NASA SP-7037 (19)

AERONAUTICAL ENGINEERING

A SPECIAL BIBLIOGRAPHY
WITH INDEXES
Supplement 19

JUNE 1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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AERONAUTICAL ENGINEERING

A Special Bibliography

Supplement 19

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in May 1972 in

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

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INTRODUCTION

Under the terms of an interagency agreement with the Federal Aviation Administration this publication has been prepared by the National Aeronautics and Space Administration for the joint use of both agencies and the scientific and technical community concerned with the field of aeronautical engineering

This supplement to *Aeronautical Engineering—A Special Bibliography* (NASA SP-7037) lists 432 reports, journal articles, and other documents originally announced in May 1972 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)* For previous bibliographies in this series, see inside of front cover

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

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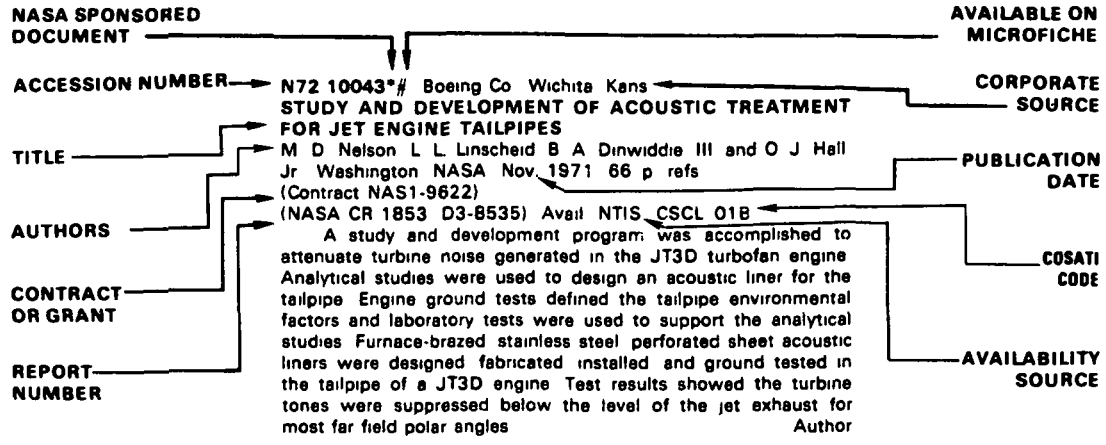

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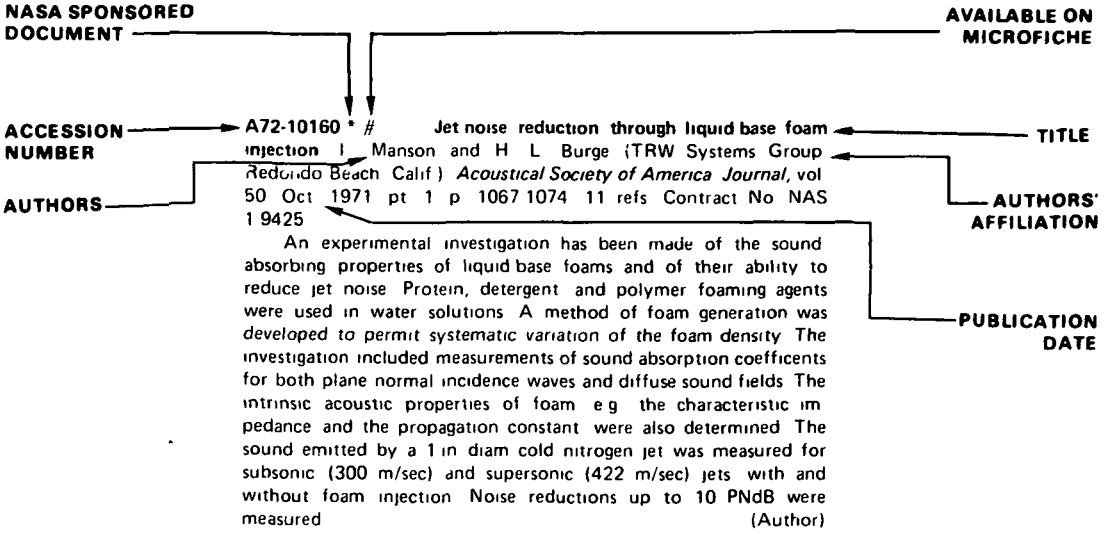

AERONAUTICAL ENGINEERING

A Special Bibliography (Suppl. 19) JUNE 1972

IAA ENTRIES

A72-22208 # **Motion of a system on a given surface in a phase space (Dvizhenie sistemy po zadannoi v fazovom prostranstve poverkhnosti)** A M Formal'skii (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) *Moskovskii Universitet, Vestnik, Seriia I - Matematika, Mekhanika*, vol 27, Jan Feb 1972, p 102-107 6 refs In Russian

Study of the problem of control synthesis for a system that is to move on a given surface in a phase space The investigation is of a mainly methodological character As an example of such a problem, the case on an aircraft is considered whose motion in the phase space is not to transgress given limits M V E

A72-22298 # **Designing an airfoil contour as the envelope of a family of circles (Postroenie kontura profilia kak ogibaiushchei semeistva okruzhnostei)** A V Kan *Energomashinostroenie*, vol 17, Dec 1971, p 10-12 In Russian

A method of determining the coordinates of an arbitrary number of points on an airfoil contour is proposed which requires a minimum of initial data on the airfoil geometry The method is based on the idea of representing the airfoil contour as the envelope of a family of circles whose centers lie on the mean camber line The theory of the method is outlined, and the method is applied to the solution of some airfoil geometry problems V P

A72-22320 # **Investigation of the effect produced by shaft and wall in aerodynamic measurements with three-orifice probes in wind tunnels (Untersuchung des Schaft- und Wandeinflusses bei aerodynamischen Messungen mit Dreilochsonden in Stromungskanälen)** H Heikal Berlin, Technische Universitat, Institut fur Luftfahrttriebwerke, Dr Ing Dissertation, 1971 120 p 75 refs In German

A number of phenomena were observed during measurements conducted with the aid of pressure probes These phenomena include a diffusor effect near the aperture used for introducing the probe, a nozzle effect at the opposite wall, a blocking action due to the displacement effect of the probe, the continuous change of the flow field at the introduction of the probe, the interaction of the probe with the wall, and the effect of the velocity gradient These phenomena cause significant deviations in the measured data from the actual values A new three-orifice probe can be used for measurements in small channels and in flow fields with velocity gradients A new approach was developed in the investigation This approach makes it possible to determine the actual values for the flow parameters by taking into account interaction effects G R

A72 22396 **Ceramic fibres for the reinforcement of gas turbine blades** J E Bailey and H A Barker (Surrey, University, Guildford, Surrey England) In Ceramics in severe environments, Proceedings of the Sixth University Conference on Ceramic Science, North Carolina State University, Raleigh, N C , December 7 9, 1970 New York Plenum Press, 1971 p 341 358, Discussion, p 358, 359 31 refs Research supported by the Department of Trade and Industry

Continuous filament reinforcement of nickel base alloy turbine blades with SiC, W, or Al2O3 has been considered as a means of improving creep resistance at high temperatures (up to 1200 C) SiC is readily available in fibre form, but reacts chemically with the matrix, tungsten wires are excessively dense and alumina fibres have not been available until recently Extrusion or pulling of molten alumina was tried but abandoned at an early stage Extrusion and sintering of a very concentrated aqueous dispersion of hydrated alumina has been moderately successful Fabrication of composite blades using polycrystalline alumina (or continuous sapphire single crystal) fibres has not proved successful by liquid infiltration since severe damage is caused to the fibres (Author)

A72-22407 # **A study of the boundary layer transition on a wing profile at supersonic speeds (Issledovanie perekhoda pogranichnogo sloia na krylovom profile pri sverkhzvukovykh skorostiakh)** V I Kornilov, V Ia Levchenko, and A M Kharitonov (Akademiia Nauk SSSR, Institut Teoreticheskoi i Prikladnoi Mekhaniki, Novosibirsk, USSR) *Akademiia Nauk SSSR, Sibirskoe Otdelenie, Izvestiia, Seriia Tekhnicheskikh Nauk*, no 1, 1971, p 15 20 6 refs In Russian

Study of the transition from a laminar to a turbulent boundary layer on a parabolic wing profile in a supersonic wind tunnel It is found that the critical Reynolds number increases greatly with an increase in the thickness of the leading edge This increase in the Reynolds number is qualitatively attributed to the formation of a favorable static pressure gradient on the wing surface, which causes a considerable decrease in the Reynolds number at the edge of the boundary layer and, consequently, promotes stabilization of the laminar layer The fact that the unit Reynolds number affects the boundary layer transition on the wing profile is confirmed It is shown that with an increase in the unit Reynolds number the transition region is widened A B-K

A72-22435 # **Optimal choice of parameters for the measurement of small scale atmospheric turbulence with an airborne hot-wire anemometer** C M Sheih (Pennsylvania State University University

Park, Pa) *Journal of Applied Meteorology,* vol 11, Feb 1972, p 81-84 7 refs U S Environmental Protection Agency Grant No AP01082, NSF Grant No GA-18109

The paper presents typical spectra of probe motions, turbulence, and electronic noise of an airborne hot-wire anemometer Their relative amplitudes as a function of aircraft size and velocity, hot wire length, and turbulence dissipation are discussed The optimal choice of these parameters in the measurement of small scale atmospheric turbulence with an airborne hot wire anemometer is recommended (Author)

A72 22438 # **Temperature gradients in stratospheric turbulence** D E Waco (Lockheed California Co , Burbank, Calif) *Journal of Applied Meteorology,* vol 11, Feb 1972, p 99-107 25 refs

Use of data obtained from U 2 HICAT flights to relate the magnitudes of horizontal temperature changes to flight conditions The empirical findings can be used in estimating the effectiveness of aircraft borne sensors which rely on temperature measurements for the remote detection of clear air turbulence Gust velocity changes of at least 20 ft/sec occurred in all but one of 68 turbulence encounters in which temperature changes were 3 C or higher, and in only 13 of 97 cases with changes of less than 1C Although short-period temperature variations were generally small during smooth flight and increased in magnitude during rougher flight, exceptions were noted Large horizontal temperature changes were observed during smooth flight in the vicinity of severe turbulence and during occasional flights where the temperature changed appreciably over shallow vertical layers Small changes were sometimes noted during moderate turbulence when the vertical temperature structure was nearly isothermal (Author)

A72-22451 # **Successful test of an airborne gas chromatograph** H F Hawkins, B M Lewis (NOAA, National Hurricane Research Laboratory, Coral Gables, Fla), K R Kurfis (U S Environmental Protection Agency, Div of Meteorology, Raleigh, N C), and H G Östlund (Miami, University, Miami, Fla) *Journal of Applied Meteorology,* vol 11, Feb 1972, p 221-226 6 refs

Use of a portable gas chromatograph designed for real time studies in diffusion and successfully tested in an airborne application A 10-mile low-level plume of colorless, odorless nontoxic sulfur hexafluoride (SF6) was laid down over northwest Andros Island, Commonwealth of Bahama Islands by a C 130 An accompanying DC-6 carrying the analyzer made 81 in flight samples over a period of less than 3 hr The chromatograph has a sensitivity limit of 0 03 parts per billion and completes the analysis for SF6 less than 2 min after the sample is injected into the column Of the more than 80 in-flight chromatograms, 11 indicated positive identification of the inert tracer gas Confirmation of the on-site analyses was provided by bottle samples taken in flight and analyzed later in the laboratory (Author)

A72-22473 Technology forecasting and risk assessment in V/STOL transport area J J Foody (Boeing Co , Military Aircraft Systems Div , Seattle, Wash) *Technological Forecasting and Social Change,* vol 3, no 1, 1971, p 89 98

Discussion of some of the procedures and issues involved in the forecasting and risk assessment of V/STOL aircraft technology and evaluation of its prospects Following a brief survey of previous history, mission issues are examined, particularly the performance characteristics emphasized by specific missions, and then the stage of development, selection criteria, and various technology implementation steps are reviewed It is pointed out that, whereas many helicopters have reached operational status, with the single exception of the Harrier (P-1127), no direct lift turbojet or turbofan has, nor has a tilt rotor type vehicle Yet, a large number of experimental vehicles of these types were built and have been considered eminently successful by their builders Ample proof was provided of available technology for powered-lift operation, but operational status could not be reached because there was no operational requirement that might have warranted the large initial investment It is concluded that not before there are urgent missions justifying the high initial costs will V/STOL aircraft reach operational status M V E

A72-22476 Large aluminum alloy forgings fly high in the DC 10 R V Turley and R H Gassner (Douglas Aircraft Co , Long Beach, Calif) *Metal Progress,* vol 101, Mar 1972, p 48-50

To achieve optimum design efficiency, several large forgings of 7075-T73 are integral parts of the DC 10, a third generation jet transport It is described how proper, careful machining and heat treating assure strong, distortion free components Structural testing of these components is briefly outlined O H

A72-22477 The B-1 materials-processing systems R D Reidelberger and W A Reinsch (North American Rockwell Corp , Los Angeles, Calif) *Metal Progress,* vol 101, Mar 1972, p 52-54, 56, 57

The titanium-aluminum-steel composites fiberglass-polyquartz materials system, employed in the advanced B 1 heavy, intercontinental range bomber, is described Principal characteristics and results of cost-weight trade studies which played a key role in material selection, are presented The fracture mechanics criteria, to which the structures were designed, are outlined O H

A72 22478 A versatile high-temperature alloy R B Herchenroeder, S J Matthews, J W Tackett, and S T Wlodek (Cabot Corp , Stellite Div , Kokomo, Ind) *Metal Progress,* vol 101, Mar 1972, p 60, 61, 64

The cobalt-base Haynes alloy No 188, which was developed through the application of advanced metallurgical and solid-state principles, features a combination of high strength, formability, weld durability, and oxidation resistance It is available in a number of forms, including plated, strip, bars, wire, and tubing It is well suited for many nuclear, chemical process, and aerospace applications, particularly in the reentry vehicle program O H

A72-22548 # **Microplasma welding of Kh18N10T steel casings (Mikroplazmennaia svarka obechaek iz stali Kh18N10T)** M A Abralov, B V Umarov, E A Sotnikov, and N N Cherkasov (Tashkentskii Politekhnicheskii Institut, Tashkent, Uzbek SSR) *Akademiia Nauk Uzbekskoi SSR, Izvestiia, Seriia Tekhnicheskikh Nauk,* vol 15, no 5, 1971, p 26 28 In Russian

Description of a technique which uses a thin argon-hydrogen plasma pencil (needle) for welding thin steel sheets with narrow seams to meet rigorous specifications in the production of casings for aircraft engines and precision equipment The seams obtained by this technique on thin steel welds were finer than those obtained by conventional argon arc welding V Z

A72-22626 Peculiarities in the control characteristic of two-stage propulsion systems with and without mixing operation (Besonderheiten in der Regelcharakteristik von Zweikreistriebwerken mit und ohne Mischung) F Fett (Fried Krupp GmbH, Essen, West Germany) *Zeitschrift fur Flugwissenschaften,* vol 20, Jan Feb 1972, p 1 8 In German

Mixed and unmixed type turbofans, having identical rotating components and thermodynamic cycles, are compared in terms of

transient characteristics and steady-state off-design operation Effects of step changes in fuel flow rate, nozzle area, inlet pressure, ambient temperature and air bleed are illustrated on both the fan and compressor operating maps Results show significant differences in the dynamic behavior of the mixed and unmixed turbofan engines without the influence of an engine control Off design steady state operating points are also different Both effects are more pronounced in the low pressure fan than in the high pressure compressor Such characteristics are important in the design of a compatible engine control unit (Author)

A72-22632 Partial load computation for axial flow compressor stages (Teillastberechnung fur Axialverdichterstufen) K Grahl (Cincinnati, University, Cincinnati, Ohio) *Zeitschrift fur Flugwissenschaften,* vol 20, Jan Feb 1972, p 42 51 19 refs In German

An application of an existing computer program is described for studying the off-design performance for axial flow compressors The presented analytical method allows to find the stage characteristics as a function of revolutions This can be accomplished in very short time with only few geometrical and aerodynamical input data The flow is described by the well known streamline curvature method It is, therefore, necessary to present an exact loss model, limitations of this method are described Some computation examples for the first and fifth stages of a ten stage subsonic axial flow compressor are presented The off-design analytical results are compared with existing experimental results (Author)

A72-22634 Methods for decreasing the secondary losses in axial-flow turbine stages (Methoden zur Verminderung der Sekundarverluste in axialen Turbinenstufen) H Prumper (Rheinisch-Westfalische Technische Hochschule, Aachen, West Germany) *Zeitschrift fur Flugwissenschaften,* vol 20, Jan Feb 1972, p 60 70 In German

The major secondary flows occurring in turbine stages are presented and their causes and their effect on the total flow are discussed Through visualization of the flow lines near the wall and accurate measurement of the three dimensional loss distribution of cascades featuring short and longer blades, detailed information may be obtained on the mechanism of the secondary flows and the secondary losses thereby produced In the course of experimental tests aimed at possibilities of suppressing secondary flows and secondary losses incidental thereto, the method of using boundary layer fences on the profile suction sides of the blades proved to be particularly effective and economical Finally, the experimental results obtained from the application of this method in a turbine stage are presented (Author)

A72 22646 A scientist in the cockpit - The case history and analysis of a UFO sighting H Wichman (California State College, San Bernardino, Calif) *Space Life Sciences,* vol 3, Dec 1971, p 165 170 7 refs

A UFO sighting took place during a night instrument training flight on which the author served as flight instructor The UFO was in the form of a bright light approaching on a collision course at a very high rate of speed - a rapid deceleration and hovering a rapid acceleration away from the author's plane followed by another deceleration and hovering This apparent reconnoitering activity was repeated approximately ten times after which the object failed to reappear The paper describes the struggle the author went through, after the first stages of alarm subsided, in an attempt to explain by means of scientific principles what was being seen A satisfactory tentative explanation was discovered and the method by which this came about is discussed as is the manner in which the explanation was tested in the cockpit (Author)

A72-22691 Non-contacting measurements using mini-radars F W Coultas (Royal Radar Establishment, Malvern, Worcs , England) *Chartered Mechanical Engineer,* vol 19, Mar 1972, p 62-66 7 refs

The compactness and reliability of the new radars is due mainly to a semiconductor microwave-generator The new solid state devices will generate microwave power quite cheaply at low voltages and at a level of a few milliwatts A miniature CW Doppler radar was developed The system detects the presence of a moving object and can give a direct reading of its speed One important direct application is the measurement of true speed over ground Relative measurements of distances to an accuracy of plus or minus 4 mm can be achieved Other applications are the determination of the rate of rotation G R

A72-22776 Deutsche Gesellschaft für Ortung und Navigation, National Convention About Man and Technology in Orientation and Navigation, Essen, West Germany, October 26, 27, 1971, Communications (Deutsche Gesellschaft fur Ortung und Navigation, Nationale Tagung uber Mensch und Technik in Ortung und Navigation, Essen, West Germany, October 26, 27, 1971, Mitteilungen) *Ortung und Navigation,* no 4, 1971 342 p In German

The respective parts played by man and technology in the solution of orientation and navigation problems are discussed, together with aspects of aircraft control automation and the possible application of experience obtained in space flight to problems of air and maritime navigation Other subjects discussed are related to the adaptation of navigation devices to human beings, criteria needed for computer analysis of operational and psychophysiological param eters, and the psychophysics of the recognition of a collision hazard G R

A72-22778 Analysis of information processing for the ground-based supervision and guidance of flight motions (Analyse der Informationsverarbeitung bei der bodenseitigen Überwachung und Lenkung der Flugbewegungen) D Reiche (Darmstadt, Tech nische Hochschule, Darmstadt, West Germany) *(Deutsche Gesellschaft fur Ortung und Navigation, Nationale Tagung uber Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971) Ortung und Navigation,* no 4, 1971 30 p 20 refs In German

Aspects of air traffic control are described from the point of view of system analysis Attention is given to questions regarding the evaluation of the work load to which the controllers are subjected The importance of an approach using algorithms for a description of information processing problems is pointed out The approach considered makes use of a transformation of flow diagrams into a one-dimensional description pattern The terminology proposed by Liapunov (1962) has great advantages in connection with the employment of electronic computers G R

A72-22779 Anthropotechnical aspects of taxiing /pilot/ and taxi-guidance /flight manager/ of aircraft in the landing area (Anthropotechnische Aspekte der Rollführung /Pilot/ und der Bewegungslenkung /Fluglerter/ von Flugzeugen auf dem Rollfeld) C Woltge (Hannover, Technische Universitat, Hanover, West Germany) *(Deutsche Gesellschaft fur Ortung und Navigation, Nationale Tagung uber Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971) Ortung und Navigation,* no 4, 1971 54 p 26 refs In German

The motions of aircraft in the landing area are subject to air traffic regulations The flight manager assigns to the pilot a runway and an approach to the apron Aircraft motions are controlled from the control tower on the basis of visual observations It is pointed out that the present approach for the guidance of aircraft on the

ground will not be satisfactory any more in the future because of orientation and observation problems occurring in connection with increasing air traffic A computer-based operational system of great reliability will be required Various factors involved in the motions of aircraft on the ground are discussed, giving particular attention to operational aspects G R

A72-22780 Automation in aeronautics from the point of view of the pilot (Automation in der Luftfahrt aus der Sicht des Flugzeugfuhrers) R D Andres (Deutsche Lufthansa AG, Frankfurt am Main, West Germany) *(Deutsche Gesellschaft fur Ortung und Navigation, Nationale Tagung uber Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971) Ortung und Navigation,* no 4, 1971 12 p In German

Scope and effects of automation concerning the planning and the execution of flights are considered, giving attention also to the reasons for an introduction of automation and its limitations It is shown that these limitations are continuously being reduced in favor of automation because of new advances in technology A highly automatic system will be the end result of this development G R

A72-22781 Division of labor between man and machine in aircraft-based flight control - Development, status, and technology (Die Arbeitsteilung Mensch - Maschine in der bordseitigen Flugfuhrung - Entwicklung, Stand und Technik) R K Bernotat (Forschungsinstitut fur Anthropotechnik, Meckenheim, West Germany) *(Deutsche Gesellschaft fur Ortung und Navigation, Nationale Tagung uber Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct 26, 27, 1971) Ortung und Navigation,* no 4, 1971 11 p 7 refs In German

The operations which can be performed by man in aircraft based flight control are briefly examined, and trends towards automatic control are discussed Criteria for optimal division of operations into those which should be performed by the pilot and those which are better undertaken by the machine are related to a high technical performance of the entire system, economic factors, and questions of job satisfaction for the pilot Stages in the development of a fully automatic system are considered G R

A72-22782 Real time-simulation technology in air traffic control (Echtzeit-Simulationstechnik in der Flugsicherung) O Warns (EUROCONTROL Versuchszentrum, Bretigny, Eure-et Loir, France) *(Deutsche Gesellschaft fur Ortung und Navigation, Nationale Tagung uber Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971) Ortung und Navigation,* no 4, 1971 15 p In German

Traffic control in the airspace depends almost exclusively on the cooperation of the pilot with flight controllers in ground based ATC centers The growth of air traffic, the introduction of new aircraft types, and new aids for navigation and supervision are responsible for continuous changes in the requirements for ATC systems It is now possible to simulate with the aid of computers the environmental conditions which are significant for the control of air traffic ATC systems can be investigated in a case study G R

A72-22783 Displays and automation in flight control (Displays und Automation in der Flugfuhrung) R Beyer (Deutsche Forschungs und Versuchsanstalt fur Luft und Raumfahrt, Institut fur Flugfuhrung, Braunschweig, West Germany) *(Deutsche Gesellschaft fur Ortung und Navigation, Nationale Tagung uber Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971) Ortung und Navigation,* no 4, 1971 14 p In German

The growing complexity of flight control problems makes flight control on a purely manual basis increasingly difficult The possibilities to obtain optimal solutions by complete automation, on the other hand, are limited Number and type of displays on board of an aircraft depend on the degree of automation available Factors to be considered in decisions between manual and automatic flight control are related to the type of the flight problem, the technology available, and the degree of attention which the pilot can devote to the problem G R

A72-22784 Flight control systems for VSTOL aircraft from an anthropotechnical point of view (Flugfuhrungssysteme fur VSTOL-Flugzeuge aus anthropotechnischer Sicht) K Brammer and G Schweizer (Dornier AG, Friedrichshafen, West Germany) *(Deutsche Gesellschaft fur Ortung und Navigation, Nationale Tagung uber Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971) Ortung und Navigation,* no 4, 1971 24 p In German

Systems for the control of VSTOL and conventional aircraft are compared, taking into account the significant landing characteristics in both cases The limits of human capability have to be considered in the design of the equipment for the control of a VTOL Various approaches for the control of a VTOL are discussed A control algorithm is described, and questions regarding the most suitable instrumentation of the aircraft are explored G R

A72-22812 # Velocity distribution at a supersonic compressor inlet (Répartition des vitesses à l'entrée d'un compresseur supersonique) B Ledoux and R Bagot (ONERA, Châtillon sous Bagneux, Hauts de Seine, France) *(NATO, AGARD, Meeting on Inlets and Exhausts for Aerospace Engines, Sandefjord, Norway, Sept 13-17, 1971) ONERA, TP* no 975, 1971 11 p In French Research supported by the Direction des Recherches et Moyens d'Essais

Development of two methods of determining radial velocities and their influence on the axial velocity profile In the first, or direct, method compressible flow is established from the duct and the cowl shapes, the computed pressure distributions are compared with those read on the external shroud and on the cowl during wind tunnel tests, from these, the velocity distribution in the duct is deduced In the second, or indirect, method, starting from the pressure distribution on the external wall and leading to the flow field, the calculation is checked by comparing the streamline corresponding to that of the inlet setup and the shape of the front cowl meridian line The two methods give coherent results F R L

A72-22813 # Theoretical and experimental study of the coexistence of two flows in a constant section duct (Etude théorique et expérimentale de la co-existence de deux flux dans un canal de section constante) J Paulon (ONERA, Châtillon sous Bagneux, Hauts de Seine, France) *(NATO, AGARD, Meeting on Inlets and Exhausts for Aerospace Engines, Sandefjord, Norway, Sept 13 17, 1971) ONERA, TP* no 976, 1971 13 p 8 refs In French

Study of the coexistence in a constant section duct of a supersonic jet within a subsonic jet, using two dimensional and asymmetrical setups of very similar characteristics The experimental analysis of the flow, made from the pressure readings on the walls and inside the fluid, led to characterizing the actual limits of the two flows, and also the transition domain between them In the two dimensional case, the schlieren visualization of the flow confirms the measurements The theoretical analysis, based on the method of characteristics, confirms the parietal readings The maximum flaring section given by this method differs from the sonic section of the external flow, and this may lead to faulty predictions in the case of a contoured ejector F R L

A72-22815 # **Study and calibration of pressure sensors in particular environments (Etude et etalonnage de capteurs de pressions en ambiances particulieres)** B Baerd, A Julienne, and R Nantois (ONERA, Chatillon sous Bagneux, Hauts-de Seine, France) *(International Congress on Acoustics, 7th, Budapest, Hungary, Aug 18-26, 1971) ONERA, TP* no 982, 1971 6 p 6 refs In French

Study of various types of sensors for unsteady pressures in order to make measurements in the interiors of turbine engines, inside jets, and on exhaust nozzles The sensors are of the capacitive type with electret effect They are required to work properly in difficult conditions such as high noise level, surrounding flow, static over pressure, vibration, and high temperature The SNR is good, and the response curve is very extensive F R L

A72 22816 # **Studies of coherent and incoherent structures of noise of aerodynamic origin (Etudes des structures coherentes et incoherentes de bruit d'origine aerodynamique)** J F de Belleval, P Harel, J Lambourion, and M Perulli (ONERA, Chatillon sous Bagneux, Hauts de Seine, France) *(International Congress on Acoustics, 7th, Budapest, Hungary, Aug 18 26, 1971) ONERA, TP* no 983, 1971 6 p 10 refs In French

Study of coherent and incoherent structures, starting with currently used theoretical models, in an attempt to define the influence of inhomogeneities of flow and of absorbed structures at the wall With the help of space time correlations, the pressure near the field of a compressor and the infrared emission of a hot jet are analyzed in order to deduce the structure of the sources F R L

A72 22822 # **Collision avoidance systems** R M G Maule *Tech Air,* vol 28, Mar 1972, p 2, 3

Investigations have been conducted to find a method for reducing the risk of midair collisions There are five criteria which any collision avoidance system should meet A collision threat evaluation is considered together with current collision avoidance systems, and collision avoidance maneuvers It is pointed out that EROS is now a working system It is already in service and has been selected by one airline in the U S SECANT has been shown to be a workable system but is still at a development stage G R

A72-22824 # **Some aspects of hovercraft aerodynamics** R G Wade (Ministry of Transport, Ottawa, Canada) *(Canadian Aeronautics and Space Institute, Annual General Meeting, Montreal, Canada, May 6, 1971) Canadian Aeronautics and Space Journal,* vol 18, Feb 1972, p 39 42

Discussion of the interdependent external and internal aero dynamic forces which act on a hovercraft in motion and contribute to its control characteristics and suspension capability The problems of operating at high angles of aerodynamic yaw and the consequent directional and roll stability of a hovercraft are examined in an analysis of external forces, taking into account the significance of yawing moment contributions Factors affecting the internal flow are also considered, with special reference to those aspects which affect vehicle performance over random surfaces V Z

A72 22860 # **General rectilinear motion of a thin airfoil (Obecny přímočarý pohyb tenkého profilu)** Z Škoda *Zpravodaj VZLU,* no 5, 1971, p 7-11 5 refs In Czech

A precise solution of a general, unsteady, rectilinear motion of a thin airfoil in an ideal, incompressible gas is presented Formulas have been derived for the calculation of the lift and pitching moment for a given vertical component of surface velocity on a thin profile An application of these formulas to the calculation of the lift of a rotor blade shows that the lift increment on the retreating blade can be as much as 16 per cent compared with the steady case O H

A72 22861 # **Force relations and effects of higher-order forces in shock absorbing systems of airplanes and vehicles (Silové vztahy a ucinky vyšších řadů v tlumene pružicich systémech letadel a vozidel)** J Šprinc *Zpravodaj VZLU,* no 5, 1971, p 13 25 9 refs In Czech

A model method of analysis has been used for studying the processes that occur in systems consisting of several masses inter connected by elastic and damping members Force equations are derived from which the resulting system rigidity and damping can be determined, and the resonance frequencies of the transfer of the load generated by the contact with the ground can be calculated An explanation is given of the significance of higher order forces which gives a partially new view of the problem of aircraft landing gears O H

A72 22862 # **The control of a two shaft gas turbine used for helicopter propelling (Řízení dvouhrídelové spalovací turbiny pri pohonu vrtulniku)** J Salaba *Zpravodaj VZLÚ,* no 5, 1971, p 27 41 7 refs In Czech

To improve the economy of helicopter operation, possible methods of controlling a two shaft gas turbine engine in a helicopter are analyzed Two methods of major importance are described in more detail For both, analyses of transient processes are given, and control block diagrams are developed An approach based on the application of a cybernetic equipment for turbine control is also proposed O H

A72-22897 Analysis of radar signals from aircraft by using radicord data K von Schlachta (Gesellschaft zur Forderung der astrophysikalischen Forschung, Forschungsinstitut fur Funk und Mathematik, Werthhoven, West Germany) *Nachrichtentechnische Zeitschrift,* vol 25, Feb 1972, p 76-78 9 refs Research supported by the European Organization for the Safety of Air Navigation

A statistical evaluation of radar data, measured with two different L-band magnetron radars, has shown that the few values received during scanning of aircraft with a rotating antenna give an astonishingly exact information on the radial velocity of the target The probability density of the scanwise calculated deviation of target amplitude and Doppler shift is given for different kinds of aircraft It is shown that the use of the mean Doppler shift allows a more exact calculation of the radial velocity of aircraft than the usual evaluation of coordinates O H

A72-22900 Concorde vision W E Goff *Flight International,* vol 101, Mar 2, 1972, p 321, 322

Discussion of the glass (Triplex Ten Twenty) used in the Concorde windscreen panels Glazing of the visor consists of six panels of glass/vinyl sandwich construction with a gold-film heating element The glazing is resistant to hail and rain, has freedom from ice and mist, provides good vision when looked through obliquely, has strength and stiffness under aerodynamic loading at speeds up to Mach 2, can withstand temperatures ranging from 54 to 112 C, and suppresses solar heating Ten Twenty glass gives a considerable reduction in weight F R L

A72-22901 Aircraft maintenance and reliability M Fukushima (Japan Air Lines Co , Ltd , Tokyo, Japan) *Microelectronics and Reliability,* vol 11, Feb 1972, p 41 46

Explanation of the means by which aircraft operational reliability is monitored and controlled on scheduled airlines Aircraft reliability indexes discussed are the mechanical delay rate (dispatch reliability), log entries per 1000 flight hr, and significant failure rate A component reliability monitoring program is outlined, the key factors of which are the component failure rate, failure mode

analysis, sampling inspection as necessary, and application of remedial action to significant failed portions and other related environments F R L

A72-22906 # **Fuel tight fastening by automatic machine** T H Speller and J A Randolph (General Electro Mechanical Corp , Buffalo, N Y) *Aircraft Engineering,* vol 44, Feb 1972, p 4-8

Use of controlled expansion in the mechanical fastening of high performance structures The technique provides that a cylindrical fastener expands plastically during installation to a slightly hourglass shaped cross section Expansion is 1 to 2% of the hole diameter at the shear plane, and 3 to 5% at the surfaces The result is a joint with remarkable integrity and attractive in cost saving potential The advantages of controlled expansion are being incorporated into the fastening of the A300B wing structure after a critical study of the systems described, in comparison with all proven and potential alternatives F R L

A72-22907 # **Civil compound helicopter** *Aircraft Engineering,* vol 44, Feb 1972, p 10-12

Description of the SIAI Marchetti SV 20 A medium weight twin-engined winged helicopter intended for commercial and utility applications The major fail safe criterion is that all parts may be easily and completely inspected The helicopter is twin turboshaft, free-turbine-engine powered, is high winged, has a two blade teetering-hub main rotor, and a 4000 to 4500 kg maximum gross take off weight F R L

A72-22908 # **The C band pulse beacon ranging system** *Aircraft Engineering,* vol 44, Feb 1972, p 14 17

Description of the Honeywell YG 1081 collision warning system (CWS), which operates on a cooperative basis with other aircraft with like equipment The system is, in effect, a C band (5 08 GHz) pulse beacon ranging system Each CWS serves both an interrogation and response function There are three modes of operation the interrogation mode, the response mode, and the system test mode, all of which are described in detail F R L

A72-22909 # **Quick estimation of wing structural weight for preliminary aircraft design** E Torenbeek (Delft, Technische Hogeschool, Delft, Netherlands) *Aircraft Engineering,* vol 44, Feb 1972, p 18, 19 8 refs

Use of a compilation of formulas and data previously compiled to enable weight engineers to make a quick estimation of wing structural weight Application of the method to 46 samples of aircraft in a wide range of sizes demonstrates a standard deviation of 9 64%, which is satisfactory for point designs and parametric studies The method is based on a generalized expression for the material required to resist the root bending moment due to wing lift in a specified flight condition, while the average stress level is related to the loading index of the compression structure F R L

A72-22910 # **Runway fog dispersal system** *Aircraft Engineering,* vol 44, Feb 1972, p 22, 23

Description of the Turboclair fog dispersal system, which has the advantage of being effective on both warm and cold fog formations Furthermore, whatever the conditions, it can provide a visual ground reference at the crucial moment of decision This makes it possible to check the radio electronics, and the visibility provided allows takeoff at any time The system uses flight discarded turbojet engines positioned near the runway which is to be cleared They produce heat in a compact volume and their kinetic energy is used to mix the hot air with the fog F R L

A72-22936 **Hybrid computation in aeronautical engineering** K R Greene (Southampton,' University, Southampton, England) *Aeronautical Journal,* vol 76, Feb 1972, p 97-100

The use of hybrid computation for helicopter simulations is discussed Particular attention is given to the nature of the integration processes involved, and a new hybrid approach to integration is explained It is shown that this technique extends the useful range of application of hybrid computation in aeronautical and other engineering disciplines O H

A72-22937 **The calibration of a surface static tube** J L Sproston and Ö T Goksel (Liverpool, University, Liverpool, England) *Aeronautical Journal,* vol 76, Feb 1972, p 101 103

The accuracy of representation of static pressure obtained from a static tube lying on a model surface was experimentally examined In the experiments, the static tube was mounted in two flows - i e , in the flow over a flat plate in a zero pressure gradient, and in the flow over a specially designed airfoil Results are plotted and analyzed O H

A72-22938 **Follower force instability of a pod mounted jet engine** G T S Done (Edinburgh, University, Edinburgh, Scotland) *Aeronautical Journal,* vol 76, Feb 1972, p 103-107 6 refs

The follower force system, represented by a jet engine enclosed in a pod and mounted as a separate unit on the main aircraft structure, is studied The dynamics of a simplified model of this system is analyzed, and the results of experimental tests in the laboratory and computer calculations on a practical example are presented O H

A72-22940 **The design of agricultural aircraft** D Lockspeiser (British Aircraft Corp , Ltd , Commercial Aircraft Div , Weybridge, Surrey, England) *(Royal Aeronautical Society, Symposium on Agricultural Aviation, London, England, Jan 27, 1971) Aeronautical Journal,* vol 76, Feb 1972, p 121 125, Discussion, p 125-127

Typical examples of current agricultural fixed wing aircraft in use throughout the world are reviewed, and their parameters are compared Requirements and design features of optimum agricultural aircraft are discussed in terms of pilot safety, performance, engine characteristics, handling, and economic efficiency Finally, future developments are considered O H

A72-22947 # **Study of the vibrations of an aerial camera during a cycle (Issledovanie kolebanii aerofotoapparata vo vremia tsikla)** Ia E Shcherbakov (Moskovskii Institut Inzhenerov Geodezii, Aerofotos'emki i Kartografii, Moscow, USSR) *Geodeziia i Aerofotos'emka,* no 6, 1970, p 94-98 In Russian

Mathematical treatment of vibrograms taken during an operational cycle of an aerial camera Correlation functions are obtained for angular vibrations of an operating aerial camera when its shutter is released for varying exposure times Approaches are proposed for damping the vibrations produced in an aerial camera by the operation of its mechanical system during the working cycle V Z

A72-22971 **X-113 Am - An air and water hybrid (X-113 Am - Zwitter zwischen luft und Wasser)** M Ziegler *Flug Revue/ Flugwelt International,* Mar 1972, p 20 24 In German

Discussion of the airfoil concept in general, with special emphasis on the present X-113 Am, which is a single-seat airfoil ram-wing vehicle powered by a 40-hp Nelson four cylinder, horizontally opposed two-stroke engine driving a two blade propeller The

airframe is of special glass fiber construction, with a core of tubular or foam plastic Results of extensive tests of this craft on Lake Constance are outlined O H

A72-22972 **Near misses - A critical discussion on an important topic (Fastzusammenstosse - Kritische Betrachtung zu einem aktuellen Thema)** L Abelshauser *Flug Revue/Flugwelt International,* Mar 1972, p 25 28 In German

Near misses within German airspace are considered After presenting a report on the current situation, detailed attention is given to IFR/IFR air misses (including coordination of ATC stations, problems due to equipment failure, personal and planning problems), and to IFR/VFR air misses Finally, measures are suggested for decreasing the risk of aircraft collisions The measures include the introduction of air traffic flow control on an international basis, specific airspace for military VFR traffic, and collision avoidance systems in aircraft Some advanced collision avoidance systems are briefly characterized O H

A72-22973 **Boundary layer blowing in the Buccaneer Mk 2 and the F-4K Phantom (Grenzschichtanblasung bei der Buccaneer Mk 2 und F-4K Phantom)** J G Burns and M Edwards (Hawker Siddeley Aviation, Ltd , Kingston-on Thames, Surrey, England) *Flug Revue/Flugwelt International,* Mar 1972, p 33-36 In German

After a brief discussion of the philosophy of boundary layer control, blowing as it is applied to the Buccaneer and Phantom aircraft is described The use of blowing for aircraft control during the takeoff and landing phases and for lateral and longitudinal control is dealt with Finally, a comparison of the Buccaneer Mk 2 and the Phantom F-4K Phantom II performance is presented O H

A72-23045 **Modern fluid dynamics Volume 2 Compressible flow** N Curle (St Andrews, University, Southampton, England) and H J Davies (Southampton, University, Southampton, England) London and New York, Van Nostrand Reinhold Co , 1971 303 p 15 refs $19 95

A detailed account is given of the physical features of ideal and real compressible fluid flow The fundamental equations governing the flow of a perfect compressible fluid are derived The propagation of waves in a medium that is otherwise at rest and in a medium with a superimposed stream flow is considered Methods of solving subsonic potential flow problems and supersonic flow problems are described, and an introduction is presented to transonic flow A study is made of the three dimensional problem with particular reference to supersonic flow past airfoils The effects of viscosity and heat conduction are discussed with reference to the significance of the boundary layer in laminar flow In particular, some attention is given to the very important practical problem in which a shock wave interacts with a laminar boundary layer A B K

A72-23185 # **Characteristics of a two-spool gas turbine engine in the case of engine speed reduction (Kharakteristiki dvukhval'nogo gazoturbinnogo dvigatelia pri sbrose oborotov turbokompressora)** I A Barskii *Mashinostroenie,* no 12, 1971, p 85 88 In Russian

The time dependence of the turbocompressor rpm, the gas temperature, and engine power is determined for the case where the turbocompressor speed is reduced from its nominal value at various idling speed fuel consumptions It is shown that a rapid drop in engine power can be obtained without a heat exchanger by shutting off the fuel supply during engine speed reduction For a gas turbine engine with a heat exchanger, the thermal inertia of the latter prevents rapid engine speed reduction even when the fuel supply is shut off V P

A72 23186 # **Characteristics of slotted-blade cascades of adjustable nozzle diaphragms of axial-flow turbines (Kharakteristiki reshetok razreznykh profilei reguliruemykh soplovykh apparatov osevykh turbin)** Iu S Kustarev *Mashinostroenie,* no 12, 1971, p 88-92 In Russian

The aerodynamic efficiency of plane slotted-blade cascades developed for gas-turbine engines of transport aircraft is determined experimentally It is shown that the aerodynamic characteristics of properly selected slotted blades are practically equal to those of unslotted blades for a wide range of blade angles The use of slotted blades in adjustable nozzle diaphragms is therefore justified V P

A72 23270 **A standardized procedure for evaluating the relative thermal life and temperature rating of thin-wall airframe wire insulation** D K Elliot (Lockheed-California Co , Burbank, Calif) *IEEE Transactions on Electrical Insulation,* vol EI-7, Mar 1972, p 16-25 19 refs

A simple specific procedure utilizing the Arrhenius plot is presented and proposed as a basis for an IEEE Standard for determining the relative thermal life and temperature rating of aerospace wire insulation Test data on life curves and thermal ratings are presented on six types of wire insulation of present interest in the aircraft industry These results illustrate the ease of directly comparing the thermal life of various new thin wall insulation systems relative to the older insulation systems of known service characteristics Included are three irradiated insulation systems and various insulations that utilize polyimide polymers O H

A72-23310 # **Up-to-date condition and automation prospects of aerial photo interpretation processes by the method of optical image filtering** I A Cherkasov (Laboratorium fur Aero methoden, Leningrad, USSR) In Internationale Gesellschaft fur Photogrammetrie, International Symposium on Photointerpretation, 3rd, Dresden, East Germany, September 10-16, 1970, Reports Part 2 Leipzig, Landwirtschaftsausstellung der DDR, 1971, p 821-834 11 refs

