AERONAUTICAL ENGINEERING

A SPECIAL BIBLIOGRAPHY

WITH INDEXES

Supplement 10

OCTOBER 1971

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
<table>
<thead>
<tr>
<th>Document</th>
<th>Date</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA SP-7037 (02)</td>
<td>February 1971</td>
<td>January 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (03)</td>
<td>March 1971</td>
<td>February 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (04)</td>
<td>April 1971</td>
<td>March 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (05)</td>
<td>May 1971</td>
<td>April 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (06)</td>
<td>June 1971</td>
<td>May 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (07)</td>
<td>July 1971</td>
<td>June 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (08)</td>
<td>August 1971</td>
<td>July 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (09)</td>
<td>September 1971</td>
<td>August 1971</td>
</tr>
</tbody>
</table>

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

Use of funds for printing this publication approved by the Director of the Office of Management and Budget June 23, 1971.
AERONAUTICAL ENGINEERING

A Special Bibliography

Supplement 10

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 September 1971 in

- Scientific and Technical Aerospace Reports (STAR)
- International Aerospace Abstracts (IAA)
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 413 reports, journal articles, and other documents originally announced in September 1971 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.

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

Three indexes—subject, personal author, and contract number—are included. An annual cumulative index will be published.
AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A71-10000 Series)

All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc (AIAA), as follows:

Paper copies are available at $5.00 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents. Microfiche(1) are available at the rate of $1.00 per microfiche for documents identified by the # symbol following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum airmail postage to foreign countries is $1.00. Please refer to the accession number, e.g., A71-10613, when requesting publications.

STAR ENTRIES (N71-10000 Series)

A source from which a publication abstracted in this Section is available to the public is ordinarily given on the last line of the citation, e.g., Avail NTIS. The following are the most commonly indicated sources (full addresses of these organizations are listed at the end of this introduction):

Avail NTIS Sold by the National Technical Information Service at a standard price of $3.00 for hard copy (printed, facsimile, or reproduced from microcopy) of 300 pages or less. Documents in the 301 to 600 page range are sold for $6.00 in hard copy, and those in the 601 to 900 page range are sold at $9.00. Documents exceeding 900 pages are priced by NTIS on an individual basis. These prices apply retroactively to all documents in the NTIS collection, but in addition, documents of 300 pages or less that are over two years old (from date of announcement in Government Reports Announcements, or STAR for those items announced only in STAR) will have a surcharge of $3.00 added for a total price of $6.00. No additional surcharge will be added for documents over 300 pages.

Microfiche is available from NTIS at a standard price of 95 cents (regardless of age) for those documents identified by the # sign following the accession number (e.g., N71-10411#) and having an NTIS availability shown in the citation.

Avail SOD (or GPO) Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The price is given following the availability line. An order received by NTIS for one of these documents will be filled at the SOD price if hard copy is requested. NTIS will also fill microfiche requests, at the standard 95 cent price, for those documents identified by a # symbol.

Avail NASA Scientific and Technical Information Office. Documents with this availability are usually news releases or informational brochures available without charge in paper form.

Avail AEC Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of U.S. Atomic Energy Commission reports, usually in microfiche form, are listed in Nuclear Science Abstracts. Services available from the USAEC and its depositories are described in a booklet, Science Information Available from the Atomic Energy Commission (TID-4550), which may be obtained without charge from the USAEC Division of Technical Information.

Avail Univ Microfilms. Documents so indicated are dissertations selected from Dissertation Abstracts, and are sold by University Microfilms as xerographic copy (HC) at $10.00 each and microfilm at $4.00 each, regardless of the length of the manuscript. Handling and shipping charges are additional. All requests should cite the author and the Order Number as they appear in the citation.

(1) A microfiche is a transparent sheet of film, 105 x 148 mm in size, containing up to 72 pages of information reduced to micro images (not to exceed 20:1 reduction).
Avail HMSO Publications of Her Majesty’s Stationery Office are sold in the U.S. by British Information Services (BIS), New York City. The U.S. price (including a service charge) is given, or a conversion table may be obtained from BIS.

Avail National Lending Library, Boston Spa, England. Sold by this organization at the price shown. (If none is given, an inquiry should be addressed to NLL.)

Avail ZLDI Sold by the Zentralstelle für Luftfahrt-Dokumentation und -Information, Munich, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.


Other availabilities If the publication is available from a source other than the above, the publisher and his address will be displayed entirely on the availability line or in combination with the corporate author line.

GENERAL AVAILABILITY

All publications abstracted in this bibliography are available to the public through the sources as indicated in the STAR Entries and IAA Entries sections. It is suggested that the bibliography user contact his own library or other local libraries prior to ordering any publication inasmuch as many of the documents have been widely distributed by the issuing agencies, especially NASA. A listing of public collections of NASA documents is included on the inside back cover.

