helicopter ATC. It contains major sections on Helicopter Capabilities and Limitations, on Helicopter Navigation and on Helicopter Control Procedures. GRA

N81-10030# Automation Industries, Inc., Silver Spring, Md.
RECOMMENDED SHORT-TERM ATC IMPROVEMENTS FOR HELICOPTERS. VOLUME 3: OPERATIONAL DESCRIPTION OF EXPERIMENTAL LORAN-C FLIGHT FOLLOWING (LOFF) IN THE HOUSTON AREA Final Report
Tirey K. Vickers and D. J. Freund Apr. 1980 32 p
(Contract DOT-FA79WA-4279)
(AD-A089385; FAA-RD-80-88-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 17/7

The recommended Short Term ATC Improvements for Helicopters are documented in three volumes. This volume (3) provides the complete Operational Description of the Experimental Loran Flight Following (LOFF) in the Houston Area. It describes both airborne and ground components and states the objectives that are being sought in the experiment. GRA

N81-10031# Federal Aviation Administration, Washington, D. C. Office of Aviation Policy.
HOURLY AIRPORT ACTIVITY PROFILES: 30 AIRPORTS BY USER, 3 AIRPORTS BY USER AND EQUIPMENT TYPE, SELECTED DAYS IN JUNE, JULY AND AUGUST, 1978
1980 156 p
(AD-A089450; FAA-AVP-80-7) Avail: NTIS HC A08/MF A01 CSCL 01/5

The first section of this report contains statistics on aircraft operations, by user category for 30 airports for selected days in June, July and August 1978. Using the series of tables and graphs on Atlanta as an example, the data should be interpreted as described in the following paragraphs. First, note that the data used for generating the statistics in the table included all operations occurring in Atlanta during August 1978. Local time in this case would be equivalent to eastern daylight time. Aircraft operations occurring between midnight and 1:00 a.m. are counted in time slot zero. Similarly, activity occurring between 12:00 noon and 1:00 p.m. is assigned to time slot 12:00. The second part of this report consists of six tables and seven graphs which portray total daily aircraft departures and average hourly aircraft departures by equipment type for three cities: Kansas City, Missouri; Omaha, Nebraska; and St. Louis, Missouri. This part of the report may be regarded as exploratory in nature. The tables and graphs provide, for the first time, information on departures by equipment type, by hour of the day. Previously, such information was available for air carrier operations at the top 100 air carrier airports. The information in this section includes operations by all user categories. GRA

N81-10032# Mitre Corp., McLean, Va.
ANALYSIS OF POTENTIALLY CORRECTABLE LANDING DELAYS AT ATLANTA
Bela P. Collins Nov. 1979 65 p refs
(Contract DOT-FA80WA-4370)
(AD-A089408; MTR-79W00415; FAA-EM-79-23) Avail: NTIS HC A04/MF A01 CSCL 17/7

The Local Flow Traffic Management order (DOT/FAA 7110.72), dated 15 November 1976, provided for the establishment of local procedures, at designated airports (16 initially), that would assist aircraft operators in minimizing fuel usage. These local procedures would be predicted on the aircraft performing a profile descent in conjunction with en route metering. This report presents the results of a field data collection and analysis of arrival traffic flows into the Atlanta-Hartsfield International Airport. The purpose of the analysis was to quantify the effect of traffic flow on runway utilization and to identify avoidable delays. Recommendations to improve the flow of traffic are also discussed. GRA

N81-10034# IIT Research Inst., Annapolis, Md.
THE DISCRETE ADDRESS BEACON SYSTEM/AIR TRAFFIC CONTROL RADAR BEACON SYSTEM/ATCRBS IFF MARK 12 SYSTEM (DABS/ATCRBS/AIMS) PERFORMANCE PREDICTION MODEL Final Report
C. Randall Crawford and C. Wayne Ehler Apr. 1980 80 p refs
(Contracts F19628-78-C-0006; DOT-FA70WAI-175; AF Proj. 649E)
(AD-A089440; ECAC-PR-77-061; FAA-RD-79-88) Avail: NTIS HC A05/MF A01 CSCL 17/9

The Discrete Address Beacon System (DABS) is to be gradually phased into the existing Air Traffic Control Radar Beacon System (ATCRBS) in the 1980's. The DABS selective address feature is designed to alleviate the ATCRBS problems of over-interrogation and synchronous garble. The FAA requested that the Electromagnetic Compatibility Analysis Center (ECAC) develop a computer model with the capability to predict mutual interference arising in a mixed secondary-surveillance radar environment. The nature of the DABS interrogation schedule required that the model be a time-event store simulation. The model inputs are selected from the ECAC data base and consist of the characteristics of a ground and air deployment of sensors and transponders. Detailed characteristics of a sensor-of-interest (So) are among the inputs. The model output is primarily a record of the events that were predicted to occur during a simulation period. The performance of each transponder is described by its reply history during the time in which the equipped aircraft is in the So mainbeam. The fruit rate at the So is predicted, and the performance of the subject sensor is represented by the results of DABS transactions and ATCRBS target evaluations. Other summary outputs are available from the model, including interrogation rates, sidelobe suppression rates, and the identity of equipments that cause observable interference. GRA

N81-10036# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.
PROPOSED ATC SYSTEM FOR THE GULF OF MEXICO: HELICOPTER OPERATIONS DEVELOPMENT PROGRAM Final Report
D. J. Freund and T. K. Vickers Nov. 1979 48 p
(Contract DOT-FA79WA-4279)
(AD-A089430; FAA-RD-80-85) Avail: NTIS HC A02/MF A01 CSCL 17/7

A helicopter ATC system for the Gulf of Mexico is set forth. It embodies a concept of evolutionary growth in four phases: (1) The Present System period of use 1980 - IFR navigation is obtained primarily with LoranC, or VLF/OMEGA. Back up systems are ADF and Airborne Weather Radar. VOR/DME is used over land. ACT is by procedural control ans separation standards because no radar or other surveillance system is available off shore; (2) LOFF Loran c Flight Following Period of Evaluation 1981 - The LOFF system is placed in operation for experimentation and evaluation. While ATC is still performed by procedural control, LOFF will assist ground controllers by reducing workload, improving flexibility, etc. Experiments will also be performed on secondary radar systems ATCRBS VLATME to provide surveillance; (3) Augmented LOFF Period of use 1983 and beyond - IFR helicopters will be able to fly direct, offset or segmented RNAV routes. ATC will be essentially equivalent to the NAS. Navigation by Loran C will expand. Surveillance will be by LOFF and/or secondary radar. Area of control will be 1,500 to 10,000 over entire Gulf, and 4 RNAV Traffic Control Period of use 1985 and beyond - IFR helicopters will be able to use any of a number of certified navigation systems. ATC systems will adapt to varying accuracies of these systems. ATC will be based on surveillance provided by aircraft reporting of position information and/or secondary radar. Separation standards will be reduced and be equivalent to Northeast Corridor. GRA

N81-10037# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.
PRELIMINARY TEST PLANS OF ATC CONCEPTS FOR LONGER TERM IMPROVEMENT HELICOPTER DEVELOPMENT PROGRAM Final Report
D. J. Freund and Tirey K. Vickers May 1980 50 p refs
(Contract DOT-FA79WA-4279)
(AD-A089407; FAA-RD-80-87) HC A03/MF A01 CSCL 17/7

Test and simulation planning is documented for longer-term improvements in helicopter ATC concepts, which are classified into the following categories: (1) Offshore Route Structure in the Gulf of Mexico, (2) Secondary Radar, (3) Analysis of Navigation Errors in the Gulf, (4) Offshore Surveillance and Communications to 300 NM Range, (5) Real-Time Reporting of Aircraft-Derived Position, (6) VHF Communications Study in the CONUS, (7) ATC Implications of Alternate Airports for Helicopters, and (8) Wake Vortex Separation. GRA

N81-10038# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.
RECOMMENDATIONS FOR SHORT-TERM SIMULATION OF ATC CONCEPTS. HELICOPTER OPERATIONS DEVELOPMENT PROGRAM Final Report
D. J. Freund and T. K. Vickers Feb. 1980 44 p
(Contract DOT-FA79WA-4279)
(AD-A089435; FAA-RD-80-86) Avail: NTIS HC A03/MF A01 CSCL 01/5

A number of recommendations from a previous helicopter air traffic control (ATC) study (See Report FAA-RD-78-150) were examined. Those which appeared to have potential for early implementation were selected for further testing. The selected recommendations included: (1) dual-fix holding patterns to save airspace; (2) speed control procedures and short approach paths to save fuel; (3) various methods of reducing separation in order to increase airport or heliport capacity. Under item 3 above, a rationale for utilizing existing parallel approaches of helicopters and CTOL aircraft was presented for consideration. Extensive use of flight simulation and ATC simulation was recommended in order to reduce the time and cost of evaluating the potential improvements. The steps of the recommended simulation program were arranged in the order of ascending cost, to learn as much as possible about the subject as quickly as possible and to weed out or revise impractical solutions before they reach a more expensive stage of evaluation or development. A detailed simulation program was prepared using a modified factorial design in order to isolate the effects of changes in various parameters. GRA

N81-10039# IIT Research Inst., Chicago, Ill.
IMPACT OF THE DISCRETE ADDRESS BEACON SYSTEM (DABS) ON AIR TRAFFIC CONTROL RADAR BEACON SYSTEM (ATCRBS) PERFORMANCE IN SELECTED DEPLOYMENTS Final Report
T. Keech and G. Fleming Apr. 1980 57 p refs
(Contract F19628-78-C-0006)
(AD-A089611; FAA-RD-80-93; ECAC-CR-79-127) Avail: NTIS HC A04/MF A01 CSCL 17/7

A computer analysis was conducted to investigate the effect of the proposed Discrete Address Beacon System (DABS) on the Air Traffic Control Radar Beacon System (ATCRBS) in a future (1982) Los Angeles, CA, air traffic environment. The performance of ATCRBS was examined at two sites, both with (a) the existing all-ATCRBS ground environment and (b) a mixed ATCRBS/DABS ground environment (using various levels of DABS channel activity). It was observed that, in general, DABS operations will not affect the ability of ATCRBS interrogators to perform their air traffic control function of reliably detecting aircraft. GRA

N81-10041# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.
RECOMMENDED SHORT-TERM ATC IMPROVEMENTS FOR HELICOPTERS. VOLUME 1: SUMMARY OF SHORT TERM IMPROVEMENTS Final Report
Tirey K. Vickers and D. J. Freund Aug. 1980 48 p
(Contract DOT-FA79WA-4279)
(AD-A089521; FAA-RD-80-88-1) Avail: NTIS HC A03/MF A01 CSCL 17/7

A summary report is made of all improvements studied. Improvements are categorized as to those that can be recommended for immediate operational consideration or use and those that require limited short term simulation or test. The recommendations for immediate use include: (1) Helicopter ATC training material, (2) Operational Description of Loran Offshore Flight Following (LOFF), (3) Recommendations concerning military training routes and (4) Survey data for use in Gulf communications and route structure planning. The recommendations for short term simulation include: (1) Dual waypoint holding patterns, (2) other holding patterns and (3) shortened entry procedures for intercepting final approach path. GRA

N81-10043# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Instrumentierung und Anthropotechnik.
ANALYSIS OF THE FUNCTION PRINCIPLE AND OPERATIONAL ASSESSMENT OF AN ONBOARD GLIDEPATH GUIDANCE SYSTEM FOR VISUAL APPROACHES (VISUAL APPROACH MONITOR (VAM)
Josef Thomas and Helmut Stein Oct. 1979 107 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-655)
(DFVLR-FB-79-38) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 20,00

The visual approach monitor, VAM, a head-up display system for manual approach was analyzed as regards its functioning principles and associated error characteristics. System simulations and flight tests were carried out with special emphasis on performance and stability studies. Experimental comparisons between VAM guided and unaided visual approaches revealed no significant advantages for VAM as far as flight path accuracy is concerned. However, VAM performed significantly better with regard to variances and extreme values for nearly all flight guidance parameters. Its overall performance was found to be comparable to that of the instrument landing system. Author (ESA)

N81-10044# Royal Aircraft Establishment, Farnborough (England).
CONTRIBUTIONS TO THE UNITED KINGDOM MICROWAVE LANDING SYSTEM RESEARCH AND DEVELOPMENT PROGRAM, 1974 TO 1978. VOLUME 1
J. M. Jones London HMSO May 1979 250 p refs 3 Vol.
(RAE-TR-79052-Vol-1; RAE-RAD-NAV-Vol-1; BR73155) Avail: NTIS HC A11/MF A01

In support of the UK MLS program Doppler Microwave Landing System (DMLS) equipment operating on both frequency division and time division multiplex formats was extensively evaluated by means of analysis, ground and flight tests and hybrid simulation. Results show that the use of the Doppler technique leads to simple and reliable equipment with performance well inside the operational requirements. A full understanding of the possible environmental effects on system performance at 5 GHz was obtained. Author (ESA)

N81-10045# Royal Aircraft Establishment, Farnborough (England).
CONTRIBUTIONS TO THE UNITED KINGDOM MICROWAVE LANDING SYSTEM RESEARCH AND DEVELOPMENT PROGRAM, 1974 TO 1978. VOLUME 2
J. M. Jones London HMSO May 1979 168 p 3 Vol.
(RAE-TR-79052-Vol-2; BR79052) Avail: NTIS HC A08/MF A01

In support of the UK MLS program, Doppler Microwave Landing System (DMLS) equipment operating on both frequency division and time division multiplex formats was extensively evaluated by means of analysis, ground and flight tests and hybrid simulation. Charts and figures pertaining to the following topics are presented: the Doppler MLS technique; basic data collection for ICAO submission; FDM system test results; and the time division multiplex system. Author (ESA)

N81-10046# Royal Aircraft Establishment, Farnborough (England).
CONTRIBUTIONS TO THE UNITED KINGDOM MICROWAVE LANDING SYSTEM RESEARCH AND DEVELOPMENT PROGRAM, 1974 TO 1978. VOLUME 3
J. M. Jones London HMSO May 1979 237 p 3 Vol.
(RAE-TR-79052-Vol-3; BR79052) Avail: NTIS HC A11/MF A01

In support of the UK MLS program, Doppler Microwave Landing System (DMLS) equipment operating on both frequency division and time division multiplex formats was extensively evaluated by means of analysis, ground and flight tests and hybrid simulation. Charts and figures pertaining to the following topics are presented: the Doppler simulator and time division multiplex bench measurements; flight trials results of the TDM system; field trials at operational airports; and a reference-less system. Author (ESA)

N81-10048# New England Research Application Center, Storrs, Conn.
ADIABATIC GAS FLOW. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1970 - Apr. 1980
Robert Hippler May 1980 167 p Sponsored in part by NTIS
(PB80-808546) Avail: NTIS HC $30.00/MF $30.00 CSCL 17G

Adiabatic gas flows for planetary and stellar atmospheres, aerodynamics, heat transfer, nozzles, turbines, and energy systems, such as magnetohydrodynamics and fusion reactors are discussed in approximately 76 citations. Analytical and modeling techniques, characteristics, experimental data, and fundamental principles are covered. Two and three dimensional, compressible and incompressible gas dynamic flows, for unbounded and bounded, stable and unstable conditions are included. GRA

N81-10049*# New England Research Application Center, Storrs, Conn.
HEAD UP DISPLAYS. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1976 - Apr. 1980
Robert Hippler May 1980 80 p Sponsored by NASA and NTIS
(NASA-CR-163656; PB80-809072) Avail: NTIS HC $30.00/MF $30.00 CSCL 01D

Head up displays are the subject of this retrospective survey of much of the world aerospace literature. Design, fabrication and use, and applications to specific aircraft, such as the F-4E, Jaguar, Tornado, F-18, Viggin, A-10, AV-8B, Sea Harrier, Space Shuttle, helicopters, KC-135S, and in commercial aircraft, are discussed. A look at the future in this field is also presented. Contains 70 citations. GRA

N81-10050# New England Research Application Center, Storrs, Conn.
HEAD UP DISPLAYS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1970 - Apr. 1980
Robert Hippler May 1980 133 p Sponsored in part by NTIS
(PB80-809064) Avail: NTIS HC $30.00/MF $30.00 CSCL 01D

Design, fabrication and use, and applications to specific aircraft, such as the F-4E, Jaguar, Tornado, F-18, Viggin, A-10, AV-8B, Sea Harrier, Space Shuttle, helicopters, KC-1358, and in commercial aircraft, are discussed. A look at the future in this field is also presented. GRA

N81-10053 Engineering Sciences Data Unit, London (England).
THE USE OF DATA ITEMS ON AIRCRAFT PERFORMANCE MEASUREMENT
1980 9 p Supersedes ESDU-75017
(ESDU-80009; ESDU-75017; ISBN-0-85679-292-6) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161

The purpose of flight testing and the principles that govern the methods of processing the data obtained, are explained to show the interrelationship between the various items that treat particular aspects and to indicate how methods not currently discussed in the items might be applied. The processing of flight test data obtained from aircraft with turbofan, turbojet, turboprop, or piston engines are described. ESDU (GRA)

N81-10054*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE XV-15 TILT ROTOR RESEARCH AIRCRAFT
Daniel C. Dugan, Ronald G. Erhart (Bell Helicopter Textron, Fort Worth, Tex.), and Laurel G. Schroers (AVRADCOM) Sep. 1980 21 p refs Prepared in cooperation with AVRADCOM
(NASA-TM-81244; AVRADCOM-TR-80-A-15; A-8343) Avail: NTIS HC A02/MF A01 CSCL 01C

The design characteristics of the XV-15 Tilt rotor research aircraft are presented. Particular attention is given to the following: control system; conversion system; and propulsion system. Flight test results are also reported. R.C.T.

N81-10055# McDonnell Aircraft Co., St. Louis, Mo.
AIRCRAFT HYDRAULIC SYSTEMS DYNAMIC ANALYSIS. VOLUME 6: STEADY STATE FLOW ANALYSIS SSFAN COMPUTER PROGRAM TECHNICAL DESCRIPTION Final Technical Report, Jun. 1978 - Nov. 1979
Ray Levek and Bob Young Wright-Patterson AFB AFAPL Apr. 1980 339 p refs Revised
(Contract F33615-74-C-2016)
(AD-A089240; AFAPL-TR-76-43-Vol-6) Avail: NTIS HC A15/MF A01 CSCL 01/3

SSFAN is a steady state hydraulic flow and pressure analysis computer program. Its primary purpose is to analyze non-linear resistance aircraft hydraulic systems. The program handles complex flow networks containing flow and/or pressure discontinuities such as unbalanced area actuators and check valves. Solutions for a combination of simultaneously operating subsystems are easily obtained. The program is designed using a building block approach so that new component or element models may be added with minimum change to the main program. The solution method is a matrix type, using iteration to obtain a final flow and pressure balance. The program internally corrects viscosities for pressure, determines whether flow is laminar, transition or turbulent for use of appropriate resistance factors and corrects reservoir pressure for altitude effects. A quasi-transient section has been added to allow multiple steady state calculations when simulating subsystem operations. The data is stored and can be printed in either tabular form or computer plot form. The program was written with the aircraft hydraulic system designer in mind. The terminology and units are commonly used terms such as fluid viscosity in centistokes, temperatures in degrees Fahrenheit and flow in gallons per minute. Conversion of units for calculation is accomplished internally in the program. GRA

N81-10056# Lockheed-Georgia Co., Marietta. Advanced Concepts Dept.

DESIGN OPTIONS STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report

W. T. Mikolowsky, L. W. Noggle, H. J. Abbey, L. A. Adkins, and H. A. Bricker Sep. 1980 27 p
(Contract F33615-78-C-0122)
(AD-A089536; LG80ER0006-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 01/3

The Advanced Civil/Military Aircraft ACMA is envisioned as an advanced technology cargo aircraft with the potential for fulfilling the needs of both military airlift and commercial air freight in the 1990's and beyond. The ultimate goal of the Design Options Sudy is the development of fundamental information regarding both the military and commercial cost and effectiveness implications of the most significant transport aircraft functional design features. This volume, the Executive Summary of the Design Options Study Final Report, presents an overview of the requirements of potential users of the ACMA and a brief summary of the results of the study. GRA

N81-10057# Lockheed-Georgia Co., Marietta. Advanced Concepts Dept.