Use of optical image filtering as a means of simplifying and facilitating the selection of various particulars of information contained in aerial photographs Investigations are described which show that when interpreting aerial photographs the decisive factors influencing the quality of the filtered image are the construction peculiarities of the Fourier transformation two-dimensional spectrum F R L

A72-23316 **Sonic boom exposure effects I 2 - The sonic boom Generation and propagation** C H E Warren (Royal Aircraft Establishment, Farnborough, Hants , England) *Journal of Sound and Vibration,* vol 20, Feb 22, 1972, p 485 497

A description is given of the technical aspects of the generation and propagation of sonic booms in order to provide the background for an understanding of their effects on animate and inanimate objects The physical aspects of boom propagation, focusing, and reception at the ground, and typical sonic boom characteristics are discussed, along with waveform freezing and distortion M V E

A72-23317 **Sonic boom exposure effects I 3 - General considerations on sonic boom research** J Balazard (Direction des Recherches et Moyens d'Essais, Paris, France) *Journal of Sound and Vibration,* vol 20, Feb 22, 1972, p 499 503

Discussion of the requirements of sonic boom studies in various scientific disciplines, and review of the research facilities and techniques currently used for meeting these requirements A general research philosophy is developed that could also aid in the development of research schemes in other areas of environment protection M V E

A72-23318 **Sonic boom exposure effects II 1 Structures and terrain** G Weber (Hannover, Technische Universitat Hanover, West Germany) *Journal of Sound and Vibration,* vol 20, Feb 22, 1972, p 505 509 15 refs

Evaluation of sonic boom effects on topographical features and ground motion effects on structures, and discussion of damage pertinent structural parameters The attempt is made to present conclusive statements on sonic boom exposure and on occurrence of damage to structures on the basis of the extensive data on sonic boom damage accumulated over the past ten years M V E

A72 23323 **Sonic boom exposure effects II 6 Sonic boom generators** C H E Warren (Royal Aircraft Establishment, Farnborough, Hants , England) *Journal of Sound and Vibration,* vol 20, Feb 22, 1972 p 535 539 15 refs

Review of the research facilities existing for the study of sonic boom effects, and discussion of the types of study for which these facilities are suitable Sonic boom simulators for field and laboratory studies discussed include explosive charges acoustic guns traveling wave devices, speakers and pistons The characteristics are enumer ated that research facilities must have in order that meaningful and relevant experiments may be performed M V E

A72-23423 **Probability of aircraft encounters with hail** J Briggs *Meteorological Magazine,* vol 101, Feb 1972, p 33 38 7 refs

Estimates of the probability of aircraft encounters with hail are presented, they depend on several assumptions and cannot do more than indicate probabilities of hail within about a factor of 10 Nevertheless, comparisons made with actual aircraft experience are encouraging The comparisons are least satisfactory for aircraft flying at the highest levels considered and so the extrapolation to the levels of most concern to supersonic transport may be less realistic though at these levels the estimates seem more likely to be pessimistic than optimistic as regards the probabilities of large hail being met (Author)

A72 23431 # **Optimal control of linear passive plants (Ob optimal'nom upravlenii lineinymi passivnymi ob'ektami)** A A Krasovskii *Avtomatika i Telemekhanika,* Jan 1972, p 5 14 In Russian

Analytical synthesis of optimal controls for linear passive stationary plants whose coefficient matrices exhibit a symmetry that makes it possible to obtain very simple solutions for a number of given coefficients of the minimized functional The prescribed part of the functional has a straightforward physical meaning The use of one obtained solution is illustrated for an example problem involving the synthesis of a system for damping flexural vibrations of an aircraft T M

A72-23446 **DC-10 design development** R E Bates (McDonnell Douglas Corp , St Louis, Mo) *Interavia,* vol 27, Mar 1972, p 228, 229

Review of the procedures by which the DC 10 was designed The detailed configuration of the wing was developed through previous experience and through extensive use of high Reynolds number wind tunnel testing Of particular importance from a performance standpoint is the drag rise characteristic which permits efficient cruise at Mach 0 85 A unique feature of the DC 10 is the mounting of strakes on the fixed cowl of the nacelle With these strakes installed the resulting maximum lift coefficient was equal to that originally expected in the landing condition, and better than predicted in the takeoff region The flight handling characteristics, structural development, and fatigue tests are discussed F R L

A72-23447 **Variable pitch fans** D G M Davis (Dowty Rotol, Ltd , Glouster, Glos , England) *Interavia,* vol 27, Mar 1972, p 241 243

Description of the technicalities of the variable pitch (VP) fan concept, with some thoughts for the future The most important attribute of the VP fan is its thrust reversing capability It provides the stopping power to balance the field length of the STOL aircraft at less cost and weight than the conventional reverser Thrust can be modulated by change of rpm or pitch or both VP is an essential element of the compound thrust/shaft engine, the combined propul sion and blowing engine for augmenter wing aircraft, and the single shaft engine The relative quietness of the VP fan makes it attractive for operation close to community centers F R L

A72-23448 **The DC 10 automatic flight guidance system** *Interavia,* vol 27, Mar 1972, p 244, 245

Description of a system that provides facilities in conditions down to Category IIIA The system is organized in two isolated fail passive automatic landing systems either of which is capable of controlling the aircraft throughout the landing phase In the event of a malfunction occurring with both systems engaged, the failed system will disconnect or shut down without disturbing the aircraft's flight path while the remaining dual system completes the landing without any degradation in performance F R L

A72-23449 **Instrument landing systems Radio landing aids from the Zeppelin to Category III** E Kramar (Standard Elektrik Lorenz AG, Stuttgart West Germany) *Interavia,* vol 27 Mar 1972, p 246 248

Review of the progress which has been made since the early days of flight in developing all weather landing aids Four course radio ranges came into general use after 1928, and were soon adapted for guidance during approach and landing Various vhf systems are described, as well as the Lorenz system for glide slope guidance The ILS system developed by CAA and ITT, which has not been changed basically for 25 years except for technological improvements, is considered in detail Attention is given to the British BLEU autoland system and the Bell GSN 5 radar system F R L

A72-23450 **Automated navigation management in the cockpit** *Interavia,* vol 27, Mar 1972, p 258, 259

Consideration of the MONA (Modular Navigation) dual channel system The system is composed of the Navigation Computer Unit (NCU), the Flight Data Storage Unit (FDSU), and the Control and Display Unit (CDU) The data of interest are for the most part a vast collection of ground referenced points, such as waypoints and navaids, together with details about each point The totality of route structure data stored in the FDSU contains the equivalent in digital magnetic tape form, of the data included in a pilot's flight bag of aeronautical charts representing his airline's route structure F R L

A72-23451 **Symposium on Non-Linear Dynamics, Loughborough University of Technology, Loughborough, Leics , England, March 27, 28, 1972, Proceedings** Symposium sponsored by the British Acoustical Society and Royal Aeronautical Society Edited by D J Johns (Loughborough University of Technology, Loughborough, Leics , England) P A T Christopher (Cranfield Institute of Technology, Cranfield, Beds , England), and A Simpson (Bristol, University, Bristol, England) Loughborough, Leics , England, Loughborough University of Technology, 1972 325 p

Topics discussed include nonlinear dynamic characteristics of a flight vehicle, nonlinear differential equations in problems of flight dynamics, nonlinear systems with n degrees of freedom, one half subharmonic oscillations, nonlinear vibrations of circular cylindrical shells, stability analysis in structural dynamics, the optimization of

landing gear suspension characteristics, effects of runway unevenness on a supersonic transport aircraft, random vibration of lumped mass systems containing nonlinear damping, the effect of aerodynamic nonlinearities on the normal acceleration response of a rigid aircraft, autoparametric nonlinear interactions between vibration modes, parametric instability of flat plates subjected to in plane periodic sinusoidal loading, the effect of frictional damping on beam vibrations, and mode coupling due to a nonlinearity in panel vibration

A B K

A72-23452 Development of a technique for the analysis of non-linear dynamic characteristics of a flight vehicle I M Titchener (Royal Aircraft Establishment, Farnborough, Hants , England) In Symposium on Non Linear Dynamics, Loughborough University of Technology, Loughborough, Leics , England, March 27, 28, 1972, Proceedings Loughborough, Leics , England, Loughborough University of Technology, 1972, p A 1 1 A 1 17

Development of a technique for the analysis of the nonlinear dynamic motion response of a class of flight vehicles typified by continuously changing damping and frequency An existing approximate method for analyzing nonlinear differential equations having almost periodic solutions is adapted and further developed to give a technique applicable to this problem The original method involved recasting the dependent motion variable in terms of a time dependent amplitude and phase, leading to a description of the dynamic behavior in the large in terms of a local damping parameter and frequency, each a function of the local amplitude Since the flight dynamic problem exhibits certain asymmetries, an explicit parameter defining the local displacement of the center of oscillation is also required This is shown also to be a function of the local amplitude Analytic expressions for damping and frequency are obtained by integrating over a complete cycle of the oscillation, assuming small variation in amplitude, phase, and center of oscillation during this interval A B K

A72 23453 Application of an approximate method of solving non-linear differential equations to some problems in flight dynamics A J Ross (Royal Aircraft Establishment, Farnborough, Hants , England) In Symposium on Non Linear Dynamics, Loughborough University of Technology, Loughborough, Leics , England, March 27, 28, 1972, Proceedings Loughborough, Leics , England, Loughborough University of Technology, 1972, p A 2 1 A 2 20 10 refs

Analytic solutions of equations of motion with nonlinearities present are given for a variety of aircraft responses which exhibit oscillatory behavior, obtained from an improved version of the Krylov and Bogoliubov method As examples of second-order systems, some experimental results of control surface buzz are analyzed to give possible variation of hinge-moment damping with amplitude For higher order systems, with one oscillatory mode, the lateral motion of a slender wing aircraft at high angle of attack is considered, the force and moments due to sideslip being nonlinear The criterion for the existence of a limit cycle is found to be a modified form of Routh's discriminant, and comparisons with digital solutions show excellent agreement for the frequency and amplitude (Author)

A72-23457 Stability analysis in structural dynamics using Liapunov functionals P C Parks and A J Pritchard (Warwick, University, Coventry, England) In Symposium on Non-Linear Dynamics, Loughborough University of Technology Loughborough, Leics , England, March 27, 28, 1972, Proceedings Loughborough, Leics England, Loughborough University of Technology, 1972, p B 4 1-B 4 11 9 refs

Generalization of Liapunov's second method to problems described by partial differential equations through the use of functional analysis Some of the relevant concepts of functional analysis are described, including inner products, norms, completeness, Hilbert space, semigroup operators, Liapunov stability, and Liapunov functionals A rather general method of constructing Liapunov functionals (called the P method) is then described, and the Liapunov functional analysis is then applied to a number of problems, including the wave equation with nonlinear damping, the stability of the Euler strut, including a 'follower force' case, divergence of an aircraft wing, including a nonuniform case, panel flutter, and feedback control of a flexible missile A B K

A72-23458 The optimisation of undercarriage suspension characteristics by a deterministic method J Reynolds, D J Johns, and R J Aird (Loughborough University of Technology, Loughborough, Leics , England) In Symposium on Non-Linear Dynamics, Loughborough University of Technology, Loughborough, Leics , England, March 27, 28, 1972, Proceedings Loughborough, Leics , England, Loughborough University of Technology, 1972, p C 1 1-C 1 31 26 refs Research supported by the Ministry of Technology

Contemporary with progress in structural design and increase in size of modern aircraft, the severity of runway induced vibration has increased This has resulted in a corresponding increase in fatigue damage and reduction of passenger and crew comfort Factors affecting the choice of a suitable cost function describing these phenomena are discussed Finally, a cost function is postulated and nonlinear equations representing the motion of a symmetric aeroplane when taxying over a defined runway profile are derived Optimum suspension characteristics which minimise this cost function deterministically are thus obtained The use of a hybrid computer to facilitate speed of solution is discussed (Author)

A72-23459 Some measured and calculated effects of runway unevenness on a supersonic transport aircraft C G B Mitchell In Symposium on Non Linear Dynamics, Loughborough University of Technology, Loughborough, Leics , England, March 27, 28, 1972, Proceedings Loughborough, Leics , England, Loughborough University of Technology, 1972, p C 2 1-C 2 16 9 refs

Review of the practical consequences of runway unevenness for an SST, indicating which of the landing gear characteristics significantly affect vibration while taxiing, taking off, and landing It is shown that for the SST class of aircraft cockpit vibration and structural fatigue damage during taxiing will be more severe than for subsonic transports unless special care is taken in the design of the main landing gear It is necessary to use a lower value of air spring stiffness and to achieve a low value of oleo friction if excitation of the fuselage bending mode is to be avoided A B K

A72-23460 Random vibration with non-linear damping C L Kirk (Cranfield Institute of Technology Cranfield, Beds , England) In Symposium on Non Linear Dynamics, Loughborough University of Technology Loughborough, Leics , England, March 27, 28, 1972, Proceedings Loughborough, Leics , England, Loughborough University of Technology, 1972, p C 3 1 C 3 18 6 refs

Study of the reaction of linearly elastic, lumped mass systems containing nonlinear damping to ideal stationary Gaussian white noise excitation A theoretical study is made of a random vibration absorber in which the damping force is proportional to the square of the relative velocity between the main mass and the absorber mass of the system The taxiing induced random vibration of a two degree of-freedom model of an aircraft on its main landing gear due to runway unevenness is considered An experimental investigation is made of the random vibration of a built up beam having hysteretic damping A B K

A72-23461 **The influence of non-linear longitudinal aerodynamic characteristics on the power spectral response of aircraft to atmospheric turbulence** P A T Christopher (Cranfield Institute of Technology, Cranfield, Beds , England) and J M H Dunn (Hawker Siddeley Aviation, Ltd , Hatfield, Herts , England) In Symposium on Non-Linear Dynamics, Loughborough University of Technology, Loughborough, Leics , England, March 27, 28, 1972, Proceedings Loughborough, Leics , England, Loughborough University of Technology, 1972, p C 4 0-C 4 16 9 refs

The power spectral technique has been extended to show the effect of aerodynamic nonlinearities on the normal acceleration response of a rigid aircraft in the cruise configuration Extreme nonlinearities in the normal force and pitching moment variations with incidence have been considered The resulting changes from the linear rms values of normal acceleration were only 3 to 5-1/2% (Author)

A72-23466 **Turbulence data in the upgraded ATC system** E Bromley, Jr (FAA, Washington, D C) *Journal of Air Traffic Control,* vol 14, Mar 1972, p 13 15

Turbulence reporting, turbulence measurement, and subsequent handling of the turbulence information will become increasingly important to the effective functioning of the upgraded ATC system The occurrence of significant turbulence due either to natural or other causes acts to disrupt the efficient flow of air traffic The impact of various categories of turbulence on the design of the upgraded ATC system is examined Pilot reports are an important input to the control system A research and development program recognizing the significance of the impact of wake turbulence on airport capacity is planned G R

A72-23467 **Area navigation in the Chicago-New York complex** W R Sonnemann (Trans World Airlines, Inc , Kansas City, Mo) *Journal of Air Traffic Control,* vol 14, Mar 1972, p 16-19

The installation of precision area navigation equipment, including vertical guidance in all air carrier aircraft has been considered together with an experimental area navigation evaluation program in the Chicago New York complex For the purpose of the evaluation program, a Decca Omnitrac 1A RNAV system was installed in a standard TWA Boeing 727 The evaluation program demonstrated the viability of the area navigation concept The control of traffic in the terminal area will most likely benefit most from the implementation of area navigation procedures G R

A72 23550 **The Peebles computer** I P Mac Cready, Jr , P Peebles, and F Moretti (Centro Nazionale di Volo a Vela, Riety, Italy) *Aero Revue,* Mar 1972, p 152

Discussion of a sailplane computer developed and tested at the Centro Nazionale di Volo a Vela in Rieti, Italy The computer shows simultaneously the rate of climb and the airspeed of the craft, and permits the pilot to determine at a glance how the sailplane should be flown to take best advantage of the local upcurrent downcurrent condition The mechanical setup of the prototype unit is discussed V Z

A72-23622 # **The effects of pitching moments on phugoid and height mode in supersonic flight** G Sachs (Darmstadt, Technische Hochschule, Darmstadt, West Germany) *Journal of Aircraft,* vol 9, Mar 1972, p 252 254 9 refs

The pitching-moment characteristics of aircraft that influence the stability of the motion in supersonic flight, where maintaining a given altitude is of increased importance, are studied An explicit expression is derived which describes the effects of pitching moments on the phugoid and height modes, and thus shows their consequences for altitude stability in general O H

A72 23684 **Goals and trends in heat transfer research** E R G Eckert (Minnesota, University, Minneapolis, Minn) *Wärme- und Stoffubertragung,* vol 5, no 1, 1972, p 3-8 12 refs

Heat transfer research is instigated primarily by new developments in technology In the last thirty years, the fields of gas turbines, aeronautics, astronautics, and nuclear power contributed many problems for basic heat transfer studies These are discussed, and presently unsolved problems are enumerated In recent years, thermal pollution and the possibility to achieve controlled fusion posed new challenges for heat transfer research (Author)

A72 23747 # **Study on flow inside diffusers for centrifugal turbomachines II - Diffusers with larger area enlargement than that of the logarithmic spiral** T Sakurai (Hitachi, Ltd , Tokyo, Japan) *JSME, Bulletin,* vol 15, Jan 1972, p 81 89, Discussion, p 90, Author's Closure, p 90 92 12 refs

Theoretical considerations are given for centrifugal turboengine diffuser designs providing a series of diffusers with area enlargement rates higher than those consistent with a logarithmic-spiral law The flow characteristics of the designs are determined, showing that the efficiency of these designs is generally higher than that of a logarithmic spiral design The boundary layers, the aerodynamic parameters and secondary flows of the diffusers are discussed V Z

A72-23750 **Safety in general aviation** H D Hoekstra and S-C Huang (Flight Safety Foundation, Inc , Arlington, Va) Arlington, Va , Flight Safety Foundation, Inc , 1971 132 p 53 refs $7 95

The objective of the study is to examine safety in general aviation through its evolution, the current record as revealed by statistics, and the design and operational means by which the record may be improved Regulatory and production problems are outlined, and some general aviation statistics are cited Accidents are analyzed, and ways of building aircraft so that a higher survival rate is possible are discussed Over 80% of all accidents in general aviation are charged to pilot error as a cause or factor F R L

A72-23805 **A near optimal closed-loop control law for a class of aircraft/aircraft pursuit-evasion differential games** G M Anderson (USAF, Institute of Technology, Wright Patterson AFB, Ohio) and W L Othling, Jr (USAF, Flight Dynamics Laboratory, Wright Patterson AFB, Ohio) In Conference on Decision and Control, Miami Beach, Fla , December 15 17, 1971, Proceedings New York, Institute of Electrical and Electronics Engineers, Inc , 1971, p 449-500

A method called dynamic modeling is used to obtain near optimal closed loop control laws for a fixed time pursuit-evasion differential game between two aircraft in a vertical plane This dynamic modeling technique involves simplifying the aircraft dynamics until a closed loop control law can be found The closed-loop control law for the simplified game is then used as a basis for obtaining a near optimal closed-loop control law for the game with realistic aircraft dynamics Results of two examples are presented to demonstrate the validity of this near optimal control law (Author)

A72-23807 **Aircraft parameter identification using state-sensitivity functions** M R Cannon, D K Frederick, and H Kaufman (Rensselaer Polytechnic Institute, Troy, N Y) In Conference on Decision and Control, Miami Beach, Fla , December 15-17, 1971, Proceedings New York, Institute of Electrical and Electronics Engineers, Inc , 1971, p 521-523

The problem presented in this paper is the identification of eleven parameter values of a 4th-order state equation used to model the incremental lateral dynamics of an aircraft subject to a step aileron deflection The objective is to minimize the difference

between the model's response and recorded inflight test data in a least squares sense State sensitivity functions, which describe the variation in the model's state response for small, constant parameter perturbations, are used to develop an iterative solution to the identification problem Results for three sets of initial parameter values show that the method rapidly converges to the same solution set (Author)

A72-23818 Associative processing in an air traffic control environment W C Meilander and R G Gall (Goodyear Aerospace Corp , Akron, Ohio) In Hardware, software, firmware trade offs, Proceedings of the Fifth Annual International Computer Society Conference, Boston, Mass , September 22 24, 1971 New York, Institute of Electrical and Electronics Engineers, Inc , 1971, p 129, 130

Evaluation of the STARAN IV-X associative array processor for additional automation functions in air terminal control Functions studied and evaluated include aircraft tracking, conflict prediction, and conflict resolution The ease of programming and the processing rate are also considered, together with the significance of conflict operations to the controller T M

A72-23820 The use of system methodology to resolve filtering deficiencies W H Harrison (General Dynamics Corp , Fort Worth, Tex) In Hardware, software, firmware trade-offs, Proceedings of the Fifth Annual International Computer Society Conference, Boston, Mass , September 22-24, 1971 New York, Institute of Electrical and Electronics Engineers, Inc , 1971, p 197, 198

Description of a digital test station developed for intermediate-level support of the navigation system in FB-111 airplanes Requirements dictated inertial reference unit (IRU) calibration that would be simultaneous with functional testing of a specific line-replaceable unit Circuitry peculiar to the IRU interface did not contain sufficient filtering to prevent power cycling noise spikes that generated false alarms terminating the calibration The application of systems methodology to the design of appropriate filters is described T M

A72 23846 The International Air Transport Association - A case study of a quasi-governmental organization R Y Chuang Leiden, A W Sijthoff International Publishing Co , 1972 200 p 514 refs $10 85

The background of international aviation before 1944 is discussed together with the results of the Chicago Conference, 1944, details regarding the Bermuda Agreement of 1946, and provisions concerning rates and IATA in other international bilateral air transport agreements Organization and functions of IATA in general are considered along with the traffic conference machinery, the outputs of the conferences and government reservations, the enforcement of IATA traffic conference resolutions, the economics of air transportation, and the legal nature of public corporations and mixed enterprises G R

A72 23851 # Maintainability - An effective engineering discipline H M Sohn (Lockheed Georgia Co , Marietta, Ga) *Logistics Spectrum, vol 6, Spring 1972, p 11 17*

Review of the general success prerequisites of a maintainability program, description of the maintainability characteristics of the C 5A Galaxy aircraft, and discussion of some of the problems encountered and resolved during the C 5A program Real and purposeful maintainability features of any system or component are shown to be numerous and seemingly insignificant like locating a part a little differently to improve access to its attaching fasteners, or making an access panel large enough not only to get both hands through it, but also to be able to see what is being done There is little glamour connected with incorporating these small features into an end item It takes a well established and properly managed maintainability program to let slip none of these features M V E

A72-23853 Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20-22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971 332 p

The invited lecture considered turbulence models and their application to the prediction of internal flows The other papers deal with diffusers, viscous, inviscid, and unsteady flows, and complex ducts and flows The study of viscous flows includes turbulent boundary layers, recirculating flows, and the computation of turbulent flows F R L

A72-23855 A calculation method for the pressure recovery produced by diffusers fitted with tailpipes E F C Ferrett and D Lampard (Nottingham University, Nottingham, England) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20 22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971, p A1-A8 9 refs Research supported by the Ministry of Technology

A calculation method is presented for the pressure recovery arising from the subsonic, adiabatic flow of air through diffusers fitted with tailpipes when the boundary layer is turbulent at the diffuser inlet, and a potential core exists throughout the flow The method is not restricted to attached flows having been developed specifically to deal with the case in which separation is deliberately induced by truncation of the diffuser When flow separation occurs, the location of the pressure maximum in the tailpipe is not predicted Although the analysis is presented for the axisymmetric case, modification to the two dimensional case is straightforward The predicted overall pressure recovery is compared with experimental results for full and truncated conical diffusers, and for sudden enlargements agreement is seen to be good, generally better than 2% (Author)

A72 23856 Measurements of the overall performance and boundary layer growth in an annular diffuser S J Stevens and G J Williams (Loughborough University of Technology, Loughborough, Leics , England) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20-22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971, p A9-A18 18 refs Research supported by the Science Research Council

Low speed tests have been carried out to investigate the performance of an optimum annular diffuser having a center body of uniform diameter and a conically diverging outer wall Measurements were made of the pressure recovery, and the growth of the boundary layers in terms of the mean velocity profile and turbulence structure The data suggests that the flow in the initial stages of diffusion is dominated by the pressure gradient, and in these circumstances the existing two part methods of representing velocity profiles are no longer valid The rate of growth of the shape parameters was found to be considerably greater along the outer wall, this effect is attributed to the distortion caused by the flow curvature at inlet which is then accentuated by the adverse pressure gradient For this diffuser geometry boundary layer types of inlet blockage were found to have only a minor influence on the overall pressure recovery coefficient (Author)

A72-23857 Boundary layer development in an annular diffuser D Hoadley (Central Electricity Generating Board, Marchwood Engineering Laboratories, Southampton, England) In

Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20-22, 1971, Proceedings
Salford, Lancs , England, University of Salford, 1971, p A19-A31 33 refs

The turbulent boundary layers on the conical casing and cylindrical hub of an annular diffuser containing a free vortex swirl were measured Separation occurred on the casing in zero swirl but under high swirl the separation was transferred to the hub Reasonable agreement with the predictions of an integral method incorporating the three dimensional entrainment equation was obtained if the interaction of the boundary layer with the main stream was taken into account The skewing of the boundary layer and the nature of the hub separation produced in swirling flow requires further investigation (Author)

A72-23858 The response of diffusers to flow conditions at their inlet C I Bradley (Gas Council, Midlands Research Station, Solihull, Warwicks , England) and D J Cookrell (Leicester, University, Leicester, England) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20 22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971, p A32 A41 20 refs Research sponsored by the Ministry of Aviation Supply

The paper first briefly considers the available experimental data on the response of conical diffusers to the variation of the time meaned velocity distribution and the turbulence intensity at inlet A mean velocity profile generator is next described which permits the independent assessment of the effects of inlet mean velocity and turbulence variation Downstream of this generator pressure recovery characteristics were obtained over a wide range of expansion angle and area ratio These results are discussed The problems entailed in establishing a computational method which considers the inlet turbulence level as a parameter affecting diffuser pressure recovery are reviewed The paper concludes by setting the flow conditions at the inlet to diffusers in their industrial context Incompressible fluid flow is assumed throughout (Author)

A72-23859 Rapid diffusers based on the egg box principle T V Lawson (Bristol, University, Bristol, England) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20 22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971, p A42 A46 5 refs

The paper starts with a conventional diffuser and tries to demonstrate that the loss of efficiency as its included angle is increased is caused by the spread of the separated regions and not by separation itself One type of rapid diffuser can be devised with the object of reducing the spread of these regions and diffusers of this type are nicknamed 'Egg Box' Diffusers The second part of the paper describes the performance, shortcomings and remedies of several diffusers of this type designed as parts of wind tunnels (Author)

A72-23860 Improvement of wide angle conical diffuser performance by means of conical vanes J T Turner (Manchester, Victoria University, Manchester, England) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20-22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971, p A47-A55 12 refs

Some experiments have been carried out to determine whether the use of conical splitter vanes can produce worthwhile improvements in the performance of wide angle conical diffusers The vanes were designed using a simple equivalent conical diffuser concept Systematic tests have been made for one diffuser (60 deg and 8 27 area ratio) using different vane configurations and taking the static pressure recovery as the main criterion of performance The best vane system produces a three times improvement in the effectiveness of the diffuser An analyis of these results, together with information obtained from flow visualization, suggests how the vane geometry should be modified to improve the performance still further The effect of changing the inlet flow distribution by altering the length of the diffuser entry pipe is also discussed (Author)

A72-23861 Compressible flow in a radial vaneless diffuser N Watson and D R Ingham (Hatfield Polytechnic, Hatfield, Herts , England) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20 22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971, p A56-A65 14 refs Research supported by the Science Research Council and C A V , Ltd

The radial vaneless diffuser is a major source of inefficiency in centrifugal compressors In attempting to increase its efficiency, a better understanding of the flow and a method of loss prediction are desirable Results from an extensive experimental investigation into the flow in the diffuser of a small, high speed centrifugal compressor (using hot-wire anemometers) are shown A theoretical analysis is presented which predicts the total pressure loss at the diffuser entry, due to the mixing out of unsteady flow from the impeller tip The analysis then takes account of compressibility, wall friction and gradual area changes through the diffuser Theoretically predicted results for a range of diffusers are compared with their experimental performance to illustrate the accuracy and limitations of the solution (Author)

A72-23862 Turbulence characteristics in a straight conical diffuser A C Trupp, R S Azad, N W Wilson, and P A C Okwuobi (Manitoba, University, Winnepeg, Manitoba, Canada) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20-22, 1971, Proceedings
Salford, Lancs , England, University of Salford, 1971, p A66-A72 16 refs Research supported by the National Research Council of Canada

The turbulence structure of subsonic air flow was investigated in a straight conical diffuser having a total included angle of 8 deg and an area ratio of 4 1 Radial distributions of mean velocity, turbulence intensities and Reynolds stresses at twelve stations along the diffuser were obtained via hot wire anemometry measurements for two flow rates A direct linear effect of Reynolds number on the root mean square velocity fluctuations was indicated The relationship between turbulent shear stress and turbulent kinetic energy was found to be identical to that which exists for other flow types (Author)

A72 23870 Effect of rotation on the development of the turbulent boundary layer D W Hughes and J H Horlock (Cambridge University, Cambridge, England) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20 22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971, p B78-B89 27 refs

Effect of simultaneously acting rotational and centrifugal (or Coriolis) forces on the development of a turbulent boundary layer A detailed description is given of the flow modification that results for a swirling flow over a rotating cylinder, the case that may arise on the hub of an axial flow turbomachine The centrifugal or Coriolis forces lead essentially to changes in the turbulent structure of the boundary layer and in the shear stress distribution A qualitative description is given of the shear stress modification in terms of a mixing length change If an integral prediction method is used, with the moment of momentum integral equation as an auxiliary equation, the shear stress modification may immediately be incorporated into the calculation method (Author)

A72-23872 Complex annular ducts for use in gas turbine engines - Current problem areas in their design K F Burrill and R

W Barnes (Rolls Royce, Ltd , Derby, England) In Symposium on Internal Flows, University of Salford, Salford, Lancs , England, April 20-22, 1971, Proceedings Salford, Lancs , England, University of Salford, 1971, p B98-B108 5 refs

The problems in the design of intercomponent ducts for modern gas turbine engines are outlined The limitations of the present design methods are discussed in the light of past experience This previous work illustrates the effect of component operation on duct performance and the difficulties that arise in trying to simulate duct entry conditions by means of spoiler systems Suggested future research work, theoretical and experimental, required to improve the available methods is presented (Author)

A72 23928 Laser recording real-time imagery S I Swinney (Honeywell, Inc , Minneapolis, Minn) In Symposium on Electron, Ion, and Laser Beam Technology, 11th, University of Colorado, Boulder, Colo , May 12-14, 1971, Record San Francisco, San Francisco Press, Inc , New York, Institute of Electrical and Electronics Engineers, Inc , 1971, p 17-26

Description of a laser recorder display subsystem for use in tactical reconnaissance aircraft The proposed arrangement is a high resolution storage subsystem for scan conversion of a line scanning sensor and features near real time viewing of the recorded and developed imagery with demonstrated recording and development in the 1- to 3 2 sec time range It provides a permanent hard copy recording of the sensor output and also has provision for remote viewing of the film, thus minimizing the display installation in the cockpit area A B K

A72 23984 The reliability program of the airborne computer CK37 B Jiewertz (Saab Scania AB, Linkoping Sweden) In Annual Reliability and Maintainability Symposium, San Francisco Calif , January 25-27, 1972, Proceedings New York Institute of Electrical and Electronics Engineers, Inc , 1972, p 158 165 12 refs

This paper describes a reliability program which was started in 1963 in connection with the development of an airborne computer (CK37) for the Swedish aircraft SAAB 37 Viggen The general purpose computer, now in serial production, also includes an input output unit which transfers analog and binary signals to joint operating equipment in the data handling system of the aircraft A total of 42,500 operating hours from seven computer prototypes have been accumulated up to the end of 1970 All operative failures have been recorded and analyzed This has given a total failure rate of 600 850 failures/1,000,000 hr referred to the ground operating mode The demonstrated failure rate of these prototype computers is of the same magnitude as was predicted for the serial production units during the early prototype design phase (Author)

A72-23999 Reliability design for an airborne ecological system L S Gephart and V Balachandran (Dayton, University, Dayton, Ohio) In Annual Reliability and Maintainability Symposium, San Francisco, Calif , January 25-27, 1972, Proceedings New York, Institute of Electrical and Electronics Engineers, Inc , 1972, p 393-399 5 refs

In the reliability design and prediction of an airborne ecological system for jumbo jets, failure was defined as 'that operating condition which could cause the aircraft to be delayed in performing its stated mission, until the failure is repaired ' This operating condition is directly related to 'adequacy' of the flushing of toilets in the 'rest rooms ' A multiple server queuing model presented describes the reliability prediction and design for such an airborne ecological system G R

A72 24012 Reliable interconnections for Army avionics J Spergel and E F Godwin (U S Army, Electronics Technology and Devices Laboratory, Fort Monmouth, N J) In Annual Reliability and Maintainability Symposium, San Francisco, Calif , January 25 27, 1972, Proceedings, New York, Institute of Electrical and Electronics Engineers, Inc , 1972 p 499-509 8 refs

Wire post terminations are discussed together with flat conductor cables and connectors, connectors with universal terminations, and a new matrix interconnection system concept for Army avionics The concept of reliability includes statistical evidence of performance, simplified and easier methods of installation and maintenance, and inspectability An extensive evaluation program was conducted to determine the best technique for terminating flat conductor cables with electrical connectors G R

A72-24019 Development of Douglas commercial aircraft reliability programs D L Gilles (Douglas Aircraft Co , Long Beach, Calif) In Annual Reliability and Maintainability Symposium, San Francisco, Calif , January 25-27, 1972, Proceedings New York, Institute of Electrical and Electronics Engineers, Inc , 1972, p 578-585

The Douglas Aircraft Company's reliability efforts on commercial aircraft up through the DC 8 were informal, following the traditional engineering pattern of development and continuous product improvement With the advent of the DC 9, which was designed for short routes with frequent stops at small airports, assurance of early profitable airline operation depended on a more formalized but strongly hardware oriented reliability effort This effort stressed major simplification of systems, a priority for design decisions based on the effect of equipment failure on aircraft utilization, component selection and improvement based on extensive historical operating data from airline experience, and optimum redundancy arrangements arrived at through reliability logic diagrams and probability calculations Because of the marked success of these techniques and the increased sophistication and complexity of the DC 10 airplane, a further expansion of formal reliability design techniques and program controls has been implemented on the DC 10, including firm reliability guarantees on subsystems and components (Author)

A72-24025 Corrosion resistant features of jumbo jetliners require fabrication and product innovations D A Petrino (Thiokol Chemical Corp , Trenton, N J) *Materials Protection and Performance,* vol 11, Mar 1972, p 53, 54

To reduce the need for maintenance and repair downtime, the designers of the L 1011 TriStar specified 7075 T6 clad wing skins and 2024-T3 clad fuselage skins, sulfuric acid anodizing, and inhibiting adhesive fluid resistant primers It was also specified to use sealing compounds which combine the corrosion resistant properties of a chromate inhibitor and the moisture-and-fuel resistant characteristics of polysulfide polymer rubber G R

A72 24036 Microwaves step up to transportation and communications needs R T Davis *MicroWaves,* vol 11, Mar 1972, p 39, 40, 42, 44

Microwave equipment for terminal air traffic control applications is described, together with the use of millimeter waves in detection of clear air turbulence and for satellite communications The conventional microwave landing system which provides guidance signals in space by using very narrow scanning fan beams is contrasted with the Doppler scanning beam concept that provides comparable angular resolution while transmitting a continuous signal with higher data rates and averaging Cylindrical arrays serving as a beacon interrogator are discussed, along with beam scanning concepts Detection of atmospheric temperature anomalies, railroad

crossing sensors, vehicle safety research, millimeter communications employing phase-shift keying, and satellite communications systems are described T M

A72-24107 Contribution to a study of the aerodynamic noise of airfoils (Contribution à l'étude du bruit aérodynamique des profils) J -P Bridelance, J Cyffers, A J de la Combe, and R Ouziaux (Etablissements NEU, Conservatoire National des Arts et Métiers, Lille, France) *Académie des Sciences (Paris), Comptes Rendus, Série B - Sciences Physiques,* vol 274, no 5, Jan 31, 1972, p 312 315 In French

Experimental study of the noise produced by a gas jet flowing around an airfoil A study is made of the turbulence noise and the pure sound emitted by cylinders and plates placed in a gas jet, and recommendations are made concerning the reference length to be chosen in each case for the calculation of the Strouhal number It is shown that for an isolated airfoil the pure sound can be reduced or eliminated by the choice of a large relative thickness or a large angle of attack The noise persists, however, at much larger angles of attack in the case of a blade cascade A B K

A72 24115 On some problems concerning constant vortex shearing flows around a fixed airfoil (Sur quelques problemes concernant les écoulements de cisaillement a tourbillon constant autour d'un profil fixe) J Obala (Besançon, Universite, Besançon, France) *Académie des Sciences (Paris), Comptes Rendus, Série A - Sciences Mathématiques,* vol 274, no 6, Feb 7, 1972, p 505 507 In French

Study of an airfoil fixed between two parallel rectilinear walls The calculation of aerodynamic forces is complicated in the general case, however, it can be shown that the resultant is perpendicular to Ox In the case where the intermediate airfoil is a symmetrical circle in relation to the real axis the calculations are simplified A theory of the thin wing in an unbounded fluid is developed, and a rectilinear airfoil below a free line is considered in terms of linear theory F R L

A72-24146 Acoustic monitoring of airframe structural proof testing J S Green and B W Toney (General Dynamics Corp , Convair Aerospace Div , Fort Worth, Tex) *Journal of Environmental Sciences,* vol 15, Jan Feb 1972, p 20 23

A Structural Acoustic Monitor (SAM) system was developed for the determination of the origins of noise events indicating possible damage during structural loading of the F-111 series of aircraft The SAM system, as utilized during low temperature, proof load testing, provides for the recording and aural monitoring of 12 channels of acoustic data derived from accelerometers mounted strategically on the test aircraft The system records a load signal generated by the control computer and a coded time signal which is synchronized with the computer clock G R

A72-24169 Where is the 'optimum' runway system - Proposals for high-capacity runway systems at major airports K Schnauffer *Airport Forum,* Mar 1972, p 7, 9, 11, 13 16 In English and German

It is pointed out that under present operational conditions a large number of aircraft very often have to wait in the stack because the capacity of the runway facilities is too low to accept approaching aircraft fast enough In addition, aircraft have to wait in line for takeoff Time losses connected with this procedure are not acceptable in an era of mass transport The runway systems of the future must be designed in such a way that an 'optimum' number of aircraft movements is possible Guidelines for such runway systems are discussed together with an all runway airport, a three- and four-runway system with conventional taxiways, and a narrow eight runway system G R

A72-24170 Britain's regional airports - Outlook unsettled A H Stratford and D M Lumb (Alan Stratford and Associates, Maidenhead, Berks , England) *Airport Forum,* Mar 1972, p 38-46 10 refs In English and German

The development of civil airports in Great Britain during the 25 post-war years has followed an ad hoc pattern without a unified policy or a formal national plan Airports not operated by the British Airports Authority are considered Particular attention is given to airports handling transport aircraft and providing facilities for the air carriers who offer scheduled and nonscheduled services on the various domestic and international routes The pattern of airport ownership and development is discussed together with aspects of regional planning for UK airports, development projects in hand, the effects of changes in traffic patterns, and the noise problem G R

A72-24171 Taxiing guidance and surface traffic control on airports C Woltge (Hannover, Technische Universitat, Hanover, West Germany) *Airport Forum,* Mar 1972, p 81, 82, 84 86 (10 ff) 15 refs In English and German

In all countries that are contracting members of ICAO, ground movements at airports follow largely standardized procedures ICAO procedures are discussed, taking into account ICAO publications and their classification After touchdown, the pilot must brake his aircraft, roll out, branch off into the turn off indicated to him by the controller, taxi on a specified route to the apron and there steer into the stand allotted him by the airport operator Two models, differing in terms of reference and results, have been worked out in recent years to overcome certain difficulties in surface traffic control G R

A72 24196 # Stability of simply supported skew plates under combined loading Mahabaliraja and S Durvasula (Indian Institute of Science, Bangalore, India) *ASME, Transactions, Series E - Journal of Applied Mechanics,* vol 39, Mar 1972, p 310, 311 15 refs Research sponsored by the Council of Scientific and Industrial Research of India

Interaction curves for buckling under combined loading are presented for simply supported rhombic plates of an aspect ratio of 1 These data are expected to be useful in wing and tail design applications for modern high-speed aircraft and missiles M V E

A72-24218 Warping of completely ventilated lifting surfaces (Vrillage des surfaces portantes totalement ventilees) L F Tsen and M Guilbaud (Poitiers, Universite, Poitiers, France) *Academie des Sciences (Paris), Comptes Rendus, Série A - Sciences Mathématiques,* vol 274, no 9, Feb 28, 1972, p 802-805 In French

Discussion, for a wing of given plan form, of the use of warping as a means of control of load distribution along a wing span, and consequently of control of the induced drag The results of a study of the effect of warping in linear theory, and of wind tunnel experiments, are summarized F R L

A72-24271 TriStar R-Nav system certification nears K J Stein *Aviation Week and Space Technology,* vol 96, Mar 20, 1972, p 46, 47, 49 52

A highly automated modular area navigation system (Mona) developed for the Lockheed L 1011 TriStar wide body jet transport has progressed into the final phase of formal flight demonstrations for the Federal Aviation Administration Four major elements comprise the Mona system including a navigation computer unit, a flight data storage unit, a control display unit, and an electronic automatic chart system G R

A72-24273 # Accelerations during parachute deployment J W Sparkman, Jr and A L Morris (National Center for Atmospheric

Research, Boulder, Colo) *Facilities for Atmospheric Research*, Sept 1971, p 17-20

With the current trend to heavier payloads and the release of payloads from higher altitudes, parachute failure may become more of a problem in the future Initial developmental work on a system designed to cause the parachute to open more reliably and with low accelerations was conducted The system uses a pneumatic tube encircling and attached to the canopy of the parachute During ascent of the balloon the decrease in ambient pressure causes the tube to pressurize After release, the continuing outward force exerted by the tube causes rapid completion of the parachute's opening G R

A72 24320 The development of a full-scale aircraft turbine engine controlled environment corrosion test J E Newhart and W W Wagner (U S Naval Air Propulsion Test Center, Philadelphia, Pa) *National Association of Corrosion Engineers, Conference on Corrosion, St Louis, Mo , Mar 20-24, 1972, Paper 76* 9 p

Description of an improved corrosion susceptibility test developed for aircraft gas turbine power plants used by the Navy air arm, in particular for shaft power gas turbines installed in fleet based helicopters It represents an accelerated full scale 150-hour engine endurance test performed in a controlled environment The conditions (simulating the natural salt environment) for the 48-hour corrosion test cycle, which includes 6 hours of actual engine operation, are outlined The cycle reflects the most significant aspects of the adverse conditions encountered in fleet operations High turbine temperatures dictated by mission requirements, exposure to high salt concentrations, and long periods of high ambient temperatures and humidities are the considerations used in designing engine operation, dynamic soak, and static soak phases of the test schedule By insuring the gas turbine engine and its components against unscheduled maintenance and repair, the test should provide the Navy with a reliable engine for a given period of operation V P