SUBSCRIPTION AVAILABILITY

This publication is available on subscription from the National Technical Information Service (NTIS). The annual subscription rate for the monthly supplements, excluding the annual cumulative index, is $18.00. All questions relating to subscriptions should be referred to the NTIS.
<table>
<thead>
<tr>
<th><strong>ADDRESSES OF ORGANIZATIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>American Institute of Aeronautics</strong>&lt;br&gt;and Astronautics**&lt;br&gt;Technical Information Service**&lt;br&gt;750 Third Ave**&lt;br&gt;New York, N.Y 10017</td>
</tr>
<tr>
<td><strong>British Information Service</strong>&lt;br&gt;845 Third Ave**&lt;br&gt;New York, N.Y 10022</td>
</tr>
<tr>
<td><strong>Commissioner of Patents</strong>&lt;br&gt;U.S Patent Office**&lt;br&gt;Washington, D C 20231</td>
</tr>
<tr>
<td><strong>ESRO/ELDO Space Documentation Service</strong>&lt;br&gt;European Space Research Organization**&lt;br&gt;114, av de Neuilly**&lt;br&gt;92-Neuilly-sur-Seine, France</td>
</tr>
<tr>
<td><strong>Her Majesty’s Stationery Office</strong>&lt;br&gt;P O Box 569, S E 1**&lt;br&gt;London, England</td>
</tr>
<tr>
<td><strong>NASA Scientific and Technical Information Facility</strong>&lt;br&gt;P O Box 33**&lt;br&gt;College Park, Maryland 20740</td>
</tr>
<tr>
<td><strong>National Aeronautics and Space Administration</strong>&lt;br&gt;Scientific and Technical Information Office (KSI)**&lt;br&gt;Washington, D C 20546</td>
</tr>
<tr>
<td><strong>National Lending Library for Science and Technology</strong>&lt;br&gt;Boston Spa, Yorkshire, England</td>
</tr>
<tr>
<td><strong>National Technical Information Service</strong>&lt;br&gt;Springfield, Virginia 22151</td>
</tr>
<tr>
<td><strong>Superintendent of Documents</strong>&lt;br&gt;U.S Government Printing Office**&lt;br&gt;Washington, D C 20402</td>
</tr>
<tr>
<td><strong>University Microfilms, Inc.</strong>&lt;br&gt;A Xerox Company**&lt;br&gt;300 North Zeeb Road**&lt;br&gt;Ann Arbor, Michigan 48106</td>
</tr>
<tr>
<td><strong>University Microfilms, Inc</strong>&lt;br&gt;Tylers Green**&lt;br&gt;London, England</td>
</tr>
<tr>
<td><strong>U.S Atomic Energy Commission</strong>&lt;br&gt;Division of Technical Information**&lt;br&gt;P O Box 62**&lt;br&gt;Oak Ridge, Tennessee 37830</td>
</tr>
<tr>
<td><strong>Zentralstelle für Luftfahrtdokumentation und -Information</strong>&lt;br&gt;8 München 86**&lt;br&gt;Postfach 880**&lt;br&gt;Federal Republic of Germany</td>
</tr>
</tbody>
</table>
**TABLE OF CONTENTS**

| IAA Entries | .......................... | 533 |
| STAR Entries | .......................... | 565 |
| Subject Index | .......................... | A-1 |
| Personal Author Index | .......................... | B-1 |
| Contract Number Index | .......................... | C-1 |

**TYPICAL CITATION AND ABSTRACT FROM STAR**

<table>
<thead>
<tr>
<th>NASA SPONSORED DOCUMENT</th>
<th>AVAILABLE ON MICROFICHE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N71-12035*# Pratt and Whitney Aircraft, East Hartford, Conn.</td>
<td></td>
</tr>
</tbody>
</table>

**DEVELOPMENT OF MAINSHAFT SEALS FOR ADVANCED AIR BREATHING PROPULSION SYSTEMS, PHASE 2 Final Report**

V. P. Povinelli and A. H. McKibben 23 Jun 1970 122 p refs

(Contract NAS3-7609)

(Two mainshaft face seal configurations for advanced gas-turbine engines were designed, fabricated, and tested. The seal concepts incorporated lift geometries which used the relative motion between the primary seal surfaces to provide positive separation (film lubrication). One design (self-acting) with shrouded Rayleigh step lift pads operated with a gas film separating the sealing faces. The other design (hydrodynamic) with a spiral groove geometry operated with oil-film separation. Tests of the gas-film seal demonstrated the feasibility of operation at gas temperatures to 1200 °F, pressure differentials to 250 psi, and sliding speeds to 450 ft/sec. Excellent correlations with analytically predicted performance parameters were obtained. Face wear was less than 0.1 mil after 320 hours at an air temperature of 1000 °F, a pressure differential of 200 psi, and a sliding speed of 400 ft/sec. Average air leakage during that test was 14 scfm. These operating conditions exceed the capability of conventional contact seals and the air leakage is 1/10 that of a labyrinth seal. Testing of the oil-film seal revealed an inadequate seal force balance.**