DESIGN OPTIONS STUDY. VOLUME 2: APPROACH AND SUMMARY RESULTS Final Report

W. T. Mikolowsky, L. W. Noggle, H. J. Abbey, L. A. Adkins, and H. A. Bricker Sep. 1980 177 p refs
(Contract F33615-78-C-0122)
(AD-A089537; LG80ER0007-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 01/3

Background information for the requirement for the advanced civil military aircraft (ACMA) is given and the approach used to investigate transport aircraft design options is described. The initial qualitative assessment used to reduce the scope of the study and the results of the detailed analyses are summarized. These results include estimates of the effects on aircraft geometry and efficiency, military effectiveness, and both civil and military costs for incorporating in the ACMA each of the design options identified in the qualitative assessment. GRA

N81-10058# Lockheed-Georgia Co., Marietta. Advanced Concepts Dept.

DESIGN OPTIONS STUDY. VOLUME 3: QUALITATIVE ASSESSMENT Final Report

W. T. Mikolowsky, H. J. Abbey, L. A. Adkins, H. A. Bricker, and E. W. Caldwell Sep. 1980 177 p refs
(Contract F33615-78-C-0122)
(AD-A089538; LG80ER0008-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 01/3

All functional design features and associated options that have a potential impact on military/commercial commonality of the advanced civil military aircraft are qualitatively assessed. Functional areas considered include basic aircraft performance, ground interface, airfield compatibility, cargo compartment, inflight refueling, personnel accommodations, and military/civil design criteria. Based on this assessment, the following features are recommended for further analysis: design payload, loading/unloading apertures, planform shape of the cargo compartment, floor height, takeoff distance/gear flotation, noise characteristics/engine-out climb gradient, cargo-envelope maximum height, passenger provisions, maximum structural payload, service life specifications, cargo compartment pressurization, and cargo accommodation provisions. GRA

N81-10059# Lockheed-Georgia Co., Marietta. Advanced Concepts Dept.

DESIGN OPTIONS STUDY. VOLUME 4: DETAILED ANALYSES SUPPORTING APPENDICES Final Report

W. T. Mikolowsky, H. J. Abbey, L. A. Adkins, H. A. Bricker, and E. W. Caldwell Sep. 1980 202 p refs
(Contract F33615-78-C-0122)
(AD-A089539; LG80ER0009-Vol-4) Avail: NTIS HC A10/MF A01 CSCL 01/3

Nonproprietary information and study methods are presented. The baseline aircraft that serves as the basis for the qualitative assessment is described, as well as the computer methods used to assist in the redesign of aircraft incorporating each design option. GRA

N81-10060# Naval Postgraduate School, Monterey, Calif.

THE USE OF PARAMETRIC COST ESTIMATING RELATIONSHIPS AS THEY PERTAIN TO AIRCRAFT AIRFRAMES: A NEW PERSPECTIVE M.S. Thesis

Bruce Robert Bennett Mar. 1980 47 p refs
(AD-A089525) Avail: NTIS HC A03/MF A01 CSCL 14/1

The purpose of this thesis was to review cost estimating relationships that have been developed and used for aircraft airframe costs, to identify existing problems, and where appropriate, to suggest alternatives for the future application of cost estimating relationships to aircraft airframes. Mahalanobis distance was explored as a means of complementing the more traditional statistical measures for regression analysis. This study supports the conclusion that cost estimating relationships should be developed for a specific system to be estimated, and that Mahalanobis distance is a potentially effective tool by which the analyst may address the important issue of analogy between the data base and the proposed system. GRA

N81-10061# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.

PRELIMINARY AIRWORTHINESS EVALUATION AH-1S HELICOPTER WITH OGEE TIP SHAPE ROTOR BLADES Final Report, Nov. 1979 - Apr. 1980

Gary L. Bender, Henry Arnaiz, David Ottomeyer, Ralph Woratschek, Larry Higgins, and John S. Tulloch May 1980 40 p refs
(AD-A089625; USAAEFA-77-25) Avail: NTIS HC A03/MF A01 CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted a Preliminary Airworthiness Evaluation of the AH-1S helicopter with OGEE tip-shape main rotor blades to determine if any improvement in performance or handling qualities resulted from replacing the K747 blades. Additionally, the acoustics signature of the OGEE blades were measured by the US Army Research and Technology Laboratories (Aeromechanics Lab). Tests were conducted at Edwards Air Force Base (elevation 2302 feet) and Coyote Flats (elevation 9980 feet), California from 1 November 1979 through 8 April 1980. Forty-five test flights were flown for a total of 36.6 productive hours (63.2 total hours). Both hover and level flight performance were degraded by installation of OGEE tip-shape main rotor blades. Low-speed handling qualities were unaffected by the OGEE blades. Other handling qualities tests were not accomplished. Results of acoustics tests will be reported by the laboratories under a separate cover. GRA

N81-10062# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flaechenflugzeuge.

AN ANALYTICAL STUDY OF LANDING FLARE

Guenther Knorr and Knut Wilhelm Sep. 1979 77 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-656)
(DFVLR-FB-79-40) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 15,20

The relation between landing flare and the specific dynamic characteristics of an aircraft as studied. A simple behavioral law is used to obtain analytical solutions for state variables. Both conventional flare maneuver operations and coupled control operations are investigated. The effects of wind shear on landing flare are also demonstrated. Analytical solutions applicable to a transport aircraft are discussed; these solutions lead to a definition of the time range for flare initiation. Author (ESA)

N81-10063# Illinois Univ. at Urbana-Champaign. Coordinated Science Lab.

OPTIMIZED COMPUTER SYSTEMS FOR AVIONICS APPLICATIONS Final Technical Report, 1 Feb. - 30 Sep. 1979

R. T. Chien and L. J. Peterson Feb. 1980 175 p refs
(Contract F33615-78-C-1559; AF Proj. 2003)
(AD-A089570; AFAL-TR-79-1235) Avail: NTIS HC A08/MF A01 CSCL 09/5

The main purpose of this project is to investigate the commonalities among the four subareas of signal processing, namely, radar, communications, image processing and electronic warfare; and to establish possible common functional descriptions as the basis for a common architecture. An extensive search was made to list all important kernels and algorithms in radar, communications and image processing. These kernels and algorithms were carefully analyzed with respect to their computational complexity and identification of commonality for architectural purposes. It was discovered that significant commonalities do exist in many areas. These common areas represent significant overlap and commonality which can be utilized in a common architecture. GRA

N81-10064# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.

SYSTEM SIMULATION APPLIED TO THE EVALUATION OF DISPLAYS FOR GUIDANCE AND CONTROL

Uwe Teegen (Technische Univ., Brunswick) Jun. 1979 62 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-659)
(DFVLR-Mitt-79-10) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 12,60

The development of displays for monitoring and controlling complex technical systems is facilitated by employing a computer simulation of the man-machine system during the theoretical design phase. A simulation model for the manual control task is described which leads to a method for evaluating displays. The capabilities and applications of this simulation model to a pilot airplane system restricted to aircraft motion in the vertical plane and a two channel pilot mode are presented. The results obtained suggest that the model should be further developed. Author (ESA)

N81-10065*# New England Research Application Center, Storrs, Conn.

GYROCOMPASSES. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1972 - Apr. 1980

C. Gilbert Young May 1980 165 p Sponsored by NASA and NTIS
(NASA-CR-163675; PB80-809023) Avail: NTIS HC $30.00/MF $30.00 CSCL 17G

Research on gyrocompasses and related areas, such as navigation, inertial navigation, gyrocompass design and construction, and gyrocompass systems is reported. Kalman and other types of electronic systems used in conjunction with the basic gyrocompass unit are also considered. Strap down systems are discussed. This bibliography contains 186 abstracts. GRA

N81-10067*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPARISONS OF FOUR ALTERNATIVE POWERPLANT TYPES FOR FUTURE GENERAL AVIATION AIRCRAFT

T. J. Wickenheiser, G. Knip, R. M. Plencner, and W. C. Strack Oct. 1980 50 p refs
(NASA-TM-81584; E-561) Avail: NTIS HC A03/MF A01 CSCL 21E

Recently completed NASA sponsored conceptual studies were culminated in the identification of promising new technologies for future spark ignition, diesel, rotary, and turbine engines. The results of a NASA in-house preliminary assessment study that compares these four powerplants types in several general aviation applications are reported. The evaluation consisted of installing each powerplant type in rubberized aircraft which are sized to accomplish fixed missions. The primary evaluation criteria include projected aircraft cost, total ownership cost, and mission fuel. Author

N81-10068# General Electric Co., Lynn, Mass. Aircraft Engine Group.

MARITIME PATROL AIRCRAFT ENGINE STUDY. GENERAL ELECTRIC DERIVATIVE ENGINES. VOLUME 2: APPENDIX A. PERFORMANCE DATA - GE27/T3 STUDY A1 TURBOPROP Final Report, Oct. 1978 - Apr. 1979

R. Hirschkron, R. H. Davis, and R. E. Warren 30 Apr. 1979 81 p
(Contract N62269-78-C-0414)
(AD-A089336; R79AEG052-Vol-2; NADC-79133-60-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 21/5

This study developed data on General Electric common core derivative engines for use in Maritime Patrol Aircraft (MPA) concept formulation studies. The study included the screening of potential General Electric turbofan and turboprop/turboshaft engines and the preparation of technical and planning information on three of the most promising engine candidates. Screening of General Electric derivative candidates was performed utilizing an analytical MPA model using synthesized mission profiles to rank the candidates in terms of fuel consumption, weight, cost and complexity. The three turboprop engines selected for further study were as follows: TF34 growth derivative version with boost and new LPT (TF34/T7 Study A1), F404 derivative with booster stages and new LPT (F404/T1 Study A1), and GE27 scaled and boosted study engine (GE27/T3 Study A1). Volume 1 summarizes the screening analysis and contains technical, planning, installation, cost and development data for the three selected turboprop engines. Volumes 2, 3 and 4 of this report contain the detailed performance data estimates for the GE27/T3 Study A1, TF34/T7 Study A1 and F404/T1 Study A1 turboprop engines, respectively. GRA

N81-10069# General Electric Co., Lynn, Mass. Aircraft Engine Group.

MARITIME PATROL AIRCRAFT ENGINE STUDY. GENERAL ELECTRIC DERIVATIVE ENGINES. VOLUME 3: APPENDIX B. PERFORMANCE DATA - TF34/T7 STUDY A1 TURBOPROP Final Report, Oct. 1978 - Apr. 1979

R. Hirschkron, R. H. Davis, and R. E. Warren 30 Apr. 1979 81 p
(AD-A089279; R79AEG052-Vol-3; NADC-79133-60-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 21/5

This study developed data on General Electric common core derivative engines for use in Maritime Patrol Aircraft (MPA) concept formulation studies. The study included the screening of potential General Electric turbofan and turboprop/turboshaft engines and the preparation of technical and planning information on three of the most promising engine candidates. Screening of General Electric derivative candidates was performed utilizing an analytical MPA model using synthesized mission profiles to rank the candidates in terms of fuel consumption, weight, cost and complexity. The three turboprop engines selected for further study were as follows: TF34 growth derivative version with boost and new LPT (TF34/T7 Study A1), F404 derivative with booster stages and new LPT (F404/T1 Study A1), and GE27 scaled and boosted study engine (GE27/T3 Study A1). Volume 1 summarizes the screening analysis and contains technical, planning, installation, cost and development data for the three selected turboprop engines. Volumes 2, 3 and 4 of this report contain the detailed performance data estimates for the GE27/T3 Study A1, TF34/T7 Study A1 and F404/T1 Study A1 turboprop engines, respectively. GRA

N81-10070# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

AN ANALYSIS OF AIR FORCE MANAGEMENT OF TURBINE ENGINE MONITORING SYSTEMS (TEMS) M.S. Thesis

Elbert B. Hubbard, III and Gregory A. Swecker Jun. 1980 118 p refs

(AD-A089365: AFIT-LSSR-68-80) Avail: NTIS HC A06/MF A01 CSCL 21/5

Turbine Engine Monitoring Systems (TEMS) are engine health monitoring and diagnostic tools being developed and tested for use on Air Force engines in order to improve and reduce the cost of engine maintenance and management and to aid in the implementation of On Condition Maintenance. Previous researchers have described the major features of TEMS, analyzed the results of development and test efforts, and identified problems which must be overcome. This study examines the problem of fragmentation which exists in the Air Force management of TEMS development and testing. The authors describe and analyze the overall Air Force management of TEMS. Management problems were identified and classified into three major areas: structure and role problems, information flow and integration problems, and leadership and command problems. Four alternative management concepts were analyzed. Based on this analysis, the authors recommend that the management structure be modified, and a TEMS Task Force be established to more effectively utilize TEMS for Air Force engine maintenance and management. GRA

N81-10072# AiResearch Mfg. Co., Phoenix, Ariz.

COMPOUND CYCLE TURBOFAN ENGINE (CCTE). TASK 9: CARBON-SLURRY FUEL COMBUSTION EVALUATION PROGRAM Final Report, Jun. - Sep. 1979

T. W. Bruce and H. Mongia Mar. 1980 101 p refs
(Contract F33657-77-C-0391)
(AD-A089451; Rept-21-3365-A; AFWAL-TR-80-2035) Avail: NTIS HC A06/MF A01 CSCL 21/4

The carbon slurry fuel evaluation program demonstrated the feasibility of running a currently available carbon slurry fuel in a combustion rig and a turbine engine. This program also established the preliminary design criteria for operating on carbon slurry fuels. Subcontracts work was performed by Pennsylvania State for fuel droplet measurements and by Suntech, Inc. for fuel development and manufacture. GRA

N81-10073# Detroit Diesel Allison, Indianapolis, Ind.

FUEL CHARACTER EFFECTS ON CURRENT, HIGH PRESSURE RATIO, CAN-TYPE TURBINE COMBUSTION SYSTEMS Final Report, Jun. 1978 - Jun. 1979

Rodney E. Vogel, Dennis L. Troth, and Albert J. Verdouw Wright-Patterson AFB, Ohio AFAPL Apr. 1980 163 p refs
(Contract F33615-78-C-2006; AF Proj. 3048)
(AD-A089182; DDA-EDR-9762; AFAPL-TR-79-2072; AFESC/ESL-TR-79-29) Avail: NTIS HC A08/MF A01 CSCL 21/4

The effect of limited fuel property variation on the performance of current, high pressure ratio, can type combustors was evaluated. The TF41 turbofan combustor was employed. This combustor has conventional, dual orifice fuel injection and film cooling. The combustion zone is approximately stoichiometric at takeoff. Twelve experimental fuels, including JP-4 and JP-8, were tested. Distillation range, hydrogen content, and aromatic type were varied by blending JP-4 and JP-8 fuels with mineral seal oil and two types of aromatic solvents. Performance tests were accomplished at idle, altitude cruise, dash, and takeoff conditions. Sea level altitude ignition tests were also completed. Fuel fouling and carboning characteristics were established. Combustor operating parameters such as linear temperature, pattern factor, ignition fuel/air ratio, lean blow out fuel/air ratio, and exhaust emissions were correlated to fuel properties. The effect of fuel properties on combustor and turbine hardware durability was assessed analytically. GRA

N81-10074# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.

DISK RESIDUAL LIFE STUDIES. PART 2: TF30 10TH-STAGE COMPRESSOR DISK (INCOLOY 901) Final Report, 1 Apr. 1976 - 30 Jun. 1979

J. S. Cargill, J. K. Malpani, and Y. W. Cheng Dec. 1979 96 p refs
(Contract F33615-76-C-5172; AF Proj. 7351)
(AD-A089524; PWA-FR-11878-Pt-2; AFML-TR-79-4173-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 21/5

A residual fatigue life prediction method, suitable for retirement for cause application, has been developed for two p WA turbine disks the F100 1st-stage high pressure turbine disk and the TF30 10th-stage compressor disk. The method is based upon interaction of fracture mechanics crack propagation modeling concepts with laboratory nondestructive evaluation NDE hyperbolic sine SINH model refined during an earlier Air Force Materials Laboratory AFML program. Stress intensity K solution for the eingine components were based upon experimental effective K determinations made during full-scale component fatigue tests. The NDE techniques developed for disk inspections included acoustic emission AE, eddy current EC, and fluorescent penetrants FP. Stress-enhanced penetrant and semi-automated rotating probe EC techniques were developed as periodic inspections, while the AE time-domain technique was developed as a real-time inspection tool. GRA

N81-10075# Rolls-Royce Ltd., Derby (England).

QUANTITATIVE THERMOGRAPHY IN AERO-ENGINE RESEARCH AND DEVELOPMENT

M. Hilton 1980 21 p
(PNR-90021) Avail: NTIS HC A02/MF A01

The use of a recording thermograph to study an engine exhaust unit which is suspected of having thermal gradients of sufficient severity to cause local distortion is described. Temperature measurements obtained from color contoured thermograms are compared with thermocouples embedded in the exhaust unit. The data processing and analysis techniques are described together with the problems encountered when correlating the Thermovision results with those obtained from the thermocouples. Reasons for the discrepancies are discussed with an assessment of the problem magnitude and possible means of overcoming them in future applications. Author (ESA)

N81-10076# New England Research Application Center, Storrs, Conn.

AXIAL FLOW COMPRESSORS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Apr. 1980

Robert Hippler May 1980 140 p Sponsored in part by NTIS
(PB80-808611) Avail: NTIS HC $30.00/MF $30.00 CSCL 21E

Axial flow compressors used in jet engines, gas turbines, turbo fans, ultra centrifuges and other turbomachinery are discussed in approximately 123 citations. Design, blades and rotors, materials, flow measurement, performance and applications are included. GRA

N81-10077*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A PILOTED SIMULATOR INVESTIGATION OF STATIC STABILITY AND STABILITY/CONTROL AUGMENTATION EFFECTS ON HELICOPTER HANDLING QUALITIES FOR INSTRUMENT APPROACH

J. V. Lebacqz, R. D. Forrest, and R. M. Gerdes Sep. 1980 393 p refs
(NASA-TM-81188; FAA-RD-8064; A-8125) Avail: NTIS HC A17/MF A01 CSCL 01C

A motion base simulator was used to compare the flying qualities of three generic single rotor helicopters during a full attention to flight control task. Terminal area instrument approaches were flown with and without turbulence. The turbulence of helicopter static stability was investigated in terms of the values of cockpit control gradients as specified in the existing airworthiness criteria. The effectiveness of several types of stability control augmentation systems in improving the instrument flight rules capability of helicopters with reduced static stability was examined. Two levels of static stability in the pitch, roll, and yaw axes were examined for a hingeless rotor configuration; the variations were stable and neutral static stability in pitch and roll, and two levels of stability in yaw. For the lower level of static stability, four types of stability and control augmentation were examined for helicopters with three rotor types: hingeless, articulated, and teetering. S.F.