A72-24331 On the noise of a nearly ideally expanded supersonic jet C K W Tam (MIT, Cambridge, Mass) *Journal of Fluid Mechanics*, vol 51, Jan 11, 1972, p 69-95 32 refs

A noise generation mechanism for a nearly ideally expanded supersonic jet is proposed It is suggested that the dominant part of the noise of a supersonic jet is generated at two rather localized regions of the jet These regions are located at distances quite far downstream of the nozzle exit Large-scale instabilities of the jet flow are believed to be responsible for transferring the kinetic energy of the jet into noise radiation An analysis based on a simple mathematical model reveals that two large scale unstable waves are preferentially amplified in a supersonic jet The rapid growth of these waves causes the oscillations of the jet to penetrate the mixing layer at two locations and to interact strongly with the ambient fluid there This gives rise to intense noise radiation Theoretical results based on the proposed noise generation mechanism are found to compare favourably with experimental measurements A simple scaling formula is also derived (Author)

A72-24490 Advances in radar technology I - The effects of electronics and data processing (Fortschritte in der Radartechnik I - Auswirkungen der Elektronik und der Datenverarbeitung) H Becker *VDI-Z*, vol 114, no 4, Mar 1972, p 235 238 18 refs In German

Primary radar makes the location, pursuit, and relative velocity measuring of flying objects It cannot, however, identify these objects which is a function of paramount importance for air traffic control This latter function devolves upon secondary surveillance radar that in combination with primary radar and with the aid of a digital computer is shown to make possible various more or less automated air surveillance systems providing a foundation for effective air traffic control M V E

A72-24497 # Measurement of the angular velocity of a flight vehicle by linear accelerometers (Ob izmerenii uglovoi skorosti letatel'nogo apparata lineinymi akselerometrami) Ia L Lunts and V V Khabalov *Priborostroenie*, vol 14, no 12, 1971, p 73-76 In Russian

Equations are derived which describe the motion of the sensitive masses of three accelerometers relative to a frame of reference tied to the flight vehicle The equations of motion are used to obtain algorithms for calculating angular velocity components of the vehicle T M

A72-24562 Wall effect in cavitating flow past a thin jet-flapped foil T Kida and Y Miyai (Osaka Prefecture, University, Osaka, Japan) *Quarterly Journal of Mechanics and Applied Mathematics*, vol 25, Feb 1972, p 83-103 6 refs

A theory is introduced to study the effect of the rigid walls of a tunnel on a supercavitating foil with a thin jet flap The analytical formulation is derived as an integro-differential equation with singular kernels from the boundary-value problem of a harmonic function (Riemann-Hilbert problem) The lift coefficient can be obtained in terms of the forward uniform velocity normalized with respect to the far downstream velocity (i e , the cavitation number) Linearized first and second-order theories are formulated by means of a small-perturbation technique Numerical calculations were carried out using the linear and second order theories Results of these calculations indicate that the derivatives of lift coefficient with respect to the incidence angle and to the jet deflection angle (lift slopes) are remarkably affected by the rigid walls, especially in the case when the foil approaches to the lower wall in a tunnel (Author)

A72 24563 Laminar film condensation in forced flows P Beckett and G Poots (Hull, University, Hull, Yorks , England) *Quarterly Journal of Mechanics and Applied Mathematics*, vol 25, Feb 1972, p 125-152 12 refs

Two dimensional laminar film condensation on a surface is investigated on the basis of boundary layer theory The case of flow past a semi infinite flat plate, which is aligned parallel to a uniform mainstream is discussed by means of a perturbation analysis for both small and large rates of cooling at the surface Predictions, for this similar solution of the boundary layer equations, are compared with exact numerical solutions in the case of steam water condensation The perturbation analysis is then extended to treat nonsimilar flows and results on steam water condensation are compared with exact numerical solutions obtained using the Hartree Womersley method The cases of potential flow past a circular cylinder and past a flat plate with retarded mainstream are used for comparison (Author)

A72 24654 # Adaptation of the hydraulic tank to flow visualization in turbomachines (Adaptation de la cuve hydraulique a la visualisation de l'écoulement dans les turbomachines) H Werlé and M Gallon (ONERA, Châtillon sous Bagneux, Hauts-de Seine, France) *La Recherche Aérospatiale*, Jan Feb 1972, p 15-21 8 refs In French Research supported by the Direction des Recherches et Moyens d'Essais

The hydraulic tank, up till now used only for experiments on fixed models with jets or moving parts, has been adapted for visualizing the internal flow in rotating systems, in particular in an axial turbomachine model The paper gives a description of the equipment and the methods used, and presents a few examples of visualizations obtained during their development These first results

confirm and add to those provided by other devices for hydraulic or aerodynamic testing They give a preview of fruitful comparisons for the studies at present under way (Author)

A72 24655 # **Adaptation of lidar to aircraft and missile ranging (Adaptation d'un lidar a la telemetrie des avions et des missiles)** P Weber (ONERA, Châtillon sous Bagneux Hauts-de-Seine, France) *La Recherche Aérospatiale,* Jan Feb 1972, p 23-35 12 refs In French

From its inception, lidar has been considered as a remarkable localization instrument due to its space and time coherence The operating conditions of lidar on satellites and on aircraft or missiles are compared Means for adapting one case to the other are proposed Results obtained with ONERA experimental lidars are presented an accuracy of about 0 8 m and a reproducibility of about 1 3 m (rms) were obtained on a vehicle carrying cube corner reflectors (Author)

A72-24656 # **Preliminary results of a study of infrared emission from a hot jet (Resultats préliminaires de l'etude de l'emission infrarouge d'un jet chaud)** J F de Belleval, M Perulli (ONERA, Châtillon sous Bagneux, Hauts de Seine, France), G Richter, and C Schmidt (SNECMA, Paris, France) *(Association Française des Ingénieurs et Techniciens de l'Aéronautique et de l'Espace and Groupement des Acousticiens de Langue Française, Colloque d'Acoustique Aéronautique, 2nd, Paris, France, May 4, 5, 1971) La Recherche Aérospatiale,* Jan Feb 1972, p 37-45 9 refs In French

The axial and transverse profiles of turbulence intensity and of the characteristic parameters of turbulence (convection speed, lifetime, integral scale, spectrum, etc) are measured by means of an optical system in which mirrors focus the infrared emission of sub or supercritical hot jets upon detectors The sound infrared correlations and a comparison of the spectra show that this method of measurement can be used to determine the characteristic features of sound sources within a turbulent medium when temperature is sufficiently high (Author)

A72-24657 # **Reynolds number effects on a model equipped with high lift devices (Influence du nombre de Reynolds sur une maquette hypersustentée)** X Vaucheret (ONERA, Châtillon sous Bagneux, Hauts-de Seine, France) *La Recherche Aérospatiale,* Jan Feb 1972, p 52, 53 In French

Experimental investigation of Reynolds number effects on the incidence angle at which boundary layer separation occurs and on the maximum lift coefficient of a fixed-wing aircraft model equipped with high-lift devices The study was conducted over a wide range of Reynolds number values at the variable-pressure wind tunnel facility at Modane Avrieux M V E

A72-24682 **Stochastic optimization of some of the design parameters of airborne laser seeker systems** W H Clearfield (Ford Motor Co , Dearborn, Mich) and B L Capehart (Florida, University, Orlando, Fla) *IEEE Transactions on Aerospace and Electronic Systems,* vol AES 8, Jan 1972, p 19 26 5 refs

The search process of an airborne laser seeker system is studied to maximize the probability of target acquisition with respect to the following parameters altitude, velocity, seeker scan angle, seeker depression angle, laser illuminator peak power, scan pattern, and acceptance logic The relationships between the objective variable and the first five parameters are established through a regression analysis of data points collected from a computerized system model Classical techniques applied to the regression equation isolate a local maximum Scan pattern and acceptance logic are each studied separately since their optima are independent of the other parameters of the system Maximum probability of target acquisition is nearly unity (Author)

A72 24725 # **Minimum operational characteristics for airborne VHF omnirange /VOR/ systems** Washington D C , Radio Technical Commission for Aeronautics (Document No DO 149) Jan 14, 1972 30 p 11 refs $6 00

Demonstration of the need for minimum operational charac teristics for airborne systems, and recommendation of minimum operational characteristics for airborne VOR systems The need for basic characteristics for navigation and communication systems used in air traffic control is cited, minimum operational characteristics of the airborne system elements are suggested and the preparation of minimum operational characteristics for airborne systems is dis cussed Minimum operational characteristics for airborne VOR

A72 24756 **International Symposium on Electro-Magnetic Suspension, 2nd, University of Southampton, Southampton, England, July 12-14, 1971, Proceedings** Southampton England, University of Southampton, 1971 343 p

Topics discussed include the use of superconductivity in magnetic suspension design, losses in superconducting magnets an automatic suspension using tuned LCR circuits, an electromagnetic model position sensing system for wind tunnels, electrooptical detectors for magnetic suspension, an optical scanning detection system for low density drag measurements, data acquisition and reduction for a superconducting magnetic suspension and balance facility, a dc power supply for a magnetic suspension system, wind tunnel tests of conical and winged model configurations using a magnetic suspension and balance system the use of an electromag netic balance in rarefied gas research, an electromagnetic position sensor for a magnetically supported model, and the simulation of gravity in wind tunnels with the aid of magnetic fields A B K

A72-24757 * # **The University of Virginia superconducting magnetic suspension and balance facility** R N Zapata (Virginia University Charlottesville, Va) In International Symposium on Electro Magnetic Suspension, 2nd University of Southampton, Southampton England, July 12 14, 1971 Proceedings Southampton, England, University of Southampton 1971, p A 1 A 22, Discussion p A 23 A 24 9 refs Grants No NGR 47 005 029 No NGR 47 005 110 No NGR 47 005 112

Description of a prototype facility comprising a super conducting magnetic suspension and balance and a supersonic wind tunnel This facility was developed with the objectives of establishing the feasibility of applying the three-component magnetic balance concept to dynamic stability studies, and investigating design concepts and parameters that are critical for extrapolation to large scale systems Many important design and operational aspects, as well as safety considerations are dictated by the cryogenic nature of this advanced technology facility Results of initial tests demonstrate that superconductors can be utilized safely and efficiently for wind tunnel magnetic suspensions At the present stage of develop ment of this facility, controlled one dimensional support of a spherical model has been achieved (Author)

A72 24759 # **The use of superconductivity in magnetic balance design** F E Moss (Virginia, University, Charlottesville, Va) In *International Symposium on Electro Magnetic Suspension,* 2nd, University of Southampton, Southampton, England, July 12 14, 1971, Proceedings Southampton, England, Uni

versity of Southampton, 1971 p C 1 C 15 15 refs

Summary of the magnetic field and field gradient requirements for magnetic suspension in a Mach 3, 6 in diam wind tunnel, along with the power requirements for gradient coil pairs wound of copper operating at room temperature and aluminum cooled to 20 K The power dissipated is large enough so that the use of superconductivity in the coil design becomes an attractive alternative The problems of stability and ac losses are outlined along with the properties of stabilized superconductors A brief review of a simplified version of Bean's (1964) critical state model is presented, and the problems involved in calculations of the ac losses in superconducting coils are outlined A summary of ac loss data taken at Brookhaven National Laboratories (BNL) on pancake coils wound of commercially available Nb3Sn partially stabilized tape is presented and shown as leading to the University of Virginia gradient coil design The actual coil performance is compared with predictions based on the BNL results Finally, some remarks are presented concerning scaling of the ac losses to larger magnetic suspension systems as well as prospects for improved performance using newer multifilament superconductors (Author)

A72-24765 # **Determination of forces and moments with a magnetic wind tunnel balance system** G D Gilliam (MIT, Cambridge, Mass) In International Symposium on Electro Magnetic Suspension, 2nd, University of Southampton, Southampton, England, July 12-14, 1971, Proceedings Southampton, England, University of Southampton, 1971, p J 1 J 17, Discussion, p J 18

The aerodynamic forces and moments experienced by a model in a wind tunnel may be deduced from the magnetic forces and moments required to balance them The derivation of the equations presently used to determine the forces and moments exerted on a body by the magnetic fields produced by the M I T N A S A Prototype Magnetic Balance is presented In addition, a procedure for determining the parameter in the equations for a particular model is outlined (Author)

A72 24766 * # **Data acquisition and reduction for the U Va superconducting magnetic suspension and balance facility** I D Jacobson, J L Junkins, and J R Jancaitis (Virginia, University, Charlottesville, Va) In International Symposium on Electro-Magnetic Suspension, 2nd, University of Southampton, Southampton, England, July 12 14, 1971, Proceedings Southampton, England, University of Southampton, 1971, p K 1-K 12 Discussion, p K 13, K 14 9 refs Grants No NGR 47 005 029, No NGR-47 005-149, No NGR-47 005-112

The problems associated with data acquisition and reduction in the University of Virginia superconducting magnetic suspension and balance facility are similar to those in free flight ranges (or tunnels) The model undergoes a 'Quasi six-degree of freedom' motion which must be monitored both in position and angular orientation from which the aerodynamics must be inferred The data acquisition problem is made more difficult because geometric constraints prevent direct visual access to the model in the Mach 3 wind tunnel The methods, accuracies and problems associated with the acquisition of data are discussed (Author)

A72-24769 # **Aerodynamic characteristics of axisymmetric and winged model configurations using a magnetic suspension and balance system** M Vlajinac (MIT, Cambridge, Mass) In International Symposium on Electro Magnetic Suspension, 2nd, University of Southampton, Southampton, England, July 12 14, 1971, Proceedings Southampton, England, University of Southampton, 1971, p N 1 N 12, Discussion, p N 13 11 refs

Results of subsonic and supersonic wind tunnel tests with a magnetic balance and suspension system on a family of bulbous based cone models are presented At subsonic speeds the base flow and separation characteristic of these models is shown to produce anomalous behavior of the static force and moment coefficients with angle of attack Comparison of data obtained with a dummy sting is made with support interference free results The static aerodynamic characteristics of three sharp edged, slender wings at subsonic speeds is presented Comparison of the present results with tests at Reynolds numbers an order of magnitude higher is considered good, thereby validating the small scale tests (Author)

A72 24770 # **Aerodynamic data acquisition with the Uni versity of Southampton magnetic balance** S Abdel Kawi, T Diab, M J Goodyer, R I Henderson, and M Judd (Southampton, University, Southampton, England) In International Symposium on Electro Magnetic Suspension, 2nd, University of Southampton, Southampton, England July 12 14 1971 Proceedings Southampton England University of Southampton, 1971, p O 1 O 17, Discussion p O 18 O 19 11 refs Research supported by the Ministry of Aviation Supply and Ministry of Defence

A brief description of the Southampton magnetic balance is presented first with particular emphasis on the methods for extracting steady and unsteady wind tunnel data New acquisition and analysis methods are then described Steady lift, drag and pitching moment measurements have been made on a body of revolution and on wing body combinations of delta and AGARD G wing planform Roll damping for the wing body combination is also presented (Author)

A72 24771 # **Research in rarefied gas dynamics using an electromagnetic wind tunnel balance** R N Zapata, A R Kuhlthau, and S S Fisher (Virginia, University, Charlottesville Va) In International Symposium on Electro-Magnetic Suspension, 2nd, University of Southampton Southampton, England July 12 14, 1971, Proceedings Southampton, England, University of Southampton, 1971, p P 1 P 16, Discussion p P 17, P 18 6 refs Grant No AF AFOSR 69 1798

Aerodynamic forces on spheres and slender cones in hypersonic, low density flows have been measured with a 3 component magnetic balance of improved capabilities Advances in the experimental techniques permitting measurements of increased accuracy, precision, and resolution have made possible interesting studies of slender cone aerodynamics Preliminary results of an investigation of sting effects are reported Current and future research plans are discussed from the point of view of facility development (Author)

A72 24773 # **Electromagnetic position sensor for a magnetically supported model in a wind tunnel** W R Towler (Virginia University, Charlottesville, Va) In International Symposium on Electro Magnetic Suspension 2nd, University of Southampton, Southampton, England, July 12 14, 1971, Proceedings Southampton, England, University of Southampton, 1971, p Q 4 Q 7 Discussion, p Q 8

Description of the design, principle of operation, and performance characteristics and problems of an electromagnetic position sensor for a magnetically supported model in a wind tunnel The sensor is based upon the principle of a differential transformer, and it is hoped that the problems encountered in its operation will be solved eventually M V E

A72 24775 * # **Magnetic simulation of gravity** E E Covert and T Stephens (MIT Cambridge, Mass) In International Symposium on Electro Magnetic Suspension, 2nd University of Southampton, Southampton England, July 12 14, 1971, Proceedings Southampton England, University of

Southampton, 1971, p R 1-R 33 Discussion, p R 34 9 refs Contract No NAS1 9812

Investigation of the feasibility of a magnetically simulated gravity that could make it possible to simulate aircraft jettison processes in a wind tunnel It is shown that coils capable to produce a thereto suitable magnetic field configuration do exist Circumstances are defined for which multiple jettison releases may be simulated, and an approximate calculation for the errors due to magnetic field nonuniformities is presented M V E

A72-24776 * # **The use of iron and extended applications of the U Va cold balance wind tunnel system** H M Parker and J R Jancaitis (Virginia, University, Charlottesville, Va) In International Symposium on Electro-Magnetic Suspension, 2nd, University of Southampton, Southampton, England, July 12-14, 1971, Proceedings Southampton, England, University of Southampton, 1971, p S 1-S 10 *Grants No NGR-47 005-029, No* NGR-47-005-112

Consideration of the possibility of extending the use of a cold magnetic balance wind tunnel system to non-continuously spinning aircraft configurations and to subsonic flow regimes The problems involved in these extensions are discussed The possible use of iron for the magnetic support element, or some material reasonable equivalent, is found to be crucial The existing theoretical evidence that iron may be used without penalty is summarized (Author)

A72-24842 **A method for reducing the base drag of wings with blunt trailing edge** M Tanner (Aerodynamische Versuchsanstalt, Gottingen, West Germany) *Aeronautical Quarterly,* vol 23, Feb 1972, p 15-23 10 refs

To study the possibilities of reducing the base drag of profiles with a blunt trailing edge, experiments were performed in two low-speed wind-tunnels at the DFVLR-AVA, Gottingen (some on models between walls and some on rectangular wings with an aspect ratio of 2 5) The results show that the mean base pressure can be increased, and so the base drag reduced, by using a special form of the blunt trailing edge The variation of local base pressure along the span, and the way in which this variation is influenced by the form of the trailing edge, is also shown Some results for the total drag and lift are also indicated (Author)

A72-24844 **Some stability problems of ground effect wing vehicles in forward motion** P E Kumar (Hawker Siddeley Aviation, Ltd , Hatfield, Herts , England) *Aeronautical Quarterly,* vol 23, Feb 1972, p 41-52 11 refs Research supported by the Ministry of Technology

Recent advances in the development of ground cushion vehicles have indicated the need for a more efficient means of providing lift at the higher speeds envisaged in the future A wing operating in ground effect could provide this lift and might be far more attractive economically than the 'hovercraft ' This note investigates some of the stability aspects of such a ground effect wing vehicle, using linear analysis, by developing the relevant equations of motion and examining the characteristic equations using quasi-steady derivatives, at fixed heights, obtained from wind tunnel tests In addition, comparison is made between an analogue simulation and the flight paths obtained from a free flight model This investigation showed that the longitudinal mode of oscillation for both single and tandem wings with endplates was unstable and artificial stability was necessary The lateral mode of oscillation for a single wing was stable in both roll and yaw, the latter being subject to fin and endplate configurations (Author)

A72-24845 **Aerodynamic throttling of two-dimensional nozzle flows** R H Nunn (U S Naval Postgraduate School, Monterey, Calif) and H Brandt (California, University, Davis, Calif) *Aeronautical Quarterly,* vol 23, Feb 1972, p 53-61 6 refs

The inviscid interaction resulting from the penetration of a jet of air into the throat region of a bounded mainstream flow is investigated analytically and experimentally Taking into account the effects of jet shocks, a control volume analysis is used to calculate the mainstream and jet conditions at the boundaries of the interaction region These results are then used to estimate the shape of the interface separating the jet and mainstream Particular attention is given to the throttling of the mainstream flow and the analytical predictions show agreement with the experimental measurements (Author)

A72-24846 **Lower bounds for the pressure jumps of the shock waves of a supersonic transport of given length** L B Jones (Bradford, University, Bradford, England) *Aeronautical Quarterly,* vol 23, Feb 1972, p 62 76 14 refs

In an earlier paper the lower bounds for the pressure jumps across the bow shock waves of a supersonic transport were derived, it being assumed that all the shocks had coalesced into either the bow or rear shocks, but not that the shocks were at such a great distance (asymptotic) that they had the same strength In this paper the results of the earlier work are developed so that the lower bounds for the pressure jumps across shock waves propagating through a homogeneous atmosphere are determined by considering bow and rear shock waves simultaneously (Author)

A72-24854 **Subsonic unsteady aerodynamic pressures on compressor blades (Pressions aerodynamiques instationnaires subsoniques sur les ailettes de compresseurs)** J Leclerc and P Salaun (ONERA, Châtillon sous Bagneux, Hauts de-Seine, France) *Académie des Sciences (Paris), Comptes Rendus, Série A - Sciences Mathématiques,* vol 274, no 10, Mar 6, 1972, p 863-866 In French

Solution of the problem of determining the aerodynamic pressures acting on the blades of a compressor wheel freely rotating in an air stream As in wing theory, the blades are replaced by a distribution of pressure doublets, which requires the determination of the potential due to N isolated sources regularly distributed in a circle on each blade The problem of calculating the aerodynamic pressures is reduced to the solution of an integral equation the kernel of which is decomposed into a double series of products of functions of a single variable A B K

A72-24864 # **Creation and dissemination by computer of electrical interface information in avionics systems** D C J Garrett and R A Bolton (E A Space and Advanced Military Systems, Ltd , Frimley, Camberley, Surrey, England) *Aircraft Engineering,* vol 44, Mar 1972, p 4 6

Application of a computer to the solution of a communication problem in avionics systems The problem involves the creation of a document which defines all the electrical interface connections in the system, and the dissemination of the design information contained in the document to all the project participants on a regular basis A computer program (EMPRENT) which has the ability to select and sort designated data is described F R L

A72-24865 # **A common design approach to STOL and V/STOL transport aircraft** T K Szlenkier (Hawker Siddeley Aviation, Ltd , Kingston upon Thames, Surrey, England) *Aircraft Engineering,* vol 44, Mar 1972, p 10 15 5 refs

Discussion of the fan lift solution to STOL and V/STOL requirements, which is based on the use of common propulsion and lift engine types for both applications Such an approach gives substantial advantages in that the technology is applicable to either regime of operation or in that there can be an evolutionary

development through STOL to VTOL Comparative assessments indicate that fan lift aircraft are superior to the best alternative STOL and VTOL designs F R L

A72-24866 # **The non synchronous techniques** *Aircraft Engineering,* vol 44, Mar 1972, p 16-19

Description of the RCA SECANT (separation and control of aircraft using nonsynchronous techniques) method of collision avoidance It is a cooperative transponding system which operates at L band, and performs the collision avoidance function by trans mitting probes and receiving replies with a 1 microsec pulse, at 1000 pulses/sec, on 24 different frequencies Various discriminants are used to eliminate the undesired signals Different frequencies are allocated as a function of altitude of the flight of the aircraft The fields above and below the aircraft are probed separately, and analog thresholds are established based on the range required for the collision avoidance function, which discriminate against signals coming from aircraft too far away to be involved F R L

A72 24867 # **Planning and operational aspects of 'on condition' philosophies** F S Nowlan (United Air Lines, Inc , Chicago, Ill) *Aircraft Engineering,* vol 44, Mar 1972, p 26 28

Review of the practices of United Air Lines in identifying and continuing those scheduled maintenance activities which are effective in protecting reliability characteristics, and identifying and dis continuing those activities which are ineffective Turbine engine reliability, component reliability, reliability controlled overhaul, and test and repair as necessary programs are outlined Attention is given to system and component operating performance evaluation F R L

A72 24877 Contributions of the Bell Helicopter Company to helicopter development /12th Cierva Memorial Lecture/ B Kelley (Bell Helicopter Co , Fort Worth, Tex) *Aeronautical Journal,* vol 76, Mar 1972, p 157 165

The Bell lifting rotor systems and the principal contributions in the fields of electronics and avionics are examined, with particular reference to the development and constant improvement of the two bladed motor and to research work on the prop-rotor Solutions to the rotor vibration problem are examined The history of the Bell Helicopter Company, starting with 1941, is reviewed, together with policies concerning the development of new ideas, and the research and development projects V P

A72-24881 Legal aspects of international co-operation on aircraft design and production W B Jenkins (British Aircraft Corp , Ltd , Commercial Aircraft Div , Weybridge, Surrey, England) *Aero nautical Journal,* vol 76, Mar 1972, p 188-191

The legal framework within which an international cooperative project can be established is related in this study with matters arising from the relationship of parties to an international collaborative project which requires regulation, such as work sharing and adjustment thereto, management of the project, sharing of liabilities, proprietary rights, and joint insurances The different types of legal organization appropriate for the management of international aircraft projects are examined V P

A72-24882 Co-operation between the parties to the project itself and third parties C B White (Hawker Siddeley Group, Ltd , London, England) *Aeronautical Journal,* vol 76, Mar 1972, p 192-194

Problems arising between collaborating parties and outsiders are discussed The aspects of collaborating relations with governments, government organizations, airworthiness authorities, subcontractors, financial institutions, marketing agencies, and customers are examined V P

A72 24922 # **Statistical assessment of the linear fatigue damage increment of a welded airframe component** V Nejedly *Zprava VZLU,* Jan 1972, p 1-14 15 refs

A contribution is presented to the objective statistical evaluation of experimental data resulting from fatigue tests of aircraft structural parts under constant force amplitude conditions Two methods for determining the fatigue damage increment during cyclic loading with a constant force amplitude are described and compared At the same time, the effect of the form of the loading cycle on the component fatigue life is investigated Finally, a critical discussion of the results is presented, taking into account the effect of the life scatter with respect to the evidence of safe fatigue life O H

A72-24923 # **Maneuverability of jet helicopters (Manovrabilità dei velivoli a reazione)** A Malfertainer *Rivista Aeronautica,* vol 47, Dec 1971, p 2083-2106 In Italian

Review of the factors affecting the maneuverability of jet helicopters during the main types of maneuvers It is shown that the maneuverability of a jet helicopter does not depend only on the flight characteristics of the helicopter and the capacity of the pilot, but also on other factors, such as the flight configuration and the flight altitude, and, to a considerable extent, also on the load factor Attention is called to the phenomenon of false altitude readings of the altimeter, especially during diving or rapid climbing A B K

A72-24940 The role of surface acoustic wave technology in communication systems J H Collins and P M Grant (Edinburgh, University, Edinburgh, Scotland) *Ultrasonics,* vol 10, Mar 1972, p 59-71 23 refs Research supported by the Science Research Council

A survey is presented of the principles, parameter values, and classes of the analog matched filters (AMF's) and their tradeoffs with digital matched filters when viewed in the context of future systems applications For illustrative purposes, the role of AMF's is identified in M-ary, frequency hopped, and direct sequence spread spectrum modems, a continuous multiple access communication system, navigation systems, a time division multiple access air traffic control system and, finally, in a high traffic density, large spatial volume, aircraft collision avoidance system O H

A72 25023 High resolution observations of the submillimetre stratospheric emission spectrum J E Harries, N R W Swann (Department of Trade and Industry, National Physical Laboratory, Teddington, Middx , England), J E Beckman, and P A R Ade (Queen Mary College, London, England) *Nature,* vol 236, Mar 24, 1972, p 159-161 20 refs

Preliminary results of some recent (Nov 11, 1971) measurements of the thermal emission spectrum of the stratosphere in the submillimeter region obtained at 12-km altitude by instruments mounted on board a Comet 2E experimental aircraft In this case an improvement in resolution was achieved by using a helium cooled InSb electron bolometer instead of a Golay cell detector used in previous experiments In addition to the lines of H2O, O2, and O3 previously observed, evidence is obtained which strongly suggests the presence of emission from HNO3 A B K

A72-25070 # **The trailing vortex wake downwind of an external flow jet flap** R H Wickens (National Aeronautical Establishment, Ottawa, Canada) *Canadian Aeronautics and Space*

Journal, vol 18, Mar 1972, p 67, 68

Discussion of experiments in which the physical nature of the trailing vortex wake downward of an external flow jet flap was studied by having a five hole probe make traverses through the flow Diagrams are given to show the spanwise distribution of sidewash angle and dynamic pressure A diagram of sidewash, downwash and propulsive contours downstream of the wing is also included Smoke flow visualization was used to observe the rolled-up vortices characterizing the trailing jet sheet V Z

A72-25078 # **Operational aviation meteorological requirements, present and future** N A Lieurance (NOAA, Washington, D C) In Symposium on Meteorological Observations and Instrumentation, 2nd, San Diego, Calif , March 27 30, 1972, Preprints Boston, American Meteorological Society, 1972, p 32 36 8 refs

Operational requirements for meteorological information in aviation are dictated by categories of aircraft, types of users, and varied aircraft avionics and navigational aids The wide spectrum of users is categorized (including the air traffic control system), and individual requirements are reviewed Type of information desired and length of forecast periods are summarized, including specifications of new instrumentation that must be developed to meet projected needs T M

A72-25079 # **Real-time pilot reports utilizing data-link communications** P W Kadlec (Continental Air Lines, Inc , Los Angeles, Calif) In Symposium on Meteorological Observations and Instrumentation, 2nd, San Diego, Calif , March 27 30, 1972, Preprints Boston, American Meteorological Society, 1972, p 37 39

Transmission of air-ground and ground-to-air messages by a digital data link is explained in terms of encoding and processing equipment employed in recently developed systems Typical message formats are illustrated, and the significance of meteorological codes employed is outlined Future developments leading to the dissemination of automatic real time weather forecasts are discussed T M

A72-25093 # **General examination of problems set by meteorological instrumentation on airports (Examen général des problemes posés par l'instrumentation météorologique sur les aerodromes)** H P Treussart (Meteorologie Nationale, Trappes, Yvelines, France) In Symposium on Meteorological Observations and Instrumentation, 2nd, San Diego, Calif , March 27 30, 1972, Preprints Boston, American Meteorological Society, 1972, p 217-222 In French

Discussion of elements influencing the development of meteorological instrumentation, and of the evolution of detectors Meteorological instrumentation has been strongly influenced by the rapid development of electronics, and particularly by the wide availability of transistorized or integrated devices of high reliability Ground wind measurement detectors, and detectors for measurement of visibility, cloud base height, air temperature, and humidity are briefly considered Attention is given to meteorological radar and data processing F R L

A72-25096 # **Forecasting the needs of the 80's** L L LeBlanc (USAF, Offutt AFB, Neb) In Symposium on Meteorological Observations and Instrumentation, 2nd, San Diego, Calif , March 27-30, 1972, Preprints Boston, American Meteorological Society, 1972, p 236-241

Factors expected to dominate military weather support procedures during the present decade are identified as the centralization of the decision making process, the development of more effective data processing techniques and an increase in the quality and quantity of satellite data A system producing mission tailored forecasts, a terminal forecast model, a selective display mode, and a computer flight planning model are discussed as major anticipated developments in the field V Z

A72 25107 **Mitsubishi XT-2 - Japan's new jet trainer (Mitsubishi XT-2 Japans neuer Strahltrainer)** H Brenner *Flug Revue/Flugwelt International,* Apr 1972, p 20 24 In German

In September 1967 the Japanese aerospace company Mitsubishi was named prime contractor of the XT-2 Basic design studies were completed during 1968 Two prototypes of the new aircraft were built The first flight was made on July 20, 1971 It is intended to use the XT 2 also as a replacement for the F 86F for ground support missions Tentative plans call for the eventual purchase of 130 aircraft for ground support duties and of 80 aircraft for training purposes G R

A72 25108 **Optimization of aircraft maintenance (Optimierung der Instandhaltung von Fluggerat)** K Harling and K Schurger (Deutsche Lufthansa AG, Hamburg, West Germany) *Flug Revue/Flugwelt International,* Apr 1972, p 27-31 In German

The factors which have to be considered in the optimization include objectives of safety and reliability, punctuality, and the performance of the required maintenance functions at costs which are as low as possible The development of maintenance systems is discussed together with the accepted maintenance principles The maintenance system for the propulsion units of the aircraft of the German Lufthansa is considered as an example for the practical application of the theory of aircraft maintenance G R

A72-25118 # **Supersonic flow around an antisymmetrical thin cruciform wing which has a horizontal plane with supersonic leading edges, taking into account flow separation at the edges (Scurgerea supersonica in jurul aripii cruciforme subtiri antisimetrice avind planul orizontal cu bordurile de atac supersonice, considerind separatia de curent la borduri)** S Staicu (Bucuresti, Institutul Politehnic Gheorghe Gheorghiu Dej, Bucharest, Rumania) *Bucuresti, Institutul Politehnic Gheorghe Gheorghiu-Dej, Buletinul,* vol 33, Jan Feb 1971, p 103 118 10 refs In Rumanian

Study of supersonic flow around a thin cruciform wing which has an antisymmetrical angle of attack distribution and a horizontal plane with supersonic leading edges, taking into account flow separation along the supersonic leading edges of the vertical plane Proceeding as in the case of a cruciform wing with all edges subsonic, it is assumed that a real thin cruciform wing is equivalent from the aerodynamic standpoint to a fictitious thin wing with a suitable angle of attack variation This fictitious wing is then divided into three component wings which are studied by the method of conical flows, and the axial perturbation velocities of these three component wings are determined A B K

A72-25120 # **The velocity field in the three-dimensional boundary layer formed on the walls of axial-flow turbomachines (Cimpul de viteze in stratul limita tridimensional format pe peretii turbomasinilor axiale)** C Guta (Bucuresti, Institutul Politehnic Gheorghe Gheorghiu Dej, Bucharest, Rumania) *Bucuresti, Institutul Politehnic Gheorghe Gheorghiu-Dej, Buletinul,* vol 33, Mar Apr 1971, p 49-58 7 refs In Rumanian

Derivation of the equations of motion of a steady viscous fluid flow in the three-dimensional boundary layer on the walls of axial flow compressors and turbines The laws of variation of the the velocity components are derived in a first approximation as a function of the boundary layer thickness The effect of the velocity

field twist angle on the investigated parameters is ascertained by applying d'Alembert's principle to an elementary volume of fluid moving in the boundary layer A B K

A72-25122 **Flow technology and fluid-flow machines (Stromungstechnik-Stromungsmaschinen)** E Windemuth (Ingenieur fachhochschule des Heeres, Darmstadt, West Germany) Munich, R Oldenbourg Verlag, 1971 302 p 61 refs In German Price, US dollars 7 70

The principles of operation and the principal problems of fluid flow engines and systems are outlined in a systematic manner Complex theoretical relationships and mathematical derivations are intentionally omitted to focus the attention of the reader on the basic problems Discussions of individual machines include design examples which demonstrate the problems involved and means of solving them The fundamentals of fluid dynamics are outlined, making use of application examples to provide a clearer understanding The principles of fluid mechanics are reviewed in concise form V P

A72-25128 # **Contribution to the theory of power plants employing gas-liquid mixtures (K teorii gazozhidkostnykh energodvi zhitel'nykh ustanovok)** I M Chernyi, N A Prikhod'ko, and Iu G Mokeev (Akademiia Nauk Ukrainskoi SSR, Institut Gidromekhaniki, Kiev, Ukrainian SSR) *Gidromekhanika,* no 19, 1971, p 15 24 9 refs In Russian

The hydrothermodynamic foundations of the theory of hydrofoil vessel engines running on gas water mixtures and employing a gas turbine as the gas generator are outlined The relations obtained are used to analyze the thrust coefficient with allowance for the principal engine losses It is shown that efficiency is a complex function of numerous parameters and their combinations V P

A72 25129 # **Investigation of hydrodynamic forces in the sinusoidal vibrations of a disk (Issledovanie gidrodinamicheskikh sil pri sinusoidal'nykh kolebaniiakh diska)** G V Logvinovich and Iu N Savchenko (Akademiia Nauk Ukrainskoi SSR, Institut Gidromekhaniki, Kiev, Ukrainian SSR) *Gidromekhanika,* no 19, 1971, p 24 28 In Russian

Experiments are described in which the reciprocating sinusoidal large amplitude vibrations of a disk in a water channel were studied to determine the hydromechanics of the formation of hydrodynamic forces and to apply the results to the mechanics of a flapping wing Flow visualization techniques revealed a wake pattern characterized by toroidal vorticity Empirical formulas for calculating the maximum force and required power for large amplitudes are proposed V P

A72-25131 # **Calculation of the flow past a small-aspect-ratio delta wing from the viewpoint of slender body theory (Raschet obtekaniia del'ta-kryla malogo udlineniia s pozitsii teorii tonkogo tela)** R A Soroka (Akademiia Nauk Ukrainskoi SSR, Institut Gidromekhaniki, Kiev, Ukrainian SSR) *Gidromekhanika,* no 19, 1971, p 44-47 6 refs In Russian

The integral equation of a small-aspect-ratio delta wing with a straight trailing edge is derived under the assumption that the lifting vortices are distributed along rays running from the apex of the wing A method of obtaining solutions in series form is proposed It is shown that in the limiting case, the solutions correlate well Jones' (1946) theory V P

A72-25136 # **Semibounded laminar jet of an incompressible fluid on a moving plate (Poluogranichennaia laminarnaia struia neszhimaemoi zhidkosti na dvizhushcheisia plastine)** R A Antoniuk (Kievskii Institut Inzhenerov Grazhdanskoi Aviatsii, Kiev, Ukrainian SSR) *Gidromekhanika,* no 19, 1971, p 76-79 In Russian

The propagation of a plane laminar semibounded incompressible fluid jet expelled from a slot into a slipstream along a plate moving in the same direction and at the same velocity as the slipstream is analyzed The system of boundary layer equations of the problem is solved under the assumption that the velocity of the jet at the nozzle exit differs only slightly from that of the slipstream V P

A72 25137 # **Test stand for studying the effectiveness of rain protection by blowing (Eksperimental'nyi stend dlia issledovaniia effektivnosti struinoi zashchity ot dozhdia)** A M Mkhitarian, P S Lazniuk, and L P Goliakov (Kievskii Institut Inzhenerov Grazhdanskoi Aviatsii, Kiev, Ukrainian SSR) *Gidromekhanika,* no 19, 1971, p 112 115 In Russian

A wind-tunnel facility capable of producing artificial rain with the required droplet size and velocity is described The facility is used to study the effectiveness of turbulent jets in the protection of such aircraft surfaces as radomes and cabin windows from rain of various intensity A technique for measuring the dimension of rain droplets with a stroboscope and photocamera is described The parameters of the test stand are chosen to simulate external flow conditions during takeoff and landing V P

A72-25146 **Identification and adaptive control - An application to flight control systems** A V Balakrishnan (California, University, Los Angeles, Calif) *Journal of Optimization Theory and Applications,* vol 9, Mar 1972, p 187 213 7 refs

This paper presents the first results obtained in the application of stochastic control theory to flight control problems It involves identification and adaptive control of an aircraft which operates over a wide range of environmental conditions that affect its dynamic characteristics The bulk of the paper deals with the identification problem of estimating stability derivatives in the presence of turbulence Simulation results are presented both for identification and control (windgust alleviation and desired response to pilot input) While no practical implementation is reported, the implications for such implementation appear to be promising (Author)

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STAR ENTRIES

N72-17987*# National Aeronautics and Space Administration Ames Research Center Moffett Field Calif

LARGE-SCALE WIND-TUNNEL INVESTIGATION OF A V/STOL TRANSPORT MODEL WITH PODDED LIFT FANS FORWARD AND AFT OF A LOW MOUNTED WING

Leo P Hall and Jerry V Kirk Feb 1971 60 p refs (NASA-TM-X-62102) Avail NTIS CSCL 01A

A configuration with outboard pod mounted front fans and rear fans located in the wing trailing-edge and fuselage juncture might have superior induced lift and variation of moment with airspeed A large scale investigation of this type of configuration was conducted in 40- by 80-foot wind tunnel The model used was a low wing transport representative of currently operating aircraft Two lift fans were placed in pods forward of and below the wing with the fan centerline near mid semi-span Two rear fans were mounted at the wing trailing-edge close to the fuselage with the fan rotor in the wing chord plane Fan performance was measured statically and with forward speed and longitudinal aerodynamic characteristics were obtained with *the fans operating at various tip-speed ratios* Author

N72-17988*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio

FORTRAN PROGRAM FOR CALCULATING VELOCITIES IN THE MERIDIONAL PLANE OF A TURBOMACHINE 1 CENTRIFUGAL COMPRESSOR

Michael R Vanco Washington Mar 1972 57 p refs (NASA-TN-D-6701 E-6592) Avail NTIS CSCL 20D

The program will determine the velocities in the meridional plane of a backward-swept impeller a radial impeller and a vaned diffuser The velocity gradient equation with the assumption of a hub-to-shroud mean stream surface is solved along arbitrary quasi-orthogonals in the meridional plane These quasi-orthogonals are fixed straight lines Author

N72-17990*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio

SPLITTING SUPERSONIC NOZZLE FLOW INTO SEPARATE JETS BY OVEREXPANSION INTO A MULTILOBED DIVERGENT NOZZLE

Ronald G Huff and Donald E Groesbeck Washington Mar 1972 55 p refs (NASA-TN-D-6667 E-6640) Avail NTIS CSCL 20D

Air flowing from a convergent nozzle at pressure ratios greater than 2 5 has been split into eight separate jets by overexpansion of the flow into a divergent eight-lobed passage The splitting of the flow is accompanied by a decrease in the nozzle axial centerline Mach number This in part is due to the radial inflow of secondary air between the lobes toward the nozzle centerline Each of the smaller jets is partially split after it leaves the end of the divergent lobed section of the nozzle thus creating a velocity profile having 16 peaks At a pressure ratio of 3 5 the flow decelerates to Mach 1 in three convergent nozzle throat diameters Convergent nozzle flow normally requires 12 diameters to reach Mach 1 The nozzle has a sound attenuation of 12 decibels with a thrust loss of 9 percent for the best configuration tested Author

N72-17991# Royal Aircraft Establishment Farnborough (England)

MEASUREMENTS OF STEADY LOAD ON A T-TAIL FLUTTER MODEL

D A Drane R Gray and Irene A Levett Feb 1971 20 p refs (RAE-TR-71035 BR-24880) Avail NTIS

An experiment to measure steady lift loads on a T-tail flutter model is described The method of test has been adapted from a technique used for measuring loads on air craft in flight A way of correcting the measurements has been devised The measurements obtained are shown to explain a discrepancy hitherto observed between experimentally obtained and calculated flutter speeds Author

N72-17992# Cranfield Inst of Technology (England) Dept of Aerodynamics

THE EFFECT OF LIFT SYSTEM AIRFLOW ON THE HULL AERODYNAMICS OF HOVERCRAFT

E J Andrews Aug 1971 55 p refs Sponsored by Min of Technol (Cranfield-Aero-7) Avail NTIS

The influence of aerodynamic characteristics on the handling qualities of amphibious hovercraft was considered Aerodynamic characteristics of related hovercraft shapes the effect of cushion efflux on external aerodynamic characteristics and the effects of lift system airflow and location of induction ports on the aerodynamic characteristics of hovercraft hulls are included It was established that no major effects of consequence exist However certain measures can be taken during the design stages of hulls skirts and induction ports which will minimize inherent adverse characteristics Author

N72-17993# National Aerospace Lab Amsterdam (Netherlands)