**TYPICAL CITATION AND ABSTRACT FROM IAA**

<table>
<thead>
<tr>
<th>NASA SPONSORED DOCUMENT</th>
<th>AVAILABLE ON MICROFICHE</th>
</tr>
</thead>
</table>

Investigation of the drag coefficient of spheres at hypersonic Mach numbers for near-free-molecule flow conditions. Sphere drag data in the near-free-molecular regime for flow conditions close to earth satellite conditions, obtained by using a free-flight technique in the Ames 42-in. shock tunnel are tabulated, shown graphically, and discussed.**
A Special Bibliography (Suppl. 10)  OCTOBER 1971

AERONAUTICAL ENGINEERING

IAA ENTRIES


Summary of various tests of theoretical resolution of the detachment. The purpose of these theoretical approaches is the prediction of characteristic magnitudes of the phenomenon of detachment in external aerodynamics such as the base pressure, the vortex column characterized by the form of the jet line, and the evolution of the velocity profile in the mixing zone. Following an outline of the basic hypotheses of the study, methods for the case of evolution of the velocity profile in the mixing zone. Following an outline of the basic hypotheses of the study, methods for the case of flow separation around the edges, as a result of the flow separation around the edges, two concentrated vortex nuclei of the same intensity and of opposite sign occur which will alter the field of vertical and horizontal velocities. As a means of simplification of the theoretical model is established by means of which the problem may be easily solved. A comparative study of the various kinds of distributions of downwash on the wing, by applying this theoretical model is presented. It is concluded that the mode of the downwash variation does not greatly influence the pressure distribution and the aerodynamic characteristics

A71-34190 # Comparative applications of a 'theoretical model' concerning the supersonic flow past a delta wing with flow separation at the leading edges. E Carafoli and Sf Stancu (Bucuresti Institutul Politehnic Gheorghe Gheorghiu-Dej, Bucharest, Rumania). Revue Roumaine des Sciences Techniques, Série de Mécanique Appliquée, vol 16, no. 2, 1971, p 395-407 7 refs

Study of the flow in the supersonic regime past a thin delta wing, considering the flow separations around the supersonic leading edges. As a result of the flow separation around the edges, two concentrated vortex nuclei of the same intensity and of opposite sign occur which will alter the field of vertical and horizontal velocities. As a means of simplification a 'theoretical model' is established by means of which the problem may be easily solved. A comparative study of the various kinds of distributions of downwash on the wing by applying this theoretical model is presented. It is concluded that the mode of the downwash variation does not greatly influence the pressure distribution and the aerodynamic characteristics

A71-34209 # Distribution of viscous stresses in an incompressible turbulent boundary layer (Raspredelenie ksatel'nykh naprazenii v neshzimaemom turbulentnom poganichnom sloe). P N Romanenko and V G. Kalmykov (Moskovskii Institut Neftekhimi- mcheskoi i Gazovoi Promyshlennosti, Moscow, USSR) Izvestiema-Fizicheskii Zhurnal, vol 20, Apr. 1971, p 666-673 8 refs In Russian

Isothermal turbulent boundary layers with a positive pressure gradient are studied by means of axisymmetric and plane diffusers in an open jet wind tunnel at Reynolds numbers between 48,600 and 202,000 at the diffuser inlet, using air as the working medium. It is shown that the distribution of viscous stresses in such layers can be approximated by a simple formula

A71-34213 # Acoustic emission of subsonic turbulent jets (Akusticheskoe izluchenie dozvukovykh turbulentnykh strui). L M Via'z'menskii (Mekhanicheskii Instut, Leningrad, USSR) Izvestiema-Fizicheskii Zhurnal, vol 20, Apr. 1971, p 711-716 10 refs In Russian

A method, based on Lighthill's (1963) wave equation, is proposed for calculating the noise intensity of turbulent jets. Noise levels in the far-field are obtained for various Mach numbers at the nozzle-exit section. The method proposed is applicable also to near-field calculations

A71-34225 # Fan propulsion system influence on VTOL transport design. Aubrey M Bland (McDonnell Aircraft Co., St Louis, Mo.) American Institute of Aeronautics and Astronautics and Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971, AIAA Paper 71-743 8 p Members, $1.50, nonmembers, $2.00