N81-10078# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Flaechenflugzeuge.
FLIGHT TEST RESULTS OF THE HFB 320 MODEL FOLLOWING CONTROL SYSTEM FOR THE IN-FLIGHT SIMULATION OF AIRBUS A 130
Sep. 1979 76 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-660)
(DFVLR-Mitt-79-13) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 15,40

The programming of the airborne computer is discussed. The effects on nonlinearities were demonstrated from the results of ground-based simulation of the test aircraft, model and control system. The high quality of the A 310 model aircraft simulation is confirmed from the flight-test results obtained. Examples are presented in which the ground based simulation technique is used to predict flight test results. Author (ESA)

N81-10079# Naval Construction Battalion Center, Port Hueneme, Calif.
FIBERGLASS-REINFORCED RIGID POLYURETHANE EXPEDIENT PAVEMENT SUBJECT TO SIMULATED F-4 AIRCRAFT TRAFFIC
P. S. Springston May 1980 65 p refs
(YF53536091)
(AD-A089266; CEL-TN-1578) Avail: NTIS HC A04/MF A01 CSCL 11/2

A multipurpose expedient paving system is being developed to enable more rapid construction of expeditionary airfields by Marine Corps forces engaged in an amphibious landing. Previous research has resulted in a conceptual pavement, FIBERMAT, which consists of a facing of fiberglass-reinforced polyester resin (FRP) bonded to a core of fiberglass-reinforced rigid polyurethane foam. FIBERMAT has been subjected to a series of laboratory tests to define response to stress fatigue and environmental cycling. A similar structural sandwich of FRP and rigid polyurethane foam has been tested and found to meet F-4 aircraft static load, tailhook impact, and engine exhaust blast requirements. This report documents the results of a traffic test conducted on a section of FIBERMAT having a 5 inch thick fiberglass-reinforced foam core and a 1/4 inch thick FRP facing. Distributed traffic was applied to the test section with a load cart which simulated a main gear of an F-4 aircraft. The cart was equipped with a 30-7.7, 18 plyrating tire inflated to 265 psi and loaded to 27,000 pounds. The first failure within the test section was recorded at 136 coverages (1,306 passes) of the load cart, and the entire test section was considered failed at 310 coverages (2,141 passes). GRA

N81-10080# Battelle Columbus Labs., Ohio.
POLYMER RESEARCH IN RAPID RUNWAY REPAIR MATERIALS Final Report, Jan. - Oct. 1979
Manfred Luttinger, Charles W. Kistler, Jr., Henry M. Grotta, and Richard G. Sinclair Tyndall AFB, Fla. Air Force Engineering and Service Lab. Nov. 1979 93 p refs
(Contract F08635-79-C-0040)
(AD-A089606; AFESC/ESL-TR-79-43) Avail: NTIS HC A05/MF A01 CSCL 11/1

Low viscosity, two-component epoxy resins were formulated for airless spray application over quartz or dolomite aggregates. The formulation selected for full evaluation was based on mercaptan curing systems. Trifunctional acrylate monomers were used in some formulations as modifiers. The resulting polymer concrete set up within 3 to 4 minutes after mixing at temperatures around 73 degrees F. Good cures within 1/2 hour of mixing can be obtained in wet environments down to 5 degrees C and in dry environments down to -25 degrees C. Good adhesion to wet aggregates requires the use of coupling agents, organofunctional silanes being preferred. Good bonding to asphalt and Portland cement concrete and good wear characteristics were demonstrated. Flexural strength properties are satisfactory after cool down both under dry and wet application conditions. While the polymer concrete is hot due to the exotherm of the curing reaction, flexural strength properties are low. GRA

N81-10081# Systems Research Labs., Inc., Dayton, Ohio. Aerosystems Group.
AIRCRAFT ENGINE NACELLE FIRE TEST SIMULATOR. VOLUME 1: TECHNICAL Final Report, Sep. 1976 - Apr. 1980
Karlheinz O. W. Ball, Dennis B. Burnsides, Rolf D. Hegele, and Paul R. Hughes Apr. 1980 81 p
(Contract F33615-76-C-2084; AF Proj. 3048)
(AD-A089629; AFWAL-TR-80-2055-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 14/2

This report describes the design, installation, and initial checkout of the Aircraft Engine Nacelle Fire Test Simulator. This facility was designed to realistically reproduce the environments and combustion related phenomena encountered within an engine nacelle. The facility provides both heating and cooling of the inlet air, heating of the engine case, control of air velocity and air pressure, and for the injection of fluids, combustibles or extinguishants. The report presents the final implementation of the system and details the hardware installation, the control system, and the software needed to provide integrated control, safety, and data acquisition. Only limited checkout was possible due to the failure of the air compression and the cleaning and modification efforts required to return the system to a safe operating level. GRA

N81-10083# National Technical Information Service, Springfield, Va.
AIRFIELD PAVEMENT EVALUATION. CITATIONS FROM THE NTIS DATA BASE Progress Report, Jul. 1975 - Jun. 1980
Guy E. Habercom, Jr. Jul. 1980 211 p Supersedes NTIS/PS-79/0754; and NTIS/PS-78/0685
(PB80-812860; NTIS/PS-79/0754; NTIS/PS-78/0685) Avail: NTIS HC $30.00/MF $30.00 CSCL 01E

The bibliography contains abstracts of Government sponsored research reports relative to airfield pavement structures. Durability, wear resistance, skid resistance and surface qualities are analyzed and evaluated. This updated bibliography contains 202 citations, 12 of which are new entries to the previous edition. GRA

N81-10128# National Bureau of Standards, Washington, D.C. Center for Fire Research.
IGNITION OF A LIQUID FUEL Final Progress Report, 1 May 1978 - 30 Sep. 1979
Takashi Kashiwagi, Howard R. Baum, and John A. Rockett Jan. 1980 78 p refs
(Grant AF-AFOSR-0006-79; AF Proj. 2308)
(AD-A089295; AFOSR-80-0476TR) Avail: NTIS HC A05/MF A01 CSCL 20/5

This report summarizes progress in the study of ignition of a liquid fuel under high intensity radiation. It describes an experimental study of the key processes during ignition and a theoretical modeling study of part of the phenomena during the ignition period. The experiments were conducted using a CW CO2 laser with incident fluxes from 1000 to 5000 W/sq cm and n-decane as the flammable liquid. High speed photographs of ignition events showed a periodic depression in the decane surface, probably caused by the thrust of the strong decane vapor flux; radial outward motion of the liquid, probably caused by a surface tension, gradient was also observed. The first appearance flame was in the gas phase well above the surface. The proposed autoignition mechanism of decane by the CO2 laser is the absorption of the incident laser beam by the vapor plume. The effect on ignition of the incident angle of the laser beam with respect to the decane surface was studied from 90 to 30 degrees. On reducing the incident angle, the ignition delay time becomes longer and the minimum incident flux for ignition increases significantly. A theoretical model describing the flow motion in the gas phase caused by a heated surface was calculated numerically and solved analytically. GRA

N81-10152# Boeing Military Airplane Development, Seattle, Wash. Advanced Aircraft Branch.
CAST ALUMINUM STRUCTURES TECHNOLOGY (CAST). TECHNOLOGY TRANSFER (PHASE 6) Summary Technical Report

James W. Faber Apr. 1980 255 p refs
(Contract F33615-76-C-3111)
(AD-A087492; D180-25725-1; AFWAL-TR-80-3020) Avail: NTIS HC A12/MF A01

Structural and manufacturing technologies, integrity, producibility, and viability of cast aluminum primary airframe structures are discussed. Preliminary design, manufacturing methods, detailed design, fabrication of demonstration articles and production hardware, structural test evaluation, and technology transfer are included. S.F.

N81-10168 Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.

ELASTOMERS USED IN AERONAUTICS INDUSTRY [LES ELASTOMERES UTILISES DANS L'INDUSTRIE AERONAUTIQUE]

G. Dallemagne Paris 11 Jun. 1980 25 p In FRENCH Presented at Stage Mater. Nonmetal., Jun. 1980
(SNIAS-801-551-105) Avail: NTIS HC A02

The physicochemical structure of elastomers is briefly examined. The performance of various elastomers under specific conditions is given. Their uses in various aircraft components and systems are discussed. Classification and standardization procedures are exposed together with the testing equipment employed and the results obtained. Author (ESA)

N81-10436# National Gas Turbine Establishment, Farnborough (England).

A METHOD OF PERFORMANCE PREDICTION FOR CENTRIFUGAL COMPRESSORS. PART 1: ANALYSIS. PART 2: COMPARISON WITH EXPERIMENT

M. V. Herbert London Feb. 1980 175 p refs Supersedes NGTE-M78029; ARC-38052; NGTE-M78031; ARC-38053
(ARC-R/M-3843; BR73151; NGTE-M78029; ARC-38052; NGTE-M78031; ARC-38053) Avail: NTIS HC A08/MF A01; HMSO £18 PHI

A method was developed capable of producing reasonably accurate stage characteristics, in terms of mass flow, pressure ratio, work input and efficiency, for any centrifugal compressor with radial outflow (i.e., with no axial component of velocity at outlet), given only overall geometric properties. The analytical treatment and assumptions used are presented along with the results of applying the method to various machines and comparison of the predictions with test data. Prediction of choking flow is generally satisfactory, and the mass flow/pressure ratio characteristics produced have substantially correct form, although no general means have been found of predicting the onset of surge. For the cases examined the error in predicted efficiency level is within 1 to 2 percent at design speed, sometimes more at low speed. Author (ESA)

N81-10437# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

INLET FLOW IN CENTRIFUGAL PUMPS AT PARTIAL DELIVERIES

Mete Sen Jun. 1979 9 p In FRENCH; ENGLISH summary Presented at Soc. Hydrotech. de France Session 113 on Comportement Dyn. des Turbomachines Hydrauliques, 20-21 Jun. 1979 Submitted for publication
(VKI-Preprint-1979-16) Avail: NTIS HC A02/MF A01

Pump design parameters influencing swirling reverse flow were investigated. Several impellers were developed and tests were performed to investigate inlet flow characteristics. An important parameter is called the Pump's Critical Delivery which corresponds to the onset of swirling reverse flow at the tip of the blade's leading edge. The results showed uniform aerodynamic hub to tip blade loading to be the most important criterion associated with low critical deliveries. High critical deliveries are obtained with a high aerodynamic blade loading at the tip. Head stability is not related to swirling reversed flow. A relation does, however, exist between shaft power and reverse flow. Author (ESA)

N81-10441# New England Research Application Center, Storrs, Conn.

AXIAL FLOW COMPRESSORS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1974 - Apr. 1980

Robert Hippler May 1980 217 p Sponsored in part by NTIS
(PB80-808603) Avail: NTIS HC $30.00/MF $30.00 CSCL 13G

Various axial flow compressors, used in jet engines, gas turbines, turbo fans, ultra centrifuges, and in other turbo machinery, are treated in these abstracts. Citations center on design, including blades and rotors, and materials, measurements of flow, performance, and applications. This bibliography contains 200 citations. GRA

N81-10446# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

A CONTROLLED EVALUATION OF THE DIFFERENCES BETWEEN TWO APPROACHES TO RELIABILITY INVESTMENT SCREENING M.S. Thesis

Russell M. Genet and John M. Wallace Jun. 1980 73 p refs
(AD-A087506; AFIT-LSSR-36-80) Avail: NTIS HC A04/MF A01 CSCL 14/1

There is a continuing concern about the high aircraft support cost and poor availabilities caused by some aeronautical equipments. It is generally accepted that basic research, engineering development, and improvements in fielded equipments should concentrate on high burner types of equipment. This has been countered by the suggestion that the emphasis would be better placed on those equipment types with the highest return on investment. An experiment was conducted, using data from over 20,000 aeronautical equipments, to determine if the high burner and return on investment approaches really emphasize different equipment types. It was found that, in fact, different equipment types were emphasized. The high burner approach emphasized jet engines, radar sets, etc., while the return on investment approach emphasized valves and actuators, fuel gauges, and other mundane but troubelsome equipments. These research findings suggest that a change in policy might be appropriate. GRA

N81-10454# Politecnico di Milano (Italy).

EVALUATION OF SECTION PROPERTIES FOR HOLLOW COMPOSITE BEAMS

Vittorio Giavotto, Marco Borri, Luigi Puccinelli, Vittorio Caramaschi (Construzioni Aeronautiche Giovanni Agusta S. P. A. Cascina Costa di Samarate, Italy), and Francesco Mussi (Construzioni Aeronautiche Giovanni Agusta S. P. A. Cascina Costa di Samarate, Italy) 7 Sep. 1979 30 p refs Presented at the Fifth European Rotorcraft and Powered Lift Aircraft Forum, Amsterdam, 4-7 Sep. 1979
(Paper-Nr-35) Avail: NTIS HC A03/MF A01

The plan for the development and the validation of design procedures for composite beam-like structures and structural components is described. Analytical as well as experimental results are reported. The development of the program HANBA (Hollow Anisotropic Beam Analysis) which, based on an original displacement method approach, allows the evaluation of section stiffnesses and stresses is presented. The program works on a finite element idealization of the beam section and computes the stresses from the resultant forces and moments acting on the particular section, as the usual engineer's beam theory. Experimental results mainly concern the identification of elastic properties for composite laminates, at relativevly low stress levels, and the validation of the results of the program HANBA. Analytical results compare very well with experimental ones, the largest differences in section stiffenesses so far evaluated being of the order of 1%. The plan is still going on and future activities are also outlined in the paper. R.K.G.

N81-10576*# National Aeronautics and Space Administration, Washington, D. C.

SURVEY POPULATION RESPONSE TO AIRPLANE NOISE, PART 1

C. Bitter and K. W. Schwager May 1980 71 p Transl. into ENGLISH from Enouete Reacties Bevolking op Vliegtuiglawaai, (Leiden), Aug. 1964 69 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Institute for Health Techniques, TNO, Netherlands

(Contract NASw-3199)
(NASA-TM-75790; Rept-D-19) Avail: NTIS HC A04/MF A01 CSCL 13B

A questionnaire concerning aircraft noise is presented. The tabulated responses to it are also presented. T.M.

N81-10577*# National Aeronautics and Space Administration, Washington, D. C.

ANNOYANCE FROM LIGHT AIRCRAFT INVESTIGATION CARRIED OUT AROUND FOUR AIRPORTS NEAR PARIS

Apr. 1980 55 p refs Transl. into ENGLISH of La gene causee par laviation legere-enquete effectuee autour de quatre aerodromes de la region parisienne Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Centre Ketudes et de Recherches Pyschologiques Air and Analyse, Recherche et Conseil en Marketing et Communication (Paris)
(Contract NASw-3199)
(NASA-TM-75823) Avail: NTIS HC A04/MF A01 CSCL 13B

An opinion survey was carried out on residents living near four airports in the Paris, France area. An evaluation of their responses concerning noise pollution and possible expansion of airport activity is presented. L.F.M.

N81-10578# Committee on Public Works and Transportation (U. S. House).

AVIATION SAFETY AND NOISE ABATEMENT

Washington GPO 1979 448 p refs Hearings on H. R. 2458, H. R. 3547 and H. R. 3596 Before the Subcomm. on Aviation of the Comm. on Public Works and Transportation, 96th Congr., 1st Sess., 24 Apr. and 1 May 1979
(GPO-50-923) Avail: Subcommittee on Aviation

The 1979 hearings before the House subcommittee on aviation considering legislation to establish noise reduction and safety programs are presented. Three bills are introduced and examined, the general proposal of each being to provide Federal assistance to airport operators to prepare and carry out noise compatibility programs and to provide assistance to assure continued safety in aviation. Both indirect methods of noise abatement involving land use and flight pattern control and direct aircraft engineering investigations are addressed. M.G.

N81-10580# Air Force Engineering and Services Center, Tyndall AFB, Fla. Environics Div.

FUEL JETTISONING BY U.S. AIR FORCE AIRCRAFT. VOLUME 1: SUMMARY AND ANALYSIS Final Technical Report, Feb. 1972 - Dec. 1979

Harvey J. Clewell, III Mar. 1980 60 p refs
(AF Proj. 1900)
(AD-A089010; AFESC/ESL-TR-80-17-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 13/2

An analysis of 3 1/2 years of data on fuel jettisoning by US Air Force aircraft was performed to provide the basis for an accurate assessment of the environmental effects associated with this practice. The nature and extent of US Air Force jettisoning was examined, and the principal commands, aircraft, locations, altitudes, and quantities were identified. The reasons for fuel jettisoning were also investigated, and the relative importance of fuel jettisoning as a source of hydrocarbon pollution was estimated, considering both the possibility of ground contamination by liquid fuel, and the potential for production of photochemical oxidant pollution from the vapors. The analysis indicates that current Air Force policies concerning fuel jettisoning are adequate to minimize any negative environmental consequences, and that Air Force operational practices are in keeping with these policies. Fuel jettisoning as carried out by Air Force aircraft does not appear to produce any serious environmental consequences. GRA

N81-10581# Air Force Engineering and Services Center, Tyndall AFB, Fla. Environics Div.

FUEL JETTISONING BY U.S. AIR FORCE AIRCRAFT. VOLUME 2: FUEL DUMP LISTINGS Final Technical Report, Feb. 1972 - Dec. 1979

Harvey J. Clewell, III Mar. 1980 186 p refs 2 Vol.
(AF Proj. 1900)
(AD-A089076; AFESC/ESL-TR-80-17-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 13/2

An analysis of 3 1/2 years of data on fuel jettisoning by US Air Force aircraft was performed to provide the basis for an accurate assessment of the environmental effects associated with this practice. This volume contains complete listings of all reported fuel dumps by Air Force aircraft for the period 1 Jan 75 through 30 Jun 78, sorted by Air Force command and by aircraft. A third section presents the distribution of fuel jettisoning by latitude and longitude coordinates. GRA

N81-10636*# FWG Associates, Inc., Tullahoma, Tenn.

PILOT-AIRCRAFT SYSTEM REPONSE TO WIND SHEAR Interim Report

Barry S. Turkel and Walter Frost Washington NASA Nov. 1980 98 p refs
(Contract NAS8-33458)
(NASA-CR-3342) Avail: NTIS HC A05/MF A01 CSCL 04B

The nonlinear aircraft motion and automatic control model is expanded to incorporate the human pilot into simulations of aircraft response to wind to wind shear. The human pilot is described by a constant gains lag filter. Two runs are carried out using pilot transfer functions. Fixed-stick, autopilot, and manned computer simulations are made with an aircraft having characteristics of a small commuter type aircraft flown through longitudinal winds measured by a Doppler radar beamed along the glide slope. Simulations are also made flying an aircraft through sinusoidal head wind and tail wind shears at the phugoid frequency to evaluate the response of manned aircraft in thunderstorm wind environments. S.F.

N81-10807*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NEW INTERPRETATIONS OF SHOCK-ASSOCIATED NOISE WITH AND WITHOUT SCREECH

U. vonGlahn 21 Nov. 1980 25 p refs To be presented at the 100th Meeting of the ASA, Los Angeles, 17-21 Nov. 1980
(NASA-TM-81590; E-569) Avail: NTIS HC A02/MF A01 CSCL 20A

Anomalous trends in present convergent nozzle (Mach 1) shock associated noise analyses and predictions, with particular emphasis on the roles of screech and jet temperature, are discussed. Experimentally measured values of shock associated noise are used to reassess data trends, including both frequency and sound pressure level. The data used includes model-scale nozzles, varying in nominal diameter from 5 cm to 13 cm, and full scale engine nozzles up to 48 cm. All data were obtained at static conditions. From this reassessment of the measured data, new empirical methods for the prediction of shock associated noise are developed. Separate procedures are presented for screech free and screech contaminated shock associated noise. In the present approach, shock associated noise spectra are developed from considerations that include the peak sound pressure level and its frequency, the low frequency sound pressure level slope, and the high frequency sound pressure level slope or roll-off; the latter is shown to vary with directivity angle. Author

N81-11013*# Kentron International, Inc., Hampton, Va.

PRELIMINARY DESIGN CHARACTERISTICS OF A SUBSONIC BUSINESS JET CONCEPT EMPLOYING AN ASPECT RATIO 25 STRUT BRACED WING

R. V. Turriziani, W. A. Lovell, G. L. Martin, J. E. Price, E. E. Swanson, and G. F. Washburn Oct. 1980 101 p refs
(Contract NAS1-16000)
(NASA-CR-159361) Avail: NTIS HC A06/MF A01 CSCL 01A

The advantages of replacing the conventional wing on a transatlantic business jet with a larger, strut braced wing of aspect ratio 25 were evaluated. The lifting struts reduce both the induced drag and structural weight of the heavier, high aspect ratio wing. Compared to the conventional airplane, the strut braced wing design offers significantly higher lift to drag ratios achieved at higher lift coefficients and, consequently, a combination of lower speeds and higher altitudes. The strut braced wing airplane provides fuel savings with an attendant increase in construction costs. Author

N81-11014*# Boeing Vertol Co., Philadelphia, Pa.
FULL SCALE WIND TUNNEL INVESTIGATION OF A BEARINGLESS MAIN HELICOPTER ROTOR Final Report
10 Oct. 1980 608 p refs
(Contract NAS2-10333)
(NASA-CR-152373; D210-11659-1) Avail: NTIS HC A99/MF A01 CSCL 01A

A stability test program was conducted to determine the effects of airspeed, collective pitch, rotor speed and shaft angle on stability and loads at speeds beyond that attained in the BMR/BO-105 flight test program. Loads and performance data were gathered at forward speeds up to 165 knots. The effect of cyclic pitch perturbations on rotor response was investigated at simulated level flight conditions. Two configuration variations were tested for their effect on stability. One variable was the control system stiffness. An axially softer pitch link was installed in place of the standard BO-105 pitch link. The second variation was the addition of elastomeric damper strips to increase the structural damping. The BMR was stable at all conditions tested. At fixed collective pitch, shaft angle and rotor speed, damping generally increased between hover and 60 knots, remained relatively constant from 60 to 90 knots, then decreased above 90 knots. Analytical predictions are in good agreement with test data up to 90 knots, but the trend of decreasing damping above 90 knots is contrary to the theory. A.R.H.