A SURVEY OF TEN YEARS OF NLR ACTIVITIES ON RINGWING-BODY CONFIGURATIONS, 1956-1966

S F Erdmann and P J Zandbergen [1967] 84 p refs (NLR-TR-69070-U) Avail NTIS

A survey is given of ten years of activities in designing and testing low drag ringwing-body combinations Theoretical work is discussed based on the linearized theory as well as on the more exact theory and their implications for the design of an optimum ringwing-body combination A number of interesting investigations on the effects of base drag boundary layer displacement thickness and lift are also considered Measurements on a stylized configuration demonstrate that at low velocities the wing only begins to stall at 20 deg incidence and that in the transonic region the blockage phenomena between body and wing are in approximate agreement with those to be expected from the application of one-dimensional theory The results of the experimental investigation of the behavior under off-design conditions i e Mach number and incidence differing from their design values indicate that a pronounced minimum exists at design conditions Author

N72-17995# Naval Weapons Center China Lake Calif

COMPUTATION OF CAPTIVE FLIGHT LOADS ON AIR CARRIED WEAPONS

J W Onstott and W J Werback Sep 1971 103 p refs (AD-733673 NWC-TP-5235) Avail NTIS CSCL 01/3

A computer program for calculating airborne store loads shears and moments is described Three hanger configurations can be treated two lugs and four sway braces a statically determinate two-hanger rail-launch two T-lugs with no sway braces The program automatically calculates lug and sway brace reactions Shear and moment distributions are plotted and tabulated for the vertical lateral and resultant loads Expanded capabilities of this program also permit determination of the effect of varying cant orientation angles of the store with the same bomb rack geometry A new feature is a quick-look calculation using a standard set of load factors from the captive flight catapult takeoff and arrested landing load factor curves Author (GRA)

N72-17996# Texas Univ Austin Dept of Aerospace Engineering and Engineering Mechanics
SUMMARY OF RESEARCH ACCOMPLISHMENTS, 1 DEC 1966 TO 30 NOV 1970 Final Report
Ronald Stearman Jan 1971 32 p
(Grant AF-AFOSR-1234-67 AF Proj 9782-01)
(AD-733370 AFOSR-71-2895TR) Avail NTIS CSCL 01/3

A combined theoretical and experimental research program has been carried out over the past four years to establish preliminary design criteria for estimating the aeroelastic stability and forced-response characteristics of thin-walled circular cylindrical shell structures As a result of this study several basic observations were made concerning the degree of sophistication required in the aerodynamic and structural modeling of this aeroelastic problem It was found for example that small details in the description of the structural boundary conditions can strongly influence the aeroelastic stability of the shell The most significant structural boundary condition effect was observed when the shell geometry and loading conditions were such that the edge disturbances were propagated well into the interior of the shell On the other hand when conditions were such that these edge disturbances were confined to a small boundary layer region near the ends of the shell no significant edge effects were noticed on the overall shell aeroelastic stability Small initial deviations of the shell s surface from its idealized shape were also shown to drastically reduce its resistance to panel flutter even though the deviations were only on the order of one shell thickness Panel flutter instabilities in the presence of a laminar boundary layer profile were also found to be much less destructive to the shell than those originating in the presence of a turbulent profile Author (GRA)

N72-17997# Office of Naval Research London (England)
THIRTEENTH ANNUAL ISRAEL CONFERENCE ON AVIATION AND ASTRONAUTICS
Richard D Mathieu 18 Oct 1971 11 p Conf held at Tel Aviv and Haifa Israel 3-5 Mar 1971
(AD-733400 ONRL-C-20-71) Avail NTIS CSCL 01/2

The Thirteenth Annual Israel Conference on Aviation and Astronautics was held during the period 3-5 March 1971 The titles and authors of the papers presented are listed Papers covered the general areas of applied aerodynamics experimental methods in aeronautics aircraft structures flight mechanics and rocket engines The invited lectures on wide body jet aircraft rocket engines and the Apollo program are summarized Author (GRA)

N72-17998# Flight Dynamics Research Corp Burbank Calif
HIGH L/D SUPERSONIC LIFTING SYSTEMS Final Report Jan - Jul 1971
Morton Alperin Wright-Patterson AFB Ohio AFFDL Jul 1971 56 p refs
(Contract F33615-71-C-1297 AF Proj 1366)
(AD-731566 TR-71-07-01 AFFDL-TR-71-99) Avail NTIS CSCL 20/4

The system investigated is comprised of two elements whose shape and relative position create a beneficial interference effect similar to that achieved by swept wings The particular geometry of the Compound System is investigated for the capability of recovering loss in L/D resulting from the airfoil thickness without the favorable interference effect Although the basic concept was conceived in terms of triangular shaped airfoils with interfering shock waves which interacted with the airfoil boundary layers the information derived from this simplified analysis has been utilized to derive airfoil shapes to accomplish the desired effect without undesirable shock boundary layer interactions Author (GRA)

N72-18000*# Scientific Translation Service Santa Barbara Calif
DEVELOPMENT OF SUPERSONIC AIRCRAFT COMPONENTS OF FLIGHT SAFETY
I Kumkov Washington NASA Feb 1972 11 p Transl into ENGLISH from Grazhdanskaya Aviatsiya (Moscow) no 10 Oct 1970 p 10-11
(Contract NASw-2035)
(NASA-TT-F-13952) Avail NTIS CSCL 01B

The Tu-144 the Soviet supersonic aircraft was test-flown in December of 1968 and the time when the first passengers will appear in the luxurious compartments of this swift giant is near Problems are going to be faced by pilots when the supersonic aircraft start regular service Radically new factors are going to be present in the organization and execution of flights and in the methods of air traffic control These and others questions are considered Author

N72-18001*# Hydrospace Research Corp San Diego Calif
NOISE REDUCTIONS ACHIEVED ON A 720-023B AIRCRAFT USING A TWO-SEGMENT APPROACH
Ray E Glass Dec 1971 88 p refs
(Contract NAS2-6490)
(NASA-CR-114417 HRC-TR-S-205) Avail NTIS CSCL 01B

A flight investigation to determine the operational feasibility of two-segment approaches as a means for reducing airport community noise has been conducted The effective perceived noise level (EPNL) associated with these approach profiles using a 720-023B jet aircraft has been obtained The tests were designed to determine an operationally optimum approach profile and to quantify the reduction in noise level at predetermined locations on the ground beneath the flight track The acoustic aspects of the test program are examined An analysis of the optimum and reference profiles was made using a group of pilots Information was also obtained on the types of pilot operational procedures used for the optimum profile Author

N72-18002# National Transportation Safety Board Washington D C
AIRCRAFT INCIDENT REPORT NORTHEAST AIRLINES, INCORPORATED MCDONNELL DOUGLAS DC-9-31 N982NE, MARTHA S VINEYARD, MASSACHUSETTS, 22 JUNE 1971
29 Dec 1971 18 p
(NTSB-AAR-72-4) Avail NTIS

On June 22 1971 a DC-9-31 aircraft struck the water during a nonprecision instrument approach and received minor damage There were no injuries to the three passengers and five crewmembers aboard the aircraft The flight was performing a VOR straight-in approach to Runway 24 at Martha s Vineyard at the time of the incident The aircraft struck the water approximately 3 miles short of the runway Minor structural damage was incurred by the lower aft section of both engines The probable cause of this incident was the lack of crew coordination in monitoring the altitude during the performance of a nonprecision instrument approach the misreading of the altimeter by the captain and a lack of altitude awareness on the part of both pilots Author

N72-18003*# National Aeronautics and Space Administration Flight Research Center Edwards Calif
EXPLORATORY FLIGHT INVESTIGATION OF AIRCRAFT RESPONSE TO THE WING VORTEX WAKE GENERATED BY JET TRANSPORT AIRCRAFT
William H Andrews Glenn H Robinson and Richard R Larson Washington Mar 1972 32 p
(NASA-TN-D-6655 H-671) Avail NTIS CSCL 01B

The effect of intercepting wing tip vortices generated by large jet transports including jumbo jets over separation distances from 1 nautical mile to 15 nautical miles is evaluated on the basis of the response of a vortex probe airplane in the roll mode The vortex probe test aircraft included a representative general aviation airplane an executive jet a fighter and light and medium weight jet transports The test conditions and airplane configurations were comparable to those normally used during takeoff landing or holding pattern operations For flight safety

the tests were performed at altitudes from 9500 feet to 12 500 feet In addition to an evaluation of the probe airplane response a flight test technique is suggested for determining minimum separation distance using as variable the ratio of vortex-induced roll acceleration to maximum lateral control acceleration and the gross weight of the generating aircraft Author

N72-18004*# Hamilton Standard Windsor Locks Conn
ADVANCED GENERAL AVIATION PROPELLER STUDY
Rose Worobel and Millard G Mayo 21 Dec 1971 54 p refs
(Contract NAS2-6477)
(NASA-CR-114399) Avail NTIS CSCL 01C

Methods for predicting the performance noise weight and cost of propellers for advanced general aviation aircraft of the 1980 time period were developed and computerized This basic program was refined to incorporate a method of including the blade shape parameter integrated design lift coefficient This method and a reverse thrust computational procedure were included in the computer program The weight equation was refined and also incorporated in the computer program A User s Manual which includes a complete listing of this computer program with detailed instructions on its use has been written Author

N72-18005*# Boeing Co Philadelphia Pa Vertol Div
AN EXPERIMENTAL INVESTIGATION OF THE HELICOPTER ROTOR BLADE ELEMENT AIRLOADS ON A MODEL ROTOR IN THE BLADE STALL REGIME
Richard K Fisher Jr Jerome E Tompkins Christopher J Bobo and Richard F Child Sep 1971 120 p refs
(Contract NAS2-5473)
(NASA-CR-114424 D210-10347-1) Avail NTIS CSCL 01B

A wind tunnel test program was conducted on an eight foot diameter model rotor system to determine blade element airloads characteristics in the unstalled and stalled flight regimes The fully articulated model rotor system utilized three blades with a Vertol 23010-1 58 airfoil section the blades being 1/7 5 scale models of the Ch-47C rotor blades Instrumentation was incorporated at the blade 75% radial station to measure pressure and skin friction distributions surface streamline directions and local angle of attack The test program was conducted in three phases non-rotating hover and forward flight at advance ratios of 0 15 0 35 and 0 60 Test data were analyzed with respect to providing insight to the mechanisms affecting blade stall particularly retreating blade stall during forward flight conditions From such data an assessment was made as to the applicability of current theoretical analyses used for the prediction of blade element airloads in the stall regime Author

N72-18007*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
AERODYNAMIC CHARACTERISTICS OF A SIX-JET V/STOL CONFIGURATION WITH FOUR SWING-OUT LIFT JETS IN THE TRANSITION SPEED RANGE
Arthur W Carter Washington Nov 1970 191 p refs
(NASA-TM-X-2060 L-7246) Avail NTIS CSCL 01A

A wind-tunnel investigation has been made of the longitudinal aerodynamic characteristics and jet-interference effects of a model of a jet V/STOL variable-sweep fighter airplane that employs four direct-lift engines which swing out from the fuselage and two lift-cruise engines located in the rear part of the fuselage Data were obtained with two wing areas for various forward speeds and power conditions in the transition speed range The data are presented without analysis or discussion Author

N72-18008*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
EFFECTS OF GROUND PROXIMITY ON THE AERODYNAMIC CHARACTERISTICS OF A SIX-JET V/STOL CONFIGURATION WITH FOUR SWING-OUT LIFT JETS
Arthur W Carter Washington May 1971 225 p refs
(NASA-TM-X-2212 L-7555) Avail NTIS CSCL 01B

A wind-tunnel investigation has been made of the effects of ground proximity on the longitudinal and lateral-directional aerodynamic characteristics and jet-interference effects of a model of a jet V/STOL variable-sweep fighter airplane that employs four direct-lift engines which swing out from the fuselage ahead of the wing and two lift-cruise engines located in the rear part of the fuselage Data were obtained through a range of angles of attack and sideslip at simulated speeds from hover through transition at various heights of the model above a moving-belt ground plane Power-off data and power-on data at several power conditions are presented The data are presented without analysis or discussion Author

N72 18009*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
METHODS FOR REDUCING POLLUTANT EMISSIONS FROM JET AIRCRAFT
Helmut F Butze 1971 16 p refs Presented at 92d Winter Ann Meeting of ASME Washington D C 28 Nov -2 Dec 1971
(NASA-TM-X-68000 E 6762) Avail NTIS CSCL 01B

Pollutant emissions from jet aircraft and combustion research aimed at reducing these emissions are defined The problem of smoke formation and results achieved in smoke reduction from commercial combustors are discussed Expermental results of parametric tests performed on both conventional and experimental combustors over a range of combustor-inlet conditions are presented Combustor design techniques for reducing pollutant emissions are discussed Improved fuel atomization resulting from the use of air assist fuel nozzles has brought about significant reductions in hydrocarbon and carbon monoxide emissions at idle Diffuser tests have shown that the combustor-inlet airflow profile can be controlled through the use of diffuser-wall bleed and that it may thus be possible to reduce emissions by controlling combustor airflow distribution Emissions of nitric oxide from a shortlength annular swirl-can combustor were significantly lower than those from a conventional combustor operating at similar conditions Author

N72-18010*# Bell Aerospace Co Buffalo N Y
DESIGN AND EVALUATION OF ACTIVE COOLING SYSTEMS FOR MACH 6 CRUISE VEHICLE WINGS
W A McConarty and F M Anthony Washington NASA Dec 1971 270 p refs
(Contract NAS1-7468)
(NASA-CR-1916 Rept-7305-901001) Avail NTIS CSCL 01B

Active cooling systems which included transpiration film and convective cooling concepts are examined Coolants included hydrogen helium air and water Heat shields radiation barriers and thermal insulation are considered to reduce heat flow to the cooling systems Wing sweep angles are varied from 0 deg to 75 deg and wing leading edge radii of 0 05 inch and 2 0 inches are examined Structural temperatures are varied to allow comparison of aluminum alloy titanium alloy and superalloy structural materials Cooled wing concepts are compared among themselves and with the uncooled concept on the basis of structural weight cooling system weight and coolant weight Author

N72-18011*# Bell Aerospace Co Buffalo N Y
DESIGN OF A CONVECTIVE COOLING SYSTEM FOR A MACH 6 HYPERSONIC TRANSPORT AIRFRAME
R G Helenbrook and F M Anthony Washington NASA Dec 1971 131 p refs
(Contract NAS1-7468)
(NASA-CR-1918 Rept-7305-903001) Avail NTIS CSCL 01B

Results of analytical and design studies are presented for a water-glycol convective cooling system for the airframe structure of a hypersonic transport System configurations and weights are compared The influences of system pressure drop and flow control schedules on system weight are defined Author

N72-18012*# National Aeronautics and Space Administration *Langley Research Center Langley Station Va*
INVESTIGATION OF AN AUTOMATIC SPIN PREVENTION SYSTEM FOR FIGHTER AIRPLANES
William P Gilbert and Charles E Libbey Washington Mar 1972 49 p refs
(NASA-TN-D-6670 L-8112) Avail NTIS CSCL 01B

An investigation was conducted to evaluate the effectiveness of an automatic spin-prevention system for current fighter airplanes as a first step in determining the feasibility of such a system The concept makes use of the components of the conventional flight-control system with the addition of control logic to monitor angle of attack yaw rate and normal acceleration Analytical techniques were used to study the system concept applied to three representative fighter configurations and model flight tests were employed to evaluate a prototype system on a representative fighter configuration Emphasis was placed on the development of the control logic required A discussion of possible implementations of the system concept is presented Results of the investigation indicated that a relatively simple system (with full control authority) was effective in preventing the developed spins of the fighter configurations considered and that the system design is dependent on the stall and spin characteristics of the particular airplane Author

N72-18013*# National Aeronautics and Space Administration *Langley Research Center Langley Station Va*
LONGITUDINAL STABILITY AND CONTROL DERIVATIVES OF A JET FIGHTER AIRPLANE EXTRACTED FROM FLIGHT TEST DATA BY UTILIZING MAXIMUM LIKELIHOOD ESTIMATION
George G Steinmetz Russell V Parrish and Roland L Bowles Washington Mar 1972 44 p refs
(NASA-TN-D-6532 L-7882) Avail NTIS CSCL 01B

A method of parameter extraction for stability and control derivatives of aircraft from flight test data implementing maximum likelihood estimation was developed and successfully applied to actual longitudinal flight test data from a modern sophisticated jet fighter The results of this application establish the merits of the estimation technique and its computer implementation (allowing full analyst interaction with the program) as well as provide data for the validation of a portion of the differential maneuvering simulator (DMS) The results are presented for all flight test runs in tabular form and as time history comparisons between the estimated states and the actual flight test data Comparisons between extracted and manufacturer s values for five major derivatives are presented and reveal good agreement for these principal derivatives with one exception This particular derivative is extensively investigated by utilizing the interactive capabilities of the computer program The results of this investigation verify the numbers extracted by maximum likelihood estimation Author

N72-18014*# National Aeronautics and Space Administration *Lewis Research Center Cleveland Ohio*
MIXER NOZZLE-EXTERNALLY BLOWN FLAP NOISE TESTS
Jack H Goodykoontz Robert G Dorsch and Donald E Groesbeck Feb 1972 19 p
(NASA-TM-X-68021 E-6827) Avail NTIS CSCL 01B

A summary is given of the noise suppression tests conducted for the STOL aircraft The tests were made using a large scale mixer nozzle and externally blown flap model Data were obtained over a range of nozzle exhaust velocities (172 to 284 m/sec) and flap angles Comparisons were made between the results of the mixer nozzle and those obtained with a standard single convergent nozzle The resulting conclusions show that a reduction in noise level did occur using the mixer nozzle system Author

N72-18015# Air Canada Montreal (Quebec)
MAINTENANCE QUALITY AUDIT PROGRAM
R J Thatcher 1971 12 p Presented at 7th Ann FAA Intern Aviation Maintenance Symp Oklahoma City 7-9 Dec 1971
Avail NTIS

A quality control program for application to the maintenance of commercial aircraft is presented The maintenance organization involved in the operation is discussed The two major areas of concern are (1) the decisions and programs with respect to what maintenance will be carried out when and (2) the quality and consistency of the actual scheduled and unscheduled work The application of the system to aircraft operated by Air Canada airlines is emphasized Author

N72-18016# Atlantic Aviation Corp Wilmington Del Aircraft Maintenance Service
THE FIXED BASE OPERATOR'S INSPECTION RESPONSIBILITIES CONFORMANCE WITH CUSTOMERS INSPECTION PROGRAM
John G Hite 17 Nov 1971 9 p Presented at the 7th Ann FAA Intern Aviation Maintenance Symp 7-9 Dec 1971
Avail NTIS

The responsibilities and duties of fixed base operators taken to mean aircraft maintenance shop operators in business to support the aviation public are considered with regard to aircraft inspection The FAA regulations and options afforded to the operator are discussed K P D

N72-18017# Federal Aviation Administration Washington D C Maintenance Div
ACHIEVING GENERAL AVIATION SAFETY GOALS THROUGH AN AIRWORTHINESS SYSTEM
Sam J Corso 1971 16 p Presented at 7th Ann Maintenance Symp Oklahoma City Dec 1971
Avail NTIS

A number of safety goals to promote airworthiness systems for flight safety are presented They encompass inspection rules for the design and manufacture of aeronautical products overhaul and repair manuals for aircraft maintenance operating procedures for use of manpower and manpower standards regulations for ground services and maintenance research G G

N72-18018# United Air Lines Inc Chicago Ill
THE RELATIONSHIP BETWEEN MAINTENANCE AND OPERATING SAFETY IN AIR TRANSPORTATION
T D Matteson 1971 14 p refs Presented at 7th Ann FAA Intern Aviation Maintenance Symp Oklahoma City 7-9 Dec 1971
Avail NTIS

The effect of design on safety and reliability is examined The effectiveness of air transport maintenance and methods for its improvement are discussed K P D

N72-18019# Douglas Aircraft Co Inc Santa Monica Calif Structural Mechanics Subdiv
DEVELOPING THE DC-10 STRUCTURAL INSPECTION PROGRAM
M E Stone and H F Heap (United Air Lines) 1971 59 p refs Presented at 7th Ann FAA Intern Aviation Maintenance Symp Oklahoma City 7-9 Dec 1971
Avail NTIS

The development of a structural inspection program to extend the service life of DC-10 aircraft is discussed The three steps required to achieve a safe and economical structure with a service life of twenty years are presented The factors which affect the variability of service life are described The basis for the structural inspection program depends upon the effects of fatigue crack propagation residual strength corrosion and preload The major differences between the DC-10 inspection program and more conventional programs are identified Author

N72-18020# General Electric Co Cincinnati Ohio Commercial Engine Div
CF6-6 ENGINE MAINTENANCE PLANNING AND EXPERIENCE
S H Davison 1971 54 p Presented at 7th Ann Intern Aviation Maintenance Symp Oklahoma City 7-9 Dec 1971 sponsored by FAA
Avail NTIS

The proceedings of the International Aviation Maintenance Symposium concerning engine maintenance planning and experience on the CF6-6 jet engine are presented The important elements used in the development of the maintenance plan are presented The significance of the relationship of each element to the development of the engine maintenance management program is examined The process to be followed for correct diagnosis of problem areas and response to the maintenance problem is described P N F

N72-18021# National Transportation Safety Board Washington D C
MAINTENANCE A DIRECT FACTOR IN AVIATION SAFETY
James T Childs 1971 13 p Presented at 7th Ann FAA Intern Aviation Maintenance Symp Oklahoma City 7-9 Dec 1971
Avail NTIS

The effects of aircraft maintenance practices as an aircraft accident causal factor are discussed A statistical analysis is presented to show the significance of improper maintenance servicing or inspection as an influence on the safe operation of aircraft It is concluded that a major step toward better aircraft safety can be accomplished with the elimination of maintenance and servicing faults supported by meticulous quality inspection Author

N72-18022# Federal Aviation Administration Washington D C
THE FAA'S MAINTENANCE ANALYSIS CENTER
Dec 1971 6 p
Avail NTIS

The operation of the Federal Aviation Administration Maintenance Analysis Center is discussed The objective of the center is to improve aviation safety through service difficulty analysis and the interchange of service difficulty information The reliability systems microfilm data bank technical library and communications procedures are described The four major computer programs currently in operation by the center are defined Author

N72-18023# Douglas Aircraft Co Inc Santa Monica Calif Maintenance Data Analysis
MAINTAINABILITY AND MAINTENANCE MEASUREMENT
R V MacGregor 1971 18 p Presented at the Ann FAA Intern Aviation Maintenance Symp Oklahoma City 7 Dec 1971
Avail NTIS

The concept of quantitatively defining and measuring maintainability loss or achievement in the environment of the designer and manufacturer is considered A most important difference between maintainability and maintenance measurements is the distinction between cost and value as a characteristics of design The ability to hypothesize coefficients of lift and drag and to subsequently measure them in wind tunnel tests produces relative but measurable values G G

N72-18024*# Lockheed-California Co Burbank
CHARACTERISTICS OF HINGELESS ROTORS WITH HUB MOMENT FEEDBACK CONTROLS INCLUDING EXPERIMENTAL ROTOR FREQUENCY RESPONSE VOLUME 1 Final Report
W A Kuczynski and G J Sissingh Jan 1972 143 p refs
(Contract NAS2-5419)
(NASA-CR-114427 LR-25048-Vol-1) Avail NTIS CSCL 01B

Wind tunnel tests to determine the dynamic characteristics of hingeless rotors with hub moment feedback controls and to acquire experimental hingeless rotor transfer functions are discussed Rotor transfer functions were calculated from data acquired during open loop frequency response tests The transfer functions are linear and present the rotor longitudinal and lateral frequency responses to collective pitch longitudinal cyclic pitch and lateral cyclic pitch The theoretical analysis was based on the rigid blade flapping model coupled with appropriate control system and cyclic pitch actuator equations of motion P N F

N72-18025*# Lockheed-California Co Burbank
CHARACTERISTICS OF HINGELESS ROTORS WITH HUB MOMENT FEEDBACK CONTROLS INCLUDING EXPERIMENTAL ROTOR FREQUENCY RESPONSE VOLUME 2 Final Report
W A Kuczynski and G J Sissingh Jan 1972 172 p
(Contract NAS2-5419)
(NASA-CR-114428 LR-25048-Vol-2) Avail NTIS CSCL 01B

The test obtained from wind tunnel tests of a rigid rotor with hub feedback controls are presented Four types of tests were conducted and the data from each are presented in separate appendices The data are presented in the form of tables and charts Author

N72-18026# Sydney Univ (Australia)
THE CONTROL OF WING TIP VORTICES Dept of Aeronautical Engineering
E D Poppleton Aug 1971 10 p refs
(ATN-7102) Avail NTIS

A device is proposed for the control of the velocity distribution in the core of a trailing vortex Preliminary calculations show that the required plan-form shape does not differ radically from that of a conventional wing and that there is a considerable reduction in vortex drag Author

N72-18027# Colorado Univ Boulder Dept of Electrical Engineering
FLIGHT SAFETY ASPECTS OF RADAR TECHNIQUES IN BIRD/AIRCRAFT COLLISION AVOIDANCE Final Report, 1 Oct 1967 - 30 Sep 1971
Warren L Flock Sep 1971 13 p refs
(Grant AF AFOSR-1377-68 AF Proj 9777)
(AD-732945 AFOSR-71-2917TR) Avail NTIS CSCL 01/2

Federal Aviation Administration and Air Force surveillance radars are capable of monitoring bird movements efficiently and can be used to minimize the hazard of collisions between birds and aircraft if those responsible for the operation of these systems take a sufficient interest in this application This statement is supported by successive-time-exposure photographic recordings of bird echoes seen by the North Platte and Denver radars In addition visits have been made to numerous FAA air route surveillance centers in the lower forty-eight states and DEW and AC and W radar sites in Alaska Simultaneous monitoring of radar screens at three FAA centers on one occasion provided information about bird movements in the area from Ohio on the east to Arizona on the West Air Force radars in Alaska have provided interesting new information on bird migration between Alaska and Siberia and along the coastline of Alaska Such use of existing radar systems on a partially multipurpose basis justifies further their expense of operation The research conducted with the support of the AFOSR has led to new programs of research at the University of Colorado involving the bird hazard in the immediate vicinity of airports and the identification of birds by radar Author (GRA)

N72-18028# Army Materials and Mechanics Research Center Watertown Mass Structural Mechanics Div
RESPONSE OF ROTOR BLADES TO RANDOM INPUTS

PART 1 BENDING MODES
Chatta Lakshmikantham and Chintakindi V JogaRao Jul 1971 18 p refs
(DA Proj 1T0-61102-B-33-A)
(AD-732395 AMMRC-TR-71-20-Pt-1) Avail NTIS CSCL 01/3

The bending response of flexible rotating blades in an airflow is investigated when the input velocities are random functions of time The spectral density and the mean square of the transverse displacement of the blade is computed based on the spectral density of the input function Results for both hinged and hingeless cases of root-end fixity are obtained and compared Author (GRA)

N72-18029# National Transportation Safety Board Washington D C
AIRCRAFT ACCIDENT REPORT ROCKY MOUNTAIN AIRWAYS, INCORPORATED, AERO COMMANDER 680V N6359U ASPEN, COLORADO 22 JANUARY 1970
29 Dec 1971 31 p refs
(NTSR-AAR-72-1) Avail NTIS

Rocky Mountain Airways Inc Flight 10 Aero Commander 680V N6395U crashed at approximately 0806 mountain standard time January 22 1970 near Aspen Colorado The aircraft struck obstructing terrain after the pilot discontinued an approach to land because of an ice accumulation on the windshield of the aircraft The probable cause of this accident was the pilot s use of other than the recommended procedures for a go-around following the discontinuance of a landing approach The landing approach was discontinued and a go-around attempted because the aircraft was too high to attempt a straight-in approach The ice accumulation on the windshield obscured the obstructing terrain Author

N72-18030# Naval Air Engineering Center Philadelphia Pa Engineering Dept (SI)
CARRIER AIRCRAFT OPERATIONAL COMPATIBILITY SYSTEM (CAOCS - MOD 2) COMPUTER PROGRAM Program Development and Operation Report May 1970 - Mar 1971
Eugene P Lorge and Paul M Saia 20 Oct 1971 405 p refs
(AD-732755 NAEC-ENG-7695) Avail NTIS CSCL 01/1

The report describes the development and operation of the Carrier Aircraft Operational Compatibility System Model 2 (CAOCS - MOD 2) As with CAOCS - MOD 1 this computerized system allows a numerical evaluation of naval carrier aircraft in the aircraft carrier environment The comprehensive evaluation which results is a combination of parameter and criteria definition coupled with a definitive rating system both of which have been computerized and are evidenced by a hard copy print-out Mod 2 incorporates modifications to the earlier program principally involving standardization which resulted in reductions in computer operating times storage and core requirements and overall program volume Contained within this report are descriptions concerning historical development program philosophies rating techniques employed and computer program development operation and maintenance
Author (GRA)

N72-18031# RAND Corp Santa Monica Calif
A MODEL FOR EVALUATING V/STOL VERSUS CTOL COMBAT AIRCRAFT SYSTEMS
Seymour Horowitz (FAA) and Robert Shishko Mar 1971 31 p refs
(AD-732681 P-4587) Avail NTIS CSCL 01/3

The paper describes a cost-effectiveness study of the use of vertical or short takeoff and landing (V/STOL) aircraft for combat missions A comparison is made with conventional (CTOL) aircraft as tactical fighters in a future NATO environment A model yielding the probability of completing n successive missions is used as a measure of combat effectiveness A cost model was constructed to reflect the resource impact of the same variables or alternatives that affect the measure of effectiveness Author (GRA)

N72-18032# Naval Air Development Center Johnsville Pa Aero Mechanics Dept
A REVISED CRITICAL STATE IDENTIFICATION SCHEME FOR THE WAVE-OFF DECISION DEVICE
Mark E Reigle 27 Oct 1971 34 p refs
(AD-732760 NADC-AM-7121) Avail NTIS CSCL 01/2

A revised critical flight state identification scheme has been developed for the Wave-Off Decision Device The new program referred to as Terminal State Predictor predicts accurately the ramp altitude clearance of an aircraft approaching a carrier and identifies a critical wave-off state Author (GRA)

N72-18033# Air Force Dept Washington D C
THE DEVELOPMENT AND TEST OF THREE FLIGHT TEST B-1 AIRCRAFT WAS PREPARED ON 25 MARCH, 1971 B-1 WEAPONS SYSTEM
3 Nov 1971 33 p Supercedes PB-201711-D
(PB-201711-F AF-ES-71-2F) Avail NTIS CSCL 01C

The major environmental impacts are air pollution and noise These will have less of an adverse environmental impact than current military aircraft Author (GRA)

N72-18034# Air Force Dept Washington D C
F-15 AIRCRAFT Final Environmental Statement
3 Nov 1971 34 p refs
(PB-201710-F AF-ES-71-3F) Avail NTIS CSCL 01C

The major environmental impacts are air pollution and noise These are not considered as adverse environmental effects as compared to present systems and the achievements in reducing the current effects on air and sound Author (GRA)

N72-18035# Bolt Beranek and Newman Inc Canoga Park Calif
AVIATION NOISE EVALUATIONS AND PROJECTIONS SAN FRANCISCO BAY AREA
Aug 1971 151 p refs Sponsored by HUD
(PB-204035) Avail NTIS CSCL 20A

Effects of aviation noise upon the region are presented Certain assumptions as to future runway utilization aircraft types and airport use were necessary The NEF noise environment analysis procedure represents the best knowledge of aviation-generated noise and its impact upon human activities GRA

N72-18036# Aberdeen Proving Ground Md Human Engineering Labs
SEARCH AND RESCUE CREW COMPARTMENT MOCK-UP PROGRAM
John A Barnes Sep 1971 39 p refs
(NR Proj 213-072B)
(AD-733375 APG-TM-16-71 JANAIR-710601) Avail NTIS CSCL 01/3

A new cockpit system designed for a Search and Rescue Helicopter to satisfy the needs of the Army Navy Air Force and Coast Guard and to comply with existing Military Specifications and Standards is described in detail and accompanied by scale drawings Author (GRA)

N72-18037# ARO Inc Arnold Air Force Station Tenn
CALCULATION OF FORCES ON AIRCRAFT STORES LOCATED IN DISTURBED FLOW FIELDS FOR APPLICATION IN STORE SEPARATION PREDICTION Final Report 1 Apr 1970 - 30 Jun 1971

W N MacDermott and P W Johnson AEDC Nov 1971 68 p refs
(Contract F40600-72-C-0003)
(AD-733325 AEDC-TR-71-186 ARO-PWT-TR-71-150) Avail NTIS CSCL 19/2

The aerodynamic characteristics of an M-117 bomb in steady incompressible potential flow are computed by representing the bomb planform with a discrete network of vortex singularities Distribution of velocity and pressure coefficients over the bomb as well as total force and moment coefficients are calculated as functions of pitch attitude the surrounding flow field and various assumed vortex-lattice modelings Both spatially uniform and nonuniform flow fields are investigated the nonuniformities were created by the presence of a parent aircraft For a properly modeled bomb immersed in a uniform flow the lift and pitching moment coefficients summed over the entire configuration are found to be within 10 percent of wind tunnel measurements When the bomb is surrounded by the disturbance flow field produced by an F-4C aircraft the incremental effects on lift and pitching moment are very similar for theory and experiment Author (GRA)

N72-18038# Dynamic Science Phoenix Ariz AvSER Facility
CRASH SURVIVAL DESIGN GUIDE
J W Turnbow D F Carroll J L Haley Jr W H Reed S H Robertson S H Weinberg H G C Henneberger S P Desjardins A D Harper R L Cook et al Ft Eustis Va Army Air Mobility Res and Develop Lab Oct 1971 444 p refs Revised Supersedes AD-695648 dated Aug 1969
(Contract DAAJ02-69-C-0030 DA Proj 1F1-62203-A-529)
(AD-733358 AVSER-1500-71-6 USAAMRDL-TR-71-22) Avail NTIS HC $6 00/MF $0 95 CSCL 01/3

The guide presents design techniques and criteria which are presently available in flight areas aircraft crash kinematic and survival envelopes airframe crashworthiness design criteria aircraft seat design criteria (crew and troop/passenger) restraint system design criteria (crew troop/passenger and cargo) occupant environment design criteria emergency escape provisions and postcrash fire design criteria Author (GRA)

N72-18040# McDonnell Aircraft Corp St Louis Mo
SURVIVABLE FLIGHT CONTROL SYSTEM STUDIES, ANALYSES AND APPROACH
David S Hooker Robert L Kisslinger George R Smith and M Sheppard Smyth May 1971 383 p refs
(Contract F33615-69-C-1827 AF Proj 680J)
(AD-733582 AFFDL-TR-71-20 IR-1) Avail NTIS CSCL 01/3

The Survivable Flight Control System (SFCS) Program is an advanced development program of which the principal objective is the development and flight test demonstration of an SFCS utilizing Fly-By-Wire and Integrated Actuator Package techniques The studies and analyses conducted to date have sufficiently defined the system requirements to provide a definition of an approach to the implementation of the SFCS The results of these studies and the definition of the approach are presented Author (GRA)

N72-18041# Army Test and Evaluation Command Aberdeen Proving Ground Md
DIAGNOSTIC AND INSPECTION EQUIPMENT (AIRCRAFT) Final Report
1 Nov 1971 18 p refs
(AMCR Proj 310-6)
(AD-733283 MTP-7-3-059) Avail NTIS CSCL 01/3

The report describes a system for evaluation of aircraft diagnostic and inspection equipment performance characteristics Provides procedures for test preparation initial inspection electrical power requirements compatibility with related equipment operational performance electromagnetic interference durability maintenance evaluation maintainability reliability safety human factors and personnel training requirements Author (GRA)

N72-18043# Transportation Systems Center Cambridge Mass
SIMULATION MODEL FOR THE PIPER PA-30 LIGHT MANEUVERABLE AIRCRAFT IN THE FINAL APPROACH
Joseph F Koziol Jr Jul 1971 30 p refs Sponsored by FAA
(AD-733757 TSC-FAA-71-11) Avail NTIS CSCL 01/2

The report describes the Piper PA-30 Twin Comanche aircraft and a representative autopilot during the final approach configuration for simulation purposes The aircraft is modeled by linearized six-degree-of-freedom perturbation equations referenced to the aircraft stability axis Other equations are presented which derive the body axis rates velocities and accelerations and ground referenced velocities (translation equations) The autopilot is a representative system for automatic ILS approaches from initial localizer track down to decision height The glideslope system is engaged by approaching the glidepath at constant altitude (usually in the altitude hold mode) on the localizer beam The pilot must take over manually at the decision height since light aircraft are not normally equipped with automatic flare capability The aircraft autopilot model described herein has been used extensively in simulation studies at TSC and exhibits the expected behavior Author (GRA)

N72-18044# Goodyear Aerospace Corp Akron Ohio
INVESTIGATION OF STABILITY CHARACTERISTICS OF TETHERED BALLOON SYSTEMS
George R Doyle Jr and Jerome J Vorachek 30 Jul 1971 231 p refs
(Contract F19628-71-C-0091 AF Proj 7659)
(AD-731570 GER-15325 AFCRL-71-0406 SR 2) Avail NTIS CSCL 01/3

An analytical investigation of the dynamic behavior of tethered balloons is in progress The report the second of three scientific reports covers a study of stability characteristics of tethered balloon systems Balloon systems which are investigated use the British BJ Barrage Balloon the Vee Balloon and a Goodyear Aerospace Model No 1649 Single-Hull Balloon The major tether construction is Columbian Rope Company s NOLARO utilizing prestretched polyester filaments Three design altitudes 5 000 10 000 and 20 000 feet are considered The model for the tethered balloon system consists of the streamlined balloon and a tether made up of three discrete links Computer programs for the IBM 360 digital computer are presented to determine the characteristic equations of the systems and obtain the roots which represent the frequency and damping qualities Author (GRA)

N72-18045# Air Force Systems Command Wright-Patterson AFB Ohio
FRACTURE CONTROL PROCEDURES FOR AIRCRAFT STRUCTURAL INTEGRITY
Howard A Wood Jul 1971 90 p refs Presented at the Intern Comm on Aeron Fatigue Miami Beach Fla 13-14 May 1971
(AF Proj 1467)
(AD-731565 AFFDL-TR-71-89) Avail NTIS CSCL 01/3

The report reviews the application of applied fracture mechanics in the design analysis and qualification of aircraft structural systems Recent service experiences are cited Current trends in high strength materials application are reviewed with particular emphasis on the manner in which fracture toughness and structural efficiency may affect the material selection process General fracture control procedures are reviewed in depth with specific reference to the impact of inspectability structural arrangement and material on proposed analysis requirements for safe crack growth The relative impact on allowable design stress is indicated by example Design criteria material and analysis requirements for implementation of fracture control procedures are reviewed together with limitation in current available data techniques A summary of items which require further study and attention is presented Author (GRA)

N72-18046# Air Force Academy Colo
ADVANCED AIRCRAFT PROPULSION/ENGAGEMENT

STUDY VOLUME 2
Sep 1971 75 p refs
(AD-731578 USAFA-RR-71-7-Vol-2) Avail NTIS CSCL 01/3

The report considers some of the aspects of one-on-one engagements between aircraft In addition to some general observations and comments it presents results of the application of differential games techniques Additional investigations concern the geometry of the intercept problems and minimum time turns
Author (GRA)

N72-18047# Naval Air Development Center Johnsville Pa Aero Mechanics Dept
AN EVALUATION OF SEARCH AND RESCUE MISSION CHARACTERISTICS Final Report
Thomas J Brennan 10 Nov 1971 135 p refs
(AD-733987 NADC-AM-7136) Avail NTIS CSCL 01/3

The report provides an overview of the general requirements for an airborne rescue system to fulfill a military SAR (Search and Rescue) mission Projected mission and airframe/propulsion system requirements are presented to provide a baseline for initial development analyses A standard methodology for the conduct of detailed performance evaluation and overall mission analyses are proposed to define critical areas in SAR aircraft designs An aircraft/propulsion system is designed to illustrate the applications
Author (GRA)

N72-18057# Army Electronics Command Fort Monmouth N J Electronics Technology and Devices Lab
ENGINEERING EVALUATION OF AIRCRAFT BATTERIES
Sylvia Duze Jul 1971 36 p refs
(DA Proj 1T6-62705-A-053)
(AD-733289 ECOM-3456) Avail NTIS CSCL 10/3

Changes in aircraft technology and advances in electronic and electrical equipment design have caused increased demands for electric power Batteries in the smallest and lightest design must be capable of delivering high rate currents under all ambients for starting power have good high rate charge acceptance and be available in the fully charged state in case of emergency The report details all the problem areas evaluates the various secondary electrochemical systems in terms of aircraft use describes the redesign efforts of the Military Services and presents a critique of specifications covering aircraft batteries
Author (GRA)

N72-18120# Dunlap and Associates Inc Santa Monica Calif Western Div
HUMAN FACTORS RESEARCH ON CARRIER LANDING SYSTEM PERFORMANCE Final Report 1966 - 1971
Clyde A Brictson Jul 1971 22 p refs
(Contract N00014-70-C-0202 NR Proj 197-007)
(AD-733703) Avail NTIS CSCL 05/9

A five-year program of human factors research on carrier landing performance is summarized Empirical measures of day and night final approach to landing were recorded and used to describe differences in landing performance across a wide variety of aircraft ship pilot LOS and environmental conditions The empirical data were used to develop carrier landing performance criteria which were applied to evaluate and assess the relative influence of system components on carrier landing system effectiveness Carrier landing accident data for 1965-1970 are briefly reviewed and referenced Studies covering the prediction of touchdown performance from approach data and pilot night landing proficiency from training measures are also summarized A listing of all technical reports published during the research program is provided
Author

N72-18158# Lockheed Missiles and Space Co Palo Alto Calif
AIRCRAFT AND MISSILE RADAR UNITS UTILIZED TO COMBAT AN AIRBORNE ENEMY
V V Grigorin-Riabov ed [1971] 25 p refs Transl into ENGLISH from the book Radiolokatsionnye Ustroistva (Teoriia i Printsipy Postroeniia) Moscow Sovetskoe Radio Press 1970 p 555-590
Avail NTIS National Translations Center John Crerar Library Chicago Ill 60616

The whole complex of equipment intended especially to annihilate airborne means of attacking the enemy is part of the aircraft interception system On-board radar units of the interception system mounted on fighters and guided missiles of the air-to-air class as well as radar means of the system to protect the aircraft are examined The required detection range measurement accuracy and other radar characteristics depend essentially on the tactical and technical characteristics of the aircraft on which the equipment is installed and of the other facilities taking part in solving the given problem hence tactical-technical demands are fundamental
Author

N72-18171# Pennsylvania Univ Philadelphia Moore School of Electrical Engineering
PENNSYLVANIA-PRINCETON ARMY AVIONICS RESEARCH PROGRAM ACOUSTIC NOISE ENVIRONMENT IMPROVEMENT OF SPEECH INTELLIGIBILITY IN A HIGH NOISE ENVIRONMENT Final Report
Fred Haber Nov 1971 15 p refs
(Contract DA-28-043-AMC-02411(E) DA Proj 1H1-62202-A-219)
(AD-733431 Rept-72-06 ECOM-02411-23) Avail NTIS CSCL 17/2

A study was made to determine methods of improving intelligibility of voice transmissions which are in a high acoustic noise environment such as exists inside helicopters operating under technical conditions The report summarizes three areas of study and a tested technique using multiple microphones for increasing voice intelligibility
Author (GRA)