Some key design considerations are given to obtain the best overall airframe/propulsion combinations for VTOL transport propulsion systems. The effects of such combinations are evaluated in terms of VTOL thrust requirements, propulsion cycle optimization, aircraft performance, and aircraft control in the VTOL mode. The VTOL thrust requirements are shown to be most affected when the propulsion system designs are to perform lift, control and cruise functions simultaneously. It is also demonstrated that such a multi-function propulsion system can be designed with a cruise thrust matching an optimum specific fuel consumption cycle. The effects of fan design, location and response on aircraft control characteristics are reviewed. The combined effects of advanced technology and the multi-function propulsion system are projected to a VTOL transport anticipated for operation in the mid-80s


The nature and extent of the requirements of the satellite mobile service are examined and the charges which might be levied are estimated. It is suggested that a frequency band at around 5000
MH should be selected for the satellite-ground station links and a spectrum between 1540 and 1660 MHz for the satellite moving-craft repeaters. In this case relatively high-grain antennas are required ranging from 10 dB for aircraft and from 13 to 15 dB for ships. The possibilities offered by modulation technique are examined. It is proposed that two generations of satellites should be envisaged in the Atlantic-Pacific system. The first generation operating between 1975 and 1980 would have a low communication capacity and would comprise at least three satellites in orbit, two over the Atlantic and one over the Atlantic-Pacific. For the second generation, which would be in service between 1980 and 1987, traffic capacity would be considerable, and there will probably be five satellites in orbit, two over the Atlantic, two over the Pacific and one over the Indian Ocean.

**A71-34424** # Approximate method of calculating the laminar boundary layer on a wing and on a body of revolution (Nablizhenn sposob rozrakhunku laminarnogo pogranichnogo sharu na krili ta tili obertanniu) L. P. Kozlov (Akademia Nauk Ukrain's'koi RSR, Institut Didromekhaniki, Kiev, Ukrainan SSR) Akademia Nauk Ukrain's'koi RSR, Dopovidi, Seriia A - Fiziko-Tekhnichni i Matematichni Nauki, vol 33, May 1971, p 457-461 refs In Ukrainian

A method which is based on an integral momentum relation, and in which the velocity distribution is approximated by a trigonometric function is proposed. Using this method, the characteristics of the laminar boundary layer on a wing profile or body of revolution can be determined for any velocity distribution at the external boundary of the layer. The agreement with Hartree's (1937) exact solution and Schubauer's (1935) experimental data for the separation point is superior to other approximate methods.

**A71-34446** Approximate methods of constructing stream lines in meridional plane of blade nozzle annular cascades of steam and gas turbines in subsonic and supersonic flows. K. L. Yadav (Government Engineering College, Jabalpur, India) Indian Journal of Technology, vol 9, Mar 1971, p 93-98 refs

Two approximate methods of constructing stream lines in the meridional plane of blade nozzle annular cascades of steam and gas turbines involving the use of the coefficient of velocity and the coefficient of mass flow are described. The basic aerodynamic parameters used were taken from the static aerodynamic experimental data obtained in subsonic and supersonic flows through the annular cascades with constant Reynolds' number.

**A71-34447** Assessment of the anti-wear property of fuels under point contact conditions N. Suresh, A. D. Tuteja, and P. K. Goel (Indian Institute of Petroleum, Dehra Dun, India) Indian Journal of Technology, vol 9, Mar 1971, p 110-115

The results of studies made under the point contact conditions obtainable in rigs like the 4-Ball m/c and the Ball and Cylinder m/c with the object of selecting suitable test parameters for assessing the wear protection (anti-wear) property of piston engine and aviation jet fuels are presented. It is concluded that the Ball and Cylinder test technique enables the assessment of the anti-wear properties of aviation jet fuels to a better degree of confidence than the 4-Ball test technique. The anti-wear property is not directly related to the viscosity, volatility or aromatic content of aviation jet fuels.

**A71-34469** Concepts of fiber-resin composites. R. L. McCullough (Boeing Scientific Research Laboratories, Seattle, Wash, New York, Marcel Dekker, Inc Monographs and Textbooks in Material Science Volume 2), 1971 122 p 76 refs $8.50

The main significance of this book lies in its direct approach to the fundamentals of composite materials, with emphasis on stress properties. The properties of typical materials for composites are examined giving attention to fibers of glass, boron, and carbon, and to epoxy as matrix material. Elemental material candidates are Be, Mg, C, Si, Ti, N and O. Typical applications for composite materials include aircraft components such as compression panels, spoilers, fuselage stiffeners, and helicopter rotor blades. Composite properties are examined taking into consideration thermal properties and tensile strength. The characteristics of the interphase region are investigated.