N81-11016# ARO, Inc., Arnold Air Force Station, Tenn.
WIND TUNNEL INVESTIGATION OF THE AERODYNAMIC HYSTERESIS PHENOMENON ON THE F-4 AIRCRAFT AND ITS EFFECTS ON AIRCRAFT MOTION Final Report, 1 Oct. 1978 - 31 Oct. 1979
J. F. Herman and E. S. Washington AEDC Sep. 1980 96 p refs Sponsored by Air Force
(AD-A089851; AEDC-TR-80-10) Avail: NTIS HC A05/MF A01 CSCL 20/4

A wind tunnel test program and an analytical study were conducted to investigate aerodynamic hysteresis phenomena on the F-4 aircraft. The wind tunnel test was conducted in the Arnold Engineering Development Center (AEDC) Aerodynamic Wind Tunnel (4T) to investigate the source of aerodynamic hysteresis in static aerodynamic data. The wind tunnel test also provided data that were used in a motion simulation study of the effect of hysteresis on predicted aircraft motion. Static longitudinal lateral directional force and moment data and wing pressure data were obtained on a 0.5 scale model (without pylons or external stores) with various simulated leading-edge slats. These data include the effects of Mach number, angle of attack, model movement, and time dependence on the aerodynamic hysteresis characteristics. Data are presented for the Mach number range from 0.7 to 0.95 at angles of attack from -4 to 24 deg at zero deg sideslip angle and for sideslip angles from -12 to 12 deg at angles of attack of 5, 10, 15, and 20 deg. Six degrees of freedom motion simulation studies were used to assess the effect of hysteresis in the rolling-moment coefficient on the prediction of aircraft motion. Simulations of various flight maneuvers were conducted both with and without hysteresis in the aerodynamic data. GRA

N81-11017# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
A COMPARISON OF NEWTON-LIKE METHODS FOR THE TRANSONIC SMALL DISTURBANCE EQUATION
A. B. Stephens and A. G. Werschulz 24 Jun. 1980 20 p refs
(AD-A090270; NSWC/TR-80-271) Avail: NTIS HC A02/MF A01 CSCL 20/4

We investigate the efficiency of Newton's method and two variants of Newton's method for the numerical solution of the small disturbance equation of non-lifting transonic flow past a parabolic airfoil. In particular, it is shown that the efficiency of Newton's method can be substantially improved with respect to both storage and computational time if the Jacobian matrix is suitably altered. GRA

N81-11019# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
COMPARISON OF UNSTEADY PRESSURE FIELDS COMPUTED AND MEASURED ON THE ZKP MODEL
M. Couston, J. J. Angelini, and J. P. Meurzec Aug. 1980 21 p refs In FRENCH; ENGLISH summary Presented at the 50th Conf. of the Commission on Structures and Materials, Athens, Apr. 1980
(AGARD-R-688; ISBN-92-835-2107-2) Avail: NTIS HC A02/MF A01

The unsteady pressure fields prediction for a supercritical wing is considered from a bidimensional nonlinear method corrected for tridimensional interactions between strips using an asymptotic approximation. This approximation is derived for a wing with large aspect ratio and low sweep angle. An application of this method to a real case is described. Oscillation of the control surface on a rigid model in a transonic wind tunnel is considered. M.G.

N81-11020# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
THE TURBULENT WIND AND ITS EFFECT ON FLIGHT
Bernard Etkin Aug. 1980 93 p refs
(UTIAS-Review-44; CN-ISSN-0082-5247) Avail: NTIS HC A05/MF A01

An overview of the problems posed for aviation by turbulent winds is presented. The technical issues, especially for design, simulation and certification, are delineated and commented upon. The present state of knowledge of turbulence at altitude and of the wind and turbulence near the ground are reviewed. The input/response problem is discussed in depth, with special attention to the requirement for unsteady aerodynamics and how it can be fulfilled. The four point model of the airplane is introduced and developed, and an extension made to the existing spectral theory of response to two dimensional inputs. Passenger comfort, gust alleviation, and representation of turbulence in piloted flight simulators are discussed. S.F.

N81-11021# RANN, Inc., Palo Alto, Calif.
EXPLORATORY STUDY OF HAZARD MITIGATION AND RESEARCH IN THE AIR TRANSPORT SYSTEM Final Report
R. L. Bisplinghoff, P. G. Dembling, A. J. Eggers, Jr., C. W. Harper, and J. D. Young 31 Mar. 1980 99 p refs
(AD-A089204; EMW-00432) Avail: NTIS HC A05/MF A01 CSCL 13/12

The study examines a series of principles that may effectively mitigate technological hazards within the Air Transport System. These principles are: precise design criteria and verification of the standards which relate to an airplane:s operating environment; quality control in manufacturing with high levels of performance in design, construction, inspection, and maintenance of the system; periodic testing and evaluation of equipment and human elements to meet performance standards; training and education of key managers and operators in emergency procedures with emphasis in new systems and multi-problem hazards; establish communication modes linking key elements with institutions in the system to mitigate, respond, and recover from emergencies; a system of reporting incident and accident investigations in a prompt manner to allow for a coordinated recovery; and the system must be regulated, audited, and demonstrated frequently to protect public interest, including proper liability. These principles are then analyzed in three areas in which successful hazard mitigation will reduce the effects of increased technological applications. These topic areas include: design, construction, inspection, and maintenance; system development and operation; and liability and regulation. The study concludes that with the rapid development in high technology and with its subsequent rapid application to our national capability, technological hazards converge onto a wide variety of societies' activities. The report suggests that successful mitigation of technological hazards can be achieved through utilizing the previously outlined principles within the total air transport system environment. GRA

N81-11022# Federal Aviation Administration, Atlantic City, N.J.
SUMMARY OF FEDERAL AVIATION ADMINISTRATION

RESPONSES TO NATIONAL TRANSPORTATION SAFETY BOARD SAFETY RECOMMENDATIONS Quarterly Report, Apr. - Jun. 1980
J. R. Harrison et al Jul. 1980 167 p
(AD-A089971; FAA-ASF-80-2; ASF-300) Avail: NTIS HC A08/MF A01 CSCL 01/2

This report contains NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions. The table of contents for this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as 'closed' by the NTSB as a result of acceptable action). Accordingly, the table of contents may reflect a number of multiple recommendations (example: A-80-5 through 7), but background material is included only for those recommendations which remain in an 'open' status. Background information for those recommendations which have been closed is available in FAA headquarters files. GRA

N81-11023# Civil Aeronautics Board, Washington, D.C. Financial and Traffic Data Section.
AIRPORT ACTIVITY STATISTICS OF CERTIFICATED ROUTE AIR CARRIERS, CALENDAR YEAR 1979
31 Dec. 1979 357 p Prepared in cooperation with FAA, Washington, D.C.
(AD-A089748) Avail: NTIS HC A16/MF A01 CSCL 01/2

This report furnishes airport activity of the Certificated Route Air Carriers. Included in the data contained in Table 6 are passenger enplanements, tons of enplaned freight, express, and mail. Both scheduled and non-scheduled service, and domestic and international operations are included. These data are shown by airport and carrier. Table 7 includes departures by airport, carrier and type of operation, and type of aircraft. GRA

N81-11024# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
PROCEEDINGS OF THE 1979 SEMINAR ON AIR TRAFFIC CONTROL. TERMINAL RADAR APPROACH CONTROL (TRACON) FACILITY SUPERVISORY DESK COMPLEX Progress Report, Nov. 1979 - Feb. 1980
Paul Zito, John Goodwin, Felix Hierbaum, Michael Massimino, and Tom E. Zurinskas Aug. 1980 107 p Seminar held at Atlantic City, N.J.
(FAA Proj. 219-151-140)
(AD-A089914; FAA-CT-80-170; FAA-RD-80-105) Avail: NTIS HC A06/MF A01 CSCL 17/7

With the planned construction of new control tower and TRACON facilities, the Federal Aviation Administration (FAA) has established a need for standardized supervisory desk complexes. The Air Traffic Control (ATC) Systems Applications Branch (ACT-210) at the Federal Aviation Administration (FAA) Technical Center conducted a study of selected field facilities. In addition, a seminar was held at the Technical Center which resulted in recommending several different supervisor's desk designs for future implementation at new facilities or as useful, functional, and efficient replacements for existing TRACON installations. GRA

N81-11025# Federal Aviation Administration, Atlantic City, N.J.
NEW TERMINAL RADAR APPROACH CONTROL IN TOWER CAB CONCEPT FOR LOVE FIELD, DALLAS, TEXAS Final Report, Mar. - May 1980
Donald Bottomley, Edward G. Ezekiel, and Thomas Zurinskas Aug. 1980 17 p
(AD-A089996; FAA-CT-80-40; FAA-RD-80-79) Avail: NTIS HC A02/MF A01 CSCL 17/7

This study was accomplished in response to a request from Air Traffic Service (AAT-100), for development of a mockup to evaluate a centrally positioned terminal radar approach control in a tower cab (TRACAB) console. Presently, the Local Control position at Love Field, Dallas, Texas, generally faces both southeast runways, with all the attendant instrumentation in front of the controller. However, when conditions dictate a northwest operation, the Local Controller must turn away to see and sequence his traffic. The work effort addressed the relocation of operational positions from their usual peripheral sites in the tower cab to a unique four-winged central console with each wing having its own instrumentation. This console housed two Local Control and two Airport Surveillance Radar (ASR) positions on one side of the console and a Ground Control position on the opposite side with identical instrumentation. These five positions were endowed with a 'flip/flop' capability as traffic dictated. The other two positions, Clearance Delivery/Flight Data and Watch Supervisor, remained constant at each end of the console, regardless of traffic flow. While the four-winged central console solved the Local Controller's instrumentation availability, it reflected two problems. Limited room on the console caused overcrowding and resultant overheating of the operational equipment. Local Control perambulation was restricted due to the two ASR controllers and tower peripheral boundaries. Since few airports require the 'flip/flop' design necessary by a tower located between dual runways, it was concluded that no further evaluation of this console concept would be made. GRA

N81-11026# Federal Aviation Administration, Atlantic City, N.J. Office of Systems Engineering Management.
ATARS IMPLEMENTATION TRADEOFF
Robert W. Sittler and Karl Seiler, III Jul. 1980 108 p refs
(AD-A089977; FAA-EM-80-10; AEM-200) Avail: NTIS HC A06/MF A01 CSCL 01/2

The study is a comparative analysis of the costs and benefits from competing distributed and centralized ATARS architectures. The current DABS/ATARS structure is a distributed one; a new architecture is postulated for deployment as a centralized ATARS system. Distributed and centralized ATARS are compared as to performance, cost, reliability, maintainability, vulnerability and growth potential. Performance and reliability are treated as constraints to be met equally by all architectures. Maintainability is included in cost. The cost analysis including cost sensitivities forms the bulk of the study. It is found that centralization of most sites is more costly than a distributed deployment and that the individual sites which contribute most to a cost advantage for centralization lie in high density terminal areas. A most significant finding is that centralized ATARS is inferior to distributed ATARS in vulnerability. The options are about equal in growth potential. GRA

N81-11028# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FORMATS FOR DABS DATA LINK APPLICATIONS
J. L. Leeper and R. S. Kennedy 30 Jul. 1980 34 p refs
(Contract F19628-80-C-0002; DOT-FA78WAI-895)
(AD-A089963; ATC-96; FAA-RD-80-81) Avail: NTIS HC A03/MF A01 CSCL 01/2

The purpose of this paper is to describe formats developed for transmitting aviation-related messages over the Discrete Address Beacon System (DABS) data link. Initial data link applications include: Minimum Safe Altitude Warning (MSAW) alerts (Terminal Area); Takeoff Clearance Confirmation; Altitude Assignment Clearance Confirmation (Enroute); Weather Reports; Enhanced Terminal Information Service (ETIS); Downlink of Airborne Measurements. The formats described in this paper cover the DABS communications formats for uplink messages from the DABS sensor to the airborne data link system, and the downlink messages from the aircraft. Downlink messages include pilot requests for routine weather information and ETIS service, pilot acknowledgements for uplink tactical messages, and airborne measurements. GRA

N81-11030 Michigan Univ., Ann Arbor.
IMPROVED AIRCRAFT CRUISE BY PERIODIC CONTROL Ph.D. Thesis
Daniel Thomas Lyons 1980 302 p
Avail: Univ. Microfilms Order No. 8025721

The possibility of improving aircraft cruise by periodic motion was investigated for subsonic aircraft with jet engines. Three cruise problems were studied: maximum range, maximum endurance, and peak altitude. Normal steady state cruise was compared with periodic cruise in which the controls and state variables were time-dependent periodic functions. Periodic cruise results in improved performance under certain circumstances.

Periodic cruise gives greater peak altitudes than are possible with steady state cruise. A state inequality constraint which limits the peak altitude is required to retain dynamic pressure for aerodynamic control at the peak altitude. A large energy height is desirable for maximum peak altitude. However, the period increases rapidly as the energy height approaches the maximum energy height for steady cruise. Dissert. Abstr.

N81-11032*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BIBLIOGRAPHY ON AERODYNAMICS OF AIRFRAME/ENGINE INTEGRATION OF HIGH-SPEED TURBINE-POWERED AIRCRAFT, VOLUME 1
Mark R. Nichols Nov. 1980 92 p refs
(NASA-TM-81814; L-13251-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 01C

This bibliography was developed as a first step in the preparation of a monograph on the subject of the aerodynamics of airframe/engine integration of high speed turbine powered aircraft. It lists 1535 unclassified documents published mainly in the period from 1955 to 1980. Primary emphasis was devoted to aerodynamic problems and interferences encountered in the integration process; however, extensive coverage also was given to the characteristics and problems of the isolated propulsion system elements. A detailed topic breakdown structure is used. The primary contents of the individual documents are indicated by the combination of the document's title and its location within the framework of the bibliography. T.M.

N81-11033# Army Research and Technology Labs., Moffett Field, Calif. Aeromechanics Lab.
EXPERIMENTAL AND ANALYTICAL STUDIES OF A MODEL HELICOPTER ROTOR IN HOVER
F. X. Caradonna and C. Tung 1980 20 p refs Presented at the European Rotorcraft and Powered Lift Aircraft Forum, Bristol, England, 16-19 Sep. 1980
(AD-A089780; Rept-25) Avail: NTIS HC A02/MF A01 CSCL 20/4

The present study is a benchmark test to aid the development of various rotor performance codes. The study involves simultaneous blade pressure measurements and tip vortex surveys. Measurements were made for a wide range of tip Mach numbers including the transonic flow regime. The measured tip vortex strength and geometry permit effective blade loading predictions when used as input to a prescribed wake lifting surface code. It is also shown that with proper inflow and boundary layer modeling, the supercritical flow regime can be accurately predicted. GRA

N81-11034# Martin Marietta Corp., Baltimore, Md.
CONTAINER LIFE ADAPTER-HELICOPTER (CLAH) OPERATIONAL PROTOTYPE (PREPRODUCTION) MILITARIZED UNITS FOR FLIGHT EVALUATION AND OPERATIONAL TESTING Final Report, Sep. 1978 - Apr. 1980
Edgar G. Ball Aug. 1980 76 p
(Contract DAAK51-78-C-0026; DA Proj. 1L1-62209-AH-76)
(AD-A089794; ER-15047; USAAVRADCOM-TR-80-D-20) Avail: NTIS HC A05/MF A01 CSCL 01/3

This report covers the efforts required to manufacture and test two operational preproduction militarized CLAHs for Army flight evaluation and operational suitability. The CLAH is an external load-carrying device that is suspended under a cargo helicopter and enables the helicopter flight crew to automatically align with, engage, lock on, pick up, transport, and deposit an 8 x 8 x 20 foot MILVAN or commercial container without assistance of ground crew. This production prototype CLAH design has evolved from a series of contracts involving research, study, development, and testing of experimental container lifting devices. The design change per this contract included eliminating the retractable guide system and the pyrotechnic emergency jettison system. Reliability, maintainability, logistic and cost analyses were conducted, and orientation/training sessions were provided to enable Government personnel to operate, maintain, repair, and provide logistic support for the CLAH field test program.
GRA

N81-11035# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va. Manpower and Educational Systems Technical Area.
HELICOPTER ELECTRO-OPTICAL SYSTEM DISPLAY REQUIREMENTS. 1. THE EFFECTS OF CRT DISPLAY SIZE, SYSTEM GAMMA FUNCTION, AND TERRAIN TYPE ON PILOTS REQUIRED DISPLAY LUMINANCE
Aaron Hyman, Richard M. Johnson, and Paul A. Gade Mar. 1980 29 p refs
(DA Proj. 2Q1-62722-A-765)
(AD-A089755; ARI-TR-441) Avail: NTIS HC A03/MF A01 CSCL 05/8

Twenty-four Army helicopter pilots viewed videotaped segments of low-level and nap-of-the-Earth (NOE) helicopter flights as presented on television monitors designed to simulate an airborne low-light-level television cockpit display system. While viewing these displays in an environment having no additional ambient illumination, these pilots were asked to set cockpit monitor luminance at the lowest level that they judged would permit successful flight control over the terrain being overflown. Each pilot adjusted luminance levels for eight different display conditions formed by the factorial combination of display size, type of terrain, and object-luminance to display-luminance transfer function (system gamma function). Results show that pilots used lower luminance settings when viewing the larger of the two display sizes presented. They also used significantly lower luminance settings when viewing wooded terrain, with the system gamma function modified to provide 'enhanced' contrast in the luminance range of interest, as against an unmodified system gamma function. The pilot's subjective impressions agreed with their measured settings. This report discusses the impact of these results on the specifications of display requirements for a low light-level television system for aiding night NOE flight. GRA

N81-11036# Aircraft Research and Development Unit, Edinburg (Australia).
FITMENT OF TAMAM STANDBY ATTITUDE INDICATORS TO MACCHI AIRCRAFT Engineering Report
D. K. King Aug. 1980 17 p
(AD-A089378; TI-683) Avail: NTIS HC A02/MF A01 CSCL 01/4

The Aircraft Research and Development Unit reworked Macchi MB 326H Draft Modification Order No 365 to install the 'TAMAM' Standby Attitude Indicator (SAI) in the front and rear instrument panels of Macchi aircraft. Modifications were also developed to provide independent switching and circuit protection for each SAI on the existing FIRE/OVERHEAT panel in the Right hand console of the front cockpit. RPM indicator lighting control was transferred from its individual rheostat to the panel lighting control and protection circuit. The modification was successfully test flown with particular emphasis on instrument readability, lack of conflict with the flight controls and ease of operation. Residual errors noted in the SAIs after maneuvers were large but were immediately cancelled by operation of the caging knob. Trial flying of the installation showed the modification to be operationally acceptable and fleet wide installation was recommended.
GRA

N81-11037*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW-SPEED AERODYNAMIC PERFORMANCE OF 50.8-CENTIMETER-DIAMETER NOISE-SUPPRESSING INLETS FOR THE QUIET, CLEAN, SHORT-HAUL EXPERIMENTAL ENGINE (QCSEE)
John M. Abbott, James H. Diedrich, and Robert C. Williams Aug. 1978 37 p refs
(NASA-TP-1178; E-9542) Avail: NTIS HC A03/MF A01 CSCL 21E

Two basic inlet concepts, a high throat Mach number (0.79) design and a low throat Mach number (0.60) design, were tested with four diffuser acoustical treatment designs that had face sheet porosity ranging from 0 to 24 percent for the high Mach number inlet and 0 to 28 percent for the low Mach number inlet. The tests were conducted in a low speed wind tunnel at free stream velocities of 0, 41, and 62 m/sec and angles of attack to 50 deg. Inlet throat Mach number was varied about the design value. Increasing the inlet diffuser face sheet porosity resulted in an increase in total pressure loss in the boundary layer for both the high and low Mach number inlet designs, however, the overall effect on inlet total pressure recovery of 0.991 at the design throat Mach number, a free stream velocity of 41 m/sec, and an angle of attack of 50 deg; Inlet flow separation at an angle of attack of 50 deg was encountered with only one inlet configuration the high Mach number design with the highest diffuser face sheet porosity (24 percent). A.R.H.

N81-11038*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. Propulsion Lab.