N72-18173# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
THE UTES MULTIPURPOSE RADAR COMPLEX
V Kulikov 24 Aug 1971 12 p Transl into ENGLISH from Grazhdanskaya Aviatsiya (USSR) v 28 no 1 1971 p 32-33
(FTD Proj 7R4)
(AD-733273 FTD-HT-23-952-71) Avail NTIS CSCL 17/9

The article briefly describes the UTES radar complex intended for multipurpose use in civilian air-traffic control (height 20 m parabolic reflector grid (18 x 10 5 m) range 450 km at high altitudes) The physical layout of the equipment room is described as well as several features giving UTES a decided advantage over similar foreign models
Author (GRA)

N72-18180# Leach Corp Azusa Calif Controls Div
AIR TRAFFIC CONTROL VOICE RECORDER DEVELOPMENT Final Technical Report 30 Jun 1970 - 30 Jun 1971
John T Sapp Richard E Crowe and Eugene M Farole Sep 1971 253 p refs
(Contract F30602-70-C-0297)
(AD-731562 Rept-203296A RADC-TR-71-181) Avail NTIS CSCL 14/3

The report summarizes the results of the Phase I study portion of a two-phase program designed to establish the technical base for development of two new standard multichannel voice recorder-reproducer sets These sets are intended for use in recording the radio and landline communications at fixed and mobile Air Traffic Control (ATC) facilities The basic problem is to provide a technically feasible cost effective means of recording 80 channels of voice data on a single reel of magnetic tape for a period of 25 hours The choice of head track geometry and multiplexing techniques emerge as the most critical factors affecting the design concept A study of multiplexing techniques as affected by tape transport anomalies and signal conditioning characteristics is conducted in depth Tape drive electronics are analyzed for performance at low speeds to optimize the

recording time available for a given tape length As a result of the Phase I study the conclusion is that a record/reproduce tape speed of 1 2 inches per second should be utilized to record three (3) channels of the input voice data on each track of a 28-track head/tape configuration using a double sideband multiplexing technique Author (GRA)

N72-18199*# National Aeronautics and Space Administration Ames Research Center Moffett Field Calif
DATA ACQUISITION SYSTEM FOR OPERATIONAL EARTH OBSERVATION MISSIONS
J M Deerwester D Alexander R D Arno L E Edsinger S M Norman K F Sinclair E L Tindle and R D Wood Washington Feb 1972 253 p refs
(NASA-TM-X-62107) Avail NTIS CSCL 05B

The data acquisition system capabilities expected to be available in the 1980 time period as part of operational Earth observation missions are identified By data acquisition system is meant the sensor platform (spacecraft or aircraft) the sensors themselves and the communication system Future capabilities and support requirements are projected for the following sensors film camera return beam vidicon multispectral scanner infrared scanner infrared radiometer microwave scanner microwave radiometer coherent side-looking radar and scatterometer Author

N72-18242# Stichting Nationaal Lucht- en Ruimtevaartlaboratorium Delft (Netherlands)
STICHTING NATIONAL AIR AND SPACEFLIGHT LABORATORY REPORT FOR THE YEAR 1970 [VERSLAG OVER HET JAAR 1970 STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM]
1970 107 p refs
Avail NTIS

Research activities are reported in the following fields of interests applied aeronautical research for air traffic control and temperature distribution in spacecraft aerodynamic evaluation of aircraft structures flight mechanics and aircraft operations space flight technology for development of ELDO launch vehicle applied mathematics in data handling and computer operations and development of test equipment and flight simulators G G

N72-18256# Aktiebolaget Rollab Stockholm (Sweden)
THE CONTINUOUSLY VARIABLE WIND TUNNEL NOZZLE OPERATED ONE SINGLE SCREW MECHANISM
1 Mar 1970 51 p refs Original contains color illustrations
(RR-018) Avail NTIS

A single screw continuously variable nozzle for varying the Mach number in supersonic wind tunnels is described along with its working principles design features and performance Various facilities using this nozzle are also briefly described F O S

N72-18265# Royal Aircraft Establishment Farnborough (England)
SOME PRELIMINARY STUDIES OF FACTORS INFLUENCING AIRPORT CAPACITY INCLUDING CURVED FINAL APPROACH PATHS
N H Hughes K Watling and R A Harlow Mar 1971 43 p refs
(RAE-TR-71059 BR-25181) Avail NTIS

Fast-time simulation is used to examine the airport capacity benefit resulting from the use of a guidance and control system which permits curved final approach paths The benefit is compared with that obtainable by other means such as parallel runway operation and reduced longitudinal separation at the approach gate It is shown that a capacity improvement can be obtained from curved approach paths in the case of a runway used for arrivals only but this disappears when the runway handles mixed arrivals and departures It is concluded that the way in which ATC operates the airport has a strong influence on the benefit realizable from applications of R & D to the capacity problem and it is considered that further studies in depth are required to establish how ATC can take fullest advantage from such systems as area navigation and wide coverage approach and departure guidance Author

N72-18267# *Naval Postgraduate School Monterey Calif*
A VISUAL APPROACH AND LANDING SIMULATOR SYSTEM M S Thesis
James Nicholas Kraft Sep 1971 35 p refs
(AD-733240) Avail NTIS CSCL 14/2

An F-105 Canopy/Seat Cockpit Trainer Panasonic Television Monitor System and an SMK-22 Visual Approach Simulator were interfaced to yield a low-cost six-degree-of-freedom visual approach and landing simulation system for future research and classroom use Stick and throttle outputs from the cockpit were made to operate all six degrees of freedom The television monitor was mounted forward of the cockpit instrument panel to provide visual cues for approaches landings and take-offs Cockpit instruments consist of airspeed altimeter and ID-249 ILS indicators Author (GRA)

N72-18268# Army Test and Evaluation Command Aberdeen Proving Ground Md
CLIMATIC HANGAR TESTING Final Report
1 Nov 1971 14 p
(AMCR Proj 310-6)
(AD-733299 MTP-7-3-521) Avail NTIS CSCL 01/5

The report describes a method for evaluation of Army aircraft materiel climatic effects and provides procedures for test preparation initial inspection electrical power requirements installation characteristics climatic operational performance characteristics maintenance evaluation safety human factors and personnel training requirements Author (GRA)

N72-18272# Naval Air Engineering Center Philadelphia Pa Engineering Dept (SI)
MARK 7 ARRESTING ENGINE ALIGNMENT MEASURING SYSTEM AND PROCEDURES FOR ALIGNING CROSSHEAD TRACKS, SIDE RAILS, AND ENGINE CYLINDER
William A Teasdale and Edward W Williams 21 Oct 1971 45 p
(AD-732445 NAEC-ENG-7689) Avail NTIS CSCL 01/5

The report contains instructions for the use of Arresting Engine Alignment Measuring System 61545-1 to determine alignment conditions of crosshead tracks crosshead side rails and engine cylinder bore on Mark 7 Arresting Engines and outlines procedures necessary to correct any engine misalignment found to exist on those engines Author (GRA)

N72-18273# Naval Air Engineering Center Philadelphia Pa Engineering Dept
MARK 7 ARRESTING GEAR PURCHASE CABLE DEVELOPMENT PROGRAM, JULY THROUGH DECEMBER 1970
Robert Black 24 Nov 1971 126 p
(AD-733988 NAEC-ENG-7699) Avail NTIS CSCL 13/9

The report summarizes wire rope testing conducted at the Naval Air Engineering Center on the various test machines during the indicated period The effects of synthetic and fiber cores upon wire rope fatigue and interstrand notching are examined as well as their relation to wire rope creep and its interrelation with fatigue The influence of the number of wires in a round strand rope is investigated and an analysis is performed to determine the effect of the loss of metallic area from abrasion upon rope strength for these constructions Fatigue data is given for ropes with variable wire strength and also for two non-rotating wire ropes Load-strain and load-torque data is presented for a number of 6 X 25 FWLLRS fiber and synthetic core ropes Author (GRA)

N72-18279# National Aerospace Lab Tokyo (Japan)
INVESTIGATION OF AIR STREAM FROM COMBUSTOR LINER AIR ENTRY HOLES 2 EXPERIMENTS WITH PAIRED AIR ENTRY HOLES AND A NUMERICAL ANALYSIS
Tetsuro Aiba and Masayuki Inoue Dec 1970 41 p refs In JAPANESE ENGLISH summary
(NAL-TR-227) Avail NTIS

Investigation of the jets flowing from air entry holes of the combustor liner of a gas turbine was carried out using simplified models Cold air was supplied through the air entry holes normally into the primary hot-gas flows The mass flow of the primary hot-gas and issuing jets were measured and the behavior of the air-jets was studied by the measurement of the temperature distribution of the gas mixture The air-jets flowing from paired air entry holes were studied for two different configurations one being parallel to and the other being normal to the primary flow The effects of jet and gas stream velocities gas temperature together with the two different configurations were investigated The discharge coefficient the maximum penetration of the jets the jet flow path the mixing of the jets and the temperature distribution across the jets were investigated Empirical expressions which describe the characteristics of the jets under the conditions of the experiments were formulated The experimental results showed that the penetration and the path of the jets flowing from the paired holes can be estimated from the modified empirical expressions obtained for the single air entry hole The path and temperature variation of the jets were also numerically analyzed considering aerodynamic and thermal characteristics and entrainment Author

N72-18281# National Aerospace Lab Tokyo (Japan)
A METHOD FOR THE FORMULATION OF LIFTING POTENTIAL FLOW PROBLEMS
1971 72 p refs In JAPANESE ENGLISH summary
(NAL-TR-243) Avail NTIS

A formulation of lifting potential flow problems was worked out in terms of a doublet distribution over the body surface and the trailing vortex sheet It is shown that the velocity field due to surface distribution of doublets is equivalent to that due to surface distribution of vortices This face was utilized to derive a non-singular expression of surface derivatives of potential due to a doublet distribution In view of the significance of the Kutta condition in controlling the lifting flow field the behavior of the potential and its derivatives was examined in the neighborhood of the trailing edge of a wing Conditions on the strength of doublets were obtained for which flow velocity remains finite at the trailing edge These conditions are incorporated in the final formulation of the lifting potential flow field Author

N72-18285# Grumman Aerospace Corp Bethpage N Y Research Dept
SHOCK IMPINGEMENT CAUSED BY BOUNDARY LAYER SEPARATION AHEAD OF BLUNT FINS
Louis G Kaufman II Robert H Korkegi (ARL Wright-Patterson AFB Ohio) and Leo C Morton (ARL Wright-Patterson AFB Ohio) Feb 1972 18 p refs
(RM-536) Avail NTIS

High speed flow past a blunt protuberance on a surface results in a complex three dimensional inviscid-viscous interaction flow field Tests were conducted to examine and obtain a better understanding of these interaction flow fields the most recent tests included detailed flow field surveys for Mach 3 flows ahead of blunt fins on a flat plate surface with turbulent boundary layers The separated flow was found to be unsteady attributed to a pulsating scavenging action of the horseshoe vortices In addition to the peak pressures and heating rates at shock impingement on the fin leading edge the plate experiences very large pressure and heating rates in the immediate vicinity of the fin root Results from these tests and many other sources were analyzed to provide a better description of the interaction flow field Author

N72-18293# Technion - Israel Inst of Tech Haifa Dept of Aeronautical Engineering
BOUNDARY LAYERS ON AXISYMMETRIC BODIES AT SMALL ANGLE OF ATTACK
Oscar Pinkus Jun 1971 38 p refs
(TAE-131) Avail NTIS

Utilizing an expression given by Cooke and a previously obtained solution for yawed cones an equation is derived for a three-dimensional equivalent radius for axisymmetric bodies at small angles of attack This function when used in any of the available axisymmetric boundary layer equations yields corresponding solutions for yawed bodies Expressions for the streamlines along which the boundary layer equations are to be integrated are also derived The solutions are linked to the prevailing inviscid flow properties which are allowed to vary in an arbitrary manner along the generatrix but in the circumferential direction are assumed to have the same functional variation as did the conical flow The method yields longitudinal and circumferential boundary layer properties for both concave and convex configurations Author

N72-18424*# Mississippi State Univ State College Dept of Aerophysics and Aerospace Engineering
A CATALOGUE OF DEVICES APPLICABLE TO THE MEASUREMENT OF BOUNDARY LAYERS AND WAKES ON FLIGHT VEHICLES
Stan J Miley Jan 1972 134 p refs
(Grant NGR-25-001-036)
(NASA-CR-116776 AASE-71-51) Avail NTIS CSCL 14B

A literature search was conducted to assemble a catalog of devices and techniques which have possible application to boundary layer and wake measurements on flight vehicles The indices used in the search were NACA NASA STAR IAA USGRDR and Applied Science and Technology Index The period covered was 1950 through 1970 The devices contained in the catalog were restricted to those that provided essentially direct measurement of velocities pressures and shear stresses Pertinent material was included in the catalog if it contained either an adequate description of a device and associated performance data or a presentation of applicable information on a particular measurement theory and/or technique When available illustrations showing the configuration of the device and test condition data were also included Author

N72-18448*# Geological Survey Washington D C
THE FRAUNHOFER LINE DISCRIMINATOR AN AIRBORNE FLUOROMETER
George E Stoertz 1969 34 p refs
(NASA Order T-80485-C)
(NASA-CR-125643 USGS-IR-NASA-157) Avail NTIS CSCL 14B

An experimental Fraunhofer Line Discriminator (FLD) can differentiate and measure solar-stimulated luminescence when viewed against a background of reflected light Key elements are two extremely sensitive photomultipliers two glass-spaced Fabry-Perot filters having a bandwidth less than 1 A and an analog computer As in conventional fluorometers concentration of a fluorescent substance is measured by comparison with standards Quantitative use is probably accurate only at low altitudes but detection of luminescent substances should be possible from any altitude Applications of the present FLD include remote sensing of fluorescent dyes used in studies of current dynamics The basic technique is applicable to detection of oil spills monitoring of pollutants and sensing over land areas Author

N72-18450*# Geological Survey Washington D C
TESTING THE FRAUNHOFER LINE DISCRIMINATOR BY SENSING FLUORESCENT DYE
George E Stoertz 1969 53 p
(NASA Order T-80485)
(NASA-CR-125653 USGS-IR-NASA-159) Avail NTIS CSCL 14B

The experimental Fraunhofer Line Discriminator (FLD) has detected increments of Rhodamine WT dye as small as 1 ppb in 1/2 meter depths It can be inferred that increments considerably smaller than 1 ppb will be detectable in depths considerably greater than 1/2 meter Turbidity of the water drastically reduces luminescence or even completely blocks the transmission of detectable luminescence to the FLD Attenuation of light within the water by turbidity and by the dye itself are the major factors to be considered in interpreting FLD records and in relating luminescence coefficient to dye concentration An airborne test in an H-19 helicopter established feasibility of operating the FLD from the aircraft power supply and established that the rotor blades do not visibly affect the monitoring of incident solar radiation Author

N72-18464# Technology Inc Dayton Ohio
INTRODUCTION TO MULTISENSOR RECONNAISSANCE Final Report Jul 1969 - Dec 1970
James E Hawkins and Horace H Valverde Jun 1971 114 p refs Prepared in cooperation with Autonetics Anaheim Calif
(Contract F33615-69-C-1187 F33615-69-C-1821)
(AD-733347 AFAL-TR-71-43) Avail NTIS CSCL 15/7

The document presents a comprehensive but practical introduction to multisensor usage in aerial reconnaissance It covers primarily the current and conceptual multisensors operating in electro-optical and microwave regions of the electro-magnetic spectrum the various types of aerial reconnaissance/surveillance missions and the factors to be considered in utilizing these sensors for such missions The document also includes a bibliography and an extensive glossary to cover all reconnaissance-oriented nomenclature Author (GRA)

N72-18468# Naval Air Development Center Johnsville Pa Aero Structures Dept
STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT FROM 1 JANUARY 1962 TO 1 JULY 1971 Summary Report
Thomas A DeFiore 1 Nov 1971 110 p ref
(AD-733678 NADC-ST-7108-1) Avail NTIS CSCL 14/2

The report is a specialized summary of normal acceleration data recorded by counting accelerometers Data are separated by calendar time and mission category Only data reported in the counting accelerometer program are included Author (GRA)

N72-18469# Southwest Research Inst San Antonio Tex
A FACILITY AND INSTRUMENTATION FOR STUDYING ENGINE CONTROL AND PERFORMANCE Technical Report, 2 Dec 1969 - 1 Jun 1971
James E Johnson William J Astleford Jesse L Holster Robert L Bass III and C Richard Gerlach Wright-Patterson AFB Ohio AFAPL Nov 1971 111 p refs
(Contract F33615-69-C-1231 AF Proj 3066)
(AD-733353 SWRI-RS-576 AFAPL-TR-71-80 TR-2) Avail NTIS CSCL 14/2

The general objectives of the present study are threefold (1) to implement an engine test facility incorporating a digital computer for data reduction and analysis and for advanced control and performance studies (2) to advance the state-of-the-art of instrumentation for measuring flow variables and other parameters in propulsion systems and (3) to provide feasibility demonstrations of new parameter sensing techniques for control applications of new control mechanizations of advanced engine control loops and of high response actuators Initial studies of a single resonant tube fluidic temperature sensor have demonstrated its potential for turbine inlet temperature sensing Author (GRA)

N72-18501# Royal Aircraft Establishment Farnborough (England)
INSTRUCTION CONCERNING CASTINGS FOR AERO-NAUTICAL USE EDITION 3, 30 NOVEMBER 1956
Feb 1971 62 p Transl into ENGLISH from Ministere de la Defense Nationale report AIR-3380
(RAE-Lib-Trans-1557 AIR-3380 BR-27949) Avail NTIS

This new edition of Specification AIR 3380 contains the following modifications Introduction of inspection procedures for motor and turbo-machinery components new magnesium alloys having mechanical properties superior to those of the alloys used hitherto optional omission of cut-up tests and radiographic inspection for pressure-tight components relaxation of radiographic inspection of Class B components and the granting of permission to combine break-up and cut-up tests Author

N72-18503# Naval Air Development Center Johnsville Pa Aero Materials Dept
AN EVALUATION OF THE RECIRCULATING CHROMATE RINSE CONCEPT FOR AIRCRAFT CORROSION CONTROL
W C Hallow and W E Knight 16 Sep 1971 24 p refs
(NAEC Proj PO-1-8027)
(AD-732762 NADC-MA-7160) Avail NTIS CSCL 01/3

A feasibility study of the recirculating chromate aircraft rinse is presented A preliminary design plan is presented along with test data to support the design conclusions Author (GRA)

N72-18505# Battelle Memorial Inst Columbus Ohio
SLEEVE BEARING MATERIALS AND LUBRICANTS FOR ADVANCED AIRFRAMES
Keith F Dufrane William A Glaeser and Fred F Zugaro 19 Nov 1971 38 p
(Contract N00019-71-C-0119)
(AD-733705) Avail NTIS CSCL 01/3

Bearing materials shaft materials and lubricants for airframe-bearing applications have been evaluated using an apparatus that simulates the loads motions and temperatures encountered by typical airframe bearings Beryllium-copper bearings which are capable of operation at very high stresses in reversing-load applications were found to be limited to 20 000 psi for satisfactory operation in unidirectional loading On the other hand aluminum-bronze bearings were capable of operation at higher unidirectional loads than they were under reversing loads Beryllium-copper bearings were also found to be sensitive to lubricant starvation regular relubrication is required to insure satisfactory operation Elevated-temperature bearing experiments using several versions of MIL-G-81322 grease showed a considerable variation in performance While some versions operated successfully at 350 F (which is the maximum recommended temperature) others were limited to 300 F MIL-G-81322 and MIL-G-27617 provided adequate corrosion protection for unplated steel shafts in all but severe corrosion situations Plasma-sprayed aluminum-bronze and 440 C stainless steel were shown to be promising airframe-bearing and shaft materials Author (GRA)

N72-18507# Naval Postgraduate School Monterey Calif
PROGRAM FOR THE DESIGN OF AN AXIAL COMPRESSOR STAGE BASED ON THE RADIAL EQUILIBRIUM EQUATIONS
Kyriacos D Papailiou 1971 64 p refs
(AD-733437 NPS-579PY719091A) Avail NTIS CSCL 13/7

A computer program is presented to determine the three-dimensional flow conditions in an axial flow compressor stage Entropy and energy gradients are taken into account as well as the radial shift and the curvatures of the axisymmetric stream surfaces The program can be used at elevated Mach numbers since shock losses and compressibility effects are included It represents an extension of work done for a research program to investigate the tip clearance effects in a three-stage compressor GRA

N72-18541*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio

HOT-SALT STRESS-CORROSION OF TITANIUM ALLOYS AS RELATED TO TURBINE OPERATION
Hugh R Gray 1972 12 p refs Proposed for presentation at 20th Intern Conf on Titanium Cambridge Mass 2-5 May 1972 sponsored by Met Soc and the Am Soc for Metals
(NASA-TM-X-68015 E-6802) Avail NTIS CSCL 11F

In an effort to simulate typical compressor operating conditions of current turbine engines special test facilities were designed Air velocity air pressure air dewpoint salt deposition temperature salt concentration and specimen surface condition were systematically controlled and their influence on hot-salt stress-corrosion evaluated The influence of both continuous and cyclic stress-temperature exposures was determined The relative susceptibility of a variety of titanium alloys in commonly used heat-treated conditions was determined The effects of both environmental and material variables were used to interpret the behavior of titanium alloys under hot-salt stress-corrosion conditions found in jet engines and to appraise their future potential under such conditions Author

N72-18545# *Cranfield Inst of Technology (England) Dept of* Materials
METALS FOR AEROSPACE APPLICATIONS
P Hancock and B S Hockenhull Oct 1971 29 p refs
(Cranfield-Mat-6) Avail NTIS

Metals available currently in two parts one dealing with structural aerospace applications at relatively low temperatures and one dealing with the high temperature aerospace field are reviewed It is shown that the last decade or so has produced improvements mainly in the specific strength of titanium alloys and steels the latter showing very considerable improvements but without significant improvement in specific modulus Superalloys were further developed to the status that compromise is now sought between the creep properties and the oxidation resistance with upper working temperatures in the region of 1250 C Above this temperature the refractory metals have superior strength properties but all suffer poor resistance to oxidation Author

N72-18578*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
COATINGS FOR AIRCRAFT GAS TURBINE ENGINES AND SPACE SHUTTLE HEAT SHIELDS A REVIEW OF LEWIS RESEARCH CENTER PROGRAMS
Salvatore J Grisaffe and John P Merutka 1 Feb 1972 7 p refs Presented at 19th Refractory Composite Working Group Houston Tex 1 2 Feb 1972 sponsored jointly by NASA and AFML
(NASA-TM-X-68007) Avail NTIS CSCL 11C

The status of several coating programs is reviewed These include efforts on protecting aircraft gas turbine engine materials from oxidation/corrosion and on protecting refractory metal reentry heat shields from oxidation Author

N72-18584*# TRW Systems Group Redondo Beach Calif
THERMALLY STABLE LAMINATING RESINS
R J Jones R W Vaughan and E A Burns 7 Feb 1972 201 p refs
(Contract NAS3-13489)
(NASA-CR-72984 TRW-16402-6012-R0-00) Avail NTIS CSCL 11I

Improved thermally stable laminating resins were developed based on the addition-type pyrolytic polymerization Detailed monomer and polymer synthesis and characterization studies identified formulations which facilitate press molding processing and autoclave fabrication of glass and graphite fiber reinforced composites A specific resin formulation termed P10P was utilized to prepare a Courtaulds HMS reinforced simulated airfoil demonstration part by an autoclave molding process Author

N72-18588# Naval Air Development Center Johnsville Pa Aero Materials Dept
SELF-LUBRICATING COMPOSITE MATERIALS FOR NAVAL AIRCRAFT DIFFERENTIAL THERMAL ANALYSIS OF SELF-LUBRICATING BEARING SYSTEM COMPOSITIONS AND WEAR DEBRIS Progress Report
Alfeo A Conte Jr 28 Jun 1971 25 p refs
(AD-732761 NADC-MA-7138) Avail NTIS CSCL 13/9

Differential Thermal Analysis (DTA) was employed as an analytical device in the study of physical and chemical changes associated with high bearing contact area temperatures for self-lubricating Mo-S-Fe and W-S-Fe bearing systems which were investigated using Falex lubricant equipment Initial reaction temperatures for the elemental constituents comprising these systems were determined Wear debris from those self-lubricating systems which exhibited extended endurance life was analyzed using the DTA technique Free energy considerations together with thermoanalytical results and wet chemical tests suggest that compound formation i e MoS2 and WS2 is a key factor in achieving extended performance life for these systems Author (GRA)

N72 18602# Naval Air Development Center Johnsville Pa Aero Materials Dept
THE DEVELOPMENT OF IMPROVED ALUMINUM POLISHES FOR NAVAL AIRCRAFT, PART 2 Final Report
W E MacKenzie and P N Bellavin 28 Sep 1971 20 p ref
(AD-733403 NADC-MA-7163) Avail NTIS CSCL 11/11

A final report is made on the development of polishes and corrosion removers for use on bare aluminum surfaces of naval aircraft Typical formulations and specification requirements are given Author (GRA)

N72-18621*# Scientific Translation Service Santa Barbara Calif
MICROMETEOROLOGIC TEMPERATURE MEASUREMENTS FROM AIRCRAFT
Dieter Lorenz Washington NASA Feb 1972 12 p refs Transl into ENGLISH from Ann Meteorol (Offenbach am Main) no 3 1967 p 154-158
(Contract NASw-2035)
(NASA-TT-F-14139) Avail NTIS CSCL 04B

Industrially manufactured radiometers were used for airborne surface temperature measurements of the earth The practicality of these measurements in micrometeorology and mesometeorology is shown by some examples It is found that this kind of measurement is highly influenced by the type of surface This influence may be reduced if the measurements are taken at an inclination of 30 to 45 deg from the horizontal rather than vertically Author

N72-18636# Meteorology Research Inc Altadena Calif
WARM FOG MODIFICATION STUDIES Final Report, 18 Aug 1969 - 31 Aug 1971
Theodore B Smith 31 Aug 1971 103 p refs
(*Contract F19628-70-C-0069 AF Proj 7605 AF Proj 8620*)
(AD-733671 MRI-71-978 AFCRL-71-0467) Avail NTIS CSCL 04/2

A series of field experiments were carried out to investigate the treatment of warm fogs by hygroscopic materials The program philosophy has involved strong interaction between physical observations made in the field experiment phases and computer modeling which attempts to simulate the treatment effects An instrumented ground site was set up in October 1969 in the Noyo River Valley in northern California Fourteen tests were carried out using a DC-3 aircraft and a helicopter to dispense hygroscopic material at the fog top Extensive ground instrumentation recorded the effects of the treatment Results of the Noyo Valley experiments led to the establishment of a semi-operational test program at McClellan AFB in Sacramento California in January 1971 C-130 aircraft and an Air Force helicopter were used as the seeding aircraft A previous study was made at Forbes AFB in November 1970 to obtain dispensing characteristics from the helicopter Ground instrumenta-

tion at McClellan recorded the results of the tests It was found that the hygroscopic treatment could be carried out readily within the constraints of an operational base using operational personnel for aircraft vectoring and dissemination Author (GRA)

N72-18641# Transportation Systems Center Cambridge Mass
CLEAR AIR TURBULENCE RADIOMETRIC DETECTION PROGRAM Annual Report, 1 Jul 1970 - 30 Jun 1971
George W Wagner G G Haroules and Brown W E Jul 1971 64 p Sponsored by FAA
(AD-733762 TSC-FAA-71-19) Avail NTIS CSCL 04/1

The report presents a review of accomplishments for the Clear Air Turbulence Detection Program The objectives instrumentation supporting hardware and interfaces leading up to and including the test flights for the reporting period are given The ultimate goal of this program is the development of a remote method for detecting and thereby alerting high-altitude high-speed aircraft in sufficient time to avoid the hazards associated with Clear Air Turbulence CAT Author (GRA)

N72-18648# Army Electronics Command Fort Monmouth N J
MATHEMATICAL WIND GUST MODEL AND COMPUTER PROGRAMS FOR USE WITH AIRCRAFT SIMULATIONS
Robert W Campagna Sep 1971 73 p refs
(DA Proj 1F1-63207-D-235)
(AD-733905 ECOM-3479) Avail NTIS CSCL 20/4

A description is given of atmospheric turbulence and its spectral characteristics with emphasis placed on the application of this information to the aircraft equations of motion The gust model developed accounts for not only the effect of body axis gust velocities applied at the center of gravity but also includes the effect of gust gradients along the length and span of the aircraft The latter effect is usually neglected but can be quite significant with small aircraft at high speeds Thus the model varies as a function of both aircraft size and velocity An analog and digital model is developed for use with large scale aircraft simulations or less sophisticated linearized aircraft models
Author (GRA)

N72-18649# National Aviation Facilities Experimental Center Atlantic City N J
INVESTIGATE INCOMPATIBILITY BETWEEN GROUND AND AIRBORNE MEASUREMENTS OF VOR SPACE MODULATION Final Report Jul 1970 - Mar 1971
Matthew Naimo Jr Feb 1972 63 p refs
(Proj 041 305-05X)
(FAA-NA-72-18 FAA-RD-71 119) Avail NTIS

An investigation was conducted into the cause of incompatibility between ground and airborne measurements of VOR space modulation when using the latest flight inspection receiver FA-4165 3A The effort included a survey of the existing procedures and equipment used throughout the FAA an evaluation of the ground measurement technique and an evaluation of the airborne measurement technique The investigation identified problem areas with both the ground and airborne techniques but the largest contributing factor to incompatibility is due to the erroneous indication at times of the 30-Hz variable monitor output of the FA-4165 3A flight inspection receiver Author

N72-18650# National Aviation Facilities Experimental Center Atlantic City N J
TEST AND EVALUATION OF ENGINEERING MODELS OF TERMINAL AREA DME Final Report Feb 1970 - Jul 1971
George J Hartranft Mar 1972 81 p
(Proj 330-018-01X)
(FAA-NA-72-25 FAA-RD-71-108) Avail NTIS

Testing results are presented for two low-powered distance measuring equipment (DME) The equipments were delivered to National Aviation Facilities Experimental Center (NAFEC) to evaluate suitability of design concepts for use in preparing a prototype specification The laboratory tests dealt with the effects of continuous wave interference on reply delay receiver sensitivity and squitter rate the effect of various squitter rates on airborne interrogators the effect of various interrogation levels on receiver delay and the effects of various transmitted pulse parameters on the pulse pair spectrum The flight tests identified the coverage area provided by a 90-watt DME ground station to various commercial and general aviation type DME interrogators Author

N72-18651# Flight Standards Service Washington D C
EVALUATION OF VOR FIX LIMITATIONS Final Report
D D Murphy Allan W Hunting and Frank Parr Feb 1972 61 p
(Proj FS-460-8)
(FAA-FS-600-4) Avail NTIS

A flight evaluation of non-precision VHF omnirange (VOR) approaches to determine possible improvements in the final approach fix distance without derogation of procedure flyability is discussed Two published VOR procedures and two additional VOR procedures designed for evaluation purpose were flown Simulated instrument conditions were used for comparison of flyability problems on final approach distances of 3 5 7 0 10 5 and 18 5 nautical miles It was concluded that distance measuring equipment dual VOR receivers or an improved timing device for distances greater than 7 0 miles should be used Author

N72-18653# National Aviation Facilities Experimental Center Atlantic City N J
INVESTIGATE AND ANALYZE DME TRAFFIC LOAD Final Report, Mar 1970 - May 1971
George J Hartranft and Harold Postel Feb 1972 27 p
(Proj 330-006-07X)
(FAA-NA-72-24 FAA-RD-71-109) Avail NTIS

The development of a method of measuring DME traffic for both a DME-saturated and non-saturated TACAN site is reported DME traffic counts were conducted at the following Eastern Region VORTACs LaGuardia Robbinsville Coyle Kenton Deer Park Sea Isle and Yardley The LaGuardia VORTAC experienced the highest peak traffic of the VORTACs tested The LaGuardia traffic count indicates the system is operating at 66 percent of full-load capacity during peak traffic Author

N72-18659# National Aviation Facilities Experimental Center Atlantic City N J
EVALUATION OF TWO-BAY ANTENNA FOR VOR APPROACH MARKER BEACON Interim Report Jul 1970 - Sep 1971
Wesley O Mickey Mar 1972 42 p
(Proj 041-305 07X)
(FAA-RD-72-33 FAA-RD-72-11) Avail NTIS

The Scanwell two-bay marker beacon antenna was installed and tested at three sites Tests were performed with two aircraft a T-29 aircraft and a flight inspection DC-3 aircraft The DC-3 was equipped and calibrated as determined by the investigation of the marker beacon flight inspection system Preliminary test at two sites the asphalt Multiple Object Phase Tracking and Ranging (MOPTAR) site and 500 feet northwest of the MOPTAR site were performed with the T-29 aircraft These tests determined that the Scanwell antenna radiation pattern provided the desired ratio 8 3 or higher and that further testing was necessary to determine the power required to obtain the size pattern desired Tests were performed with the DC-3 aircraft with the antenna installed at the approach end of runway 4 The output power tested of 1 2 and 4 watts was limited by the capabilities of the TV-26 transmitter The power required to be assured of an 8 000-foot minimum major axis at 400 feet above ground level was 32 watts and was determined by projecting the increase of the radiation pattern observed when the power to the antenna was doubled Author

N72-18660# Naval Postgraduate School Monterey Calif
DETERMINATION OF STOL AIR TERMINAL TRAFFIC CAPACITY THROUGH USE OF COMPUTER SIMULATION M S Thesis
Robert Evans Rinker Sep 1971 69 p refs
(AD-733185) Avail NTIS CSCL 17/7

The capacity of an air terminal for Short Takeoff and Landing aircraft is analyzed The terminal is considered to be operating as part of an intra-urban air rapid transit system The air traffic flow through the terminal is modeled by a computer simulation written in both the FORTRAN IV and GPSS languages The model is used to solve the traffic capacity problem under two sets of traffic control rules In the first case existing FAA rules which require 3 miles separation between arrivals and 2 miles between an arrival and a departure are used In a second case the rules are 2 miles between arrivals and 1 mile between an arrival and a departure A detailed description of the model is presented so that others might use the model Author (GRA)

N72-18662# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
GYROSCOPIC DEVICES (CHAPTERS 2-17)
V P Danilin 8 Sep 1971 693 p refs Transl into ENGLISH from the book Giroskopicheskie Pribory Moscow Izd-vo Vysshaya Shkola 1965 p 70-535
(AF Proj 6050)
(AD-733275 FTD-MT-24-307-70) Avail NTIS HC $9 00/MF $0 95 CSCL 17/7

The book contains the following subjects Gyro Horizons with Proportional (Radial) Correction Gyro Horizons with Constant Correction in Several Directions Gyro Horizons with Constant Radial Correction Gyro Horizons with Mixed Correction in Several Directions Certain General Questions on the Theory and Design of Gyro Horizons Some Information About Gyro Compasses Directional Gyroscopes (Directional Gyros) Gyromagnetic Compasses Free Gyroscopes Angular Rate Sensors (ARS) Based on Gyroscopes with Two Degrees of Freedom Angular Rate Sensors Based on Gyroscopes with Three-Degrees Of-Freedom Certain Special Gyroscopic Instruments and Devices Floating Gyroscopes Single-Axis Power Gyroscopic Stabilizer The Selection of the Parameters of the Stabilization System Two-Axis and Three-Axis Gyrostabilizers Power Gyro Horizons and Course-Verticals Certain General Questions of Design and Components of Gyroscopic Instruments Author (GRA)

N72-18663# Pennsylvania Univ Philadelphia Moore School of Electrical Engineering
INERTIAL NAVIGATION TASK Final Technical Report
Kenneth A Fegley Oct 1971 50 p refs
(Contract DA-28-043-AMC-02411(E) DA Proj 1H1-62202-A-219)
(AD-733430 Rept-72-07 ECOM-02411-22) Avail NTIS CSCL 17/7

The report is the final report for the task on research in the area of Inertial Navigation The report summarizes the results of the main objectives which were to determine the feasibility of using a strapdown inertial system aboard a helicopter to simulate systems which employ inertial elements and to determine improved techniques to apply aided inertial navigation to Army aircraft Author (GRA)

N72-18664# Southern Methodist Univ Dallas Tex Information and Control Sciences Center
AUTOMATIC NAVIGATION Interim Report 1 Sep 1970 - 31 Aug 1971
Andrew P Sage 31 Aug 1971 54 p refs
(Contract F44620-68-C-0023 AF Proj 9559)
(AD 733397 AFOSR-71-2965TR) Avail NTIS CSCL 17/7

The contract is charged with conducting a program of predominantly theoretical research in the general field of optimal control with special emphasis on the estimation problem and automatic navigation The twenty-one research summaries contained in the report document in part new research initiated since the last interim summary report As evidenced by these summaries the most noticable change from the efforts of previous years is the increasing emphasis of the research upon the application of optimum systems control and estimation theory to specific problems in automatic navigation Author (GRA)

N72-18665# Mitre Corp Bedford Mass
MODELS OF INFORMATION EXCHANGE AND DATA RATES FOR A POST-1975 AUTOMATED TACTICAL AIR CONTROL SYSTEM DEPLOYMENT
Emile A Babineau and E David Howes Jr Oct 1971 165 p
(Contract F19628-68-C-0365 AF Proj 603B)
(AD-733584 MTR-1875 ESD-TR 71-371) Avail NTIS CSCL 17/7

Some changes in operations and technology will be introduced in the post-1975 TACS Among these will be the use of digital secure voice and data management automation To permit the development of Air Force ground environment communications requirements for the TACS of this era estimated total point to-point data rates are needed The anticipated TACS operations with some expected changes are modeled The resulting information exchange data rates for the total ground environment is about three megabits This total data rate is impacted far more because of use of digital secure voice than because of introducing data management automation The two operational concepts which are modeled prove to have nearly identical data rate patterns Author (GRA)

N72 18666# Transportation Systems Center Cambridge Mass
EVALUATION OF AIR TRAFFIC CONTROL MODELS AND SIMULATIONS
L O Higgins and P Mpontsikaris Jun 1971 108 p refs Sponsored by FAA
(AD-733755 TSC-FAA-71-7) Avail NTIS CSCL 17/7

Approximately two hundred reports were identified as describing Air Traffic Control (ATC) modeling and simulation efforts Of these about ninety analytical and simulation models dealing with virtually all aspects of ATC were formally evaluated The bibliography lists all the reports identified There is an introduction to and a summary of the evaluation effort as of the publication The summary contains a preliminary indication of which models may be of value for ATC concept evaluation specifically traffic flow safety and system loading aspects of proposed concepts Author (GRA)

N72-18667# Transportation Systems Center Cambridge Mass
OCEANIC SURVEILLANCE AND NAVIGATION ANALYSIS, FY 1971 Final Report
Ronald M Hershkowitz Jun 1971 84 p refs Sponsored by FAA
(AD-733758 TSC-FAA-71-13) Avail NTIS CSCL 17/7

The report summarizes the oceanic surveillance and navigation analysis performed at Transportation Systems Center under PPA FA-04 for FY 71 Three major efforts are reviewed and discussed herein summary of the North Atlantic Systems Planning Group collision risk model a study of the impact of inertia air safety an investigation of the modeling techniques required to assess the effect of air traffic control satellite surveillance on separation standards in the North Atlantic region Author (GRA)

N72-18668# Transportation Systems Center Cambridge Mass
TIME/FREQUENCY SYSTEMS
E H Farr L A Frasco H D Goldfein and R M Snow Jun 1971 87 p refs Sponsored by FAA

(AD-733761 TSC-FAA-71-17) Avail NTIS CSCL 17/7

The report summarizes the work performed at DOT/TSC on the Time/Frequency ATC System study project Principal emphasis in this report is given to the evaluation and analysis of the technological risk areas A survey and description of proposed T/F system is included The technical risk areas include the effects of multipath on signalling over radio links Material is presented which bears on the comparative analysis of T/F with alternative technologies including satellite and beacon-based system concepts It is concluded that the most critical problem areas requiring further study are (a) multipath effects on T/F systems and (b) systems operability under non-ideal conditions leading to graceful degradability Author (GRA)

N72-18669# Transportation Systems Center Cambridge Mass
A CONCEPTUAL NETWORK MODEL OF THE AIR TRANSPORTATION SYSTEM THE BASIC LEVEL 1 MODEL
Aurel N DeHolland and Arthur S Priver Apr 1971 49 p
(AD-733752 TSC-FAA-71-3) Avail NTIS CSCL 17/7

A basic conceptual model of the entire Air Transportation System is being developed to serve as an analytical tool for studying the interactions among the system elements The model is being designed to function in an interactive computer graphics environment which permits rapid alteration of rules and parameters as well as continuous real-time graphical monitoring of systems operations The model described is the first member in an evolving hierarchy of increasingly complex models progressing in the direction of closer approximation to the real-world Air Transportation System Author (GRA)

N72-18670# *Transportation Systems Center Cambridge Mass*
THE IMPACT OF INERTIAL NAVIGATION ON AIR SAFETY
R M Hershkowitz D OMathuna and K R Britting (MIT Cambridge) May 1971 27 p refs
(AD 733753 TSC-FAA 71-5) Avail NTIS CSCL 01/2

An analysis of inertial navigation system performance data was carried out to assess the probable impact of inertial navigation on the aircraft collision risk in the North Atlantic region These data were used to calculate the collision risk between two aircraft flying at the same nominal flight level on adjacent tracks The inertial system s error sources are treated in a statistical sense to infer the en route error behavior from the terminal error data Collision risk estimates are derived for easterly and westerly transatlantic flights Author (GRA)

N72-18671# Transportation Systems Center Cambridge Mass
COLLISION RISK MODEL FOR NAT REGION
Ronald Hershkowitz May 1971 55 p refs
(AD-733754 TSC-FAA-71-6) Avail NTIS CSCL 01/2

The paper reviews and summarizes the essential features of the collision risk model used to analyze the effects of separation standards on safety for the parallel tracking system employed in the North Atlantic The derivation of the model is traced from a set of basic assumptions to formulation of various philosophies and a brief set of conclusions and recommendations for future work A complete reference list is included Author (GRA)

N72-18764# Southwest Research Inst San Antonio Tex
PHYSICAL AND CHEMICAL PROPERTIES OF JP-4 JET FUEL FOR 1970 Technical Report, 1 Jan 1970 - 1 Jun 1971
Robert K Johnston Charles M Monita and William A Kemper Wright-Patterson AFB Ohio AFAPL Sep 1971 129 p
(Contract F33615-69-C 1231 AF Proj 3048)
(AD-733352 SWRI-RS-577 AFAPL-TR-71-79) Avail NTIS CSCL 21/4

Test reports on 5611 samples of JP-4 fuel purchased in 1970 have been analyzed to determine average properties and distribution of values for each of eight geographical districts and the results have been compared with those of previous years A significant trend toward lower-boiling fuel was noted The frequency of values outside the specification limits was quite low below 0 1% for most tests Criteria and methods used in the present analysis have been listed and suggestions have been made for improvements that can be made whenever a standardized test report form is available Author (GRA)

N72-18769*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
ENGINE SELECTION FOR TRANSPORT AND COMBAT AIRCRAFT
James F Dugan 1972 76 p refs Proposed for presentation at Conf on Aircraft Performance Prediction Methods and Optimization Brussels 24-28 Apr 1972 sponsored by Advisory Group on Aeron Res and Develop
(NASA-TM-X-68009 E 6783) Avail NTIS CSCL 21E

The procedures that are used to select engines for transport and combat aircraft are discussed In general the problem is to select the engine parameters including engine size in such a way that all constraints are satisfied and airplane performance is maximized This is done for four different classes of aircraft (1) a long haul conventional takeoff and landing (CTOL) transport (2) a short haul vertical takeoff and landing (VTOL) transport (3) a long range supersonic transport (SST) and (4) a fighter aircraft For the commercial airplanes the critical constraints have to do with noise while for the fighter maneuverability requirements define the engine Generally the resultant airplane performance (range or payload) is far less than that achievable without these constraints and would suffer more if nonoptimum engines were selected Author