**A71-34472** # Passenger plane power supply systems (Sistemy elektroobnableniya passazhirskikh samoletov) V. S. Zlochevski (Moscow, Izdatel'stvo Mashinostroenie, 1971 377 p in Russian

The power supply systems of 50 foreign (primarily U.S. and British) subsonic gas-turbine driven passenger planes of all classes are described, systematized, and analyzed. The trends in the development of power supply systems, and the influence of the aircraft characteristics and other aircraft systems on these trends is noted. Particular attention is given to the power supply systems of large airliners, such as the Boeing 747, and of short-haul aircraft, such as the Douglas DC-10 and the Lockheed L-1011. The book is intended for scientists and engineers, as well as students.

**A71-34473** # Aircraft automatic control systems. Methods of analysis and design (Sistemy avtomaticheskogo upravleniya samoletom - Metody analiza i rascheta), I. A. Mikhailov, B. N. Okeev, V. G. Pavlina, M. S. Chikulaev, and N. M. Edinov Moscow, Izdatel'stvo Mashinostroenie, 1971 464 p 22 refs In Russian

Methods of analyzing and calculating automatic control system parameters are discussed for a linear formulation of the problem. It is shown how the apparatus of linear theory makes it possible to assess, in the preliminary design phase, the capabilities of a simple control system for a specific plant, to determine the means of automation of flight control processes, and to derive the design characteristics of the autopilot from such analyses. Typical modes of operation of aircraft autopilots are examined, and the functions required from an autopilot are discussed. Much attention is given to the role of the human pilot in automatic flight control. The book is intended for engineers dealing with aircraft automatic control system design.

**A71-34481** Application of the low disc-loading proprotor to a series of aircraft for the short-haul market K. W. Sambell (Bell Helicopter Co., Fort Worth, Tex.) American Institute of Aeronautics and Astronautics, Aircraft Design and Operations Meeting, 3rd, Seattle, Wash, July 12-14, 1971, Paper 71-781 15 p 15 refs Members, $1.50, nonmembers, $2.00

It is shown that the interconnected shaft-driven low-speed lift-propulsion system based on four gimbal-propeller/rotors has potential for STOL aircraft with cruise speeds ranging from 250 to 500 knots. The same technology can be used to add VTOL aircraft to the short-haul system. The high propulsion efficiency at low speeds ensures minimum installed power and noise for any subsonic design cruise speed. The trend towards low disc-loading rotor systems and high aspect ratio wings requires careful attention to structural dynamics to ensure aeroelastic stability.


In an investigation, which takes into account theoretical models and empirical data, it was found that the effects produced by an airport are partly connected with its function as an enterprise and...
partly with its function as an element of the air traffic system. The airport plays also an important part in the total national economy and its growth. Therefore, it is possible to employ the airports considered as an enterprise on the basis of investment decisions as an instrument for controlling the level of economic activity within the national economy. The airport is also a factor in determining the location of enterprises which maintain connections with foreign countries.

A71-34493


Using room-temperature tests on strain-rate insensitive nickel-base superalloy single crystals of Mar-M200, it is shown that the deleterious effect of environment is suppressed when the fatigue frequency is increased to the ultrasonic range. It was found that above a stress amplitude of 30,400 psi the fatigue lives of crystals ultrasonically fatigue in air increase with decreasing stress in a manner which is functionally similar to that of crystals conventionally fatigue in vacuum. These results indicate that the major effect of increasing the fatigue frequency of the ultrasonic range is in the suppression of the influence of oxygen in enhancing the rate of crack propagation.

Z. W.

A71-34498


The definition of a maximum temperature engine (MTE) is considered, and the particular characteristics that such an engine will provide for propulsion systems of future aircraft are discussed. It is shown that the MTE concept when properly employed to aircraft applications which can utilize its specific capabilities holds the promise of significant improvements in aircraft performance levels. An overview of some of the potential benefits is given by a comparison of one MTE with current development state-of-the-art engines.

A71-34499


The actual Category II experience has been limited primarily because of problems associated with upgrading selected airports for Category II operation. Some of the considerations that have been taken into account in CAT II operations are discussed. Improved training in a number of areas can be accomplished by the use of additional training films and/or improved visual simulation. Aspects of an engine out missed approach are examined, and head-up displays are considered.

A71-34523


In this paper we review several classes of models of Air Traffic Control-related systems that have been presented over the years. These models cover the complete spectrum of ATC activities surface traffic movement, runway utilization, terminal areas, and enroute traffic. Outstanding work in each area is summarized and criticized. The employed techniques range from the purely analytical to real and fast-time simulations. Topics for possible future work are also identified on the basis of the present review. Finally, an extensive annotated bibliography is included.