OFF-DESIGN PERFORMANCE LOSS MODEL FOR RADIAL TURBINES WITH PIVOTING, VARIABLE-AREA STATORS

Peter L. Meitner and Arthur J. Glassman Nov. 1980 15 p refs

(NASA-TP-1708; AVRADCOM-TR-80-C-13; E-455) Avail: NTIS HC A02/MF A01 CSCL 21E

An off-design performance loss model was developed for variable stator (pivoted vane), radial turbines through analytical modeling and experimental data analysis. Stator loss is determined by a viscous loss model; stator vane end-clearance leakage effects are determined by a clearance flow model. Rotor loss coefficient were obtained by analyzing the experimental data from a turbine rotor previously tested with six stators having throat areas from 20 to 144 percent of design area and were correlated with stator-to-rotor throat area ratio. An incidence loss model was selected to obtain best agreement with experimental results. Predicted turbine performance is compared with experimental results for the design rotor as well as with results for extended and cutback versions of the rotor. Sample calculations were made to show the effects of stator vane end-clearance leakage. Author

N81-11039*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SURFACE PYROMETRY IN PRESENCE OF RADIATION FROM OTHER SOURCES WITH APPLICATION TO TURBINE BLADE TEMPERATURE MEASUREMENT

Donald R. Buchele Nov. 1980 19 p refs

(NASA-TP-1754; E-396) Avail: NTIS HC A02/MF A01 CSCL 21E

Surface pyrometry is feasible even when the amount of surface radiation is exceeded by radiation from surrounding sources. To measure and correct for this interfering radiation, several methods that use multiple wavelength pyrometry were compared by an error analysis. For a specific application to turbine blade temperature measurement in a turbofan engine, a two wavelength method was best. Auxiliary measurements at the same wavelengths substantially improve the accuracy of the method. S.F.

N81-11040# ARO, Inc., Arnold Air Force Station, Tenn.

AN EVALUATION OF STATISTICAL METHODS FOR THE PREDICTION OF MAXIMUM TIME-VARIANT INLET TOTAL PRESSURE DISTORTION Final Report, 1 Oct. 1978 - 24 Sep. 1979

Marvin E. Sanders and Richard E. Christenson AEDC Sep. 1980 56 p refs Sponsored by Air Force

(AD-A089817; AEDC-TR-79-77) Avail: NTIS HC A04/MF A01 CSCL 21/5

An analysis was conducted to determine the accuracies and limitations of three statistical methods used to predict engine-face maximum time-variant total pressure distortion. The statistical methods have all been proposed as low-cost alternatives to the time-consuming and costly deterministic method generally used for reducing engine-face time-variant total pressure data. The statistical methods are evaluated by comparing their predicted distortion values and patterns to those measured with the deterministic method. Data comparisons from tests of four different inlet models, covering a wide range of Mach numbers, mass flow ratios, model attitudes, and distortion factors, were used during the analysis. The results show good agreement between the measured and predicted values for all three statistical methods. The distortion pattern predictions, however, were inadequate at conditions with high total pressure fluctuation (turbulence). It is recommended that improvements continue to be made in the statistical methods, particularly adjustments for high turbulence conditions, and that the Melick method be used as an on-line distortion analysis tool for inlet performance tests. GRA

N81-11041# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.

DISK RESIDUAL LIFE STUDIES. PART 1: F100 1ST-STAGE TURBINE DISK (IN100)

J. S. Cargill, J. K. Malpani, and Y. W. Cheng Dec. 1979 108 p refs

(Contract F33615-77-C-5172; AF Proj. 7351)

(AD-A089791; PWA-FR-11878-Vol-1; AFML-TR-79-4173-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 21/5

A residual fatigue life prediction method, suitable for Retirement-for-Cause application, has been developed for two P WA turbine disks: the F100 1st-stage high pressure turbine disk and the TF30 10th-stage compressor disk. The method is based upon interaction of fracture mechanics crack propagation modeling concepts with laboratory nondestructive evaluation (NDE) techniques. Fracture mechanics life models were developed using the GPD hyperbolic sine (SINH) model refined during an earlier Air Force Materials Laboratory (AFML) program. Stress intensity (K) solutions for the engine components were based upon experimental effective K determinations made during full-scale component fatigue tests. The NDE techniques developed for disk inspections included acoustic emission (AE), eddy current (EC), and fluorescent penetrants (FP). Stress-enhanced penetrant and semi-automated rotating probe EC techniques were developed as periodic inspections, while the AE time-domain technique was developed as a real-time inspection tool. GRA

N81-11042# RAND Corp., Santa Monica, Calif.

AIRCRAFT TURBINE ENGINE MONITORING EXPERIENCE. AN OVERVIEW AND LESSONS LEARNED FROM SELECTED CASE STUDIES Interim Report

John L. Birkler and J. R. Nelson Aug. 1980 115 p refs

(Contract F49620-77-C-0023)

(AD-A089752; RAND/R-2440-AF) Avail: NTIS HC A06/MF A01 CSCL 21/5

Two approaches have evolved in attempts to improve engine operations, maintenance, and management while reducing support costs. The first concentrates on short-term practices (inflight data are recorded in a snapshot mode). The second approach focuses on long-term benefits through improved knowledge of the operating environment. (Data must be recorded continuously on at least a few aircraft.) Engine duty-cycle research by the military services has demonstrated that neither the services nor the manufactures have a clear idea of power requirements and frequent throttle movements during operational sorties in fighter aircraft and have generally overestimated engine parts life and underexpected life-cycle costs. The narrow concept of cost savings over the short term should not be the sole criterion on which monitoring systems are judged. Monitoring systems for recent and future engines should include continuously recorded data now that reliability, durability, and cost issues are almost on an equal footing with performance. GRA

N81-11043*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SIMULATING STUDY OF THE INTERACTION BETWEEN THE PROPULSION AND FLIGHT CONTROL SYSTEMS OF A SUBSONIC LIFT FAN VTOL

Bruce E. Tinling and Gary L. Cole Nov. 1980 50 p refs

(NASA-TM-81239; A-8346) Avail: NTIS HC A03/MF A01 CSCL 01C

The possibility of interactions between the propulsion and flight control systems of a three-fan subsonic VTOL aircraft was studied using nonreal time simulation. Time histories of critical internal engine parameters were obtained and possible deleterious effects of engine dynamics on flight control were identified and analyzed. No deleterious effects, with the exception of the effects of the fan actuator deadband, were found. A method of alleviating these effects through feedback of the actuator output to the flight controller was developed. T.M.

N81-11044*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FLIGHT EVALUATION OF STABILIZATION AND COMMAND AUGMENTATION SYSTEM CONCEPTS AND COCKPIT DISPLAYS DURING APPROACH AND LANDING OF POWERED-LIFT STOL AIRCRAFT

James A. Franklin, Robert C. Innis, and Gordon H. Hardy Nov. 1980 94 p refs

(NASA-TP-1551; A-7968) Avail: NTIS HC A05/MF A01 CSCL 01C

A flight research program was conducted to assess the effectiveness of manual control concepts and various cockpit displays in improving altitude (pitch, roll, and yaw) and longitudinal path control during short takeoff aircraft approaches and landings. Satisfactory flying qualities were demonstrared to minimum decision heights of 30 m (100 ft) for selected stabilization and command augmentation systems and flight director combinations. Precise landings at low touchdown sink rates were achieved with a gentle flare maneuver. S.F.

N81-11045# Range Commanders Council, White Sands Missile Range, N. Mex. Range Safety Group.

FLIGHT TERMINATION RECEIVER/DECODERS DESIGN, PERFORMANCE AND CERTIFICATION Final Report

1980 20 p Supersedes RSG-313-72

(AD-A089746; RSG-313-80; RSG-313-72) Avail: NTIS HC A02/MF A01 CSCL 16/1

This document contains design, performance, and certification test requirements for range safety flight termination system command destruct receiver/decoders. It replaces Range Commanders Council (RCC) Range Safety Group (RSG) Document 313-72. Flight termination is an emergency action taken by Range Safety for the protection of life and property when a vehicle violates established safety criteria. This action circumvents the vehicle's normal control modes and ends its power and/or controlled flight. Flight termination procedures may include any one or a combination of the following: (a) Complete vehicle destruction by explosive means; (b) Aerodynamic disruption of the flight mechanism; (c) Deployment of high drag devices; (d) Fuel cut-off to the combustion chambers of ignited motors; (e) Inhibit ignition of unburned motors; and (f) Other special actions dictated by the vehicle configuration or special problems. These actions may be activated by manual, computerized and/or automated modes. GRA

N81-11046# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.

MULTIVARIABLE CLOSED-LOOP ANALYSIS AND FLIGHT CONTROL SYNTHESIS FOR AIR-TO-AIR TRACKING Final Report, 1 Jan. - 31 Dec. 1979

David K. Schmidt 18 Jun. 1980 105 p refs

(Grant AF-AFOSR-0042-79; AF Proj. 2313)

(AD-A090050; AFOSR-80-0961TR) Avail: NTIS HC A06/MF A01 CSCL 05/8

A synthesis method based on optimal control techniques, closed-loop task-oriented design objectives, and an optimal control model of the human pilot was applied to augment the system dynamics in the air-to-air tracking task. Single and multi-axis analyses were performed. Single axis results, obtained for longitudinal pitch tracking with different sets of active sight display dynamics, indicate the optimum system dynamics were affected by numerator (or display) dynamics. Improved tracking performance was predicted, and the trends in augmented system dynamics (eigenvalues) were shown to agree with previous results. Moving-base simulation results obtained for a highly-banked flight condition were also used to establish a new multi-axis pilot model. This model is considered suitable for simultaneous control of the dynamically interacting longitudinal and lateral-directional axes of the vehicle/display system. The system augmentation, based on this model, again was predicted to significantly improve performance. The trends in system eigenvalues for various augmentation levels showed good agreement with the above longitudinal results. However, the lateral-directional axis was found to be much more important, and significant modification of the dynamics were predicted to lead to system improvements. GRA

N81-11047# Systems Research Labs., Inc., Dayton, Ohio.

A MULTIVARIATE APPROACH TO HANDLING QUALITIES RATING SCALE DEVELOPMENT Final Report, 1 Jun. - 30 Sep. 1979

Ralph H. Smith and Warren S. Torgenson Jan. 1980 186 p refs

(Contract F49620-79-C-0158; AF Proj. 2313)

(AD-A089825; AFOSR-80-0876TR) Avail: NTIS HC A09/MF A01 CSCL 01/3

Recent advances in aircraft handling qualities indicate the possibility that a small number of physical dimensions can be used for handling qualities quantification. Several candidate metrics for handling qualities now exist which form a portion of the set required. An exploratory study was conducted to evaluate the use of multivariate analysis techniques for identification of the necessary physical dimensions of handling qualities. It is concluded that the Cooper-Harper scale can be considered a direction in the space defined by the first few principal components of the experimental variance-covariance matrix. A simulation experiment is proposed which should permit development of a set of nonadjectival rating scales which will complement the Cooper-Harper scale, reduce the variability of pilot rating data, and better support the flight test identification of handling deficiencies. GRA

N81-11049# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.

THE PRINCIPLES AND APPLICATIONS OF CRYOGENIC WIND TUNNELS

M. J. Goodyer *In* AGARD Cryogenic Wind Tunnels Jul. 1980 6 p refs

Avail: NTIS HC A12/MF A01

The background to the emergencies of the cryogenic wind tunnel is described and its advantages compared with other means for raising the values of test Reynolds number to full scale are discussed. The basic aero and thermodynamics of wind tunnel testing is introduced and the advantages of low temperature in low speed and in transonic testing are quantified. Attention is drawn to secondary advantages unique to this tunnel, and to the potentials of unconventional test gases. Descriptions of current types and applications of cyrogenic wind tunnels are included. R.K.G.

N81-11057*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

MODEL DESIGN AND INSTRUMENTATION EXPERIENCES WITH CONTINUOUS-FLOW CRYOGENIC TUNNELS

Robert A. Kilgore *In* AGARD Cryogenic Wind Tunnels Jul. 1980 22 p refs

Avail: NTIS HC A12/MF A01 CSCL 14B

The development of wind tunnels that can be operated at cryogenic temperatures has placed several new demands on the ability to build and instrument wind tunnel models. The experiences at the NASA Langley Research Center relative to the design and instrumentation of models for continuous flow cryogenic wind tunnels are reviewed. R.K.G.

N81-11058# Douglas Aircraft Co., Inc., Long Beach, Calif. Aerodynamics Subdiv.

MODEL DESIGN AND INSTRUMENTATION FOR INTERMITTENT CRYOGENIC WIND TUNNELS

J. D. Cadwell *In* AGARD Cryogenic Wind Tunnels Jul. 1980 8 p refs

Avail: NTIS HC A12/MF A01

The design and instrumentation of a model for an intermittent cryogenic wind tunnel is discussed. The model requirements including tolerances and data accuracy are noted. The mechanical design of the wing, the considerations for material to be used, and the instrumentation that is to be installed in the wing are discussed. The design of the fuselage center section, the six component balance installation with heaters, and the heater for the balance-to-sting adapter is reviewed. The design and the aft fuselage and empennage, and the fuselage nose including the instrumentation package to be housed in the fuselage nose compartment is shown. The model conditioning that is required to obtain acceptable data; prevent frost buildup on the model after it is cooled, and reheating the model to make model configuration changes is also discussed. R.K.G.

N81-11060# Douglas Aircraft Co., Inc., Long Beach, Calif. Aerodynamics Subdiv.
CALIBRATION OF A BLOWDOWN-TO-ATMOSPHERE CRYOGENIC WIND TUNNEL
J. D. Cadwell *In* AGARD Cryogenic Wind Tunnels Jul. 1980 9 p refs
Avail: NTIS HC A12/MF A01

Calibration of short duration cryogenic wind tunnels pose difficulties and requirements beyond those already present in the calibration either of conventional short run time facilities or of cryogenic continuous tunnels. The requirements and instrumentation for calibration of a transonic blowdown to atmosphere cryogenic wind tunnel are described, with emphasis on those aspects differing from the calibration of similar non-cryogenic tunnels. Reference is made of the literature for detailed descriptions of conventional calibration practices which remain applicable for cryogenic blowdown tunnels. Author

N81-11063# Douglas Aircraft Co., Inc., Long Beach, Calif. Aerodynamics Subdiv.
THE CONTROL OF PRESSURE, TEMPERATURE AND MACH NUMBER IN A BLOWDOWN-TO-ATMOSPHERE CRYOGENIC WIND TUNNEL
J. D. Cadwell *In* AGARD Cryogenic Wind Tunnels Jul. 1980 8 p ref
Avail: NTIS HC A12/MF A01

The control system that used in a four foot blowdown wind tunnel prior to the modification of the facility to a cryogenic operation is reviewed. The control requirements for a cryogenic blowdown tunnel and the Mach and Reynolds number controls are discussed. The proposed method to be used to control the temperature in the cryogenic tunnel is shown. The start of a blow sequence in a cryogenic blowdown tunnel and the detrimental effect that it has on a pre cooled model is considered. A transient protection system, to be evaluated in a one foot pilot tunnel that will shield the model during the start of a run is shown. The conventional method of measuring model attitude by correcting the pod angle for sting and balance deflections is shown to be inadequate in a cryogenic blowdown tunnel and alternate methods that can be used are discussed. Author

N81-11064# National Aerospace Lab., Amsterdam (Netherlands).
THE EUROPEAN TRANSONIC WIND TUNNEL ETW
J. P. Hartzuiker and R. J. North *In* AGARD Cryogenic Wind Tunnels Jul. 1980 17 p refs

Avail: NTIS HC A12/MF A01

A high Reynolds number transonic tunnel is described on the basis of preliminary design results. The construction of a cryogenic pilot tunnel and supporting programs on model design and instrumentation are discussed. S.F.

N81-11065*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHARACTERISTICS AND STATUS OF THE US NATIONAL TRANSONIC FACILITY
William B. Igoe *In* AGARD Cryogenic Wind Tunnels Jul. 1980 11 p refs
Avail: NTIS HC A12/MF A01 CSCL 14B

A major application of the cryogenic wind tunnel concept is discussed. A closed return fan driven circuit with a 2.5 meter square slotted test section, pressurized up to 8.85 atmospheres, and providing chord Reynolds numbers of 120 million based on a chord of 0.25 meter at transonic speeds using cold nitrogen as the test gas is described. S.F.

N81-11093# ARO, Inc., Arnold Air Force Station, Tenn.
MISSILE MOTION SENSITIVITY TO DYNAMIC STABILITY DERIVATIVES Final Report, 1 Oct. 1978 - 30 Sep. 1979
T. F. Langham AEDC Sep. 1980 111 p refs Sponsored by Air Force
(AD-A089750; AEDC-TR-80-11) Avail: NTIS HC A06/MF A01 CSCL 16/2

A dynamic derivative sensitivity study was conducted to demonstrate the importance of dynamic derivatives in missile motion simulation studies. Generalized bank-to-turn and yaw-to-turn missile configurations were used with a six degree of freedom linearized stability program. The effects of various dynamic derivatives on missile stability were investigated in both level and turning flight for several Mach numbers and altitude conditions. GRA

N81-11113*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A PROBABILISTIC ANALYSIS OF ELECTRICAL EQUIPMENT VULNERABILITY TO CARBON FIBERS
Wolf Elber Oct. 1980 31 p refs
(NASA-TM-80217) Avail: NTIS HC A03/MF A01 CSCL 11D

The statistical problems of airborne carbon fibers falling onto electrical circuits were idealized and analyzed. The probability of making contact between randomly oriented finite length fibers and sets of parallel conductors with various spacings and lengths was developed theoretically. The probability of multiple fibers joining to bridge a single gap between conductors, or forming continuous networks is included. From these theoretical considerations, practical statistical analyses to assess the likelihood of causing electrical malfunctions was produced. The statistics obtained were confirmed by comparison with results of controlled experiments. A.R.H.

N81-11116# General Dynamics/Convair, San Diego, Calif.
DEVELOPMENT OF ADVANCED INTERCEPTOR SUBSTRUCTURAL MATERIAL
Julius Hertz and Norman R. Adsit Aug. 1980 163 p refs
(Contract DAAG46-78-C-0056; DA Proj. 1W1-62113-A-661)
(AD-A090127; AMMRC-TR-80-44) Avail: NTIS HC A08/MF A01 CSCL 11/4

This report is aimed at the development of ultra-high modulus graphite/epoxy structures for use in future advanced terminal interceptors. The work has produced a preliminary full-scale design and demonstrated, experimentally and analytically, that the design will carry the loads. More study needs to be conducted and some further experimental work is recommended before a full-scale article is tested. The present work has concentrated on testing the aft joint and an intermediate ring for holding an equipment package in the frustra. GRA

N81-11117*# Naval Surface Weapons Center, Dahlgren, Va. Environmental Test Chamber.
FIBER RELEASE FROM IMPACTED GRAPHITE REINFORCED EPOXY COMPOSITES Final Report
T. C. Babinsky Jun. 1980 71 p Sponsored by NASA
(NASA-CR-163684; AD-A090112; NSWC/TR-80-216) Avail: NTIS HC A04/MF A01 CSCL 11D

Carbon fibers released from composites by aircraft fires and crashes can cause electrical shorts and consequent equipment damage. This report investigates less vigorous release mechanisms than that previously simulated by explosive burn/blast tests. When AS/3501-6 composites are impacted by various head and weight configurations of a pendulum impactor, less than 0.2 percent by weight of the original sample is released as single fibers. Other fiber release mechanisms studied were air blasts, constant airflow, torsion, flexural, and vibration of composite samples. The full significance of the low single fiber release rates found here is to be evaluated by NASA in their aircraft vulnerability studies. GRA

N81-11118# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
MICROCRACKING IN GRAPHITE-EPOXY COMPOSITES Interim Report
Ernest G. Wolff 1 Sep. 1980 34 p refs
(Contract F04701-79-C-0080)
(AD-A089894; TR-0080-5950-01-1; SD-TR-80-65) Avail: NTIS HC A03/MF A01 CSCL 11/4

Microcracking in composite materials is commonly caused by ply stiffness variations in crossply layup during application of applied stress, and by differential thermal expansion coefficients of the fiber and the matrix during thermal excursions. It is responsible for changes in macro- and micromechanical properties, permeability to gases, and dimensional instability. Theories, experimental techniques, and effects of microcracking are reviewed. The coefficient of cracking expansion is defined, and procedures for reducing deleterious effects of microcracking on composite structures are presented. GRA

N81-11120# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

COMPATIBILITY OF AIRCRAFT OPERATIONAL FLUIDS WITH A GRAPHITE/EPOXY COMPOSITE: DEVELOPMENT OF AN EXTERIOR COATING SYSTEM AND REMOVER Final Report

K. G. Clark 26 Jun. 1980 43 p refs
(ZF54502001)
(AD-A090049; NADC-80046-60) Avail: NTIS HC A03/MF A01 CSCL 11/4

The objective of this investigation is the identification of aircraft operational and specialty chemical which are potentially detrimental to the integrity of organic matrix composites. In this report, results of several studies made with the graphite/epoxy Hercules AS/3501-6 are disclosed. Several alternatives to the problem of paint removal are discussed. It is concluded that water and maintenance fluids containing water produce significant plasticization of graphite/epoxy, while most solvents, oils, hydraulic fluids, and fuel cause no significant mechanical losses. Paint removal was found to be a significant problem due to the activity of chemical removers. Removal is complicated by the fact that stripping thermoset coatings from graphite/epoxy is more difficult than stripping from aluminum. A 'weak link' coating system using a nitrocellulose primer is, thus far, the best strippable composite coating if used with the simple methylene chloride remover designated 4-70-1. It is recommended that confirmational testing with tensile, flexure, compression, fatigue and dynamic mechanical specimens of graphite/epoxy and possibly some adhesive, be made. Following these tests, the nitrocellulose/ polyurethane coating system should be field tested on graphite/ epoxy aircraft substrates. GRA

N81-11128# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

EFFECT OF SERVICE ENVIRONMENT ON COMPOSITE MATERIALS

Aug. 1980 326 p refs In ENGLISH; partly in FRENCH Presented at the 50th Meeting of the AGARD Struct. and Mater. Panel, Athens, 14-17 April 1980
(AGARD-CP-288; ISBN-92-835-0273-6) Avail: NTIS HC A15/MF A01

The effects of environmental and mechanical stress on the composite materials of aircraft structures are described. Graphite-epoxy and carbon fiber reinforced plastics are tested for fatigue and tensile creep. Effects of environmental temperature and moisture (humidity) are emphasized. Applications for aerodynamic and aerospace engineering are included.