N72-18773*# *National Aeronautics and Space Administration*
Lewis Research Center Cleveland Ohio
PERFORMANCE OF TANDEM BLADED TRANSONIC COMPRESSOR ROTOR WITH TIP SPEED OF 1375 FEET PER SECOND
Donald C Urasek and David C Janetzke Washington Mar 1972 87 p refs
(NASA-TM-X-2484 E-6388) Avail NTIS CSCL 21E

The design and experimental performance of a 20-inch diameter tandem-bladed axial flow transonic compressor rotor is presented Radial surveys were made of the flow conditions At design speed the peak efficiency was 0 88 and occurred at an equivalent weight flow of 63 pounds per second At peak efficiency the total pressure and total temperature ratios were 1 77 and 1 20 respectively The stall margin at design speed was 10 percent based on weight flows and total pressure ratios at peak efficiency and near stall Author

N72-18774*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
COMPUTER PROGRAM FOR PRELIMINARY DESIGN ANALYSIS OF AXIAL-FLOW TURBINES
Arthur J Glassman Washington Mar 1972 38 p ref
(NASA-TN D-6702 E 6603) Avail NTIS CSCL 21E

The program method is based on a mean-diameter flow analysis Input design requirements include power or pressure ratio flow temperature pressure and speed Turbine designs are generated for any specified number of stages and for any of three types of velocity diagrams (symmetrical zero exit swirl or impulse) Exit turning vanes can be included in the design Program output includes inlet and exit annulus dimensions exit temperature and pressure total and static efficiencies blading angles and last-stage critical velocity ratios The report presents the analysis method a description of input and output with sample cases and the program listing Author

N72-18775*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
FAN AND WING FORCE DATA FROM WIND TUNNEL INVESTIGATION OF A 0 38 METER (15 INCH) DIAMETER

VTOL MODEL LIFT FAN INSTALLED IN A TWO DIMENSIONAL WING
Joseph A Yuska and James H Diedrich Washington Mar 1972 101 p refs
(NASA-TN-D-6654 E-6607) Avail NTIS CSCL 21E

Test data are presented for a 38-cm (15-in) diameter 1 28 pressure ratio model VTOL lift fan installed in a two-dimensional wing and tested in a 2 74-by 4 58-meter (9-by 15-ft)V/STOL wind tunnel Tests were run with and without exit louvers over a wide range of crossflow velocities and wing angle of attack Tests were also performed with annular-inlet vanes inlet bell-mouth surface disconuities and fences to induce fan windmilling Data are presented on the axial force of the fan assembly and overall wing forces and moments as measured on force balances for various static and crossflow test conditions Midspan wing surface pressure coefficient data are also given
Author

N72-18782*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
RESEARCH TRENDS IN TURBINE AERODYNAMICS
Warner L Stewart and Arthur J Glassman 1972 7 p Presented at Gas Turbine and Fluids Eng Conf and Products Show San Francisco 26-29 Mar 1972 sponsored by Am Soc of Mech Eng
(NASA-TM-X-68016 E-6814) Avail NTIS CSCL 21E

Recent trends in turbine aerodynamics are summarized Areas discussed include cooled turbine aerodynamics high work factor turbines pneumatic variable geometry and computer analyses
Author

N72-18783*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
GENENG A PROGRAM FOR CALCULATING DESIGN AND OFF-DESIGN PERFORMANCE FOR TURBOJET AND TURBOFAN ENGINES
Robert W Koenig and Laurence H Fishbach Washington Feb 1972 161 p
(NASA-TN D-6552 E-5867) Avail NTIS CSCL 21E

A computer program entitled GENENG employs component performance maps to perform analytical steady state engine cycle calculations Through a scaling procedure each of the component maps can be used to represent a family of maps (different design values of pressure ratios efficiency weight flow etc) Either convergent or convergent-divergent nozzles may be used Included is a complete FORTRAN 4 listing of the program Sample results and input explanations are shown for one-spool and two-spool turbojets and two-spool separate- and mixed-flow turbofans operating at design and off-design conditions
Author

N72-18786*# Boeing Co Seattle Wash
TRANSONIC AND SUPERSONIC TEST OF A MACH 2 65 MIXED-COMPRESSION AXISYMMETRIC INTAKE
J L Koncsek and J Syberg Washington NASA Mar 1972 89 p
(Contract NAS2-6152)
(NASA-CR-1977) Avail NTIS CSCL 21E

The test results describe isolated intake performance between Mach 0 95 and the cruise Mach number of 2 65 at angles of incidence from +5 to -5 deg Maximum total pressure recoveries of over 94 percent with 10 percent distortion were recorded at the compressor face in the Mach range from 2 65 to 2 4 Typical cruise operating recovery was 91 percent with 13 percent distortion 7 percent bleed 5 percent corrected flow stability margin and 2 2 deg angle-of-incidence tolerance without need for control action In the started range below Mach 2 4 recoveries were 2 percent to 4 percent lower than the recoveries above Mach 2 4 and the distortion increased to approximately 20 percent At Mach 0 95 the maximum measured capture flow was 99 4 percent of the theoretical choked value The recovery was 97 1 percent with less than 10 percent distortion
Author

N72-18788# Systems Control Inc Palo Alto Calif
A PRELIMINARY EVALUATION OF THRUST MAGNITUDE CONTROL FOR BOMBER DEFENSE MISSILES Final Report
David M Salmon Lewis Meier and Stephen R McReynolds Jul 1971 55 p refs
(Contract F44620-71-C-0018)
(AD-731812 AFOSR-71-2458TR) Avail NTIS CSCL 21/8

The findings are presented on a preliminary study to evaluate thrust magnitude control in Air Force missions in general and for bomber defense missiles in particular The first two phases of the study a survey of the application of optimal control theory to the analysis of thrust magnitude control and preparation of mathematical formulations for quantative analysis of specific applications are reviewed Then the techniques employed and results obtained in the third phase of the study analysis of horizontal rectilinear flight of a bomber defense missile are described
Author (GRA)

N72-18789# Boeing Co Renton Wash Airplane Div
NACELLE COWLING OF HIGH BYPASS RATIO TURBOFAN ENGINES
Robert L Lawrence 1971 39 p refs
(AD-733738 D6-18086TN) Avail NTIS CSCL 21/5

Consideration of mission factors for subsonic transports has led to selection of high bypass turbofan engines The proper integration of these engines with the airframe requires knowledge of the propulsive force supplied to the aircraft by the engines The propulsive force may be determined by experimentally evaluating the thrust or drag of the various parts of the engine cowling and synthesizing the nacelle drag by adding together the component drags Accurate experimental results are difficult to obtain The synthesis of component drags ignores interactions between components Consequently analytical tools are being developed to calculate the drag and thrust Suggested analysis techniques include incompressible and compressible inviscid and boundary layer flows Advances in calculation techniques are needed for compressible flows separated flows and interference effects
Author (GRA)

N72-18909*# Boeing Co Seattle Wash
AN EVALUATION OF RANDOM ANALYSIS METHODS FOR THE DETERMINATION OF PANEL DAMPING
Waman V Bhat and John F Wilby Feb 1972 116 p refs
(Contract NAS2-6285)
(NASA-CR-114423) Avail NTIS CSCL 20K

An analysis is made of steady-state and non-steady-state methods for the measurement of panel damping Particular emphasis is placed on the use of random process techniques in conjunction with digital data reduction methods The steady-state methods considered use the response power spectral density response autocorrelation excitation-response crosspower spectral density or single-sided Fourier transform (SSFT) of the response autocorrelation function Non-steady-state methods are associated mainly with the use of rapid frequency sweep excitation Problems associated with the practical application of each method are evaluated with specific reference to the case of a panel exposed to a turbulent airflow and two methods the power spectral density and the single-sided Fourier transform methods are selected as being the most suitable These two methods are demonstrated experimentally and it is shown that the power spectral density method is satisfactory under most conditions provided that appropriate corrections are applied to account for filter bandwidth and background noise errors Thus the response power spectral density method is recommended for the measurement of the damping of panels exposed to a moving airflow
Author

N72-18911*# National Aeronautics and Space Administration Ames Research Center Moffett Field Calif
STRUCTURAL WEIGHT ANALYSIS OF HYPERSONIC

AIRCRAFT
Mark D Ardema Washington Mar 1972 50 p refs
(NASA-TN-D-6692 A-3905) Avail NTIS CSCL 20K

The weights of major structural components of hypersonic liquid hydrogen fueled aircraft are estimated and discussed The major components are the body structure body thermal protection system tankage and wing structure The method of estimating body structure weight is presented in detail while the weights of the other components are estimated by methods given in referenced papers Two nominal vehicle concepts are considered The advanced concept employs a wing-body configuration and hot structure with a nonintegral tank while the potential concept employs an all body configuration and cold integral pillow tankage structure Characteristics of these two concepts are discussed and parametric data relating their weight fractions to variations in vehicle shape and size design criteria and mission requirements and structural arrangement are presented Although the potential concept is shown to have a weight advantage over the advanced it involves more design uncertainties since it is farther removed in design from existing aircraft Author

N72-18953# AeroChem Research Labs Inc Princeton N J
EVALUATION OF TEST DATA ON JET ENGINE COMBUSTOR BURN-THROUGH FLAMES Final Report, 4 May - 4 Jul 1971
H S Pergament and R R Mikatarian Mar 1972 48 p refs Prepared for presentation at US Intern Transportation Exposition Washington D C 27 May - 4 Jun 1972
(Contract DOT-FA71NA-575)
(AeroChem-TP-261 FAA-RD-71-100 FAA-NA-72 30) Avail NTIS

A method was developed to interpret flat plate impingement pressure and temperature data taken in jet engine combustor burnthrough flames in terms of free stream velocities pressures temperatures etc These flames which are high temperature turbulent underexpanded sonic jets are caused in practice by the combustion gases impinging on (and burning a hole through) the wall of the combustor Turbulent convective heat transfer coefficients were computed to determine radiation and conduction corrections to the temperature measurements The influence of mixing between the burnthrough flame and ambient air on flame properties was also studied and a correlation was developed between the angle of spread of the mixing region and enthalpy flux at the burnthrough hole Author

N72-18990# Advisory Group for Aeronautical Research and Development Paris (France)
AGARD HANDBOOK
Sep 1971 33 p
(AD-729571) Avail NTIS CSCL 01/2

The handbook was prepared primarily to serve as an introduction to AGARD describing what it is and how it works The By Laws under which AGARD operates are included in the Author Appendix for specific detailed reference purposes
Author (GRA)

N72-18994*# General Motors Corp Indianapolis Ind
DESIGN AND EXPERIMENTAL RESULTS OF A HIGHLY LOADED LOW SOLIDITY, JET FLAP ROTOR
James L Bettner Washington NASA Mar 1972 117 p refs
(Contract NAS3-12424)
(NASA-CR-1968 EDR-7045) Avail NTIS CSCL 01A

The overall performance of a single-stage turbine with a low solidity jet flap rotor blade assembly was tested over a range of cavity pressure ratios equivalent speeds and expansion ratios The rotor blades were designed with negative hub reaction and a mean-line axial chord solidity of 0 922 The results of the investigation are compared with the performance of a modified jet flap rotor blade which was designed to similar velocity diagrams but with a mean-section axial chord solidity of 1 541 Both rotors were tested with the same stator Author

N72-18995*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
EFFECT OF LIMITED AMPLITUDE AND RATE OF FLAP MOTION ON VANE-CONTROLLED GUST ALLEVIATION SYSTEM
L Keith Barker Daniel J Crawford and Gene W Sparrow Washington Mar 1972 43 p refs
(NASA-TN-D-6733 L-8027) Avail NTIS CSCL 01A

An airplane (light transport type) is assumed to be in level flight (no pitching) through atmospheric turbulence which has a mean-square vertical gust intensity of 9 3 (m/sec)sq The power spectral density of the vertical acceleration due to gusts is examined with and without a gust-alleviation system in operation The gust-alleviation system consisted of wing flaps that were used in conjunction with a vane mounted ahead of the airplane to sense the vertical gust velocity The primary purpose of this study was to examine the change in the effectiveness of the gust-alleviation system when the flap motion is limited in amplitude and rate The alleviation system was very effective if no restrictions were placed on flap motion (rate and amplitude) Restricting the flap amplitude to 0 5 radian did not appreciably change the effectiveness However restricting the flap rate did reduce the gust alleviation and restricting the flap rate to 0 25 rad/sec actually caused the alleviation system to increase the vertical acceleration above that for the no-alleviation situation Based upon this analysis rate limiting appears to be rather significant in gust-alleviation systems designed for passenger comfort Author

N72-18996*# National Aeronautics and Space Administration Flight Research Center Edwards Calif
FLIGHT-DETERMINED CHARACTERISTICS OF AN AIR INTAKE SYSTEM ON AN F-111A AIRPLANE
Donald L Hughes and Harold J Johnson Washington Mar 1972 66 p refs
(NASA-TN-D-6679 H-661) Avail NTIS CSCL 01B

Flow phenomena of the F-111A air intake system were investigated over a large range of Mach number altitude and angle of attack Boundary-layer variations are shown for the fuselage splitter plate and inlet entrance stations Inlet performance is shown in terms of pressure recovery airflow mass-flow ratio turbulence factor distortion factor and power spectral density The fuselage boundary layer was found to be not completely removed from the upper portion of the splitter plate at all Mach numbers investigated Inlet boundary-layer ingestion started at approximately Mach 1 6 near the translating spike and cone Pressure-recovery distribution at the compressor face showed increasing distortion with increasing angle of attack and increasing Mach number The time-averaged distortion-factor value approached 1300 which is near the distortion tolerance of the engine at Mach numbers above 2 1 Author

N72-18997*# Scientific Translation Service Santa Barbara Calif
TRANSONIC TESTING OF THE ENGINE NACELLE AIR INTAKE AND AFTERBODY
J Leynaert Washington NASA Mar 1972 22 p Transl into ENGLISH of Entree d air et arriere-corps de fuseau-moteur en transsonique Rept ONERA-TP-943 ONERA Chantillon France 1971 p 1-11
(Contract NASw-2035)
(NASA-TT-F-14154 ONERA-TP-943) Avail NTIS CSCL 01A

An example is presented of the study of a double-flux engine nacelle at high subsonic Mach numbers The investigation was carried out at high Reynolds numbers with two separate models for the air intake and the afterbody The test on the afterbody shows that the conditions of variable jets do not significantly affect the upstream flow around the nacelle intake and cowl except for the immediate vicinity of the exhaust This fact justifies the large scale study of the air intake with a model supported downstream by a cylindrical tube replacing the jet In the same way mass flow rate variations of the air intake do not influence the flow around the afterbody within given limits This

makes it possible to study the afterbody on an upstream sting The significance and limitations of these studies are discussed in terms of the test results Author

N72-18998*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
PERFORMANCE OF 1380-FOOT-PER-SECOND TIP-SPEED AXIAL-FLOW COMPRESSOR ROTOR WITH BLADE TIP SOLIDITY OF 1 1
David C Janetzke Calvin L Ball and Roy D Hager Washington Mar 1972 90 p refs
(NASA-TM-X-2449 E-6686) Avail NTIS CSCL 20D

The aerodynamic design parameters are presented along with the overall and blade element performance of an axial-flow compressor rotor designed to study the effects of blade solidity on efficiency and stall margin At design speed the peak efficiency was 0 853 and occurred at an equivalent weight flow of 65 7lb/sec The total pressure ratio was 1 68 Design efficiency weight flow pressure ratio and temperature ratio were 0 822 65 3 1 65 and 1 187 respectively Stall margin for design speed was 14 percent based on the weight flows and pressure ratios at peak efficiency and just prior to stall Author

N72-18999# Royal Netherlands Aircraft Factories Fokker Amsterdam
RESULTS OBTAINED BY APPLYING THE KERNEL FUNCTION METHOD TO LINEARIZED SUPERSONIC LIFTING SURFACE THEORY UPON VARIATION OF INPUT PARAMETERS FOR VARIOUS PLATFORMS
A J L R Hasekamp 14 Dec 1971 108 p refs
(X-28-445) Avail NTIS

Results are presented from a program based on the kernel function method in linearized oscillating supersonic lifting surface theory Computed generalized aerodynamic force coefficients are compared with corresponding quantities from several sources of literature For a number of cases dimensionless pressure difference plots are given over lines of the planform under consideration In the same picture these plots can be compared with plots from programs based on analytical methods Author

N72-19000*# Massachusetts Inst of Tech Cambridge Dept of Aeronautics and Astronautics
WIND-TUNNEL SIMULATION OF STORE JETTISON WITH THE AID OF MAGNETIC ARTIFICIAL GRAVITY
Timothy Stephens and Ronald Adams Washington NASA Feb 1972 154 p refs
(Contract NAS1-9812)
(NASA-CR-1955 TR-174) Avail NTIS CSCL 01A

A method employed in the simulation of jettison of stores from aircraft involving small scale wind-tunnel drop tests from a model of the parent aircraft is described Proper scaling of such experiments generally dictates that the gravitational acceleration should ideally be a test variable A method of introducing a controllable artificial component of gravity by magnetic means has been proposed The use of a magnetic artificial gravity facility based upon this idea in conjunction with small scale wind-tunnel drop tests would improve the accuracy of simulation A review of the scaling laws as they apply to the design of such a facility is presented The design constraints involved in the integration of such a facility with a wind tunnel are defined A detailed performance analysis procedure applicable to such a facility is developed A practical magnet configuration is defined which is capable of controlling the strength and orientation of the magnetic artificial gravity field in the vertical plane thereby allowing simulation of store jettison from a diving or climbing aircraft The factors involved in the choice between continuous or intermittent operation of the facility and the use of normal or superconducting magnets are defined Author

N72-19001*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
A WIND-TUNNEL EVALUATION OF ANALYTICAL TECHNIQUES FOR PREDICTING STATIC STABILITY AND CONTROL CHARACTERISTICS OF FLEXIBLE AIRCRAFT
Irving Abel Washington Mar 1972 70 p refs
(NASA-TN-D-6656 L-8105) Avail NTIS CSCL 01A

An experimental evaluation of analytical techniques for predicting certain stability and control characteristics of a large flexible aircraft is presented Analytical methods based on both the model approach and flexibility influence coefficients are developed to predict the aerodynamic characteristics of a flexible airplane These methods are then applied to a flexibly scaled model of a supersonic transport configuration Comparisons of wind-tunnel data calculations based on the model approach and flexibility influence coefficients are presented over the Mach number range from 0 6 to 2 7 An examination of the results obtained from this study indicates that both analytical techniques predict reasonably well the effect of flexibility on the basic longitudinal characteristics and that both techniques give generally comparable results Author

N72-19002*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
ANALYTICAL CORRELATION OF CENTRIFUGAL COMPRESSOR DESIGN GEOMETRY FOR MAXIMUM EFFICIENCY WITH SPECIFIC SPEED
Michael R Galvas Washington Mar 1972 39 p refs
(NASA-TN-D-6729 E-6638) Avail NTIS CSCL 21E

Centrifugal compressor performance was examined analytically to determine optimum geometry for various applications as characterized by specific speed Seven specific losses were calculated for various combinations of inlet tip-exit diameter ratio inlet hub-tip diameter ratio blade exit backsweep and inlet-tip absolute tangential velocity for solid body prewhirl The losses considered were inlet guide vane loss blade loading loss skin friction loss recirculation loss disk friction loss vaneless diffuser loss and vaned diffuser loss Maximum total efficiencies ranged from 0 497 to 0 868 for a specific speed range of 0 257 to 1 346 Curves of rotor exit absolute flow angle inlet tip-exit diameter ratio inlet hub-tip diameter ratio head coefficient and blade exit backsweep are presented over a range of specific speeds for various inducer tip speeds to permit rapid selection of optimum compressor size and shape for a variety of applications Author

N72-19004# Bochum Univ (West Germany) Inst for Thermo-and Fluid Dynamics
INVESTIGATIONS OF THE ROLLING DAMPING OF SLENDER WINGS [UNTERSUCHUNGEN DER ROLLDAEMPFUNG VON SCHLANKEN FLUEGELN]
F Schlottmann Cologne DGLR 1971 20 p refs In GERMAN Presented at the 4th DGLR Annual Meeting Baden-Baden West Ger 11-13 Oct 1971
Avail NTIS

The aerodynamic forces acting upon slender wing configurations in roll were measured in a low speed wind tunnel in order to determine the influence of variation of angle of attack and roll angular velocity It was shown for the delta and square wing models investigated that a nonlinear relationship exists between rolling moment and roll angular velocity and relationship between roll damping and angle of attack The reason for this is the presence of the leading edge separation together with the formation of rolled up vortices over the wing plane The different vortex configurations and the resulting effects on roll damping are discussed and compared with the theory ESRO

N72-19005# Office National d Etudes et de Recherches Aerospatiales Paris (France)
REFLECTIONS OF REGULAR AND SINGULAR SHOCK WAVES APPLICATION TO INTAKES AND TO THE MACH DISC PROBLEM
Pierre Diringer 1971 58 p refs In FRENCH ENGLISH summary
(ONERA-NT-183) Avail NTIS

The reflection of shock waves within two-dimensional or axisymmetric inlets at supersonic speeds is computed using the method of characteristics The singular reflection of shock waves on the axis of axisymmetric flow encountered in jet flows is calculated The flow behind Mach disc is treated both by integral and one-dimensional flow methods Complete calculations of the hypersonic flow in the sonic throat and in the second Mach disc are presented The positions of shock waves slip line and boundary in subcritical jets are computed and confirmed by experimental results ESRO

N72-19006# Salford Univ (England)
THE EFFECT OF CONICAL THICKNESS DISTRIBUTIONS ON THE SEPARATED FLOW PAST SLENDER DELTA WINGS
H Portnoy and S C Russell (Crane Ltd Stockport Engl) London Aeron Res Council 1971 27 p refs Supersedes ARC-32834
(ARC-CP-1189) Avail NTIS HMSO 48 5p PHI $2 15

A method is described for calculating the effects of small conical distributions on the flow past slender delta wings with leading-edge separation Comparisons with limited experimental results indicate that despite the basic inaccuracies of the model some of the thickness effects are predicted Author (ESRO)

N72-19007# Royal Aircraft Establishment Farnborough (England) Aerodynamic Dept
FREE FLIGHT MEASUREMENTS OF PRESSURE AND HEAT TRANSFER ON A BLUNT LEADING-EDGE CARET WING AT DESIGN AND OFF-DESIGN MACH NUMBERS (MACH SUB INFINITY EQUALS 0 9 TO 3 36)
G H Greenwood London Aeron Res Council 1971 46 p refs Supersedes RAE-TR-70129 ARC-32593
(ARC-R/M-3679 RAE-TR-70129 ARC-32593) Avail NTIS HMSO £1 61 PHI $6 25

Pressure and heat-transfer measurements were made in free flight on a caret wing with blunt leading edges and nose at speeds below and above the design Mach number of 2 47 Comparison with data from a corresponding caret wing but with sharp leading edges indicates that the effect of blunting is confined to a region about 2 to 3 leading-edge diameters from the leading edge At M sub infinity greater than 1 5 the data for the blunt leading edges and for the plane lifting surfaces were predicted with reasonable accuracy using easily-applied existing theory A considerable reduction in heating rate was found in the wing junction Author (ESRO)

N72-19008# Technische Hogeschool Delft (Netherlands)
A METHOD TO DERIVE ANGLE OF PITCH FLIGHT-PATH ANGLE AND ANGLE OF ATTACK FROM MEASUREMENTS IN NONSTEADY FLIGHT
R J A W Hosman Apr 1971 107 p refs
(VTH-156) Avail NTIS

A method is described to determine the angle of pitch the flight-path angle and the angle of attack of an aircraft during steady or nonsteady flight These angles are determined by integration of the rate of pitch and the specific forces and not by directly measuring these angles Errors in the estimates of the initial conditions of the integrations and of the zero shifts in the measurements are corrected by comparing the computed and the measured values of the change in altitude and airspeed An error analysis is carried out to determine the accuracy with which the angles of pitch flight path and attack are determined by the described method for steady as well as for nonsteady flight Author (ESRO)

N72-19009# Technische Hogeschool Delft (Netherlands)
THE DETERMINATION OF STABILITY DERIVATIVES AND PERFORMANCE CHARACTERISTICS FROM DYNAMIC MANOEUVRES
O H Gerlach Mar 1971 44 p refs Presented at the 38th Meeting of the AGARD Flight Mech Panel Toulouse 10-13 May 1971
(VTH-163) Avail NTIS

Three frequency ranges of interest to the flight dynamicist are distinguished (1) the low-frequency or phugoid and spiral mode frequency range (2) the intermediate or short-period and Dutch roll frequency range and (3) the high-frequency or elastic modes frequency range Flight tests to determine derivatives in the combined low and intermediate frequencies are described and the importance of accurate measurements and of an adequate frequency content of the input signal in the tests is stressed The rationale behind the choice of the shape of the input signal used is given The application of the derivatives not only for stability and control purposes but also for the determination of performance characteristics is discussed Author (ESRO)

N72-19010# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
NEW RESEARCHES ON SMALL SPAN-CHORD RATIO WINGS WITH LATERAL JETS
E Carafoli and N Camarasescu 22 Oct 1971 21 p refs Transl into ENGLISH from Acad Rep Populare Romine Studii Cercetari Mecan Apl (Bucharest) v 29 no 4 1970 p 947-962
(AF Proj 7343)
(AD 733858 FTD-HC-23-319-71) Avail NTIS CSCL 01/1

The article deals with the lift increase of small span-chord ratio wings with lateral fluid jets in the plane of the wings directed along the span Some theoretical considerations as well as the experimental results obtained in the wind tunnel for a series of wings with different span-chord ratios are presented GRA

N72-19011# Army Foreign Science and Technology Center Charlottesville Va
AERODYNAMIC CALCULATION FOR HELICOPTER LIFTING ROTORS IN VERTICAL DESCENT (VORTEX RING METHOD)
V I Shaidakov Oct 1971 18 p Transl into ENGLISH from Izv Vyssh Ucheb Zaved Aviat Tekhn (USSR) v 10 no 1 1967 p 29-36
(AD-734229 FSTC-HT-23-708-71) Avail NTIS CSCL 01/1

A theoretical study was made of the performance of a lifting helicopter rotor during vertical descent The vortex ring method was used in aerodynamic calculation of lifting systems Author (GRA)

N72-19012# Massachusetts Inst of Tech Cambridge Aeroelastic and Structures Research Lab
SOME RECENT RESEARCH ON AIRFOIL DYNAMIC STALL WITH APPLICATION TO AIRFOIL DESIGN
Norman D Ham Sep 1971 30 p refs
(Contract N00019-70-C-0223)
(AD-734699 ASRL-TR-165-1) Avail NTIS CSCL 01/3

Some recent research on airfoil dynamic stall tentatively defines the boundary-layer flow processes during dynamic stall and suggests an approach to airfoil design for stall delay The effect of changes of airfoil leading-edge radius and camber on increments in maximum lift coefficients is estimated using a simple criterion for leading-edge stall Author (GRA)

N72-19013# Army Foreign Science and Technology Center Charlottesville Va
APPLICATION OF THE RING VORTEX METHOD TO AERODYNAMIC DESIGN OF LIFTING ROTOR SYSTEMS
V I Shaydakov 10 Nov 1971 14 p refs Transl into ENGLISH from Izv Vysshikh Uchebn Zavedenii Aviats Tekhn (Kazan) no 3 1966
(AD-735018 FSTC-HT-23-709-71) Avail NTIS CSCL 01/3

The operation of the lifting rotor during flight with a horizontal velocity component has been the subject of considerable study The ring vortex method is a simplified procedure for accurately determining the aerodynamic characteristics of the lifting rotor The replacement of the vortex cylinder with a system of discrete vortex rings is equivalent to expansion of the vortex cylinder into rings and longitudinal vortices Ignoring the longitudinal vortices is equivalent to ignoring the closure of the stream behind the rotor For low loaded lifting rotors no significant error is thus created GRA

N72-19015# Federal Aviation Administration Washington D C Avionics Branch
EFFECTIVE AVIONICS MAINTENANCE
Robert A Cole 1971 12 p Presented at the 7th Ann FAA Intern Aviation Maintenance Symp Okla City 7-9 Dec 1971
Avail NTIS

Avionics maintenance is discussed in terms of aviation safety The operational factors that work against aviation safety are reviewed and the avionic systems that enable aircraft to operate safely include communication navigation identification and control Four points are emphasized (1) Avionic systems are becoming increasingly important to the operational safety of modern aircraft (2) Flight safety can be improved through effective avionic maintenance (3) Mandatory requirements for periodic maintenance will not be necessary if avionic maintenance is made effective by early detection and correction of malfunctions (4) Training test equipment self-test and built in test equipment can aid in making avionic maintenance more effective F O S

N72-19016# Federal Aviation Administration Washington D C
THE ALTIMETER CREDIBILITY GAP
Hugh R Skinner Jr 1971 72 p Presented at the 7th Ann FAA Intern Aviation Maintenance Symp Okla City 7-9 Dec 1971
Avail NTIS

Altimeter errors and their causes are discussed The sources of altimeter errors include mechanical limitations of the instrument operation and installation errors the use of the standard atmosphere for conversion of pressure into height indications and human error in reading the instrument It is concluded that many errors of the system are inherent and cannot be reduced However if extra effort is made by the user to reduce error factors over which he has control the overall accuracy will be improved F O S

N72-19017# University of Southern Calif Los Angeles Inst of Aerospace Safety and Management
ANALYTICAL TECHNIQUES FOR EFFECTIVE MAINTENANCE
David S Hall and Eugene L Holt 1971 14 p refs Presented at 7th Ann Intern Aviation Maintenance Symp Oklahoma City 7-9 Dec 1971
Avail NTIS

Systems analysis techniques are applied to aircraft maintenance to achieve aviation safety The failure mode analysis method is discussed along with the fault tree analysis method It is concluded (1) The maintenance manager needs to know how to make decisions and that these decisions affect the safety and efficiency of his operation (2) Many of these decisions can be made in advance when time or other pressure is not a factor (3) Greater knowledge of the implications of a decision is available to the individual who approaches each problem systematically (4) Systematic and analytical decision making is within the capability of today s maintenance activity F O S

N72-19019*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
AERODYNAMIC PARAMETERS OF THE NAVION AIRPLANE EXTRACTED FROM FLIGHT
William T Suit Washington Mar 1972 62 p refs
(NASA-TN-D-6643 L-7910) Avail NTIS CSCL 01A

An iterative method which is characterized as a maximum-likelihood minimum-variance technique was used to extract the aerodynamic parameters of a Navion airplane from flight data The purposes were to compare the results with parameters obtained from wind-tunnel tests and with results obtained by analog matching the same data and to develop techniques for application of the parameter extraction program Results from the study showed that the parameter-extraction program can produce aerodynamic parameters which will permit close estimation of the aircraft time histories used in the extraction process The program determined an estimate of the standard deviations of the states and parameters These estimates were used to indicate how well the calculated states fit the flight data and the confidence in the values of the estimated parameters The study also showed that the values of the parameters were affected by the data and mathematical model used during the extraction process Because of the lack of confidence in the parameters extracted by use of some of the sets of data several parameters were estimated by other methods By using a combination of methods a set of parameters which gave a fit to the data was obtained Author

N72-19020# Federal Aviation Administration Washington D C Aeromedical Applications Div
THE PSYCHOSOCIAL RECONSTRUCTION INVENTORY A POSTDICTAL INSTRUMENT IN AIRCRAFT ACCIDENT INVESTIGATION
Robert E Yanowitch Stanley R Mohler and E A Nichols Jan 1972 7 p refs
(FAA-AM-72-2) Avail NTIS

A new approach to the investigation of aviation accidents has recently been initiated utilizing a follow-on to the psychological autopsy This approach the psychosocial reconstruction inventory enables the development of a dynamic retrospective portrait of the pilot-in-command subsequent to an accident Twelve fatal general aviation accidents were studied in this way in 1971 When routine accident investigation data are supplemented by a psychosocial or lifestyle reconstruction a much deeper understanding of the cause of the accident often emerges By increasing pilot insight into the role of emotions and situational stress in accident causation more effective accident prevention programs result Author

N72-19021*# Boeing Co Seattle Wash
STUDY OF AIRCRAFT IN INTRAURBAN TRANSPORTATION SYSTEMS, SAN FRANCISCO BAY AREA
Washington NASA Mar 1972 72 p refs
(Contract NAS2-5969)
(NASA-CR-2006) Avail NTIS CSCL 01B

The nine-county San Francisco Bay area is examined in two time periods (1975-1980 and 1985-1990) as a scenario for analyzing the characteristics of an intraurban commuter-oriented aircraft transportation system Aircraft have dominated the long-haul passenger market for some time but efforts to penetrate the very-short-haul intraurban market have met with only token success Yet the characteristics of an aircraft transportation system speed and flexibility are very much needed to solve the transportation ills of our major urban areas The aircraft intraurban system is a technically feasible alternative to ground transportation systems Although requiring some subsidy it becomes socially viable where substantial commuter traffic exists at ranges of 10 to 15 mi or more and where topographic features constrain ground travel The general problem areas of community noise air traffic congestion ground transportation interface pollution and safety appear to have workable solutions Author

N72-19022*# National Aeronautics and Space Administration Flight Research Center Edwards Calif
LOW-LIFT-TO-DRAG-RATIO APPROACH AND LANDING

STUDIES USING A CV-990 AIRPLANE
Berwin M Kock, Fitzhugh L Fulton and Fred J Drinkwater III Washington Mar 1972 45 p refs
(NASA-TN-D-6732 H-672) Avail NTIS CSCL 01B

The results are presented of a flight-test program utilizing a CV-990 airplane flow in low-lift-to-drag-ratio (L/D) configurations to simulate terminal area operation approach and landing of large unpowered vehicles The results indicate that unpowered approaches and landings are practical with vehicles of the size and performance characteristics of the proposed shuttle vehicle Low L/D landings provided touchdown dispersion patterns acceptable for operation on runways of reasonable length The dispersion pattern was reduced when guidance was used during the final approach High levels of pilot proficiency were not required for acceptable performance Author

N72-19023*# Scientific Translation Service Santa Barbara Calif
EVALUATION OF TAKEOFF AND LANDING PERFORMANCE OF COMMERCIAL STOL AIRPLANES
M Calcara Washington NASA Mar 1972 33 p refs Transl into ENGLISH from Aerotec Missili Spazio (Milan) Apr-Jun 1971 p 113-125
(Contract NASw-2035)
(NASA-TT-F-14166) Avail NTIS CSCL 01C

The basic requirements for commercial STOL airplanes leading to the use of high by-pass ratio turbofans and very advanced high-lift systems are briefly reviewed With the method developed a rapid evaluation of takeoff and landing performance may be made which permits an easy comparison of different configurations The method takes into account safety requirements (speed maneuvering margin critical engine failure at takeoff landing field length factor) passenger comfort and pilot limitations due to human factors (maximum rate of descent near the ground and reaction times) A numerical example illustrates the use of simple graphs which are based on the more important project parameters Author

N72-19024# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt Goettingen (West Germany)
PRESSURE MEASUREMENTS ON HARMONICALLY OSCILLATING WING TAILPLANE CONFIGURATIONS
H Triebstein and J Wagener Aug 1971 71 p refs In GERMAN ENGLISH summary
(DLR-FB-71-54 AVA-FB-7118) Avail NTIS

The results of pressure measurements on harmonically oscillating wing-tailplane configurations in the incompressible speed range are presented The model consists of a variable sweep wing and a horizontal stabilizer Special emphasis is given to the unsteady aerodynamic interfering effects at various wing-tailplane configurations In particular the effects of the wing sweep-back the wing angle of attack and the V-position of the tailplane stabilizer are investigated in detail for several reduced frequencies and longitudinal positions of the wing and tailplane Author

N72-19025*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
NOISE PRODUCED BY A SMALL-SCALE, EXTERNALLY BLOWN FLAP
William A Olsen Robert G Dorsch and Jeffrey H Miles Washington Mar 1972 39 p refs
(NASA-TN-D-6636 E-6662) Avail NTIS CSCL 01B

Noise data were obtained with a model of an externally blown flap of the type that is currently being considered for STOL aircraft The noise caused by impingement of the jet on the flap is much louder than the nozzle jet noise It is especially so directly below the wing The noise level increases as the jet velocity and flap angle are increased The sound power level increased with the sixth power of velocity Several physical variations to the STOL model configuration were also tested Two such variations a large board and a slotless curved plate wing had the same power spectra density (Strouhal number curve) as the model Author

N72-19026*# Southampton Univ (England) Inst of Sound and Vibration Research
HELICOPTER NOISE BLADE SLAP PART 2 EXPERIMENTAL RESULTS
John W Leverton Washington NASA Mar 1972 71 p refs
(Grant NGR-52-025-002)
(NASA-CR-1983) Avail NTIS CSCL 01B

Blade slap encountered in rotary wings and its effect on helicopter performance are reported The results of various individual flight tests are presented and where possible correlated with one another Observations from the subjective evaluation of blade slap are included together with a modified form of the blade slap factor (BSF) which can be used as a design criteria Author

N72-19027*# National Aeronautics and Space Administration Washington D C
FLIGHT RESEARCH CENTER, EDWARDS, CALIFORNIA FINAL ENVIRONMENTAL IMPACT STATEMENT
18 Aug 1971 12 p
(PB-202054-F NASA-TM-X-67617) Avail NTIS CSCL 14B

This is an institutional environmental impact statement relating to the overall operation of the NASA Flight Research Center The Center is located in Kern County California approximately 100 miles northeast of Los Angeles Flight activities relate primarily to areas in the vicinity of Los Angeles Kern Inyo and San Bernardino counties in Southern California and to areas in Southern Nevada (principally Nye and Clark counties Operations of the Flight Research Center have a very negligible impact on the environment and they are planned and controlled to eliminate or minimize effects on water air and noise Author (GRA)

N72-19028# National Transportation Safety Board Washington D C
AIRCRAFT ACCIDENT REPORT DOWNEAST AIRLINES SCHEDULED AIR TAXI PIPER PA-31, N595DE, AUGUSTA STATE AIRPORT, AUGUSTA MAINE, 19 AUGUST 1971
19 Sep 1971 20 p
(NTSB-AAR-72-6) Avail NTIS

On August 19 1971 a scheduled air taxi flight utilizing a Piper PA-31 crashed about 4 miles short of Augusta State Airport Augusta Maine while attempting an approach The approach was being made in instrument conditions Augusta State Airport is served by a VOR with DME capabilities requiring a nonprecision VOR appraoch The weather conditions were above minimums but required an instrument approach The pilot and two passengers were fatally injured two passengers received serious injuries and three passengers received minor injuries The probable cause of this accident was the improper action of the pilot in discontinuing the execution of a nonprecision instrument approach and attempting to maintain visual flight while operating in instrument flight conditions at an altitude below the level of obstructing terrain Author

N72-19029*# Aeronautical Research Associates of Princeton Inc N J
CROSS-SPECTRAL FUNCTIONS BASED ON VON KARMAN'S SPECTRAL EQUATION
John C Houbolt and Asim Sen Washington NASA Mar 1972 19 p refs
(Contract NAS1-9200)
(NASA-CR-2011 Rept-159) Avail NTIS CSCL 01B

Cross-spectral functions for the vertical and longitudinal components of turbulence of a two-dimensional gust field are derived from the point correlation function for turbulence due to von Karman Closed form solutions in terms of Bessel functions of order 5/6 and 11/6 are found An asymptotic expression for

large values of the frequency argument and series results for small values of frequency are also given These results now form the base for studying the effect of spanwise variations in turbulence for a turbulence environment which is characterized by the von Karman isotropic spectral relations Previous studies were based mainly on the Dryden-type spectral representation
Author

N72-19030# Motoren-Und Turbinen-Union Muenchen G m b H (West Germany)
ENVIRONMENTAL EFFECTS OF TURBOJET ENGINES [DIE UMWELTWIRKUNGEN VON TURBOFLUGTRIEBWERKEN]
N K H Scholz 1971 37 p refs In GERMAN Presented at the 4th DGLR Annual Meeting Baden-Baden West Ger 11-13 Oct 1971
Avail NTIS

A survey is presented of environmental pollution produced by turbojet aircraft engines The environmental effects are treated systematically and are subdivided into thermal noise and air pollution Comparisons are made with other known pollutants It is shown that noise generation is the hardest problem in turbine engine construction Noise reduction is technically feasible but at the expense of power weight volume and costs Cooperation between aircraft industry and basic research is found to be necessary ESRO

N72-19031# Max-Planck-Institut fuer Stromungsforschung Gottingen (West Germany)
ANNOYANCE OF THE SURROUNDINGS CAUSED BY JET AIRCRAFT TRAFFIC NOISE [LAERMBELAESTIGUNG DER UMWELT DURCH DEN STRAHLFLUGVERKEHR]
G Zimmermann Cologne DGLR 1971 27 p refs In GERMAN Presented at the 4th DGLR Annual Meeting Baden-Baden West Ger 11-13 Oct 1971
Avail NTIS

A survey is presented of commercial jet aircraft noise problems and possible ways to minimize these in the vicinity of airports Quantization measures of noise such as perceived noise level are discussed and the Q-formula developed for Germany is given Possible means of engine noise reduction such as bypasses are shown The noise situation in the vicinity of an airport is investigated noting noise abatement profiles to reduce annoyance A recent German law to limit aircraft noise is mentioned ESRO

N72-19032# Royal Aircraft Establishment Bedford (England) Aerodynamics Dept
AN INVESTIGATION OF THE PRESSURE DISTRIBUTIONS ON A 45 DEGREE SWEPT HALF WING, INCLUDING THE EFFECTS OF UPPER SURFACE SPOILERS
M D Dobson London Aeron Res Council 1971 95 p refs Supersedes RAE-TR-68118 ARC-31187
(ARC-CP-1184 RAE-TR-68118 ARC-31187) Avail NTIS HMSO £1 25 PHI $4 90

Pressure measurements flow visualization tests and force measurements were made on 45 deg swept half wings to examine the flow conditions which prevail particularly in relation to the effectiveness of an upper surface spoiler as a roll control Tests were made on 1/10 scale half-models in the 3ft x 3ft wind tunnel over a Mach number range 0 5 to 0 9 The wing flow is characterized by attached flow at low incidence and then at 4 deg to 5 deg the occurrence of leading edge separation near the tip and consequent formation of an upper surface vortex As incidence is increased the separation point moves inboard and the vortex strength increases An unvented spoiler on the upper surface of the wing is effective under attached flow conditions but loses effectiveness as it comes under the influence of vortex flow Venting the spoiler reduces its effectiveness under attached flow conditions but increases its effectiveness under vortex flow conditions Author (ESRO)

N72-19033# Glasgow Univ (Scotland) Dept of Aeronautics and Fluid Mechanics
EXPERIMENTAL INVESTIGATION OF A HIGH-LIFT LOW-DRAG AEROFOIL
F H Kelling London Aeron Res Council 1971 37 p refs Supersedes ARC-30983
(ARC-CP-1187 ARC-30983) Avail NTIS HMSO 60p PHI $2 55

One of a series of low-drag airfoils designated GU 25-5(11)8 was selected for low speed wind tunnel testing at Reynolds numbers around half a million Coefficients of lift drag and pitching moment were obtained for a range of incidence using a two-dimensional wing The maximum section lift coefficient obtained was 1 93 and the minimum profile drag coefficient was 0 0112 Results compared favorably with those deduced theoretically The addition of a boundary layer trip to the upper surface caused the profile drag to decrease at some incidences At the design lift coefficient of 1 4 the ratio of lift to profile drag was 108 at a Reynolds number of 0 63 million The addition of an extended sealed flat-plate flap with a chord one tenth that of the airfoil at the trailing edge of the airfoil gave favorable results Author (ESRO)