A71-34525


Factors and considerations affecting the design features of the DC-10 aircraft during its development stage, starting in March 1966, are reviewed. In particular, attention is paid to sizing, determination of the optimum number of engines and optimum engine thrust, and selection of the cruise, approach, and stall speeds. Characteristics of both the medium-range DC-10 and the long-range DC-10-20 and DC-10-30 versions, which incorporate numerous innovations, such as spacious interiors, elimination of visible smoke, reduction of noise levels, increased performance parameters, etc., are discussed in detail.

O. H.

A71-34556


Consideration of new design problems posed by SSTs which for solution require information on the mechanical behavior of new materials and on the effects of long exposure to elevated temperatures during service. Experimental studies of titanium alloys conducted at the NASA Langley Research Center are discussed. These studies define fatigue behavior, effects of temperature, rates of fatigue crack propagation, residual strain, strength, effect of environmental stress, the effect of outdoor exposure at elevated temperature, and behavior during simulated flights.

A71-34590


Study of a gas turbine consisting of a pure-impulse compressor, an isothermal burner, and a pure-impulse turbine. The point of the study is to demonstrate that the application of an isothermal burner makes it possible to either (1) reduce the maximum temperature of the turbine cycle without affecting the overall efficiency and specific work, or to (2) improve the overall efficiency and specific work without reducing the maximum temperature of the cycle. The term isothermal denotes that the temperature in the burner is kept as close to a selected constant value as possible. Performance curves of a gas turbine engine have been calculated for realistic process parameters in order to determine the optimal compressor pressure ratio.

A71-34597


Determination of the stress-strain distribution in a hyperboloidal-profile rotor disk loaded by linear radial forces.
originated by the action of radial blades mounted along the circumference. The analyzed model of the disk is applicable to the rotor disks of aircraft-engine compressors with two-stream flow of the working medium. The proposed computational procedure permits numerical determination of stresses in the most highly loaded regions of the disk circumference near blade mountings. An analysis of the effects of various forms of loading makes it possible to design blade shapes from the viewpoint of obtaining disk stresses which do not exceed permissible values. A comparison of the results of two numerical examples illustrates a significant influence exerted by the hyperbolic shape of the disk profile.


Topics include millimeter systems, LSI memories, active and passive filters, medical electronics, optoelectronic devices, and component manufacturing for the 70s. The optimizing selection of vacuum deposition equipment is discussed together with low-noise amplification problems at microwave frequencies, the integrated circuit overseas, the next generation of satellite systems, instrumentation for data acquisition and control systems, advances in commercial avionics, and instrumentation guidelines for the study and control of ecology and water pollution. Management control systems and management of the development of software systems, evaluation of proprietary software, minicomputers in process industries, and the impact of interactive computing systems on engineering problems are considered. A permuted index is included.

Individual items are abstracted in this issue G.R.
A difficulty is considered in the theory of inviscid incompressible flow past thin airfoils, in which an expansion for the complex potential or complex velocity is sought in powers of the thickness ratio. It is then found that such an expansion breaks down in the vicinity of the airfoil edges. At sharp edges, the method of matched asymptotic expansions fails to remedy this. This failure is explained, and, in the case of incompressible flow past a symmetric airfoil at zero incidence, it is shown that by proper choice of the dependent variable an expansion may be obtained which is uniformly asymptotic. Finally, the case of a circular-arc airfoil is considered in greater detail.

A71-34860  

Results of studies undertaken in France for the control of air traffic in regions where installations are impractical (oceans, polar regions). Air transportable models were developed with the intent to verify the feasibility of telecommunications and surveillance geostationary satellites. The system comprises a single multiplex in the earth-aircraft sense, and two multiplexes in the inverse sense. The characteristics of these multiplexes, which make use of numerical techniques, are briefly described, followed by definition of the techniques adopted, with emphasis on the aircraft equipment. The results obtained in the course of laboratory experiments or from simulations show the validity of the solutions retained, in particular, that of delta modulation for the numerical transmission of voice signals.

A71-34861  

Description of the telecommunications system for air traffic control and navigation by the Dioscures satellites which is based on the establishment of band L links between commercial aircraft and two stationary satellites. Electronic scanning makes possible an independent orientation of two antenna beams, using a fixed apparatus of small size consisting of two antennas, the associated control box, and the computer unit which controls the orientation of the beams as a function of the aircraft position. The various subassemblies and the results obtained are described. A simulation test was carried out to verify the good operation of the electronic scanning system.