N81-11129# British Aerospace Aircraft Group, Preston (England). Advanced Structural Applications Dept.

THE IMPLICATIONS OF LABORATORY ACCELERATED CONDITIONING OF CARBON FIBRE COMPOSITES

E. C. Edge *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 17 p refs

Avail: NTIS HC A15/MF A01

The evidence on the effects of long term natural weathering of carbon fiber composites is examined and its implications with regard to the conditioning of test specimens discussed. The effects of laboratory accelerated tests on the properties of some composite materials are considered in conjunction with the relevance of data thus acquired to real life situations and the need to generate the data with reasonable speed for design considerations. The changes in conditioning procedure which have taken place are outlined along with the factors which have influenced these changes. Author

N81-11130# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.

EFFECT OF VARIOUS ENVIRONMENTAL CONDITIONS ON POLYMER MATRIX COMPOSITES

R. C. Tennyson *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 21 p refs

Avail: NTIS HC A15/MF A01

Experimental results obtained on the short and long term behavior of polymer matrix composites subjected to various environmental conditions are given. Changes in mechanical stiffness, strength and coefficient of thermal expansion were measured under ambient pressure and thermal vacuum conditions. In all tests involving the vacuum environment, measurements were made in-situ, necessitating the use of mechanical loading fixtures acting through flexible bellows to provide stiffness and strength data. Results are given on the effects of varying some fabrication parameters (length of post-cure time and rate of cool-down in autoclave) on the changes observed in strength and stiffness. The materials investigated include: graphite/epoxy, boron/epoxy, PRD-49/epoxy and E glass/epoxy. S.F.

N81-11131# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. for Structural Mechanics.

PREDICTABILITY OF MOISTURE ABSORPTION IN GRAPHITE/EPOXY SANDWICH PANELS

H. W. Bergmann and P. Nitsch *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 11 p refs

Avail: NTIS HC A15/MF A01

Graphite/epoxy materials tend to degrade in hot and moist environments. The high dependence of the strength loss on the moisture content demands an assessment of the amount and distribution of absorbed moisture, particularly in the case of lightweight sandwich panels. The reliability of such predictions hinges on the formulation of theoretical considerations, the accuracy of numerical processes, the definition of material constants and a proper interpretation of the environmental conditions. The impact of errors in these parameters on predicted moisture contents, and comparisons of analytical forecasts with experimentally determined values, are the topics of this paper. S.F.

N81-11133# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

CONSTANT-AMPLITUDE AND FLIGHT-BY-FLIGHT TESTS ON CFRP SPECIMENS

F. J. Arendts, K. O. Sippel, and D. Weisgerber *In* AGARD Effects of Serv. Environ. on Composite Mater. Aug. 1980 12 p refs Sponsored in part by Ministry of Defense

Avail: NTIS HC A15/MF A01

Constant amplitude and flight by flight tests with five different load spectra were done with unnotched carbon fiber reinforced plastic specimens. The influence of overloads was investigated. The test results were compared with fatigue life predictions based on 'miner's rule' applied for different conditions. Overloads in all cases cause a significant reduction of the fatigue life. Fatigue life estimations based on 'miner's rule' are on the unsafe side in some cases by more than a factor 10, getting a big scatter among the cases investigated. S.F.

N81-11134# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).

FATIGUE STRENGTH OF CFRP UNDER COMBINED FLIGHT-BY-FLIGHT LOADING AND FLIGHT-BY-FLIGHT TEMPERATURE CHANGES

J. J. Gerharz and D. Schuetz *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 24 p refs

Avail: NTIS HC A15/MF A01

Influence of environment on the fatigue of carbon fiber reinforced plastics unnotched, notched and bolted specimens is studied. The specimens are simultaneously subjected to load and environmental histories. A flight by flight load and environment sequence typical for the wing root of a fighter airplane is applied. Tests with simplified simulation of environment, allowing high loading frequencies, are run. The admissibility of the simplifications is evaluated by comparing the results of each simplified test with the results from long time quasi real time test with temperatures accompanying the loads in each flight. The 'quasi real time' flight by flight program includes temperature cycles and a humidity cycle. The specimens are heated and cooled by preconditioned air forced through the test chamber. The results of room temperature fatigue tests and of static tests at various environmental conditions are available. For a constant fatigue stress level residual strength and stiffness data demonstrate the damage growth made apparent by ultrasonic scan records. S.F.

N81-11135# Royal Netherlands Aircraft Factories Fokker, Rijswijk.
FATIGUE TEST RESULTS OF CARBON FIBER REINFORCED PLASTIC F28 AIRCRAFT COMPONENT AND ITS STRUCTURAL DETAILS
J. A. A. M. Dijns *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 5 p

Avail: NTIS HC A15/MF A01
As a part of the development program on the structural application of carbon fiber reinforced plastic composites in aircraft structures, a speedbrake was designed and built in carbon fiber reinforced plastics and aramide fiber composites. Different configurations were studied and one was selected for a detailed design in the form of a schematic model. Test were carried out on structural details and two schematic speedbrake models were fabricated for full scale static and dynamic load tests. One speedbrake was produced for flight testing on an operational aircraft. The tests resulted in a design of the speedbrake in which no metal parts were used and in which all joints were bonded with 120 C and room temperature curing adhesives, without the use of additional fasteners. The first model speedbrake was successfully tested to ultimate load without failure or any plastic deformation. The second model speedbrake was tested at a maximum fatigue load equal to 65 percent of the ultimate load. The full size CFRP speedbrake showed a weight saving of 25 percent when compared with the Al alloy design. S.F.

N81-11137# Royal Aircraft Establishment, Farnborough (England). Materials Dept.
RELATIONSHIPS BETWEEN IMPACT RESISTANCE AND FRACTURE TOUGHNESS IN ADVANCED COMPOSITE MATERIALS
G. Dorey *In* AGARD Effects of Serv. Environ. on Composite Mater. Aug. 1980 11 p refs

Avail: NTIS HC A15/MF A01
A variety of CFRP laminates and one GRP laminate were subjected to impact by steel balls, over a range of incident energies, and residual strengths were measured. Superimposed static load during impact substantially altered the residual strength curves. The laminates were also tested with machined notches and analyzed in terms of fracture toughness. Results of impact performance both during impact and in subsequent residual strength tests were compared, with the aim of correlating service performance with laboratory toughness tests. Effects of materials and geometric variables are discussed together with possibilities for improvements. R.K.G.

N81-11138# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Div. Helicopteres.
EROSION AND IMPACTS ON COMPOSITE HELICOPTER BLADES [EROSION ET IMPACTS SUR LES PALES D'HELICOPTERES EN COMPOSITES]
M. Torres *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 10 p In FRENCH

Avail: NTIS HC A15/MF A01
Helicopter rotors are subjected to a certain number of aggressions associated with the environment in which they rotate. The use of new materials such as carbon and glass epoxy composites requires the manufacturer to conduct specific qualification research programs for each of these aggressions. The modes of degradation from rain and sand erosion and from civil and military impacts on blades made of composite materials are presented. Research on erosion enabled selection of the most effective protective materials. Experience in the use of blades as well as results from firing and impact tests show an excellent fatigue behavior after shocks and impact, due in a large measure to the fail-safe character of composite materials. This good behavior, associated with the possibility of very extensive repairs, is an important factor to the superiority of composite blades over metal blades. Transl. by A.R.H.

N81-11139*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GRAPHITE-EPOXY PANEL COMPRESSION STRENGTH REDUCTION DUE TO LOCAL IMPACT
Michael F. Card and Marvin D. Rhodes *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 13 p refs

Avail: NTIS HC A15/MF A01 CSCL 11D
The effects of low velocity impact on the compressive strength of graphite/epoxy structures are reviewed. Extensive tests were conducted on sandwich beams, laminated plates and stiffened panels. Conditions for failures were investigated by impact tests on statically loaded test specimens. Lightly loaded graphite structures (such as aircraft secondary structure) were insensitive to impact damage. In more heavily loaded structures, (such as wing panels), appreciable reductions in compressive strength occurred. The implications of the tests for structural design are discussed by comparing panel masses for designs where ultimate strains were reduced due to impact considerations with the masses of designs with higher ultimate strains. Preliminary test data are presented to show the possibility of improvements in damage to tolerance achievable by using an alternate matrix material. R.K.G.

N81-11141# Centre d'Essai Aeronautique, Toulouse (France).
ASSESSING THE BEHAVIOR OF HIGH MODULUS COMPOSITE MATERIALS IN LIGHTNING [EVALUATION DU COMPORTEMENT A LA FOUDRE DE STRUCTURES EN MATERIAUX COMPOSITES HAUT MODULE]
J. Rouchon and D. Gall *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 14 p In FRENCH

Avail: NTIS HC A15/MF A01
Lightning strikes of aircraft in flight are relatively frequent and result in damage and even destruction to both equipment and structures, particularly those made of composite materials. Generalities about lightning are reviewed and methods for measuring it during flight and simulating it on the ground are described. Results are presented for laboratory tests on carbon-epoxy monolithic and boron-epoxy coated sandwich specimens, and on the elements of real structures. Associated control processes are also considered. Transl. by A.R.H.

N81-11142# Boeing Co., Seattle, Wash.
LIGHTNING PROTECTION CONSIDERATIONS FOR GRAPHITE/EPOXY AIRCRAFT STRUCTURE
S. D. Schneider *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 6 p refs

Avail: NTIS HC A15/MF A01
When advanced composites such as graphite/epoxy were first being considered for aircraft structure, a common belief was that lightning would heavily damage the structure. This belief has since proven to be false. Advanced composites react to lightning strikes in a manner different from aluminum, but the resultant damage is by no means alarming. Two basic types of lightning damage to which aircraft structures are subjected, are discussed. Known, documented techniques and design philosophies for protection against lightning caused structural damage are reviewed for classical aluminum aircraft structure fabricated

with metal fasteners, and the impact of graphite/epoxy on these classical approaches is addressed. Detailed lightning test criteria, test techniques, and criteria are also given and related to graphite structures. R.K.G.

N81-11143*# *National Aeronautics and Space Administration.* Langley Research Center, Hampton, Va.
THE POTENTIAL FOR DAMAGE FROM THE ACCIDENTAL RELEASE OF CONDUCTIVE CARBON FIBERS FROM AIRCRAFT COMPOSITES
Vernon L. Bell *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 21 p refs

Avail: NTIS HC A15/MF A01 CSCL 11D

Carbon and graphite fibers are known to be electrically conductive. The rapidly accelerating use of carbon fibers as the reinforcement in filamentary composite materials brought up the possibility of accidental release of carbon fibers from the burning of crashed commercial airliners with carbon composite parts. Such release could conceivably cause widespread damage to electrical and electronic equipment. The experimental and analytical results of a comprehensive investigation of the various elements necessary to assess the extent of such potential damage in terms of annual expected costs and maximum losses at low probabilities of occurrence are presented. A review of NASA materials research program to provide alternate or modified composite materials to overcome any electrical hazards from the use of carbon composites in aircraft structures is described. R.K.G.

N81-11145# Westland Helicopters Ltd., Yeovil (England).
FATIGUE AND DAMAGE PROPAGATION IN COMPOSITE ROTOR BLADES
A. J. Barnard *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 17 p Sponsored by Ministry of Defense, England
Avail: NTIS HC A15/MF A01

The development and flight evaluation of carbon/glass fiber reinforced plastic rotor blades is considered. Results are presented from tests undertaken on tail and main blades. The excellent fatigue and damage propagation characteristics of the composite blades are emphasized. The rig and flight tests demonstrated unlimited fatigue lives for the composite blades and the structural element tests indicated low material scatter factors in both static and fatigue cases. Test results also indicate improved safety through the use of composite blades. J.M.S.

N81-11146# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
SERVICE EXPERIENCE WITH GRC HELICOPTER BLADES (BO-105)
K. Brunsch *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 17 p refs

Avail: NTIS HC A15/MF A01

The service experience of light helicopters (BO-105) both for civil and military operations is discussed with emphasis on data accumulated on composite (GRC) rotor blades. Full scale fatigue test results with new blades and blades after 4000 hours of flight are compared as are coupons cut out of blades before and after thousands of service hours. Impact strength and erosion-corrosion problems are among the factors considered. J.M.S.

N81-11147*# National Aeronautics and Space Administration. *Langley Research Center, Hampton, Va.*
COMPOSITE COMPONENTS ON COMMERCIAL AIRCRAFT
H. Benson Dexter *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 22 p refs

Avail: NTIS HC A15/MF A01 CSCL 11D

Flight experience gained with numerous composite aircraft structures is discussed. Both commercial transports and helicopters are included. Design concepts with significant mass savings and appropriate inspection and maintenance procedures are among the factors considered. Also, a major NASA/U.S. industry technology program to reduce fuel consumption of commercial transport aircraft through the use of advanced composites is described, including preliminary results. Ground and flight environmental effects on the composite materials used in the flight service programs are also discussed. J.M.S.

N81-11148# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Systems Support Div.
AIR FORCE APPLICATIONS AND IN-SERVICE EXPERIENCE WITH COMPOSITE STRUCTURES
Frank J. Fechek *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 10 p

Avail: NTIS HC A15/MF A01

Advanced composite development programs which contribute to the capability to use these materials in primary and secondary structures on high performance military aircraft are described. Emphasis is placed on a systematic, periodic nondestructive evaluation of selected composite structures in operational service. Visual and X-radiographic inspection techniques are shown to be quite usable on composite strucutres in the field. However, inefficiencies using available, portable ultrasonic inspection equipment in the field environment accentuate the need for the development of a semi-automated, ultrasonic inspection system specifically designed to be compatible with current, production composite aircraft structures. A system satisfying these needs is shown to be feasible. J.M.S.

N81-11149# Naval Air Systems Command, Washington, D. C.
US NAVY SERVICE EXPERIENCE WITH ADVANCED COMPOSITES
A. Somoroff, M. Dubberly, J. M. McGinn, M. Tarricone, and A. Manno (Naval Air Development Center, Warminster, Pa.) *In* AGARD Effect of Serv. Environ. on Composite Mater. Aug. 1980 16 p refs
Avail: NTIS HC A15/MF A01

Lifetime durability information encompassing laboratory programs, exposure of ground specimens and observation of flight structures is presented. The specific structures discussed include the F-14 horizontal stabilizer and the H-46 rotor blade which are in production, and the YAV-8B wing developed for production of the AV-8B. Also discussed are S-3 spoilers and F-4 access doors which were developed exclusively to acquire service data. It is noted that the F-18 aircraft makes extensive use of graphite-epoxy composites in primary wing, horizontal stabilizer, and vertical stabilizer skin structure. As of the end of February 1980, eleven F-18 development aircraft are engaged in flight test evaluation. A cumulative total of more than 900 flight hours have been accumulated with the highest number of flight hours for an individual aircraft being 214 and the longest calendar service time for an individual aircraft being 18 months. During this period the graphite-epoxy structure has performed well and without incident. J.M.S.

N81-11233# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
TOXICITY OF SYNTHETIC HIGH DENSITY AND CONVENTIONAL HYDROCARBON JET FUELS TO A SOIL BACTERIUM Technical Report, Sep. 1978 - Sep. 1979
Sheldon A. London and Charlie R. Mantel Aug. 1980 22 p refs
(AF Proj. 6302)
(AD-A089527; AFAMRL-TR-80-105) Avail: NTIS HC A02/MF A01 CSCL 06/20

The effects of selected high density and conventional jet fuels on the growth kinetics of a soil microorganism were determined. A culture of Enterobacter clocacae isolated from soil was exposed to various concentrations of each fuel in a mineral salts medium and bacterial growth was monitored turbidimetrically and by viable count techniques. Effects were indicated by observing changes in maximum bacterial growth, growth rate, lag time, and death rate. The majority of the fuels studied manifested their effects by decreasing the number of viable organisms during the stationary growth period. Stable emulsion formation resulted in erroneous turbidimetric determinations. The applicability of bacterial systems as indicators of toxicity of water insoluble jet propellants was discussed. GRA

N81-11269# Saab-Scania, Linkoping (Sweden). Aerospace Div.

COMPUTER BASED IN-FLIGHT MONITORING

Kjell Folkesson *In* AGARD Fault Tolerance Design and Redundancy Management Tech. Sep. 1980 23 p

Avail: NTIS HC A08/MF A01

Various computer techniques used to monitor flight safety critical flight control systems components such as sensors, servos, and the FSC computer itself are described. Flight safety critical FCS sensors and usually redundant. The degree of redundancy is a function of the control authority of the sensors, the stability of the aircraft, and existing back-up arrangements. The digital FCS computer can be used for servo monitoring in many different ways. The servo configuration usually determines the best monitor solution. In redundant servo configurations, various signals, such as electrical current, differential pressure, velocity, or servo position, can be provided to the digital comptuer and monitored for failure detection. The FCS digital computer is usually a flight safety critical element and must be closely monitored. Failures must be detected and isolated with very high confidence. In redundant digital FCS computers, both computer self test and monitoring of the computer outputs are used to detect computer failures. The monitoring can be relized in software or in external hardware. E.D.K.

N81-11270# Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France).

DETECTING THE FAILURE OF AIRCRAFT SENSORS USING ANALYTICAL REDUNDANCY [DETECTION DE PANNE DE CAPTEURS D'AVION PAR UTILISATION DE LA REDONDANCE ANALYTIQUE]

Marc Labarrere *In* AGARD Fault Tolerance Design and Redundancy Management Tech. Sep. 1980 17 p refs In FRENCH; ENGLISH summary

Avail: NTIS HC A08/MF A01

Failure detection techniques implemented on-board aircraft must be simple and robust. By replacing a triplex vital system with a duplex system associated with analytical redundancy, the problem is reduced to isolating the failed sensor. Estimation techniques are well suited here because of the atmospheric turbulence factor. Different techniques have been used according to whether the nature of the analytical redundancy is stochastic, deterministic, static, or dynamic. Various estimation algorithms used include: (1) mixed observations; (2) estimation by observers or Kalman filters, using one or several quations and one or several measurements; and (3) autoadaptive techniques by identifying the flight configuration. A solution based on the choice and use of deterministic redundancy relations which are independent of atmospheric disturbances is presented and applied to the records of real flights. Transl. by A.R.H.