N72-19034# Royal Aircraft Establishment Farnborough (England) Aero Dept
AN APPROXIMATE ANALYSIS OF THE NON-LINEAR LATERAL MOTION OF A SLENDER AIRCRAFT (HP 115) AT LOW SPEEDS
A Jean Ross and L J Beecham London Aeron Res Council 1971 34 p refs Supersedes RAE-TR-70085 ARC-32345
(ARC-R/M-3674 RAE-TR-70085 ARC-32345) Avail NTIS HMSO £1 25 PHI $4 90

An approximate analytical method is developed for the solution of a fourth order nonlinear equation of motion from which the frequency and amplitude of a sustained oscillation may be derived The criterion for the existence of the limit cycle is a modified form of Routh s discriminant its sign and the sign of its derivative with respect to the square of the instantaneous amplitude Comparisons at spot points show excellent agreement with exact digital computations The method was applied to the lateral motion limit cycle encountered at low speeds on the HP 115 aircraft, and comparisons with the results of wind tunnel dynamic simulations show that the onset and nature of the sustained oscillation is predicted Author (ESRO)

N72-19035# Bristol Univ (England) Dept of Aeronautical Engineering
RESEARCH INTO SLUSH DRAG, WHEEL SPRAY AND AQUAPLANING AT BRISTOL UNIVERSITY USING SMALL PNEUMATIC TYRES
R V Barrett London Aeron Res Council 1971 19 p refs Supersedes ARC-32355
(ARC-R/M-3682 ARC-32355) Avail NTIS HMSO 68 p PHI $2 95

The principle results and conclusions of research into slush drag wheel spray and aquaplaning using a moving runway and water layer model test facility are described The method has proved a valuable compliment to full scale research into these problems Suggestions for future research are made
Author (ESRO)

N72-19036# Transportation Systems Center Cambridge Mass
LINEARIZED MATHEMATICAL MODELS FOR DE HAVILLAND CANADA BUFFALO AND TWIN OTTER STOL TRANSPORTS
R A MacDonald (Service Technol Corp Cambridge Mass) Mel Garelick and J Grady Jun 1971 113 p refs
(AD-733756 DOT-TSC-FAA-71-8) Avail NTIS CSCL 01/3

Linearized six degree of freedom rigid body aircraft equations of motion are presented in a stability axis system Values of stability derivatives are estimated for two representative STOL aircraft the DeHavilland of Canada Buffalo and Twin Otter

These estimates are based on analytical expressions included in the report The combination of the equations of motion and the estimated stability derivatives provides an aircraft model which is useful for Navigation Guidance and ATC Studies Resulting transient responses to control inputs are presented GRA

N72-19037# Office of Air Force History Washington D C
UNITED STATES AIR FORCE HISTORY AN ANNOTATED BIBLIOGRAPHY
Mary Ann Cresswell and Carl Berger comps 1 Oct 1971 111 p refs
(AD-733892) Avail NTIS CSCL 01/3

Reports of American aircraft events at Fort Myer Virginia in 1908 and published extensively in the United States and Europe marked the beginning of an immense flood of literature about military aviation and aviators and air deeds in war and peace This annotated bibliography on U S Air Force history is a sampling of that literature prepared primarily for the student and scholar GRA

N72-19038# United Aircraft Corp Stratford Conn Sikorsky Aircraft Div
FULL-SCALE WIND TUNNEL INVESTIGATION OF THE ADVANCING BLADE CONCEPT ROTOR SYSTEM *Final Report*
Vincent Paglino and Edward A Beno Aug 1971 830 p refs
(Contract DAAJ02-67-C-0102 DA Proj 1F1-62203-A-143)
(AD-734338 SER-50705 USAAMRDL-TR-71-25) Avail NTIS HC $9 00/MF $0 95 CSCL 01/3

A 40-foot-diameter ABC (coaxial) rotor system was tested in a 40 ft x 80 ft wind tunnel The six rigid blades were instrumented to measure flatwise edgewise and torsional strain Advance ratios up to 0 91 and tip Mach numbers to 0 83 were tested Lateral displacement of individual rotor lift was varied The performance control stress and vibration data recorded during these tests are presented and discussed Author (GRA)

N72-19039# Boeing Co Philadelphia Pa Vertol Div
THE 1/3 SCALE V/STOL CYCLIC PITCH PROPELLERS RESULTS OF WIND TUNNEL TESTS Test Report, Nov - Dec 1970
Edward Widmayer and J Tomassoni Feb 1971 168 p refs
(Contract F33615-70-C-1000 AF Proj 698BT)
(AD-734237 D170-10040-1 AFFDL-TR-71-91-Ref-5) Avail NTIS CSCL 01/3

The report presents the results of a wind tunnel test performed in the Boeing-Vertol wind tunnel on a 1/3 scale V/STOL 4-bladed cyclic pitch propeller having a total activity factor of 640 The propeller was tested as both an isolated propeller and as an installed propeller The primary objectives of the test were to determine the effectiveness of cyclic pitch control for longitudinal control during hover and transition the change in power required for cyclic pitch control and blade and hub loads for use in design and for verification of analytical methods Author (GRA)

N72-19040# Boeing Co Philadelphia Pa Vertol Div
FOUR PROP TILT WING WITH CYCLIC PITCH PROPELLERS RESULTS OF FULL SPAN WIND TUNNEL TEST/PHASE 2
Charles E Kolesar Jun 1971 299 p refs
(Contract F33615-70-C-1000 AF Proj 698BT)
(AD-734236 D170-10039-1 AFFDL-TR-71-91-Ref-4) Avail NTIS CSCL 01/3

The report presents the results of wind tunnel test BVWT 067 the Phase II test of a two phase test program performed in the Boeing-Vertol V/STOL wind tunnel on a powered four prop tilt wing full span model equipped with cyclic pitch propellers for longitudinal control Items evaluated through transitional flight include cyclic pitch effectiveness descent performance with cyclic pitch inputs the effect of cyclic on longitudinal and lateral/directional stability plus the influence of cyclic action on the effectiveness of the aircraft surface controls (stabilizer for longitudinal trim and differentially deflected flaps/spoiler for roll/yaw control) An in-ground effect investigation with a moving ground plane was also conducted to establish the influence of the ground on cyclic pitch effectiveness and on stability characteristics with cyclic pitch inputs Author (GRA)

N72-19041# Army Edgewood Arsenal Md
AN ANALYSIS OF THE DYNAMIC AND AERODYNAMIC PERFORMANCE OF A SELF-DEPLOYING ARTICULATED AUTOROTOR DECELERATOR
Miles C Miller Oct 1971 192 p refs
(AD-734309 EA-SP-100-108) Avail NTIS CSCL 01/3

The articulated autorotor decelerator is a device intended to provide retardation and stability to air delivered stores This unique device combining aerodynamics dynamics and gyroscopics shows promise of having a significant potential in the decelerator field Limited wind tunnel tests using small models indicate that this device gives the largest drag coefficient based on solidity factor and tip speed ratio considerations of any known decelerator including parachutes Author (GRA)

N72-19042# Northrop Corp Hawthorne Calif Aircraft Div
STUDY/TEST PROGRAM TO EVALUATE THE EFFECTS OF HIGH TEMPERATURE HYDRAULIC FLUID ON T-38 CONTROL SURFACE SERVOVALVES
R A Bartens and L J Mitts Dec 1971 214 p
(AD-734259 NOR-71-217) Avail NTIS CSCL 01/3

The test program included the following objectives Conduct temperature survey on an instrumented T-38 aircraft including a malfunction pump condition Determine pilot corrective procedure Simulate aircraft thermal environment on Northrop Hydraulic System Test Stand Establish repeatable test techniques Test servovalves having lap leakages of 3 15 and 40 cc/min - approximately four valves Correlate valve spool force and control stick force to lap leakage variation Rework tight valves and retest to verify lap leakage criteria GRA

N72-19043# Honeywell Inc Minneapolis Minn Government and Aeronautical Products Div
THREE-AXIS FLUIDIC STABILITY AUGEMENTATION SYSTEM Flight Test Report, 1 Jan - 17 Dec 1970
Mark E Ebsen Harvey D Ogren and Donald H Sotanski Fort Eustis Va Army Air Mobility Res and Develop Lab Sep 1971 176 p
(Contract DAAJ02-70-C-0017)
(AD-734343 Rept-21476-FR USAAMRDL-TR-71-34) Avail NTIS CSCL 01/3

The report covers the flight test of a three-axis hydrofluidic stability augmentation system for a UH-1-type helicopter The design goal was to improve the performance of the aircraft without stabilizer bar in the speed range of 60 to 120 kn The system was installed in a UH-1C helicopter The helicopter s hydraulic power supply was used to power the FSAS controllers and servoactuators The system improved the performance of the UH-1C helicopter in all three axes by increasing the damping increasing the phugoid mode period and producing a constant vehicle rate proportional to cyclic stick input Author (GRA)

N72-19044# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
AVIATION IN THE LAND OF SOVIETS
Janusz Babiejczuk and Jerzy Grzegorzewski 23 Sep 1971 437 p Transl into ENGLISH of Lotnictwo Kraju Rad Warsaw 1969 p 1-387
(AD-734069 FTD-HC-23-04-71) Avail NTIS HC $6 00/MF $0 95 CSCL 01/2

The book deals with Soviet civilian aviation The first historical chapter presents the story of Russian and Soviet

aviation both military and civilian Subsequent chapters deal with current work of Aeroflot in passenger communication agricultural aviation and medical and special applications More interesting achievements in sports aviation are given design teams working for the needs of civilian aviation are introduced and the aviation industry and some specific plants manufacturing planes and equipment for civilian aviation are described
Author (GRA)

N72-19046# Honeywell Inc Minneapolis Minn Systems and Research Div
VP OPTIMUM FLIGHT PATH Final Report, 1 Nov 1970 31 Aug 1971
Nelson R Zagalsky and Robert P Irons Sep 1971 106 p refs
(Contract N00014-71-C-0138 NR Proj 213-080)
(AD-734167 Rept-12648-FR) Avail NTIS CSCL 01/2

Time optimal trajectories for the P-3C ASW aircraft are developed The optimization program is based on the use of the Energy State Approximation and a unique graphical construct Certain features of the program are verified by comparison to NATOPS manual flight test results while verification of the actual time savings reported requires implementation of a recommended flight test program This study establishes that flight path optimization procedures and a minimal data base can now be used in improving operational performance For the P-3C application, increases in the average transit speeds of up to 70 knots were demonstrated GRA

N72-19047# Boeing Co Philadelphia Pa Vertol Div
CYCLIC PITCH CONTROL ON A V/STOL TILT WING AIRCRAFT Final Report, Mar 1970 - May 1971
Charles E Kolesar Wright-Patterson AFB Ohio AFFDL Oct 1971 115 p refs
(Contract F33615-70-C-1000 AF Proj 698BT)
(AD-734068 D210-10353-1 AFFDL-TR-71-91) Avail NTIS CSCL 01/3

The report presents the key results of a model wing tunnel test program that was directed towards investigating the use of cyclic pitch propellers as the low speed longitudinal control system of a four propeller V/STOL tilt wing transport-type aircraft The almost linear pitch control effectiveness of this system through transitional flight and in-ground effect along with the correlation with theory is discussed and the moderate power increase associated with its use is shown Author (GRA)

N72-19048# United Aircraft Corp East Hartford Conn
VORTEX SHEDDING NOISE OF AN ISOLATED AIRFOIL Final Report, 30 Jun 1969 - 28 Dec 1971
Robert W Paterson Paul G Vogt Martin R Fink and C Lee Munich Dec 1971 121 p refs
(Contract DA Proj 200-61102-B-33-G)
(AD-734433 K910867-6 AROD-8726-1-E) Avail NTIS CSCL 20/1

The purpose of the study was to determine the vortex shedding noise characteristics of isolated airfoils in a Reynolds number range applicable to full-scale helicopter rotors Measurements of far-field noise airfoil surface pressure fluctuations and correlation coefficients were obtained for three airfoils Two models of differing thickness were tested as two-dimensional models (NACA 0012 and 0018 airfoils) and the third has a span of half the tunnel width (NACA 0012 airfoil) Airfoil vortex shedding noise was found to be discrete rather than broadband The frequency dependence of this noise on velocity and chord was found to be well predicted by a constant Strouhal number near 0 2 referenced to laminar wake thickness at the airfoil trailing edge The presence of a laminar boundary layer on the pressure surface of the airfoils was found to be critical to the presence of vortex shedding noise Author (GRA)

N72-19049# Tactical Air Command Langley AFB Va Office of Operations Analysis
BIRD STRIKES IN LOW LEVEL CRUISE FLIGHT
Robert R Graham Dec 1971 27 p refs
(AD-734803 TAC-OA-WP-71-23) Avail NTIS CSCL 01/2

A study of the overall efforts directed at reducing the probability of bird strikes showed that most of the activity has been concentrated on reducing those occurrences within the vicinity of airfields An analysis of the limited available data pertaining to low level cruise flight indicates that the probability of a collision with a large bird would be reduced somewhat if the spring and fall migratory bird flyway routes and wintering areas could be avoided Author (GRA)

N72-19050# Naval Postgraduate School Monterey Calif
A LITERATURE SURVEY OF THE PROBLEM OF AIRCRAFT SPINS M S Thesis
Arne Edward Johnson Sep 1971 67 p refs
(AD-734976) Avail NTIS CSCL 01/2

The prediction of aircraft spin characteristics has defied complete scientific analysis There are however a number of research techniques which have been utilized in attempts to understand the mechanism of spin This paper presents a survey of the literature dealing with spin research and its application to a wide variety of aircraft designs over the period 1916 to 1971
Author (GRA)

N72-19051# Honeywell Inc St Paul Minn Systems and Research Center
IRF STEEP ANGLE APPROACH EFFECTS OF WIND, SYSTEM DATA RATE, AND CONTINGENCY EVENT VARIABLES Final Report, Jul 1970 - Aug 1971
James D Wolf and Mike F Barrett Dec 1971 266 p refs
(Contract N00014-68-C-0191 NR Proj 213-061)
(AD-734702 Rept-12571-FR3 JANAIR-711105) Avail NTIS CSCL 01/2

The primary objective of the study was to investigate by means of real-time man-in-the-loop simulation techniques piloting performance as influenced by wind system data-rate and contingency-event variables during IFR steep approaches with vertical-lift aircraft By also simultaneously evaluating effects of display-format approach-angle and measurement-noise variables to the extent possible within the scope of each study task an increased degree of generality of study results was obtained A variable-velocity simulation of the Bell UH-1 helicopter served as the test vehicle in all study tasks Author (GRA)

N72-19052# National Transportation Safety Board Washington D C
AIRCRAFT ACCIDENT REPORT SOUTHERN AIRWAYS, INCORPORATED, DOUGLAS DC-9-15, N92S GULFPORT, MISSISSIPPI, 17 FEBRUARY 1971
1 Sep 1971 21 p
(PB-204111 NTSB-AAR-71-14) Avail NTIS CSCL 01B

On February 17 1971 at approximately 0809 CST a Southern Airways Douglas DC-9-15 N92S struck an electric transmission line static cable during a VOR approach to Runway 31 at the Gulfport Mississippi Municipal Airport A successful missed approach was accomplished and the aircraft landed at Gulfport The aircraft received substantial damage There was no fire The probable cause of the accident was inadequate monitoring of the approach Author (GRA)

N72-19053# Naval Aerospace Medical Inst Pensacola Fla
ORIENTATION-ERROR ACCIDENTS IN REGULAR ARMY AIRCRAFT DURING FISCAL YEAR 1968 RELATIVE INCIDENCE AND COST
Jorma I Niver W Carroll Hixson and Emil Spezia 8 Sep 1971 45 p refs Prepared in cooperation with Army Aeromed Res Lab Fort Rucker Ala

(AD-735119 NAMRL-1143 USAARL-72-4) Avail NTIS CSCL 01/2

The report is the second in a longitudinal series of reports dealing with the pilot disorientation/vertigo accident problem in Army fixed wing and rotary wing flight operations Incidence and cost data presented for fiscal year 1968 include a total of 75 major and minor orientation-error accidents (26 of which were fatal) resulting in 91 fatalities 75 nonfatal injuries and an over-all aircraft damage cost of $12 381 805 The contribution of rotary wing accidents to these totals was 66 accidents (21 of which were fatal) resulting in 80 fatalities 70 nonfatal injuries and an over-all aircraft damage of $9 077 065 Author (GRA)

N72-19054# Army Test and Evaluation Command Aberdeen Proving Ground Md

AIRCRAFT OPERATIONAL AND PERFORMANCE CHARACTERISTICS

1 Nov 1971 11 p refs

(AMCR Proj 310-623)

(AD-734850 MTP-7-3-520) Avail NTIS CSCL 01/3

The report describes a method for evaluation of Army aircraft operational and performance characteristics and provides procedures for test preparation weight balance personnel training operational and performance characteristics weather effects human factors and safety Author (GRA)

N72-19062# Aeronautical Research Council (Gt Brit) Auxiliary Power Systems Div

A FEASIBILITY STUDY ON A 200 VOLT, DIRECT CURRENT, AIRCRAFT ELECTRICAL POWER SYSTEM

1971 50 p refs Supersedes RAE-TR-70012 ARC-32640

(ARC-CP-1186 RAE-TR-70012 ARC-32640) Avail NTIS HMSO 90p PHI $3 65

For comparative purposes a 200 volt dc system for a large modern commercial aircraft has been designed and its weight compared with that of a conventional three-phase ac system To obtain necessary design information studies have been made of a 50 kW brushless dc generator the problem of circuit interruption conversion equipment and brushless motors The vulnerability of the system due to the possibility of sustained arcs during fault conditions has also been examined It is concluded that until considerable weight reduction can be p 1345-1351

(NRC-TT-1525) Avail NTIS

Hydrogen overvoltage on lead electrodes between 0 1 and 4000 A/sq m was investigated in sulfamic acid and in potassium and calcium sulfamate solutions Results show that increasing the current density the measurements with solutions containing K(+) or Ca(2+) have at first absolute overvoltage values smaller and afterwards greater than those in acid solution Increasing the current density even more a value is reached at which the solutions containing K(+) or Ca(2+) show a sudden increase in the overvoltage value Author

N72-19065# Static Power Inc Newport Beach Calif

FEASIBILITY STUDY TO DEVELOP A dc LINK VSCF SYSTEM Final Report

Reinhold Braum and Jerome B Murray Sep 1971 204 p

(Contract F33615-68-C-1686 AF Proj 3145)

(AD-734067 AFAPL-TR-71-64) Avail NTIS CSCL 10/2

The Static Power Division of Gates Learjet Corporation proposed to the Air Force to design and build a variable speed constant frequency (VSCF) inverter system using the DC link approach This approach has certain inherant advantages over mechanical systems which are now in common use in the aircraft or over other electronic inverter systems which do not employ the DC link principle An electrical breadboard was constructed and tested The program has shown that a DC link VSCF system offer superior electrical characteristics It was also learned that it is extremely difficult to package the system within the small weight and volume required to make it attractive for aircraft use Author (GRA)

N72-19102*# BioTechnology Inc Falls Church Va

HUMAN FACTORS ASPECTS OF AIR TRAFFIC CONTROL

Harry J Older and Bernard J Cameron Washington NASA Feb 1972 172 p refs

(Contract NAS1-9125)

(NASA-CR-1957) Avail NTIS CSCL 05E

An overview of human factors problems associated with the operation of present and future air traffic control systems is presented A description is included of those activities and tasks performed by air traffic controllers at each operational position within the present system Judgemental data obtained from controllers concerning psychological dimensions related to these tasks and activities are also presented The analysis includes consideration of psychophysiological dimensions of human performance The role of the human controller in present air traffic control systems and his predicted role in future systems is described particularly as that role changes as the result of the system s evolution towards a more automated configuration Special attention is directed towards problems of staffing training and system operation A series of ten specific research and development projects are recommended and suggested work plans for their implementation are included Author

N72-19106# School of Aerospace Medicine Brooks AFB Tex

AEROMEDICAL REVIEWS GRADES OF DECOMPRESSION SICKNESS IN UNPRESSURIZED AIRCRAFT

Thomas H Allen Jun 1971 26 p refs

(AD-731118 SAM-Review-4-71 SAM-TR-71-26) Avail NTIS CSCL 06/19

The purpose of this study is to show with available evidence how to set forth the incidence of the several grades of bends that could arise, persist and perhaps influence the success of sorties at altitudes above 20 000 ft Author (GRA)

N72-19123# Institute of Aviation Medicine Fuerstenfeldbruck (West Germany)

AIRCRAFT ACCIDENT INJURIES AND AIRCRAFT ACCIDENT RECONSTRUCTION c02

S Krefft *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 11 p refs

Avail NTIS HC $6 00/MF $0 95

The development and mechanics of injuries to aircraft passengers are examined The reconstructive conclusions with respect to the sequence of events that can be drawn from the type appearance location extent and severity of the external and internal injuries sustained by the crash victims are discussed Investigations are used to illustrate that owing to the injuries suffered in an aircraft accident the crash victims can bear silent witness and not only provide important clues but solid evidence permitting a reconstruction of the sequence of events Author

N72-19129# Army Board for Aviation Accident Research Fort Rucker Ala

ANALYSIS OF US ARMY HELICOPTER ACCIDENTS TO DEFINE IMPACT INJURY PROBLEMS c02

Joseph L Haley Jr *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 13 p refs

Avail NTIS HC $6 00/MF $0 95

An overall view of the occupant injury experience in U S Army helicopters from January 1967 through December 1969 is presented These data show that 40 percent of all occupant fatalities occurred in survivable accidents This percentage shows the need for further improvement of helicopter crashworthiness The statistics further indicated that fire was the single largest fatality cause with head injuries next in rank A group of severe but survivable helicopter accidents of the same time period was studied The study included three types of Army helicopters Study results indicated that the problem of postcrash fire fatalities was more severe in the utility and cargo helicopters It was also shown that potentially hazardous displacement of the transmission and main rotor blades occurred in one of every three utility and cargo helicopter accidents studied Further a roll about the long axis usually occurred At least one roll occurred in

2 of 3 light observation helicopter accidents 5 of 8 utility helicopter accidents and 1 of 2 cargo helicopter accidents The tendency to roll highlights the need to consider sideward occupant restraint and transmission/rotor blade moorings in these helicopters Author

N72-19141# Hughes Tool Co , Culver City Calif Aircraft Div
DESIGNING HELICOPTERS FOR IMPROVED CRASH SURVIVABILITY c02
Henry G Smith *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 14 p refs
Avail NTIS HC $6 00/MF $0 95

The fundamental theory for providing attenuation of the crash impact is reviewed with emphasis upon understanding the relationship of the fundamental parameters of the problem Based upon operating statistical data in regard to potentially survivable crashes along with engineering studies of any new helicopter design design objectives can be established for the level of crash protection to be provided for the occupants In problems of this type a tradeoff always exists between size and weight penalties incurred for crash survivability versus the value of that same amount of size or weight for performance payload armor or armament Methods of attenuating or absorbing the crash impact in a gradual manner are the key to the provision of high crash protection levels while imposing minimum weight penalties upon the helicopter Operating experience confirms that improved helicopter crash survivability can actually be obtained in a military operational environment In addition to the improvement of survivability improved morale of the crew members was a side benefit The current trends of crash protection for new helicopter designs are discussed with implications of further improvement from the crash survivability standpoint in future helicopters Author

N72-19144# Deputy Inspector General for Inspection and Safety (Air Force) Norton AFB Calif
OPERATIONAL ASPECTS OF FORCES ON MAN DURING EJECTION/EXTRACTION ESCAPE IN THE US AIR FORCE, 1 JANUARY 1968 - 31 DECEMBER 1970
Robert H Shannon *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 8 p
Avail NTIS HC $6 00/MF $0 95

A study of 468 ejections in the United States Air Force (USAF) reported during the period 1 January 1968 to December 1970 disclosed that one in nine crew members involved received major or fatal injuries as a result of forces encountered from system initiation to parachute opening In 49 cases the injuries received were classified as major (nonfatal) and three crew members were fatally injured The majority of the major injuries were attributed to the initial forces of ejection and were primarily compression fractures of the vertebral column These injuries continue to occur with consistent frequency in spite of the fact that the maximum accelerations of the catapults in use today are well below human tolerances The major factors which influence the incidence of ejection force injuries are the type catapult used ejection posture and age of the individual involved Of the three ejection posture appears to be the single most critical factor The correlation of the individual s weight by type catapult was not remarkable The frequency of injuries attributed to G-forces showed a significant increase over previous studies of USAF ejection escape experience Although the incidence of high speed ejections has increased only slightly G-force injuries occurred in 4 percent of all nonfatal ejections and accounted for 12 percent of the total major injuries Author

N72-19147# Royal Aircraft Establishment Farnborough (England) Human Engineering Div
BLAST TESTING AIRCREW ESCAPE EQUIPMENT INCLUDING AN ACCOUNT OF A NEW TRANSONIC TEST FACILITY
J M Rayne *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 8 p refs
Avail NTIS HC $6 00/MF $0 95

The design of a facility and its performance in determining the effectiveness of aircrew equipment to air blasts up to Mach 1 3 are discussed In this device the air speed decay profile is programmed and can be made to simulate a range of post ejection conditions from sea level to altitude Tests on a protective helmet demonstrate that it will probably be practicable to give head protection up to about 700 kt at sea level However failures of the visor which have occurred show that explosive disintegration of the whole helmet follows at air speeds from 600 kt upwards Helmet and visor failures usually occur within 100 msec of exposure and the blast effect can be regarded as an impact In testing helmets therefore the total duration of exposure to severe blast does not appear to be important On the other hand fabric is destroyed by the effects of flutter and the extent of damage seems to be time dependent Therefore in testing fabric protective equipment the shape of the air flow decay curve may well be important Author

N72-19149# Hellenic Air Force General Hospital Athens (Greece) Orthopaedic Dept
SOME OBSERVATIONS ON COMPRESSION FRACTURES OF THE SPINE IN EJECTED GREEK PILOTS c04
Pan P Symeonides *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 3 p refs
Avail NTIS HC $6 00/MF $0 95

The causes of compression fractures in Greek pilots during the decade 1960-1969 were investigated Resumption of duties by pilots with such fractures was studied It was found that 18 percent of the ejected pilots sustained compression fractures of the spine All fractures occurred during ejection and were located at the dorsolumbar region of the spine (T10 to L3) There was sufficient evidence that excessive tightening of the ejection seat belts (shoulder-buttocks) produces a permanent flexion of the spine which thus becomes more vulnerable during ejection If the wedging of a vertebra following a fracture does not exceed 1/3 of the height of the vertebral body and the symptoms are mild enough the pilot may return to the active service as jet pilot If wedging is greater than 1/3 he should not resume his previous duties either as jet or helicopter pilot because the created local kyphosis of the spine renders the neighboring vertebrae more vulnerable Author

N72-19150# Civil Aeromedical Inst Oklahoma City Okla Protection and Survival Lab
DESIGN CONSIDERATIONS FOR IMPACT TEST FACILITIES c11
Richard F Chandler *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 10 p refs
Avail NTIS HC $6 00/MF $0 95

With the advent of World War 2 pilot shortage necessitated scientific investigation of the causes of crash injury These early investigations made use of a variety of test facilities including swing seats acceleration towers drop towers acceleration tracks and deceleration tracks The facilities served as a basis for similar devices in use today The purpose of these facilities is to produce a controlled impact representative of an actual crash Good simulation of the magnitude of acceleration changes is possible on these facilities but none provide exact replication of the change in acceleration direction which is experienced in a crash Author

N72-19155# National Bureau of Standards Washington D C
THE MATHEMATICS OF IMPACT AND CRASH TESTS OF AIRPLANE AIRBAG RESTRAINT SYSTEMS
Carl C Clark *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 8 p refs
Avail NTIS HC $6 00/MF $0 95

The r sub x g sub y and g sub z linear acceleration and r dot sub x r dot sub y and r dot sub z angular acceleration terminology (the latter representing radians/sec sq) is reviewed It is urged that the representation of human acceleration environments by accelerometers be filtered to be flat (with less than 0 5 db variation) in response from 0 to 240 Hertz and then

attenuated above 240 Hz at 12 db per octave in preference to the more common representation by ac accelerometers (flat from about 10 to 2000 Hertz) This latter representation often obscures biologically important accelerations in metal ringing spikes Illustrations are drawn from crash studies of airplane airbag restraint systems and from mathematical representations of passenger compartment loads for automobile crashes of various types Author

N72-19157# Aerospace Medical Research Labs Wright-Patterson AFB Ohio
RESTRAINT DESIGN LABORATORY TEST AND EVALUATION OF OPERATIONAL EFFECTIVENESS
James W Brinkley and John T Shaffer *In* AGARD Linear Acceleration of Impact Type 26 Jun 1971 7 p refs

Avail NTIS HC $6 00/MF $0 95

Methods used to design contemporary personal flight equipment such as restraint systems and ejection seat cushions are presented Emphasis is placed on the acceleration protection aspects of the design Both analytical modeling and experimental determination of material characteristics are discussed Experimental results of laboratory impact test evaluations of three items of personal equipment using human subjects are presented These experiments include an evaluation of three operational restraint harnesses at -g sub x acceleration levels up to 15 g a study of the acceleration transmission characteristics of ejection seat cushions and work completed in the study of acceleration protection provided by rapidly deployed air bag restraint systems The implications of the experimental findings are discussed and related to operational experience Author

N72-19184# Cornell Aeronautical Lab Inc Buffalo N Y
COMPUTER PROGRAM FOR AN AIR BAG RESTRAINT SYSTEM Final Report Jul 1970 - Sep 1971
Robert H Dufort Sep 1971 89 p
(Contract DOR-FH-11-7574 CAL Proj YB-2985-V)
(PB-20417 CAL-YB-2985-V-2 DOT-HS-800-541) Avail NTIS CSCL 13F

A simulation model was developed to provide an analytical tool for rapidly and inexpensively exploring the approximate performances of an air bag system Acceleration and rebound of the impacting body are the principal measures of performance how they are influenced by system design variations are the principal results Typical design parameters which can be evaluated are inflation pressure bag size gross bag shape vent area vent actuation pressure as well as other system variables The basic model air bag consists of a fabric type container having a cylindrical center section with hemispherical ends A rigid body corresponding to the size and weight of the torso of a vehicle occupant is assumed to impact the air bag at the center and normal to the longitudinal axis A deformed shape profile is postulated which maintains the longitudinal section periphery and the cross section contour lengths constant and equal to their initial values All output parameters are provided as functions of time these include acceleration velocity displacement internal pressure volume pressure-force area gas flow and residual gas weight The report contains the equations and flow charts which describe the model A program listing in BASIC + is presented as are examples for the solution of cylindrical and customized air bags Author (GRA)

N72-19222# Army Electronics Command Fort Monmouth N J
ACTIVE FILTERS APPLIED TO HELICOPTER NOISE REDUCTION
Richard S Tilton Jul 1971 28 p refs
(DA Proj 1H6-62705-A-057)
(AD-734812 ECOM-3454) Avail NTIS CSCL 09/5

Two active filter resonators of the negative feed-back type are evaluated Claimed stability in literature and design formulas are verified by an active filter breadboard Requirements for a passive L-C filter developed for avionics equipment were used as design objectives The desired response was realized using two resonator types A hybrid version of the active filter was designed and fabricated to establish that microminiaturization was feasible without any degradation in performance Author (GRA)

N72-19230# Ohio State Univ Columbus Electroscience Lab
ADAPTIVE ANTENNA ARRAYS FOR AIRCRAFT COMMUNICATION SYSTEMS Final Report 15 Feb - 15 Aug 1971
R T Compton Jr Jan 1972 126 p refs
(Contract N00014-67-A-0232-0009)
(AD-735096 ESL-3098-2) Avail NTIS CSCL 09/5

The primary purpose of the work is to investigate the use of adaptive array techniques for obtaining scannable patterns from arrays on curved surfaces The report describes the antenna patterns obtained with an experimental adaptive array on an aircraft fuselage mockup The antenna system consisted of four flush-mounted multiturn loop elements tunable over the 200-400 MHZ band Patterns were taken on this adaptive antenna system for a variety of frequencies element locations surface configurations and for numerous angles of arrival of the desired signal Author (GRA)

N72-19238# Aeronautical Research Labs Melbourne (Australia)
REDUCTION REQUIREMENTS FOR DATA ACQUIRED BY AN AIRBORNE DATA LOGGER
K F Fraser Mar 1971 74 p refs
(ARL/ME-130 ISBN-642-47676-7) Avail NTIS

Methods to be used for reducing data recorded with an airborne magnetic tape recorder in both analog and digital form are described Most of the analog recording uses frequency modulation techniques and the digital recording uses either a special serial format or a parallel format Digital computer interface equipment which has been developed to handle the format of the digitally recorded data is described in detail Included is a description of a novel electronic flywheel circuit which detects data gaps used for word and frame synchronization over a wide range of data rates The recording of time-of-day in digital form allows for correlation of data reduced at different times Data recorded in analog form may be readily correlated with data recorded in digital form Location of any point of interest on the recorded tape is simplified by a preset stop facility which allows the analog tape machine to be stopped at any preset time of recording Author

N72-19247# Transportation Systems Center Cambridge Mass
LARGE SCALE SYSTEMS A STUDY OF COMPUTER ORGANIZATION FOR AIR TRAFFIC CONTROL APPLICATIONS
John Dumanian and David Clapp 15 Jun 1971 155 p refs
(AD-733759 DOT-TSC-FAA-71-15) Avail NTIS CSCL 09/2

Based on current sizing estimates and tracking algorithms some computer organizations applicable to future air traffic control computing systems are described and assessed Hardware and software problem areas are defined and solutions are outlined Author (GRA)

N72-19255# Naval Air Systems Command Washington D C
ADVANCED AVIONIC DIGITAL COMPUTER DEVELOPMENT PROGRAM Progress Report
Ronald S Entner 1 Nov 1971 85 p refs
(AD-734143 PR-9) Avail NTIS CSCL 09/2

Contents Preliminary statement of work of a plan to define high order language primitives for the AADC Documentation supporting request for approval of RFP for high level programming study NAVAIR R and D program in aircraft power systems for the 1970 s GRA

N72-19277# Electro Development Corp Lynwood Wash
SOLID STATE ROTARY SWITCH Final Report, 28 Aug

1970 - 28 Oct 1971
W B Marsh Dec 1971 34 p refs
(Contract F33615-71-C-1023 AF Proj 3145)
(AD-734758 EDC-710928 AFAPL-TR-71-87) Avail NTIS CSCL 09/1

The report describes the work performed on a research and development program to produce an eight position solid state rotary switch suitable for use in aircraft with solid state electrical systems Author (GRA)

N72-19291*# National Aeronautics and Space Administration Ames Research Center Moffett Field Calif
THE REQUIREMENTS FOR A NEW FULL SCALE SUBSONIC WIND TUNNEL
Mark W Kelly Marion O McKinney and Roger W Luidens Feb 1972 30 p refs
(NASA-TM-X-62106) Avail NTIS CSCL 14B

Justification and requirements are presented for a large subsonic wind tunnel capable of testing full scale aircraft rotor systems and advanced V/STOL propulsion systems The design considerations and constraints for such a facility are reviewed and the trades between facility test capability and costs are discussed Author

N72-19298# Boeing Scientific Research Labs Seattle Wash
ANALYSIS OF GROUND OPERATIONS AT AIRPORTS
R Cairns Jul 1971 52 p refs Sponsored by DOT
(AD-733111 D1-82-1042) Avail NTIS CSCL 13/2

The pollution source inventory for airports include airplane *operations (categorized according to taxi idle take-off and* landing) aircraft support vehicle operations vehicular movements stationary power and heat-source operations and fueling operations Also measurements are given of carbon monoxide hydrocarbons particulates oxides of nitrogen and meteorological parameters A mathematical dispersion model is used to derive contour maps of individual pollutant concentrations Author (GRA)

N72-19300# *Army Test and Evaluation Command Aberdeen* Proving Ground Md
AIRCRAFT TEST INSTRUMENTATION
1 Nov 1971 8 p refs
(AD-734306 MTP-6-3-526) Avail NTIS CSCL 14/2

The document provides guidance and procedures for the proper implementation of instrumentation techniques to be utilized during the service test of aircraft and airborne equipment. Use of this document will ensure that both the instrumentation used during testing (procedures and devices) and the materiel item under test meet requirements stated in the Materiel Needs (MN) and Technical Characteristics (TC) further ensuring the materiel suitability for Army use Author (GRA)

N72-19304# Naval Civil Engineering Lab Port Hueneme Calif
AIRFIELD PAVEMENT CONDITION SURVEY, USNAS IMPERIAL BEACH CALIFORNIA
H Tomita and L J Woloszynski Jul 1971 68 p ref
(NCEL Proj 53-125)
(AD-733656 NCEL-TN-1190) Avail NTIS CSCL 01/5

The results of a condition survey of the airfield pavements at the USNAS Imperial Beach California are presented The survey established statistically-based condition numbers (weighted defect densities) which were direct indicators of the condition of the individual asphaltic concrete and portland cement concrete pavement facilities Additional evaluation efforts included photographic coverage of defect types preparation of the construction history of the station compilation of data on current aircraft traffic and aircraft types using the station performance of runway skid resistance tests and a study of the requirements for future pavement evaluation efforts Author (GRA)

N72-19306# Naval Ordnance Lab White Oak Md
EVALUATION OF TWO TYPES OF FACILITIES TO FULFILL THE NEED FOR HIGH REYNOLDS NUMBER TRANSONIC TESTING
Kurt R Enkenhus and David L Merritt 30 Jul 1971 251 p refs
(ONR Proj RR009-02-01)
(AD-734648 NOLTR-71-147) Avail NTIS CSCL 14/2

The Navy s need for high Reynolds number transonic testing is reviewed and some specific problem areas in weapon and aircraft design are cited The abilities of currently available wind tunnels in the United States to meet those needs are assessed *and the Ludwieg tube wind tunnel at NASA Marshall is* evaluated The theory of the Ludwieg tube is discussed and tables and charts of the parameters are presented A second option to meet the high Reynolds number testing requirements is examined in the theory and design of a conventional blowdown tunnel The costs of the two types of facilities are compared for Navy weapons and flight vehicles at subsonic transonic and low *supersonic speeds* GRA

N72-19307# *Air Force Systems Command Washington D C*
THE TEST FACILITY'S ROLE IN THE EFFECTIVE DEVELOPMENT OF AEROSPACE SYSTEMS Final Report, 1 Sep 1970 - Jul 1971
James G Mitchell Sep 1971 199 p refs
(AD-731548 AFSC-TR-71-01) Avail NTIS CSCL 14/2

Some of the major problems associated with the use and *usefulness of aeronautical test facilities (wind tunnels etc) in the* development of aerospace systems are defined and analyzed Contributions to the study have come from 117 of this country s more experienced and prominent aerospace experts from government and industry The origin of the facility test plan and the use of the test facility to support DOD system s development philosophy are explored and suggestions are made to reduce conflicting incentives and permit an expanded role for the test facility The deficiencies in test facilities are shown to produce consequences which are resulting in higher system cost and less system performance The major facility inadequacies are enumerated and specific examples are noted wherein lack of test capability has had detrimental effects on system performance Thirty-five of the recent aircraft development programs are studied and evaluated to determine a procedure whereby the use of the test facility can be optimized A multiple regression analysis is used to develop a procedure for defining an optimal facility test program Author (GRA)

N72-19327# Office National d Etudes et de Recherches Aerospatiales Paris (France)
INTEGRAL METHOD FOR THE CALCULATION OF TWO AND THREE DIMENSIONAL TURBULENT BOUNDARY LAYERS BY USE OF SIMILARITY EQUATIONS [METHODE INTEGRALE DE CALCUL DES COUCHES LIMITES TURBULENTES BI ET TRIDIMENSIONNELLES UTILISANT DES SOLUTIONS DE SIMILITUDE]
R Michel C Quemard and J Cousteix 1971 25 p refs In FRENCH ENGLISH summary Presented at the 4th DGLR Annual Meeting Baden-Baden West Ger 11-13 Oct 1971
Avail NTIS

Theoretical results for predicting the development of two and three-dimensional turbulent boundary layers in incompressible and compressible flows are determined In both two-and three-dimensional cases an improved mixing length model is used it includes an universal mixing length curve with a correction taking into account the influence of viscosity near the *wall With this model similarity solutions to the local boundary* layer equations are devised and provide the assumptions necessary for the integral computing method The proposed method based on the streamwise and crosswise momentum integral equations makes use as auxiliary equation of the entrainment equation Application to and systematic comparison with experimental results are presented the development of a *turbulent boundary layer on swept wings is emphasized* Author (ESRO)

N72-19328# Office National d Etudes et de Recherches Aerospatiales Paris (France)
ON VORTEX BURSTING
Henri Werle 1971 52 p refs In FRENCH ENGLISH summary (ONERA-NT-175) Avail NTIS

In order to investigate the phenomena having effect on the wakes of delta wings at high incidences the vortex breakdown was studied using the flow visualization method The first series of tests carried out at low speed in a hydrodynamic tunnel evidenced the analogy of vortex breakdown with boundary layer separation or wake bursting The influence of an increasing pressure gradient on the initiation the position and the type of breaking was confirmed The evolution of the vortex breakdown phenomenon is analyzed as a function of several parameters in the case of delta wings alone or installed on aircraft models and is compared to results of similar wind tunnel or flight tests ESRO

N72-19329# Office National d Etudes et de Recherches Aerospatiales Paris (France)
HYDRODYNAMIC VISUALIZATION OF UNSTEADY FLOWS
Henri Werle 1971 43 p refs In FRENCH ENGLISH summary (ONERA-NT-180) Avail NTIS

The hydraulic analogy technique used for studying flow was applied to the analysis of unsteady phenomena such as boundary layer separation wakes etc This visualization method was applied to the study of instabilities in the permanent regime (wakes jets) phenomena preceding the establishment of a permanent regime (starting motion) phenomena pertaining to periodic movements of models (oscillating airfoils) the flow around rotating model (rotary wings) and the flow within rotating systems (turbomachines) ESRO

N72-19331# Liverpool Univ (England) Dept of Mechanical Engineering
THE PERFORMANCE OF AXIAL-FLOW COMPRESSORS OF DIFFERING BLADE ASPECT RATIO
G T S Fahmi (Baghdad Univ) London Aeron Res Council 1971 59 p refs Supersedes ARC-31818
(ARC-CP-1179 ARC-31818) Avail NTIS HMSO 95p PHI $3 90

The performance of axial-flow compressors is known to be adversely affected by increasing the aspect ratio Experimental investigations have been carried out on a single-stage low speed axial-flow compressor with a parallel annulus and a hub-tip ratio of 0 750 at blade aspect ratios one and two The Reynolds number was held constant at 1 9 x 100000 and the tip clearances and blade row axial spacing at the inner diameter were kept constant The overall performance characteristics show that the compressor of aspect ratio 1 has a wider range of operation and in general a higher static pressure rise than that of aspect ratio 2 It is concluded that the adverse effect of increasing the blade row aspect ratio on the performance of axial-flow compressor stages is caused by wall stall A three dimensional flow calculation including profile secondary and clearance losses and secondary distortion of flow angles is described Author (ESRO)