A71-34700  
Automatic control of aircraft electrical system reduces wiring and improves reliability. Manvel A. Geyer (Westinghouse Electric Corp, Aerospace Electrical Div, Lima, Ohio) and Dwayne F. Rife (Westinghouse Research and Development Center, Pittsburgh, Pa) Westinghouse Engineer, vol 31, July 1971, p 114-119

In the new automatically controlled electrical system, both control wiring and power wiring are minimized. Control and indication signals are transmitted between the cockpit and a number of remote power controllers via remote input/output units and a multiplexed data bus. The distribution control center is a 'switch-board' for properly routing signals between control and indication devices. Limit switches and other mechanical relay devices are replaced by transducers that provide signals to the distribution control center, where the logic for sequencing and automatic control is centered. Switch-indicator modules provide one means of trip and load indication as well as manual command input.

A71-34875  

Consideration of a one-dimensional Stefan problem concerning the melting of a layer of ice on the surface of a flight vehicle during the operation of a cyclic desiccation system. The investigated problem (with boundary conditions of the third kind) is solved analytically by means of Sokolov's (1967) method of averaging functional corrections.

A71-34874  
Optimization of complex structures to satisfy flutter requirements. Carl S. Rudisill (Clemson University, Clemson, S.C) and Kumar G. Bhana AIAA Journal, vol 9, Aug 1971, p 1487-1491 7 refs Grant No NGR-41-001-027

Equations for finding the partial derivatives of the flutter velocity of an aircraft structure with respect to structural parameters are derived. A numerical procedure is developed for determining the values of the structural parameters such that a specified flutter velocity constraint is satisfied and the structural mass is a relative minimum. A search procedure is presented which utilizes two gradient search methods and a gradient projection method. The procedure is applied to the design of a box beam.

A71-34884  

A method is presented by which the eddy-viscosity and mixing-length concepts, that are being used in the current differential methods, can be modified to calculate incompressible turbulent boundary layers at low Reynolds numbers. A comparison of several calculated results using this modification shows good agreement with experiment.

537
A71-34887


Investigations have been conducted in a hypersonic low-density wind tunnel to obtain an accurate knowledge of the absolute flow density. For this purpose, a method was employed which was based on time-of-flight measurements of nitrogen ions produced by a short pulsed high-energy electron beam. The results of the time-of-flight velocity measurements are given graphically and discussed.

A71-34889 // Vortex flow over a flat surface with suction. Kenichi Nanbu (Tohoku University, Sendai, Japan) AIAA Journal, vol 9, Aug 1971, p 1642, 1643 10 refs

Boundary-layer equations have been solved for steady incompressible flow with a potential vortex as the outer flow over an infinite flat surface under the boundary condition of distributed suction. It is shown that, without any speculation to the singularity on the vortex axis, a formal similarity solution can be obtained for suction parameter greater than a certain value.


Research supported by Rutgers University.

Information is presented for use in the design of nonlinear 'elastica' suspension springs with symmetrically hardening behavior which are promising as a shock and vibration isolation mount, particularly in the aerospace and transportation industries. Suspension dynamics of this suspension system is examined theoretically, the resulting frequency response, obtained numerically, is shown graphically and discussed.

A71-34895 // Shock standoff distances and Mach-disk diameters in underexpanded supersonic jets. W. Davidson and S. S. Fenner (California, University, La Jolla, Calif.) AIAA Journal, vol 9, Aug 1971, p 1651-1653 9 refs

Contract No AF 44(620)-68-C-0010

Experimental measurements were performed in a blow-down tunnel with mixtures of nitrogen dioxide and nitrogen tetroxide as working fluids. Standoff distances were determined photographically by using a movie camera. The previously published data on Mach-disk diameters have been replotted in a graph, together with experimental results for nitrogen and for the reacting system consisting of nitrogen dioxide and nitrogen tetroxide.

A71-34898 // Separation of a supersonic accelerated flow over notches. A F Charwat (California, University, Los Angeles, Calif.) AIAA Journal, vol 9, Aug 1971, p 1656, 1657

Wind tunnel experiments have been conducted to determine the effect of a negative pressure gradient on the Mach number immediately ahead of separation of a 181. Results are presented graphically, compared to those obtained theoretically, and found to be in good agreement.


The nature of the flow near the interface between the laminar and turbulent regions is examined. A wake model is suggested which explains the character of entrainment.


The influence of the ground during the takeoff and landing phases of aircraft are examined. A wake model is suggested which is based on the theoretical path by rising again after having descended close to the ground is experimentally tested to qualitatively determine the cause of this phenomenon. Results are given graphically and discussed.


Experimental results are presented for the stagnation point heat-transfer rate and the heat-transfer rate distribution over a hemisphere cylinder in hypersonic, rarefied flow. Comparison is made with the higher-order theories of Cheng (1961) and Davis (1970) for the stagnation point heat-transfer rate and the theory of Lees (1956) for the heat-transfer rate distribution.