N81-11272# Honeywell Systems and Research Center, Minneapolis, Minn.

FAILURE MANAGEMENT TECHNIQUES FOR HIGH SURVIVABILITY

Thomas B. Cunningham *In* AGARD Fault Tolerance Design and Redundancy Management Tech. Sep. 1980 25 p refs

Avail: NTIS HC A08/MF A01

Survivability of aircraft can be greatly enhanced by employing a number of considerations and techniques in design and placement of avionics components. The initial sizing and location of surfaces should include the impact of survivability. Avionics hardware sharing offers cost reductions and can provide high performance if reliability and survivability issues are successfully addressed. Observers offer a structure for seeking solutions to surivability problems. Observers for in the loop sensor reconstruction often require stability margin enhancement. Techniques for examining this problem and improving stability exist. These considerations are discussed in detail and are combined with trends in sensor and computer technology to formulate a candidate for a flutter mode control implementation. E.D.K.

N81-11273# Saab-Scania, Linkoping (Sweden). Aerospace Div.

FAILURE MANAGEMENT FOR THE SAAB VIGGEN JA37 AIRCRAFT

Kjell Folkesson *In* AGARD Fault Tolerance Design and Redundancy Management Tech. Sep. 1980 21 p ref

Avail: NTIS HC A08/MF A01

The JA-37 Viggen is the first military aircraft in series production and field-service equipped with a digital automatic flight control system. The JA-37 Digital Automatic Flight Control System has high control authority and is a flight safety critical system. It has duplex sensors, a single channel digital computer, and simple secondary servos. The digital computer performs control-law calculation and sensor and servo monitoring, as well as extensive self test on ground and during flight. The sensors are monitored by comparison. The servos are monitored by comparing the output from a software model with the servo output. E.D.K.

N81-11274*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.

FLIGHT EXPERIENCE WITH FLIGHT CONTROL REDUNDANCY MANAGEMENT

Kenneth J. Szalai, Richard R. Larson, and Richard D. Glover *In* AGARD Fault Tolerance Design and Redundancy Management Tech. Sep. 1980 27 p refs

Avail: NTIS HC A08/MF A01 CSCL 01C

Flight experience with both current and advanced redundancy management schemes was gained in recent flight research programs using the F-8 digital fly by wire aircraft. The flight performance of fault detection, isolation, and reconfiguration (FDIR) methods for sensors, computers, and actuators is reviewed. Results of induced failures as well as of actual random failures are discussed. Deficiencies in modeling and implementation techniques are also discussed. The paper also presents comparison off multisensor tracking in smooth air, in turbulence, during large maneuvers, and during maneuvers typical of those of large commercial transport aircraft. The results of flight tests of an advanced analytic redundancy management algorithm are compared with the performance of a contemporary algorithm in terms of time to detection, false alarms, and missed alarms. The performance of computer redundancy management in both iron bird and flight tests is also presented. E.D.K.

N81-11275# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. for Flight System Dynamics.

ROBUST CONTROL SYSTEM DESIGN

J. Ackermann *In* AGARD Fault Tolerance Design and Redundancy Management Tech. Sep. 1980 14 p refs

Avail: NTIS HC A08/MF A01

The short period longitudinal mode of an F 4-E with horizontal canards is instable in subsonic flight and unsufficiently damped at supersonic speed. The control system has to provide acceptable pole locations according to military specifications for flying qualities. A fixed gain controller using three paralleled gyros is designed, such that the pole region requirements in four typical flight conditions are robust with respect to gain reduction to one third. Thus nothing bad happens immediately after one or two gyro failures. Failure detection and redundancy management may be performed at a higher hierarchical level, which does not have to be extremely fast. The use of accelerometers or air data sensors for angle of attack or dynamic pressure is totally avoided in this concept and no gain scheduling is necessary. The design for robustness with respect to different flight conditions and sensor failures is performed by a novel parameter space design tool. E.D.K.

N81-11290# Federal Aviation Administration, Atlantic City, N.J. Technical Center.

TEST AND EVALUATION OF THE AIRPORT SURVEILLANCE RADAR (ASR)-8 WIND SHEAR DETECTION SYSTEM

(PHASE 2), REVISION Interim Report, Apr. - Dec. 1979
D. L. Offi, W. Lewis, T. Lee, and A. DeLaMarche Aug. 1980 40 p refs Revised
(FAA Proj. 022-242-830)
(AD-A090111; FAA-CT-80-17-A-Rev; FAA-RD-80-21-A-Rev) Avail: NTIS HC A03/MF A01 CSCL 17/9

A wind shear detection system developed by the Wave Propagation Laboratory (WPL) to operate with the Federal Aviation Administration (FAA) Airport Surveillance Radar (ASR)-8 was installed and is being tested at the FAA technical Center. Initial efforts, previously reported in Report NA-78-59-LR, were directed toward hardware and software shakedown and feasibility determination. Second phase tests compared radar with aircraft and tower winds, evaluated the wind shear measurement capability under various weather conditions, and investigated the effectiveness of a simple two-azimuth pointing strategy and system capabilities and limitations. Results showed the system to be compatible with and to operate satisfactorily with the ASR-8. The processing and spectral display of clear air and precipitation returns is feasible. The accuracy of agreement between radar-measured winds and components of the aircraft-measured winds in both radially oriented flights and runway offset flights, using a two-azimuth pointing technique, was examined. Radar versus tower wind agreement was also examined. Potentially dangerous wind shears associated with weather during these tests were detectable. Certain system limitations also have been defined and considered. It is recommended that tests continue to complete definition of and demonstrate capabilities in all weather situations, to optimize performance, and to provide information to specify system design for possible development of a prototype model. GRA

N81-11364# Aeronautical Research Labs., Melbourne (Australia).
A SIX-CHANNEL QUICK-LOOK UNIT FOR THE AODYNAMICS DIVISION MKI AIRBORNE DATA ACQUISITION PACKAGE
A. J. Farrell, S. H. Creed, I. M. Kerton, and P. Ferrarotto Feb. 1980 31 p refs
(AD-A089975; ARL/AERO-TM-319) Avail: NTIS HC A03/MF A01 CSCL 09/5

A ground-based unit is described which, when connected to a chart recorder, provides a post-flight analogue record of up to six channels simultaneously of data recorded on the Aerodynamics Division MKI Airborne Data Acquisition Package. GRA

N81-11365# Aeronautical Research Labs., Melbourne (Australia).
TRANSDUCER INSTALLATION FOR THE SEA KING MK 50 MATHEMATICAL MODEL VALIDATION FLIGHT TESTS
D. T. Hourigan Mar. 1980 24 p refs
(AD-A089924; ARL/AERO-TM-322; AR-001-806) Avail: NTIS HC A02/MF A01 CSCL 01/3

The installation of transducers in a R.A.N. Sea King MK 50 helicopter is described. These transducers were used to obtain flight trials data for validating a mathematical model of the aircraft. GRA

N81-11412*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPERHYBRID COMPOSITE BLADE IMPACT STUDIES
C. C. Chamis, R. F. Lark, and J. H. Sinclair [1980] 16 p refs Proposed for presentation at the 26th Ann. Intern. Gas Turbine Conf., Houston, Tex., 9-12 Mar. 1981
(NASA-TM-81597; E-580) Avail: NTIS HC A02/MF A01 CSCL 20K

The feasibility of superhybrid composite blades for meeting the mechanical design and impact resistance requirements of large fan blades for aircraft turbine engine applications was investigated. Two design concepts were evaluated: leading edge spar (TiCom) and center spar (TiCore), both with superhybrid composite shells. The investigation was both analytical and experimental. The results obtained show promise that superhybrid composites can be used to make light weight, high quality, large fan blades with good structural integrity. The blades tested successfully demonstrated their ability to meet steady state operating conditions, overspeed, and small bird impact requirements. A.R.H.

N81-11415# National Aerospace Lab., Amsterdam (Netherlands).
FLIGHT SIMULATION ENVIRONMENTAL FATIGUE CRACK PROPAGATION IN 2024-T3 AND 7475-T761 ALUMINUM
R. J. H. Wanhill Jan. 1980 10 p refs Presented at the 12th ICAS Congr., Munich, 12-17 Oct. 1980
(NLR-MP-80003-U; ICAF-1168) Avail: NTIS HC A02/MF A01

A gust spectrum representative of the load history of an under wing skin in a transport aircraft was used in flight simulation fatigue crack propagation tests on 2024-T3 and 7475-T761 aluminum alloy sheet. Tests were conducted at several design stress levels and in environments of air and air plus water spray. Results show that the fatigue crack propagation resistance of 2024-T3 sheet under gust spectrum loading is generally superior to that of 7475-T761 sheet, and that this superiority is mainly due to a greater amount of crack growth retardation during the less severe loads and flights that follow the peak loads in severe flights. The straightforward use of 7475 alloy in tension-critical structures like the under wing skin of a transport aircraft would result in decreased crack propagation resistance. In order to utilize the higher static structural efficiency and fracture toughness of 7475 alloy (in relation to 2024-T3), it may be possible to improve the relative performance by selecting an adhesive bonded laminated sheet or sandwich panel concepts. A.R.H.

N81-11422*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN ANALYTICAL TECHNIQUE FOR APPROXIMATING UNSTEADY AERODYNAMICS IN THE TIME DOMAIN
H. J. Dunn Nov. 1980 31 p refs
(NASA-TP-1738; L-13255) Avail: NTIS HC A03/MF A01 CSCL 20K

An analytical technique is presented for approximating unsteady aerodynamic forces in the time domain. The order of elements of a matrix Pade approximation was postulated, and the resulting polynomial coefficients were determined through a combination of least squares estimates for the numerator coefficients and a constrained gradient search for the denominator coefficients which insures stable approximating functions. The number of differential equations required to represent the aerodynamic forces to a given accuracy tends to be smaller than that employed in certain existing techniques where the denominator coefficients are chosen a priori. Results are shown for an aeroelastic, cantilevered, semispan wing which indicate a good fit to the aerodynamic forces for oscillatory motion can be achieved with a matrix Pade approximation having fourth order numerator and second order denominator polynomials. Author

N81-11448*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A STEEL SPAR WIND TURBINE BLADE ON THE MOD-0 100 kW EXPERIMENTAL WIND TURBINE Final Report
Theo G. Keith, Jr. (Toledo Univ.), Timothy L. Sullivan, and Larry A. Viterna Sep. 1980 24 p refs
(Contract EX-76-I-01-1028)
(NASA-TM-81588; DOE/NASA/1028-27; E-567) Avail: NTIS HC A02/MF A01 CSCL 10B

The performance and loading of a large wind rotor, 38.4 m in diameter and composed of two low-cost steel spar blades were examined. Two blades were fabricated at Lewis Research Center and successfully operated on the Mod-0 wind turbine at Plum Brook. The blades were operated on a tower on which the natural bending frequency were altered by placing the tower on a leaf-spring apparatus. It was found that neither blade performance nor loading were affected significantly by this tower softening technique. Rotor performance exceeded prediction while blade loads were found to be in reasonable agreement with those predicted. Seventy-five hours of operation over a five month period resulted in no deterioration in the blade. Author

N81-11492# AeroVironment, Inc., Pasadena, Calif. Aerosciences Group.
DEFINITIVE GENERIC STUDY FOR THE EFFECT OF HIGH LIFT AIRFOILS ON WIND TURBINE EFFECTIVENESS,

EXECUTIVE SUMMARY Final Report
Peter B. S. Lissaman, Robert E. Wilson, R. W. Thresher, and Stel N. Walker May 1979 93 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-98003-2) Avail: NTIS HC A05/MF A01

The effect of high lift airfoils on the cost effectiveness of HAWT and VAWT (horizontal and vertical axis wind turbine) machines is studied. The scope involved first studying modern two dimensional airfoils, and developing a generalized formulation for their performance in terms of lift, drag, and thickness at appropriate Reynolds numbers. Single element, multi-element, symmetrical, extra thick airfoils and jet flap airfoils were analyzed. The jet flap airfoils were considered to be unacceptable because of excessive power requirements. Then the effect of using the above airfoils on the rotors of a variety of wind turbines was made. Qualitative representation of the type of airfoils studied is given. DOE

N81-11500# Exxon Research and Engineering Co., Linden, N.J. Government Research Labs.
ALTERNATIVE ENERGY SOURCES FOR NON-HIGHWAY TRANSPORTATION, APPENDICES
E. N. Cart, Jr., ed. Jun. 1980 560 p
(Contract DE-AC05-77CS-05438)
(DOE/CS-05438/T1-Vol-3) Avail: NTIS HC A24/MF A01

A planning study was made for DOE on alternate fuels for nonhighway transportation (aircraft, rail, marine, and pipeline). DOE is provided with a recommendation of what alternate fuels may be of interest to nonhighway transportation users from now through 2025 and the research and development needed to allow nonpetroleum derived fuels to be used in nonhighway transportation. DOE

N81-11513# Exxon Research and Engineering Co., Linden, N.J. Government Research Labs.
ALTERNATIVE ENERGY SOURCES FOR NON-HIGHWAY TRANSPORTATION, VOLUME 1
E. N. Cart, Jr., ed. Jun. 1980 26 p refs
(Contract DE-AC05-77CS-55438)
(DOE/CS-05438/T1-Vol-1) Avail: NTIS HC A03/MF A01

Alternate fuels for nonhighway transportation (aircraft, rail, marine, and pipeline) were investigated. A recommendation of what alternate fuels may be of interest to nonhighway transportation users from now through 2025 is made. The research and development needed to allow nonpetroleum derived fuels to be used in nonhighway transportation is discussed. In the near term (present-1985), there is unlikely to be any major change in the fuels used in any of the four modes of transportation except that the average quality of the marine fuel is likely to get worse. In the midterm period (1985-2000), there will be a transition to nonpetroleum fuels, based primarily on shale oil derived liquids assuming a shale oil industry is started during this time. DOE

N81-11658*# Goodyear Aerospace Corp., Akron, Ohio.
MICROPROCESSOR SOFTWARE APPLICATIONS FOR FLIGHT TRAINING SIMULATORS
Wayne P. Leavy *In* NASA. Goddard Space Flight Center Aerospace Appl. of Microprocessors 1980 p 103-111

Avail: NTIS HC A12/MF A01 CSCL 09B

The g cueing system software design and implementation in the dual microprocessor system of the F-15 operational flight training simulator g cueing system is presented. The software is structured in the two microcomputers such that one serves as a controller performing all logical functions and interface with the host computer system while the other serves as an arithmetic unit performing all mathematical functions. M.G.

N81-11673*# Goodyear Aerospace Corp., Akron, Ohio.
MICROCOMPUTER ARRAY PROCESSOR SYSTEM
Kenneth D. Slezak *In* NASA. Goddard Space Flight Center Aerospace Appl. of Microprocessors 1980 p 259-274

Avail: NTIS HC A12/MF A01 CSCL 09B

The microcomputer array system is discussed with specific attention given to its electronic warware applications. Several aspects of the system architecture are described as well as some of its distinctive characteristics. R.C.T.

N81-11688*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN AUTOMATED PROCEDURE FOR DEVELOPING HYBRID COMPUTER SIMULATIONS OF TURBOFAN ENGINES
John R. Szuch and Susan M. Krosel 1980 19 p refs Proposed for presentation at the 14th Ann. Simulation Symp., Tampa, Fla., 18-20 Mar. 1981
(NASA-TM-81605; E-598) Avail: NTIS HC A02/MF A01 CSCL 09B

A systematic, computer-aided, self-documenting methodology for developing hybrid computer simulations of turbofan engines is presented. The methodology makes use of a host program that can run on a large digital computer and a machine-dependent target (hybrid) program. The host program performs all of the calculations and date manipulations needed to transform user-supplied engine design information to a form suitable for the hybrid computer. The host program also trims the self contained engine model to match specified design point information. A test case is described and comparisons between hybrid simulation and specified engine performance data are presented. S.F.

N81-11769*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. Fluid Mechanics and Acoustics Div.
CORE NOISE MEASUREMENTS FROM A SMALL, GENERAL AVIATION TURBOFAN ENGINE
Meyer Reshotko and Allen Karchmer 21 Nov. 1980 28 p refs Presented at the 100th Meeting of the Acoust. Soc. of Am., Los Angeles, 17-21 Nov. 1980
(NASA-TM-81610; E-607) Avail: NTIS HC A03/MF A01 CSCL 20A

As part of a program to investigate combustor and other core noises, simultaneous measurements of internal fluctuating pressure and far field noise were made with a JT15D turbofan engine. Acoustic waveguide probes, located in the engine at the combustor, at the turbine exit and in the core nozzle wall, were used to measure internal fluctuating pressures. Low frequency acoustic power determined at the core nozzle exit corresponds in level to the far field acoustic power at engine speeds below 65% of maximum, the approach condition. At engine speeds above 65% of maximum, the jet noise dominates in the far field, greatly exceeding that of the core. From coherence measurements, it is shown that the combustor is the dominant source of the low frequency core noise. The results obtained from the JT15D engine were compared with those obtained previously from a YF102 engine, both engines having reverse flow annular combustors and being in the same size class. Author

N81-11770*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF A SEMI-ANNULAR THERMAL ACOUSTIC SHIELD ON JET EXHAUST NOISE
J. Goodykoontz 21 Nov. 1980 21 p refs Presented at the 100th Meeting of the Acoust. Soc. of Am., Los Angeles, 17-21 Nov. 1980
(NASA-TM-81615; E-616) Avail: NTIS HC A02/MF A01 CSCL 20A

Reductions in jet exhaust noise obtained by the use of an annular thermal acoustic shield consisting of a high temperature, low velocity gas stream surrounding a high velocity central jet exhaust appear to be limited by multiple reflections. The effect of a semi-annular shield on jet exhaust noise was investigted with the rationale that such a configuration would eliminate or reduce the multiple reflection mechanism. Noise measurements for a 10 cm conical nozzle with a semi-annular acoustic shield are presented in terms of lossless free field data at various angular locations with respect to the nozzle. Measurements were made on both the shielded and unshielded sides of the nozzle. The results are presented parametrically, showing the effects of various shield and central system velocities and temperatures.

Selected results are scaled up to a typical full scale engine size to determine the perceived noise level reductions. A.R.H.

N81-11774# State Univ. of New York at Buffalo, Amherst. Faculty of Engineering and Applied Sciences.
COOPERATIVE INVESTIGATION OF THE NOISE PRODUCING REGION OF AN AXISYMMETRIC JET Final Report
W. K. George, R. E. A. Arndt, and H. M. Nagib Jul. 1980 34 p refs
(Contract F49620-78-C-0047)
(AD-A089692; AFOSR-80-0754TR) Avail: NTIS HC A03/MF A01

The objectives of this three-university effort are: to determine whether or not large scale structures exist in the mixing layer of an axisymmetric jet; to determine whether or not these large scale structures (if they exist) contribute to the radiated noise; and to quantify the above conclusions so that the results can be used for evaluation of jet noise theories and for prediction of radiated noise. This is a report on the initial phase of the work in which the primary emphasis has been on the construction of the experimental facilities, the acquisition and assembly of the measurement hardware and the development of computer software. Noteworthy advances include an analysis and extension of the burst-mode LDA, and the continued development of digitally sampled flow visualization techniques. Experiments on various nozzle shapes at low Reynolds number indicate that nozzle shape plays an important role in determining the vortex pairing in the mixing layer and the radiated noise. This does not appear to be the case at high Reynolds numbers. The preliminary conclusion is that the pairing and turbulence structures observed at low Reynolds numbers have little to do with jet noise. GRA

N81-11778# Rockwell International Corp., El Segundo, Calif. North American Aircraft Div.
WEAPON BAY CAVITY NOISE ENVIRONMENTS, DATA CORRELATION AND PREDICTION FOR THE B-1 AIRCRAFT Final Report, Feb. 1979 - May 1980
A. G. Tipton Wright-Patterson AFB, Ohio AFFDL Jun. 1980 239 p refs
(Contract F33615-79-C-3208; AF Proj. 2401)
(AD-A089770; NA-80-247; AFWAL-TR-80-3050) Avail: NTIS HC A11/MF A01 CSCL 20/1

During development of the B-1 aircraft, an extensive cavity noise measurement and noise reduction program using wind tunnel models and evaluation on a flight-test aircraft was conducted. Substantial cavity noise reduction was achieved with retrofitted spoilers for a Mach 0.6 to 1 range for the weapon bay cavity of L/D = 2.2. A substantial amount of cavity unsuppressed and suppressed data were acquired from wind tunnel models and the full-scale aircraft. Data for weapon bay cavities with internal stores and multiple open cavities was also obtained. The data acquired during development of B-1 cavity noise suppressors are correlated and compared with previously published data. The data are correlated with existing prediction techniques and modifications to the current prediction techniques, and guidelines are recommended. GRA

N81-11902# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
DESIGN TO COST AND LIFE CYCLE COST
Jul. 1980 333 p refs In ENGLISH and FRENCH Symp. held in Amsterdam, 19-22 May 1980
(AGARD-CP-289; ISBN-92-835-0268-X) Avail: NTIS HC A15/MF A01

Life cycle costs (LCC) methodology and its relation to specifications and requirements are discussed. Other topics include the impact of LCC analysis on total system design, cost control of operations and support, and LCC of subsystems and components.