N72-19332# Royal Aircraft Establishment Farnborough (England) Aerodynamics Dept
THE VELOCITIES INDUCED BY DISTRIBUTIONS OF INFINITE KINKED SOURCE AND VORTEX LINES REPRESENTING WINGS WITH SWEEP AND DIHEDRAL IN INCOMPRESSIBLE FLOW
G G Brebner and L A Wyatt London Aeron Res Council 1971 29 p refs Supersedes RAE-TR-70077 ARC-32389
(ARC-R/M-3667 RAE-TR-70077 ARC-32389) Avail NTIS HMSO 80p PHI $3 35

Equations have been derived for the velocities induced in an incompressible flow by distributions of infinite source and vortex lines representing wings of infinite span and constant chord having both sweep and dihedral Particular attention is paid to the center section where the dihedral effects are large The equations showed that such a source distribution does not represent a wing with symmetrical sections and that such a vortex distribution does not represent a thin wing It is therefore not possible to separate the effects of wing thickness and wing load distribution even when linear-theory assumptions are retained Author (ESRO)

N72-19338# Toronto Univ (Ontario) Inst for Aerospace Studies
CORRELATION OF NOISE AND FLOW OF A JET
Hie K Lee Aug 1971 89 p refs Sponsored in part by NRC of Can
(Grant AF-AFOSR-1885-70 AF Proj 9781)
(AD-734042 UTIAS-168 AFOSR-71-2572TR) Avail NTIS CSCL 20/1

Two approaches have been tried to develop and apply a new method for experimentally estimating at a far field position the spectra and intensity of noise originating from unit volume of a round jet extending to 7 D downstream Cross-correlation between their filtered narrow-band counterparts approach 2 has been developed and exploited The measurements were analyzed via Proudman s form of Lighthill s integral further manipulated to apply to the approaches mentioned The results showed qualitative agreement with some of the earlier theoretical predictions made by Ribner and by Powell GRA

N72-19343# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
APPLICATION OF FLUIDIC ELEMENTS AND SYSTEMS FOR AIRCRAFT, MISSILES AND SPACECRAFTS
Knezevic Dragutin 19 Oct 1971 18 p refs Transl into ENGLISH from Nauchn -Tehnicki Pregled (Yugoslavia) v 20 no 3 1970 p 27-34
(AF Proj 1256)
(AD-734715 FTD-HC-23-1038-71) Avail NTIS CSCL 13/7

Pneumatic automation technology showed a significant step forward during the recent years A turning point in this control technique was reached in 1959/60 when the pneumo- automatic principle using elements without moving mechanical parts and based on the reciprocal hydroaerodynamic action of the operating fluid passing through fixed lines was applied for the first time This new technology is identified today as fluidics or in the systems where air functions as the operating agent as pneumonics The article deals with the application of fluidic (pneumonic) elements and systems in craft which responds most readily to the new technology i e in aircraft missiles and spacecraft Author (GRA)

N72-19347# Technion - Israel Inst of Tech Haifa Dept of Aeronautical Engineering
THE FLOW NEAR THE TIP AND WAKE EDGE OF A LIFTING WING WITH TRAILING EDGE SEPARATION
J Rom and H Portnoy Aug 1971 42 p refs
(Grant AF-AFOSR-2145-71 AF Proj 9781)
(AD-734791 TAE-132 AFOSR-72-0010TR SR-1) Avail NTIS CSCL 20/4

A method is presented for improving the linearized solution for the flow near the tips and wake edges of a lifting wing in incompressible flow mainly with a view to its more effective utilization in the calculation of the rolling up of the trailing vortex wake The treatment takes account of the actual or in the case of the wake effective radius of the edge by the method of matched asymptotic expansions The result is presented as an integral for the perturbation potential which is uniformly valid to first approximation in all parts of the flow field about the wing and close behind the trailing edge GRA

N72-19352# Naval Postgraduate School Monterey Calif
RECIRCULATORY FLOW VISUALIZATION IN HELICOPTER FLIGHT MODES M S Thesis

Arthur William Nelson III Sep 1971 34 p refs
(AD-734873) Avail NTIS CSCL 20/4

The classical working states of the aircrew were studied employing the three-dimensional flow visualization tunnel at the Naval Postgraduate School Monterey California The various states were simulated in an attempt to gain insight into some of the present problem in helicopter rotor design This method was extended to include two particular phenomena the critical part of the vortex ring state and Mangler s distribution of induced velocity about a rotor in the helicopter mode Using a feasible distribution ascertained from the flow visualization the induced velocity distribution was calculated for several points in the vortex ring state Author (GRA)

N72-19484# Air Force Systems Command Wright-Patterson AFB Ohio Air Force Avionics Lab
MICROELECTRONICS FOR AEROSPACE SYSTEMS c26
H V Noble *In* AGARD Avionics in Spacecraft Sep 1971 11 p refs
Avail NTIS HC $6 00/MF $0 95

The reasons for the entry of the USAF into microelectronics some significant recent achievements and predictions of microelectronic devices that will be available for aerospace systems for the 1975-1980 time period are presented These predictions are based on the extension of advances made during the past few years plus estimates of results of current and future USAF programs The following types of devices are covered (1) digital and analog circuit devices for computer and data processing (2) integrated microwave devices for both receivers and transmitters (3) integrated circuit devices for high data rate transmission (4) integrated circuit - antenna arrays and (5) size reduction possibilities for computers based on use of advanced microcircuits Author

N72-19489# Montecatini Edison S p A Milan (Italy)
INTEGRATED CHECK-OUT SYSTEM FOR SPACE LAUNCHERS AND AIRCRAFT SYSTEMS c10
Mauro Falleni *In* AGARD Avionics in Spacecraft Sep 1971 16 p refs
Avail NTIS HC $6 00/MF $0 95

A completely integrated system capable of performing all the necessary operations for the check-out of space launchers of the 1970 s generation and for aircraft systems is described It is to be considered as a general purpose system Any kind of real-time operation necessary for check-out operations and all the post-flight computation can be carried on without external aids The general philosophy of its conception is such that certain attributes such as simplicity modularity minimum specialization allow for the widest possibility of efficiency and expansion possibly required for future more elaborated check-out procedures A number of degraded levels of operation is allowed the lowest of them being the manual operation level in order to face different emergency situations Special consideration has been given to the man-machine relationships and to the efficiency of maintenance and repair operations Author

N72-19536# Tyco Labs Inc Waltham Mass
HIGH TEMPERATURE INFRARED DETECTORS FOR AIRCRAFT FIRE DETECTION Final Report 1 Jan - 30 Sep 1971
G Entine C R Mitchell F V Wald and F H Cocks Dec 1971 95 p refs
(Contract F33615-71-C-1084 AF Proj 3048)
(AD-734785 C-111 AFAPL-TR-71-89) Avail NTIS CSCL 17/5

CdTe photodetectors capable of operating continuously at 750F were developed The detectors at temperature could detect a photosignal of 100 micron W/square centimeters with a signal to noise ratio of fourteen to one with an output impedance of 500 ohms The detectors had peak sensitivity near 0 9 micron and were quite insensitive above 1 2 micron making them ideal for operation as aircraft engine fire detectors Author (GRA)

N72-19541# Advisory Group for Aerospace Research and Development Paris (France) Structures and Materials Panel
APPLICATION OF NON-DESTRUCTIVE INSPECTION METHODS TO AIRCRAFT STRUCTURES
P Gallinaro and R B Oliver Oct 1971 34 p refs
(AGARD-R-587-71) Avail NTIS

Nondestructive test methods are defined and their application for inspection of aircraft structures is evaluated based on the results of an aircraft industry survey

N72-19542# Advisory Group for Aerospace Research and Development Paris (France)
NONDESTRUCTIVE INSPECTION OF STRUCTURES
P Gallinaro *In its* Appl of Nondestructive Inspection Methods to Aircraft Struct Oct 1971 p 3-14 refs

Avail NTIS

Current methods of inspection are reviewed and their application is defined for three major areas (1) inspection of adhesive bonded structures (2) inspection of welded joints and (3) inspection of riveted or bolted joints D L G

N72-19543# Advisory Group for Aerospace Research and Development Paris (France)
SURVEY ON THE APPLICATION OF NONDESTRUCTIVE INSPECTION METHODS TO COMMERCIAL AIRCRAFT, 1968 TO 1970
Robert B Oliver *In its* Appl on Nondestructive Inspection Methods to Aircraft Struct Oct 1971 p 15-20

Avail NTIS

Data related to the application of nondestructive inspection methods were acquired from commercial airline overhaul bases airframe manufacturers research laboratories and equipment manufacturers The project was aimed at (1) evaluating the current experiences in nondestructive inspection (2) isolating the best nondestructive inspection procedures and (3) making recommendations to improve the accuracy of the methods and to stimulate development of improved methods The results of the project are presented in the form of a state-of-the-art review D L G

N72-19576# Texas Univ Austin Electronics Research Center
THE SCATTERING FROM ROUGH CURVED SURFACES OF A WAVE PROPAGATED THROUGH A RANDOM MEDIUM
Darryl P Greenwood and E J Powers Jr 1 Jun 1971 90 p refs
(Contract F44620-71-C-0091 AF Proj 4751)
(AD-734044 TR-104 AFOSR-71-1988TR) Avail NTIS CSCL 17/5

A generalized investigation of wave scattering from rough surfaces yields an expression for mean scattered power flux which is the spatial Fourier transform of the product of three transfer functions The optical transfer function (OTF) of the propagating medium The joint characteristic function of the surface roughness A coherence involving the mean surface and the wave profile The results are applicable to rough surfaces which do not have rms slopes greater than a few degrees The solution is applied to laser scattering from aluminum and titanium airplane surfaces where the medium is the clear atmosphere Proficorder tracing of sample rough surfaces reveals independent roughness and waviness components normally distributed with Gaussian (isotropic) autocorrelation Author (GRA)

N72-19636# Royal Aircraft Establishment Farnborough (England)

ANALYSIS OF THE GASEOUS PRODUCTS ARISING FROM INSULATION COATINGS ON AIRCRAFT CABLING AT ELEVATED TEMPERATURES
R I Butt and J L Cotter Jul 1971 22 p refs
(RAF-TR-71134) Avail NTIS

The insulation coatings from five commercial aircraft cables were pyrolyzed in an inert atmosphere and most of the volatile degradation products were identified by combined gas chromatography-mass spectrometry The principal pyrolysis products of nonfluorine containing insulation systems were carbon monoxide methane carbon dioxide ethylene propylene and benzene Insulations based on polytetra fluoro ethylene and a copolymer of hexafluoro propylene/tetrafluoro ethylene gave low molecular weight fluorine containing compounds as well as carbon monoxide and carbon dioxide Pyrolysis of an insulation material based on silicone rubber produced appreciable amounts of silicon containing cyclic compounds Author (ESRO)

N72-19642# Stanford Univ Calif Dept of Aeronautics and Astronautics
INSTABILITY OF GLASS FIBER REINFORCED PLASTIC PANELS UNDER AXIAL COMPRESSION
Bruce Theodore Willey Sep 1971 63 p refs
(Contract DA-44-177-AMC-115(T) DA Proj 1F1-62204-A-170)
(AD-734340 USAAVLABS-TR-69-48) Avail NTIS CSCL 11/4

The report shows that the so-called strain reversal method is of little value in interpreting test data obtained on compressed panels At the same time it demonstrates that the Southwell and large displacement techniques both give results associable with theory Author (GRA)

N72-19644# Army Mobility Equipment Research and Development Center Fort Belvoir Va
DEVELOPMENT OF A CHEMICAL COATING FOR AIRFIELD RUNWAY MARKING
Harvey Miller and Stanley P Dowdy Sep 1971 81 p refs
(Contract DOT-FA69WA-1154)
(AD-734320 USAMERDC-2012) Avail NTIS CSCL 11/3

The purpose of the project was to develop an airfield runway marking system that would be superior to systems presently utilized A high-molecular-weight linear Bisphenol polyether was developed A balanced ketonic-alcoholic-aromatic hydrocarbon solvent was found to be the most effective solvent to give rapid through-dry flexibility and a minimum of reactivity with the substrate Three different antiskid additives were studied as well as a siloxane-type additive to improve bead retention and adhesion of the coating to the substrate A styrene acrylate and a chlorinated rubber alkyd have also been evaluated
Author (GRA)

N72-19647# Watervliet Arsenal N Y
METAL MATRIX COMPOSITES FOR HIGH TEMPERATURE APPLICATION Interim Progress Report 1971
Iqbal Ahmad J M Barranco K E Loomis and W J Heffernan Oct 1971 94 p refs
(DA Proj 1T0-62105-A-331)
(AD-734304 WVT-7155) Avail NTIS CSCL 11/4

The objective of the program is to develop fabrication techniques and to characterize high strength-high temperature filament reinforced superalloys for application as turbine blade materials Using the sessile drop and infiltration techniques the compatibility of W and SiC filaments against castable superalloys including Mar M200 Mar M302 Mar M322 J-1650 and IN-100 was investigated Author (GRA)

N72-19659*# National Aeronautics and Space Administration Flight Research Center Edwards Calif
DETERMINATION OF STABILITY DERIVATIVES FROM FLIGHT DATA USING A NEWTON-RAPHSON MINIMIZATION TECHNIQUE
Kenneth W Iliff and Lawrence W Taylor Jr Washington Mar 1972 59 p refs
(NASA-TN-D-6579 H-626) Avail NTIS CSCL 12A

A modified Newton-Raphson or quasilinearization minimization technique for determining stability derivatives from flight data was developed and compared with simple-equations analog-matching least-squares and Shinbrot methods of analysis For the data analyzed the solutions computed by using the estimates obtained from the Newton-Raphson technique fit the dwta and determined coefficients adequately A further modification to include a priori information was found to be useful A model statistically similar to the flight data was analyzed using the same methods (excluding analog matching) and the Newton-Raphson technique was found to yield superior estimates An approximate Cramer-Rao bound was compared with the error covariance matrix of the model and was found to provide information about the reliability of the individual estimates obtained The technique was successfully applied to data obtained from a light airplane a large supersonic airplane and a lifting body vehicle It was shown that the reliability of the estimates of a given coefficient obtained from these vehicles depends upon the data analyzed Author

N72-19663# Technische Hogeschool Delft (Netherlands)
A METHOD FOR THE DETERMINATION OF THE OPTIMUM FEEDBACK FOR A CONSTANT LINEAR DYNAMIC SYSTEM WITH FEEDBACK CONSTRAINTS
P P van den Broek Jan 1971 51 p refs
(VTH-165) Avail NTIS

A dynamic system is represented by n linear first differential equations with constant coefficients It is assumed that the m input variables are linearly dependent on the n state variables. The feedback gains are considered to be optimal if the infinite time integral of a positive definite quadratic functional of the state variables and the input variables are minimized for a given initial state of the system Equations were derived for optimal feedback These equations are valid if all feedback gains were chosen arbitrarily and if one or more feedback gains are subjected to constraints If one or more state variables cannot be fed back the solution of the equations is subject to the constraint that the corresponding feedback gains be equal to zero In this case the optimum depends on the initial condition of the system Two iteration methods are suggested to solve the equations Author (ESRO)

N72-19671# Naval Postgraduate School Monterey Calif
DIMENSIONAL ANALYSIS AND THE THEORY OF NATURAL UNITS
T H Gawain Oct 1971 117 p refs
(AD-735128 NPS-57-GN71101A) Avail NTIS CSCL 12/1

The document has been prepared as a text on dimensional analysis for students of aeronautics at this school It develops the subject from a viewpoint which is inadequately treated in most standard tests but which the author s experience has shown to be valuable to students and professionals alike The analysis treats two types of consistent units namely fixed units and natural units Fixed units include those encountered in the various familiar English and metric systems Natural units are not fixed in magnitude once and for all but depend on certain physical reference parameters which change with the problem under consideration Detailed rules are given for the orderly choice of such dimensional reference parameters and for their use in various applications Author (GRA)

N72-19682 National Lending Library for Science and Technology Boston Spa (England)
CAT INVESTIGATIONS IN THE STRATOSPHERE
N K Vinnicenko N Z Pinus and G N Sur [1971] 11 p refs Transl into ENGLISH from Tr Tsentr Aerolog Observ (Moscow) v 100 1970 p 86-98
(NLL-M-22069-(5828 4F)) Avail Natl Lending Library Boston Spa Engl 1 NLL photocopy coupon

Results of experimental studies of turbulence in the stratosphere on a specially equipped high altitude subsonic aircraft flying over mountains and plains are considered Data on

the geometry and structure of zones of turbulence are obtained In the stratosphere as in the troposphere there are local zones of turbulence but the extent and depth of these zones are much less in the stratosphere Zones of turbulence in the stratosphere are considerably more intense over mountains than over plains because the stratosphere is made turbulent by breaking mountain waves Examples of the distribution of zones of turbulence with respect to the tropopause and the level of maximum wind are given Correlation and spectral characteristics of CAT in the stratosphere are also given Some correlation functions have a harmonic tail which is not damped this suggests that there are wave motions in the stratosphere Power spectra of the horizontal wind component in the stratosphere covering the meso-scale and micro-scale regions are also given Author

N72-19687# Royal Aircraft Establishment Farnborough (England)
SPECIAL EVENTS OF METEOROLOGICAL ORIGIN (JANUARY 1966 TO NOVEMBER 1968) Civil Aircraft Airworthiness Data Recording Programme
G E King London Aeron Res Council 1971 38 p refs
Supersedes RAE-TR-70253 ARC-33163
(ARC-CP-1188 RAE-TR-70253 ARC-33163 CAADRP-TR-24) Avail NTIS HMSO 45p PHI $1 95

A small number of jet aircraft in normal airline service were fitted with recorders which produced continuous trace records of airworthiness data for 14 parameters Throughout the recording period the records were searched for unusual occurrences and each one was studied to determine its nature and where possible its cause A selection of events of meteorological origin which were found in records taken between January 1966 and November 1968 is described Author (ESRO)

N72-19713# Weather Squadron (24th) Columbus AFB Miss Detachment 02
TERMINAL FORECAST REFERENCE FILE, COLUMBUS AIR FORCE BASE, MISSISSIPPI Final Report
1 Nov 1971 52 p refs
(AD-734807) Avail NTIS CSCL 04/2

The reference file discusses factors affecting the weather at Columbus AFB Mississippi Included are location and topography weather controls climatic aids and local forecast studies
Author (GRA)

N72-19714# Weather Squadron (17th) McClellan AFB Calif Detachment 08
TERMINAL FORECAST REFERENCE FILE FOR McCLELLAN AIR FORCE BASE, CALIFORNIA
18 Oct 1971 59 p
(AD-734800) Avail NTIS CSCL 04/2

The reference file discusses factors affecting the Weather at McClellan AFB California Included are location and topography weather controls climatic aids and local forecast studies
Author (GRA)

N72-19718*# Litchford Systems Northport N Y
BROADCAST CONTROL OF AIR TRAFFIC Quarterly Progress Report
G Litchford Dec 1971 45 p refs
(Contract NASw-2247)
(NASA-CR-125807 QPR-2) Avail NTIS CSCL 17G

The proceedings of a conference on the Omega navigation system are presented Three significant low frequency/very low frequency possibilities are considered as follows (1) use of Worldwide (WW) Omega (2) use of an Omega-like system optimized for aviation in the continental United States (3) a mix use of WW Omega and Vor U S Omega and VOR and U S /WW Omega It is concluded that all possibilites can be tested with current plans for WW Omega Author

N72-19719# National Aviation Facilities Experimental Center Atlantic City N J
ATC/CAS INTERFACE SIMULATION, EXPLORATORY PHASE Interim Report, Mar - Jul 1971
Gordon Jolitz Mar 1972 166 p
(Proj 052-241-03Y)
(FAA-RD-72-10 FAA-NA-72-8) Avail NTIS

A dynamic simulation was conducted to explore the nature of the interaction between the air traffic control (ATC) system and a collision avoidance system (CAS) The simulated ATC environment was a high density terminal area which provided for simultaneous approaches to parallel runways The CAS threat logic was modeled after a design which was developed by a technical working group under the auspices of the Air Transport Association Threat evaluation and maneuver output of the CAS were based on measured range range rate and altitude difference The objective was to study the characteristics of ATC/CAS interaction as a function (a) of the location of the Cas switchpoint from full system threat evaluation to landing mode and (b) variations in controller technique Author

N72-19720# National Aviation Facilities Experimental Center Atlantic City N J
TEST AND EVALUATION OF A PORTABLE SCANNING BEAM GUIDANCE SYSTEM Final Report, Oct 1968 - Jun 1970
Vincent L Bencivenga Mar 1972 112 p
(Proj 074-319-03Y)
(FAA-RD-72-2C FAA-RD-72-16 FAA-NA-72-26) Avail NTIS

A portable scanning beam guidance system was installed and tested at 28 field locations The sites selected were located at 16 different airports in the Eastern United States and were known to be difficult instrument landing system (ILS) sites The system was tested both as a glide slope and as a localizer During these tests the guidance equipment was not affected by terrain irregularities taxiing aircraft vehicle movement buildings adjacent to the airfield etc The system was installed calibrated and initially aligned without the need for extensive flight testing to verify system performance Author

N72-19721*# National Aeronautics and Space Administration Langley Research Center Langley Station Va
DETERMINATION OF ANGLES OF ATTACK AND SIDESLIP FROM RADAR DATA AND A ROLL-STABILIZED PLATFORM
John S Preisser Washington Mar 1972 22 p refs
(NASA-TM-X-2514 L-7886) Avail NTIS CSCL 17G

Equations for angles of attack and sideslip relative to both a rolling and nonrolling body axis system are derived for a flight vehicle for which radar and gyroscopic attitude data are available The method is limited to application where a flat nonrotating earth may be assumed The gyro measures attitude relative to an inertial reference in an Euler angle sequence In particular a pitch yaw and roll sequence is used as an example in the derivation Sample calculations based on flight data are presented to illustrate the method Results obtained with the present gyro method are compared with another technique that uses onboard camera data Author

N72-19722# Federal Aviation Administration Washington D C Systems Research and Development Service
POTENTIAL ECONOMIC BENEFITS OF FOG DISPERSAL IN THE TERMINAL AREA PART 1 ESTIMATING PROCEDURE Final Report
Nov 1971 225 p
(FAA Proj RD-260-001-01R)
(AD-735132 FAA-RD-71-44-1-Pt-1) Avail NTIS CSCL 17/7

The study was designed to provide estimates of the costs of disruptions (delays diversions and cancellations) of aircraft arrivals (landings) associated with a number of Category II and III weather situations with the emphasis on fog situations at some of the major air carrier airports in the United States As

such they would be measures of the potential economic benefits the airport users would realize if the adverse effects of these weather situations on aircraft landings were completely eliminated by weather modification and/or electronic and other approach and landing aids This part of the report consists of the introduction to the report and a narrative description of the estimating procedure together with some of supporting statistical material developed in connection with the estimating process
Author (GRA)

N72-19724# National Aviation Facilities Experimental Center Atlantic City N J
A DYNAMIC SIMULATION STUDY OF AIR TRAFFIC CAPACITY IN THE SAN FRANCISCO BAY TERMINAL AREA Final Report, Feb - Sep 1970
Paul J OBrien Aug 1971 114 p ref
(FAA Proj 154-005-01)
(AD-727756 FAA-NA-71-20 FAA-RD-71-37) Avail NTIS CSCL 01/2

A dynamic simulation of air traffic operations in the San Francisco Bay terminal area was conducted to determine air traffic capacity estimates when several different airport expansion plans were implemented Capacity estimates were made for the following separate conditions first the present day system slightly modified to accommodate an increased volume of traffic second with the operation of an additional runway at San Francisco Airport third with the operation of an additional runway at Oakland Airport and fourth with the operation of a new multiparallel runway airport located near the south end of San Francisco Bay and without the expansion to either San Francisco or Oakland Airports An estimate was also made of the total system capacity when all airport expansions were implemented Author (GRA)

N72-19725# Army Land Warfare Lab Aberdeen Proving Ground Md
SITE MARKER BEACON SYSTEM Final Report
Curtis L Paxton Jun 1971 18 p refs
(LWL Proj 05-E-67)
(AD-733916 TR-71-09) Avail NTIS CSCL 17/7

The report covers the development and test of a VHF radio beacon system designed for use as a marker of friendly locations from under the dense jungle canopy In order to minimize the amount of development required the design factors of the beacon system were made compatible with the ARC-54 aircraft radio equipment and its associated homing equipment
Author (GRA)

N72-19726# Airborne Instruments Lab Deer Park N Y
MICROWAVE GLIDE SLOPE SYSTEM ENGINEERING MODEL Final Report
C J Creedon Jun 1971 47 p
(Contract DOT-FA67WA-1745)
(AD-733694 FAA-RD-71-41 Rept-2472-1) Avail NTIS CSCL 17/7

The development of an L-band 1585-MHz glide slope system is described complete with monitoring capability that is fully compatible with the existing UHF glide slope system It was necessary to develop and fabricate two slotted waveguide antennas (24 and 32 feet) solid state transmitter/modulator components an aircraft frequency converter and an antenna unit This system was tested and found to have good course quality with each of the antennas However the 32 foot antenna was best suited to the lower glide slope angles of 2 5 to 2 7 degrees and the 24-foot antenna for the 2 7 to 3 0 degree path angles in terms of below path clearance Author (GRA)

N72-19728# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
ALGORITHM AND GENERAL PRINCIPLES OF INFORMATION PROCESSING IN A CIVIL AVIATION TRAFFIC SYSTEM
M Libura and S Walukiewicz 18 Oct 1971 25 p refs Transl into ENGLISH from Polska Akad Nauk Inst Automatyki Prace (Poland) no 83 1969 p 1-25
(AD-734881 FTD-HC-23-953-71) Avail NTIS CSCL 17/7

A description is given of steps involved in flight planning and control of flight plan completion required for a complete air traffic control system at airports The proposed concept of flight control automation is characterized by the use of a closed Air Traffic ATC System where ATC has feedback on control quality which allows the introduction of changes required with time The study features mathematical descriptions which can serve as a basis for detailed theoretical and practical investigations
Author (GRA)

N72-19730# National Aviation Facilities Experimental Center Atlantic City N J
INTERMEDIATE ACTIVITY LEVEL TOWER CAB EVALUATION, PHASE 2 Final Report, Jul - Sep 1971
J Roy Bradley Jr Dec 1971 49 p
(FAA Proj 144-170-06X)
(AD-735131 FAA-NA-72-2 FAA-RD-7-104) Avail NTIS CSCL 17/7

The project was conducted to determine Air Traffic Controllers acceptance of an intermediate activity level airport traffic control tower proposed for construction on a national basis and to obtain suggestions for improving the proposed facility Full-scale mockups of the tower cab and associated junction room were constructed and equipped with operational equipments at the National Aviation Facilities Experimental Center Atlantic City New Jersey A 2-week evaluation was conducted with participation by air traffic control specialists from each of the 11 Federal Aviation Administration regions Results indicate that the proposed tower would be highly acceptable from an operational as well as an environmental standpoint Author (GRA)

N72-19737*# Scientific Translation Service Santa Barbara Calif
ACOUSTIC INTERFERENCE BY REFLECTION APPLICATION TO THE SOUND PRESSURE SPECTRUM OF JETS
P Thomas NASA Washington Mar 1972 37 p refs Transl into ENGLISH of the publ Etude des interferences acoustiques par reflexin Application aux spectres de pression acoustique desjets Paris SNECMA May 1969 p 1-20
(Contract NASw-2035)
(NASA-TT-F-14185) Avail NTIS CSCL 20/1

Theoretical and experimental studies of the interfering reflection phenomena which distort acoustic measurements and some fundamental relations for developing applicable correction factors were evaluated Two hypotheses were examined that of white noise and that of the actual source Each was found to be valid in describing jet noise distribution characteristics assuming a perfectly reflecting surface The phenomena of interferences are altered when the jet is near the surface and under certain sustained generator conditions Author

N72-19841*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
EFFECTS OF RADIAL AND CIRCUMFERENTIAL INLET VELOCITY PROFILE DISTORTIONS ON PERFORMANCE OF A SHORT-LENGTH DOUBLE-ANNULAR RAM INDUCTION COMBUSTOR
Donald F Schultz and Porter J Perkins Washington Mar 1972 43 p refs
(NASA-TN-D-6706 E-6464) Avail NTIS CSCL 21A

Inlet air velocity profile tests were conducted on a full-scale short-length 102-centimeter-diameter annual combustor designed for advanced gas turbine engine applications The inlet profiles studied include radial distortions that were center peaked and tip peaked as well as a circumferential distortion which was center peaked for one-third of the circumference and flat for the other two-thirds An increase in combustor pressure loss was the most significant effect of the radial air velocity distortions With the circumferential distortion exit temperature pattern factor doubled when compared to a flat velocity profile Author

N72-19842*# General Electric Co Cincinnati Ohio Aircraft Engine Group
LF460 DETAIL DESIGN
Sep 1971 258 p refs
(Contract NAS2-6056)
(NASA-CR-120787 Doc-71-AEG-297) Avail NTIS CSCL 21E

This is the final technical report documenting the detail design of the LF460 and advanced turbotip lift fan intended for application with the YJ97-GE-100 turbojet jet generator to a V/STOL transport research aircraft Primary objective of the design was to achieve a low noise level while maintaining the high thrust/weight ratio capability of a high pressure ratio lift fan Report covers design requirements and summarizes activities and final results in the areas of aerodynamic and mechanical design component and system performance acoustic features and final noise predictions Author

N72-19845*# National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
NOISE GENERATED BY QUIET ENGINE FANS 1 FAN B
Francis J Montegani Washington Mar 1972 81 p refs
(NASA-TM-X-2528 E-6652) Avail NTIS CSCL 21E

Acoustical tests of full scale fans for jet engines are presented The fans are described and some aerodynamic operating data are given Far field noise around the fan was measured for a variety of configurations over a range of operating conditions Complete results of one third octave band analysis are presented in tabular form Power spectra and sideline perceived noise levels are included Author

N72-19849*# Pratt and Whitney Aircraft East Hartford Conn
STUDY OF AERODYNAMIC NOISE IN LOW SUPERSONIC OPERATION OF AN AXIAL FLOW COMPRESSOR Final Report
R A Arnoldi 5 Mar 1972 80 p refs
(Contract NASw-2249)
(NASA-CR-125811 PWA-4411) Avail NTIS CSCL 21E

A study of compressor noise is presented based upon supersonic part-speed operation of a high hub/tip ratio compressor designed for spanwise uniformity of aerodynamic conditions having straight cylindrical inlet and exit passages for acoustic simplicity Acoustic spectra taken in the acoustically-treated inlet plenum are presented for five operating points at each of two speeds corresponding to relative rotor tip Mach numbers of about 1 01 and 1 12 (60 and 67 percent design speed) These spectra are analyzed for low and high frequency broadband noise blade passage frequency noise combination tone noise and haystack noise (a very broad peak somewhat below blade passage frequency which is occasionally observed in engines and fan test rigs) These types of noise are related to diffusion factor total pressure ratio and relative rotor tip Mach number Auxiliary measurements of fluctuating wall static pressures and schlieren photographs of upstream shocks in the inlet are also presented and related to the acoustic and performance data Author

N72-19852# Societe Nationale d Etude et de Construction de Moteurs d Aviation Villaroche (France)
STUDY OF THE COMPRESSION CAPACITY OF AXIAL COMPRESSORS [CONTRIBUTION A L'ETUDE DU TASSEMENT DES COMPRESSEURS AXIAUX]
J M Thiaville 1971 39 p refs In FRENCH Presented at the 4th DGLR Annual Meeting Baden-Baden West Ger 11-13 Oct 1971
Avail NTIS

The squeezing of chords and gaps is studied as a method of increasing the compression ratio by length unit in axial compressing Two three-stage transonic compressors were tested The decrease in chord was balanced by a proportional increase of blades Test results for through-flow efficiency and surge limit are presented and analyzed for the two compressors over the full range of rotation velocities The effect of adding fins on the rotor wheels of compressor 2 is discussed A complete computation of the flow through both compressors leads to a better knowledge of aerodynamical effects of the squeezing ESRO

N72-19854# Pratt and Whitney Aircraft East Hartford Conn
FAN-COMPRESSOR NOISE PREDICTION, RESEARCH, AND REDUCTION STUDIES Final Report, 9 Jan 1969 - 29 Jan 1971
E A Burdsall and R H Urban Feb 1971 406 p refs
(Contract DOT-FA69WA-2045)
(AD-733590 PWA-4154 FAA-RD-71-73) Avail NTIS CSCL 20/1

A study of fan and compressor noise was undertaken for the development of an accurate prediction system based on theoretical concepts and/or empirical data which would enable the selection of proper acoustical design choices for future engines Experimental programs were conducted using a variety of test rigs to provide acoustic data and to validate theoretical concepts Mathematical models were developed for each type of fan noise and their applicability to actual engines was evaluated The material presented represents significant progress in the understanding of particular noise-generating mechanisms and the capability to predict fan noise Author (GRA)

N72-19855# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
THE EFFECT OF A DIFFUSER ON THE CHARACTERISTIC OF STABLE OPERATION OF A CENTRIFUGAL COMPRESSOR STAGE
N L Zeldes 12 Jul 1971 19 p refs Transl into ENGLISH from Dvigateli Vnutr Sgoraniya Sb Rabot (Moscow) no 8 1969 p 135-143
(FTD Proj 6040102)
(AD-730042 FTD-HT-23-795-71) Avail NTIS CSCL 21/7

Experimental results are presented from studies of stages of centrifugal compressors with different diffusors in relation to geometric characteristics of channels and grids with the number of vanes and vane placement angle are varied A well defined analytic relationship has been established between the onset of flow separation with the moment of equality of the average flow angle at the outlet from the ring with intake angles of diffusor vane placement Recording of the moment of onset of separation by oscillography and study of flow formation in the gap behind the ring with a pneumo probe confirmed the conclusion of constancy of flow angle in separation independently of rotor revolutions and affords tracking the analytic and experimental limits of separation for satisfactory agreement GRA

N72-19856# Air Force Systems Command Wright-Patterson AFB Ohio Foreign Technology Div
CONTACTLESS MEASUREMENT OF THE TIP CLEARANCE IN JET ENGINE TURBINE
J Lewitowicz 19 Oct 1971 12 p refs Transl into ENGLISH from Inst Tech Wojsk Lotniczych (Warsaw) 1968 p 151-153
(FTD Proj AAH9)
(AD-734912 FTD-HC-23-1092-71) Avail NTIS CSCL 21/5

A description of a new method of contactless measurement of the tip clearance in a jet engine turbine based on the properties of radioactive isotopies is shown This method makes it possible to determine tip clearance in a jet engine during operation making it possible to determine clearance changes at various times between overhauls This method is also useful for measuring radial clearance between any rotating element and its housing Author (GRA)

N72-19857# Bendix Corp South Bend Ind Energy Controls Div
ELECTRONIC ENGINE CONTROL UTILIZING COMPRES-

SOR EXIT CONDITIONS FOR ACCELERATION CONTROL Final Report, Jun 1970 - Jul 1971
Samuel E Arnett 15 Oct 1971 230 p refs
(Contract F33615-70-C-1503 AF Proj 3066)
(AD-734542 ECD-863-18127-R AFAPL-TR-71-78) Avail NTIS CSCL 21/5

The document is the final report of a one-year research and development effort starting June 1970 to determine the feasibility and the general applicability of fuel flow control by sensing the airflow conditions at the discharge of the engine compressor
Author (GRA)

N72-19858# Naval Postgraduate School Monterey Calif
PROCEEDINGS OF THE WORKSHOP ON FLOW IN TURBOMACHINES
Michael H Vavra Kyriacos D Papailiou and James R Woods Jr 16 Nov 1971 441 p refs Conf held at Monterey Calif Dec 1970
(AD-735021 NPS-57VA1111A) Avail NTIS CSCL 21/5

Contents Non-steady phenomena in transonic and supersonic flows and possible methods of solution Some recent developments in the numerical analysis and simulation of fluid turbulence A review of the history of boundary layer calculation methods and the present state of the art New measuring and flow-visualization techniques Applicability of cascade test data to design methods Radial equilibrium across a normal shock in an axial rotor Three-dimensional inviscid flow analysis in turbomachinery Application of results of research to engine design problems Loss evaluation methods in axial-flow compressors The turbulence structural hypothesis and loss coefficient predictions Loss correlations and off-design performance predictions Flutter Noise Stall and surge and Turbine blade cooling GRA

N72-19922*# National Aeronautics and Space Administration Flight Research Center Edwards Calif
EXPERIMENTAL INVESTIGATION OF MACH 3 CRUISE HEATING SIMULATIONS ON A REPRESENTATIVE WING STRUCTURE FOR FLIGHT LOADS MEASUREMENT
Roger A Fields Frank V Olinger and Richard C Momaghan Washington Mar 1972 42 p refs
(NASA-TN-D-6749 H-676) Avail NTIS CSCL 20K

Radiant heating experiments were performed in the laboratory on an instrumented multispar wing structure to investigate (1) how accurately the structural temperatures of a Mach 3 cruise-flight profile could be simulated (2) what the effects of the heating and heating inaccuracies would be on the responses of strain-gage bridges installed on the structure and (3) how these responses would affect flight loads measurements Test temperatures throughout the structure agreed well with temperatures calculated for a Mach 3 profile In addition temperatures produced by two identical tests were repeatable to less than + or -6 K deg Thermally induced strain-gage-bridge responses were large enough to be detrimental to a high-speed flight loads program with a goal of establishing aerodynamic loads (exclusive of thermal loads) It was shown that heating simulation can be used effectively for thermal calibration (that is to provide corrections for a high-temperature environment) and that thermal calibration may not be needed if the simulation data are used to carefully select bridges and load equations Author

N72-19932# Naval Air Development Center Johnsville Pa
EFFECTS OF SPECTRUM BLOCK SIZE AND STRESS LEVEL ON FATIGUE CHARACTERISTICS OF ALUMINUM ALLOY BOX BEAMS UNDER RANDOM SEQUENCE UNIDIRECTIONAL LOADING Final Report
William Breyan and Erwin P Roeser 8 Dec 1971 63 p refs
(AD-734393 NADC-ST-7013) Avail NTIS CSCL 01/3

The results of random-sequence fatigue tests of 7075-T6 aluminum-alloy box beams in unidirectional bending are presented The relative damaging effect of four airplane flight-maneuver-loads spectra was determined and the effects on life for variation in spectrum block size and stress level were established The effects of load sequence on life were determined through comparison and analysis of these data with that for fixed-sequence loading of a previous investigation Author (GRA)

N72-19964# Bureau of Mines Pittsburgh Pa Mining and Safety Research Center
IGNITION OF AIRCRAFT FLUIDS BY HOT SURFACES UNDER DYNAMIC CONDITIONS Technical Report, 1 Jan 1969 - 31 Aug 1971
Alexander Strasser Nov 1971 41 p refs
(Contract F33615-69-M-5002 AF Proj 3048)
(AD-734238 PMSRC-4162 AFAPL-TR-71-86) Avail NTIS CSCL 21/2

Data are presented on the ignition characteristics of various aircraft fluids under conditions in which they impinge upon a hot surface in the presence of air flow similar to that possible in an aircraft enclosure The fluids included two jet fuels (JP-4 and JP-8) two hydraulic fluids (MIL-H-5606 and MIL-H-83282) and an engine oil (MIL-L-7808) Generally the ignition temperatures decreased with an increase in target diameter or surface area and increased with increasing air velocity At all test conditions the ignition temperatures of the fluids were noticeably higher than their minimum autoignition temperatures which are determined in uniformly heated vessels GRA

N72-19968# Southwest Research Inst San Antonio Tex
GASEOUS EMISSIONS FROM A LIMITED SAMPLE OF MILITARY AND COMMERCIAL AIRCRAFT TURBINE ENGINES Interim Report
Charles T Hare Harry E Dietzmann and Karl J Springer 31 Aug 1971 131 p refs
(Contract EPA-EHSH-70-108)
(PB-204177 SwRI-AR-816) Avail NTIS CSCL 21B

The objective of the aircraft turbine emissions measurement was to provide baseline gaseous emission data including hydrocarbons carbon monoxide carbon dioxide and oxides of nitrogen in a very limited time frame Seventy-one tests were conducted in all first on two types of military engines and later on six types of commercial engines GRA

N72-19969# Teledyne Continental Motors Muskegon Mich
COLLECTION AND ASSESSMENT OF AIRCRAFT EMISSIONS Final Report
Jose F Reguerro 22 Oct 1971 121 p refs
(Contract EPA-68-04-0035)
(PB-204196 TCM-635) Avail NTIS CSCL 21B

Five engines each of four different models of aircraft piston engines were tested for gaseous emission (NO HC and CO) All of the engines were new engines In addition two tests were performed to determine the effect of installing the sample probe in different locations One test was conducted to determine the effects of various air/fuel ratio settings on an engine at take-off power Author (GRA)

N72-19975# Federal Aviation Administration Washington D C Office of Aviation Economics
WASHINGTON NATIONAL AND DULLES INTERNATIONAL AIRPORT FORECASTS FISCAL YEARS 1972 - 1983
Nov 1971 48 p
Avail NTIS

Forecasts are presented for eight major traffic categories at Dulles International and Washington National Airports Categories included are passengers (air carrier and general aviation) cargo (express freight and mail) and aircraft operations (air carrier general aviation and military) The report contains actual figures in each of these eight categories for the last six years (1966 through 1971) The forecasts were prepared to meet the planning needs of the Federal Aviation Administration and the Department of Transportation Expected aviation demand for the Washington Metropolitan Area is indicated The forecasts provide

guidance to airport engineers regional airport planning officials and policy makers with which they can develop their specialized studies and recommendations on how this demand can best be met Author

N72-19986# National Academy of Sciences-National Research Council Washington D C Committee on Fire Research
EMPLOYMENT OF AIR OPERATIONS IN THE FIRE SERVICES PROCEEDING OF A SYMPOSIUM
R Keith Arnold 1971 148 p refs Symp held at Argonne Ill 9-10 Jun 1971
(AD-734078) Avail NTIS CSCL 13/12

Contents Urban and rural fire fighting (Los Angeles County operations Chicago fire department operations forest fire air attacks helicopter fire fighting in Viet Nam) Aircraft and facilities (Helicopter accessories for fire fighting Manufacturers specifications and aircraft performance Helicopter flight restriction and fire service operations Communications are essential Operation and safety problems) Strategy and tactics in air attack (Integrating air attack with fire-fighting strategy Fire-fighting chemicals Diversified helicopter services Current techniques employed by USAF helicopters in crash fire operations Fire intelligence General summary and development) Helicopter display and flight demonstration by manufacturers GRA

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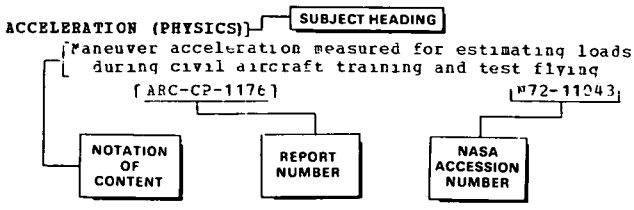

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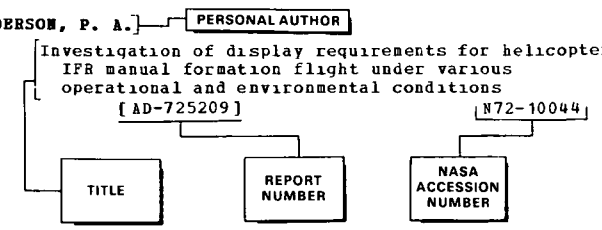

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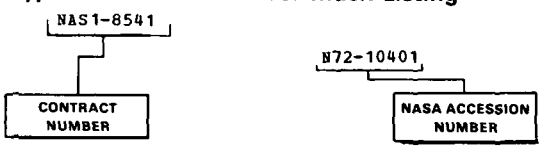

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