N81-11903# British Aerospace Aircraft Group, Preston (England).
LIFE CYCLE COST ANALYSIS (LCCA) IN MILITARY AIRCRAFT PROCUREMENT
R. Chisholm *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 8 p refs
Avail: NTIS HC A15/MF A01

The changing economic environment and the developing requirement to put increased emphasis on downstream activities in the early phases of a weapon system program are discussed. A possible approach to calculating the magnitude and spread of cost reducing investments is considered and applications of life cycle cost analysis in strategic decision making, the design process, and as a sales aid are mentioned. E.D.K.

N81-11905# Army Aviation Research and Development Command, St. Louis, Mo.
US ARMY DESIGN-TO-COST EXPERIENCE
Richard B. Lewis, II, Edward P. Laughlin, and Francis E. Spring *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 11 p
Avail: NTIS HC A15/MF A01

Design-to-Cost procedures were included in all major U.S. Army aviation procurements since 1972. Experience was gained during design, development, procurement and initial fielding of several major systems. The ownership cost of this equipment is considered during development. Production and operational phases and techniques for cost control are discussed. Lessons learned as a result of joint Government-Industry Design-To-Unit-Production-Cost programs are presented. Techniques which were effective in cost management on utility and attack helicopters and turbine engine programs are listed. Producibility engineering planning, initial production tooling, and facilitization to reduce production costs are discussed. The role of warranties in controlling operating and support costs is illustrated. It is concluded that Design-To-Unit-Production-Cost techniques were effective in achieving lower production costs, but that additional work is necessary to better control operating and support costs and thereby achieve optimal life cycle costs. E.D.K.

N81-11906# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
A REVIEW AND ASSESSMENT OF SYSTEM COST REDUCTION ACTIVITIES
W. E. Lamar *In its* Design to Cost and Life Cycle Cost Jul. 1980 38 p refs
Avail: NTIS HC A15/MF A01

A review of the evolution of cost reduction concepts over the past decade to current design to life cycle cost (DTLCC) efforts is presented. Emphasis is given to progress achieved and basic problems and issues which have confronted successful application of these concepts. The review addresses the importance of top management action, consideration of costs in the early phase, and a credible data base. Progress in developing cost prediction and analysis methods, technologies to reduce development, acquisition, operations and support costs, the institutionalization of design to cost and design to life cycle cost methods, and remaining challenges are discussed. E.D.K.

N81-11907# Boeing Aerospace Co., Seattle, Wash.
DESIGN TO LIFE CYCLE COST RESEARCH
Fred T. Carlson *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 15 p
Avail: NTIS HC A15/MF A01

Design to life cycle cost research applied to the area of logistics systems is discussed with a look at history data for typical aircraft systems. Deficiencies in systems operations and support are identified and described. Methods of assessing the cost, risk, and program application are discussed. Areas of emphasis, cost drivers, and their impacts are shown. It is determined that many deficiencies in the ownership of systems do not relate to program plans. Resolution by future technology advances must be aimed toward elimination of manpower, material, and program causative factors through research of logistics subsystems, i.e., inspections, material distribution, people use, and logistics networks. E.D.K.

N81-11909# British Aerospace Aircraft Group, Preston (England).
EVOLUTION OF TECHNIQUES FOR LCC ANALYSIS
J. M. Jones *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 13 p
Avail: NTIS HC A15/MF A01

The need to control aircraft operating and support costs starting with a coordinated approach to life cycle cost (LCC) analysis during the conceptual design stage is identified. Experiences in the development and use of LCC models are discussed. The limitations of existing systems together with examples of current work on this subject are presented. E.D.K.

N81-11910# McDonnell Aircraft Co., St. Louis, Mo.
THE HORNET PROGRAM: A DESIGN TO LIFE CYCLE COST CASE STUDY
Robert D. Dighton *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 12 p

Avail: NTIS HC A15/MF A01
A primary requirement of the Hornet program is significant reduction in life cycle cost (LCC). The design and management techniques used to develop a new fighter/attack system at an affordable LCC are described. The designer must consider key elements of LCC such as reliability, maintainability, unit production cost, and logistics support cost elements in parallel with traditional concerns of weight and performance when designing life cycle costs. Examples of trade studies resulting in relatively large LCC avoidances are summarized. E.D.K.

N81-11911# General Dynamics/Fort Worth, Tex. F-16 Systems Engineering Management.
DESIGN TO COST AND THE F-16 MULTIROLE FIGHTER
W. M. Rowell *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 14 p refs

Avail: NTIS HC A15/MF A01
The low cost of the F-16 Fighter Aircraft is the result of a selected balance of innovative technologies, available low cost material and equipment, and cost reducing configuration options. This was implemented through the application of design to cost concepts from the beginning of the program. The F-16 full scale development contract contained several clauses which provided downstream cost control including control of both acquisition and operations. A key part of this plan was the identification and close tracking of a few cost drivers which comprise over 50% of the air vehicle cost. A number of specific contract provisions are aimed at control of operating and support costs. These provisions provide financial incentives and penalties for consideration of reliability and other logistic support parameters. Other control provisions require cost considerations in trade studies, engineering change proposals, and in vendor selections. E.D.K.

N81-11912# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.
STRUCTURAL INTEGRATION AS A MEANS OF COST REDUCTION
P. E. Siebert *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 17 p
Avail: NTIS HC A15/MF A01
Through some components of the Tornado fighter aircraft it is demonstrated how costs can be reduced by structural integration. The components are two flat panels, the wing carry through box and the Taileron. Cost savings could be achieved from 15% to a maximum of 68%. E.D.K.

N81-11913# Avions Marcel Dassault, Saint-Cloud (France).
DESIGN-TO-COST AND NEW TECHNOLOGIES [DESIGN-TO-COST ET TECHNOLOGIES NOUVELLES]
Francois Cordie *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 8 p In FRENCH
N81-11902 02-81)
Avail: NTIS HC A15/MF A01
Modern combat aircraft design can no longer be undertaken without giving equal consideration to mission cost and performance when making compromises which lead to the choice of an aircraft formula. These compromises are based on technologies which can be used from the beginning of production. Usually they are new technologies which have passed the laboratory stage and applied to existing aircraft before being integrated into the design on a large scale. With respect to structures, carbon-epoxy composite technology is one of the most remarkable. Its introduction at the design stage results in reduction of mass and cost, first on the elements to which it is applied, and then by the amplifying effect on the assembly of the structure and the rest of the aircraft: engine, equipment, and fuel. Such a process supposes that the technology to be applied has attained a degree of maturation which permits prediction of performance and cost with certitude. Transl. by A.R.H.

N81-11914# Societe Nationale Industrielle Aerospatiale, Paris (France). Aircraft Div.
ORGANIZING A DESIGN-TO-COST PROGRAM
Robert Tassinari *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 14 p

Avail: NTIS HC A15/MF A01
Total cost control at all development and production stages is a prerequisite to any significant design-to-cost (DTC) program. Design to life cycle cost (DTLCC) methods further require intimate knowledge of operational and maintenance costs. Specialists in this cost management method are aware of these two principles. Less obvious, perhaps are the great advantages to be derived through an organization specifically trained in the application of DTC and DTLC principles. A specialized organization and methods for integrating costs into all phases of new programs was created much in the way that weights were calculated into programs in the past. To keep pace with this reorganization in development, emphasis was placed on training personnel in value analysis and DTC methods. Results of these efforts first became apparent in 1977, during development of the A 200. Today, the same principles are being applied in development of the A 310. E.D.K.

N81-11915# American Airlines, Inc., Tulsa, Okla.
A NEW METHOD FOR ESTIMATING TRANSPORT AIRCRAFT DIRECT OPERATING COSTS
Keith Grayson *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 20 p refs

Avail: NTIS HC A15/MF A01
A means of estimating aircraft direct operating costs for comparative purposes was developed which was able to recognize and include the potential benefits to be gained from technology and design innovation when applied to commercial transport aircraft. The work performed on this subject is reviewed. The validity of the developed methods and how they can be used in the evaluation of aircraft for an airline's fleet is also demonstrated. E.D.K.

N81-11916# Societe Nationale Industrielle Aerospatiale, Marignane (France.)
DESIGN-TO-COST APPLIED TO THE AS350 HELICOPTER [LE DESIGN TO COST APPLIQUE A L'HELICOPTERE AS350]
Rene Mouille *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 18 p In FRENCH

Avail: NTIS HC A15/MF A01
In order to remain competitive on the international market, cost reduction studies were undertaken at Aerospatiale and were concretized in the design of the AS350 helicopter after two years' effort by a small experimental research group. The development of this helicopter, which is definitely more economical than the Alouette 2 or the Gazelle, has followed the same cost reduction spirit as was used in its design. The method is classic and is based on (1) analysis of the value of functions and of the parts assuring these functions; (2) criticism of the solution; (3) search for new solutions; and (4) choice of compromises. The experience of the participants permitted rapid elimination of the most expensive choice as well as those with least performance. The benefits to be obtained from proceeding correctly from the design stage can be very important with regards to both acquisition and utilization costs. This is of interest to both civil and military users. Transl. by A.R.H.

N81-11917# United Air Lines, Inc., San Francisco, Calif.
RELIABILITY-CENTERED MAINTENANCE
F. S. Nowlan *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 13 p refs

Avail: NTIS HC A15/MF A01
The use of reliability centered maintenance principles are discussed with respect to aircraft component life cycle costs. The following inherent reliability characteristics are emphasized: failure consequences, judged by the effect of loss of function on safety, mission capability and operational readiness; failure modes which lead to an item's loss of function; exposure to secondary damage that results from certain failure modes; visibility of the failure process and a mechanic's ability to discover potential failures and thereby prevent functional failures; evidence by which the operating crew can realize that a functional failure has occurred; exposure to the consequences of multiple failures; and failure rates. R.C.T.

N81-11918# British Aerospace Aircraft Group, Preston (England).
SOME ENGINEERING ASPECTS OF LIFE CYCLE COSTING
G. W. Bleasdale *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 9 p refs

Avail: NTIS HC A15/MF A01
The constituents that are common to most life cycle cost methods are identified. Ways in which some of the engineering costs can be minimized are discussed. It is shown that the extra cost of better engineering design may increase the acquisition cost but this will be more than offset by the large reduction in support costs complemented by the increase in reliability and aircraft availability. Examples are given showing typical contributions to high support costs of mechanical components. R.C.T.

N81-11919# Northrop Corp., Hawthorne, Calif. Aircraft Group.
BALANCED DESIGN: MINIMUM COST SOLUTION
E. Huie and H. F. Harris *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 8 p

Avail: NTIS HC A15/MF A01
The application of life cycle cost analysis is discussed and the techniques used to assessed life cycle costs during the different phases of weapon system development are described. An illustrative case study showing the benefits of the application of life cycle costing on availability, sustained sorties, and requirements are presented. R.C.T.

N81-11920# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
DESIGN TO COST AND SYSTEMS, LCC
Klaus Wickel *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 9 p
Avail: NTIS HC A15/MF A01
Different aspects of the design to costs approach are addressed with special attention given to their operational and maintenance cost and methodological implications. Three major subtasks of the design to cost task are examined: design to financial feasibility; design to personnel feasibility; and design to system's life cycle costs. It is shown that design to cost is indisputably an absolutely essential approach to tackling the cost problems as long as the objective does not degenerate to mere design to financial feasibility. R.C.T.

N81-11921# British Aerospace Aircraft Group, Preston (England).
IMPACT OF MAINTAINABILITY OF LIFE CYCLE COSTS
G. R. Thornber *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 11 p
Avail: NTIS HC A15/MF A01
The interpretation of the definitions of the varied parameters used in assessing maintainability with respect to their significant effect on the quantification of the effect on life cycle cost. One possible interpretation is considered and the results obtained using this are indicated. Methods of assessing maintainability as applied to two international collaborative military aircraft are considered and some of the lessons and problems encountered are addressed. R.C.T.

N81-11922# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
ESTIMATION OF RELATIVE TOTAL COST FOR AIRCRAFT SYSTEMS
J. Bollmann and H. Lankenau *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 9 p refs

Avail: NTIS HC A15/MF A01
A suitable method for determining the relative total costs (fixed and operating costs) is described. It is shown that during the operating phase a clear statistical comparison must continuously be accomplished between the target and the actual values in order to ensure that any deviations and the causes of such deviations can be detected and eliminated. The need to have an agreed procedure between operator, aircraft manufacturer and equipment supplier is emphasized. R.C.T.

N81-11923# Messier-Hispano-Bugatti S.A., Montrouge (France).
USING COST REDUCTION CONCEPTS AT MESSIER-HISPANO-BUGATTI [MISE EN OEVRE DES CONCEPTS DE REDUCTION DES COUTS CHEZ MESSIER-HISPANO-BUGATTI]
M. Eslinger *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 11 p In FRENCH

Avail: NTIS HC A15/MF A01
Industrialization, value analysis, production cost objective, and life cycle cost objective are four concepts used at M-H-B to reduce the cost of products such as landing gear, hydraulic equipment, wheels, and brakes. Each of these concepts is examined, and the means necessary for their implementation are indicated. Results of using these techniques are described. Transl. by A.R.H.

N81-11924# Gabelman (Irving J.) Technical Associates, Rome, N.Y.
SUMMARY OF AGARD LECTURE SERIES 100: METHODOLOGY FOR CONTROL OF LIFE CYCLE COSTS FOR AVIONICS SYSTEMS
Irving J. Gabelman *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 8 p Lecture held in Bonn, 7-8 May 1979 and in Athens, 10-11 May 1979

Avail: NTIS HC A15/MF A01
The continually increasing cost of avionics and weapons systems between aquisition and their lifetime operation are discussed. Specific emphasis is given to the following: elements of life cycle costs; parametric cost analysis; and life cycle cost methodology. R.C.T.

N81-11926# Ministry of Defence, London (England).
SUMMARY OF AGARD LECTURE SERIES 107: THE APPLICATION OF DESIGN TO COST AND LIFE CYCLE COST TO AIRCRAFT ENGINES
E. J. Jones *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 5 p Lecture held in Saint Louis, France 12-13 May 1980 and in London, 15-16 May 1980

Avail: NTIS HC A15/MF A01
The latest methodologies of cost/performance comparison and trade offs for aircraft engines are examined. Information includes data collection, analysis, modelling and estimating all development and operations costs. R.C.T.

N81-11927# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aero Propulsion Lab.
THE ROLE OF ADVANCED TECHNOLOGY OF TURBINE ENGINE LIFE CYCLE COST

Robert F. Panella, Michael A. Barga, and Richard G. McNally *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 13 p refs
Avail: NTIS HC A15/MF A01

The advanced technology of the turbine engine and its impact on life cycle costs (LCC) is addressed. To adequately assess this advanced technology, LCC techniques are to be developed which are sensitive to performance, structural design, manufacturing processes, reliability and maintainability. These techniques are then used to determine the performance/life/cost trade-offs of the advanced technology. An overview of current efforts in LCC techniques, and trade-offs is given. R.C.T.

N81-11928# Lucas Aerospace Ltd., Birmingham (England). Engine Management Div.

COST CONSIDERATIONS OF ENGINE FUEL CONTROL SYSTEMS

A. J. Eccleston *In* AGARD Design to Cost and Life Cycle Cost Jul. 1980 14 p

Avail: NTIS HC A15/MF A01

The manufacture of hydromechanical systems is discussed. It is shown that by applying well tried principles a value engineering team can identify considerable potential savings, particularly in the case of new designs. While lower life cycle costs are frequently only achieved at the expense of increased first cost this is not invariably so. R.C.T.

N81-11953*# AiResearch Mfg. Co., Phoenix, Ariz.

COST/BENEFIT ANALYSIS OF ADVANCED MATERIALS TECHNOLOGY CANDIDATES FOR THE 1980'S, PART 2 Final Report

R. E. Dennis and H. F. Maertins Aug. 1980 106 p refs
(Contract NAS3-20073)
(NASA-CR-165176; AIRESEARCH-21-3663-PT-2) Avail: NTIS HC A06/MF A01 CSCL 05A

Cost/benefit analyses to evaluate advanced material technologies projects considered for general aviation and turboprop commuter aircraft through estimated life-cycle costs, direct operating costs, and development costs are discussed. Specifically addressed is the selection of technologies to be evaluated; development of property goals; assessment of candidate technologies on typical engines and aircraft; sensitivity analysis of the changes in property goals on performance and economics, cost, and risk analysis for each technology; and ranking of each technology by relative value. The cost/benefit analysis was applied to a domestic, nonrevenue producing, business-type jet aircraft configured with two TFE731-3 turbofan engines, and to a domestic, nonrevenue producing, business type turboprop aircraft configured with two TPE331-10 turboprop engines. In addition, a cost/benefit analysis was applied to a commercial turboprop aircraft configured with a growth version of the TPE331-10. M.G.

N81-12010# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

AIR FORCE TECHNICAL OBJECTIVE DOCUMENT FY 1981

Sidney O. Davis Dec. 1979 30 p Supersedes AFML-TR-78-195
(AD-A089709; AFML-TR-79-4222; AFML-TR-78-195) Avail: NTIS HC A03/MF A01 CSCL 15/3

This technical objective document was prepared by the Materials Laboratory and describes the materials technology areas for meeting future Air Force operational needs. The six technology areas encompass the full spectrum of materials capabilities required for future aircraft, missile, space, and electronic systems: thermal protection materials; aerospace structural materials; aerospace propulsion materials, fluid, lubricant, and elastomeric materials; protective coatings and materials, and electromagnetic windows and electronics. Presented for each TA is the general objective, specific goals, technical approaches, and a Laboratory TA focal point who can facilitate face-to-face discussions with Laboratory engineers and scientists. GRA

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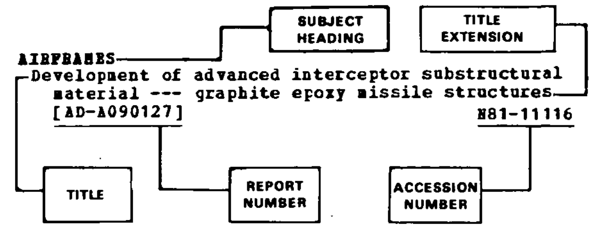
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Search and rescue methods and equipment. A bibliography with abstracts
[PB80-812837] N81-10026

Bird strikes and aviation safety. Citations from the NTIS data base
[PB80-812944] N81-10027

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[PB80-808611] N81-10076

Airfield pavement evaluation. Citations from the NTIS data base
[PB80-812860] N81-10083

Axial flow compressors. Citations from the NTIS data base
[PB80-808603] N81-10441

Bibliography on aerodynamics of airframe/engine integration of high-speed turbine-powered aircraft, volume 1
[NASA-TM-81814] N81-11032

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Bird strikes and aviation safety. Citations from the NTIS data base
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Axial flow compressors. Citations from the Engineering Index data base
[PB80-808611] N81-10076

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COMMERCIAL AIRCRAFT
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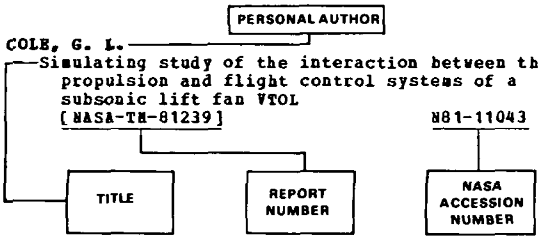
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