Derivation of a procedure for calculating the levels of oscillation damping by aerodynamic forces in turbine blades of aircraft engines. The procedure is based on a method proposed by the authors (1968) for calculating the parameters of an array of arbitrary profiles vibrating with arbitrary phase shifts in a plane incompressible fluid flow.


Description of the installation and experimental program of the Comet 4 aircraft which is being fitted out as a flying laboratory at the RAE Farnborough, UK. One of the main tasks in this aircraft will be to investigate the techniques necessary for the integration of avionics systems. The navigation system lends itself more readily than most to integration and will be studied in the early experiments. Besides the investigation of the use of digital computers and digital techniques, the work will include research and development in computer controlled displays such as 'projected map' and cathode ray tube displays, and in digital data transmission both along conventional cables and along fiber optic links. The operation of the multifunction keyboard and cathode ray tube displays is described.

M M.

A71-35097 Characteristics of satellite-to-aircraft links. Howard C Salwen (Signatron, Inc., Lexington, Mass.) In Institute of Electrical and Electronics Engineers, Annual International Conference on Communications, 7th, Montreal, Canada, June 14-16, 1971, Proceedings

Edited by H L Blaneker New York, Institute of Electrical and Electronic Engineers, Inc (ICC Conference Record Volume 7), 1971, p 29-14 to 29-18 16 refs

The propagation characteristics of satellite-to-aircraft links are reviewed, and estimates of channel parameters are given. A general method for describing the multipath on such links is presented. The
characteristics of specular reflected signals are described, and aspects of diffuse scattering are investigated. The computation of the scattering function is discussed. Characteristics of the diffuse multipath include specification of the relative delay and Doppler. The characteristics of the multipath are further characterized by the delay spread, and the fading bandwidth. Approaches for studying ionospheric effects are considered.

G R

A71-35106
A queueing theory approach to communication satellite network design. Herbert G Raymond (TRW Systems Group, Redondo Beach, Calif.) In Institute of Electrical and Electronics Engineers, Annual International Conference on Communications, 7th, Montreal, Canada, June 14-16, 1971, Proceedings
Edited by H L Blacker New York, Institute of Electrical and Electronics Engineers, Inc (ICC Conference Record Volume 7), 1971, p 42-26 to 42-31 6 refs

The increasing use of communication satellites has led to rising interest in networks that best exploit the unique capabilities of satellite repeaters. Utilizing the techniques of queueing theory the behavior of two useful satellite networks is analyzed. First a single multichannel node is used to model an Oceanic Air Traffic Control System. This model was employed not only to calculate the required satellite capacity, but also to determine its sensitivity to the traffic assumptions. Next the model was extended to a multinode network representing a worldwide military broadcast communication system. The behavior of this network was then examined for varying traffic patterns. This parametric analysis identified key network design parameters and suggested several useful design guidelines. (Author)

A71-35151

The articles provide information on the growth of cracks in engineering structures and the residual strength of cracked structures for the purpose of predicting service lives of structures subjected to fatigue loading and to establish safe inspection intervals. Basic concepts in fatigue crack propagation, the effects of panel geometry, the influence of panel stiffeners, and the application of fracture mechanics and crack propagation to the design and testing of aircraft structures are dealt with. Ballistics damage characteristics and tolerance are also discussed.

A B K

A71-35153

The test program was conducted on 60 centrally cracked specimens varying in thickness from 0.05 to 0.75 in Analysis of the results showed that the two materials displayed substantially different characteristics. This is attributed to the fact that, owing to the low proportional limit of the T73 material, the net section stress was in the plastic range for most specimens, whereas for the T6 material the net section stress was always in the elastic range. It was noted that during slow crack growth, the crack grew faster in the center than at the surface of the material. A lumped parameter, redundant force analysis of three plates of varying thickness was made. The results show the development of plane strain conditions with increased thickness.

Z W

A71-35156 *

Rates of fatigue crack growth were measured in fatigue tests of stiffened panels constructed with bolted and integral stringers. The panels with bolted stringers were made from 2024-T3 aluminum alloy sheet with either aluminum alloy or steel stringers. The stringers were attached to the sheet with interference fit lock bolts. Stinger spacing and stiffness were varied systematically in the construction of the panels. The integrally stiffened panels were made from 7075-T6 aluminum alloy sheet extruded with outstanding stringers. The stress intensity factor, calculated by a previously developed method, is used to predict the crack growth rates for the stiffened panels. Fatigue tests were conducted on unstiffened panels to determine the relationship between the stress intensity factor and crack growth rate. In general, the stress intensity factor correctly predicts the crack growth rates in panels with bolted and with integral stringers except when the cracks are long. In these cases, the measured rates are slightly higher than the predicted rates. Furthermore, the stress intensity factor correctly predicts the rates to be lower in the panels with stiffer and more closely spaced stringers and to be equal in panels with steel and with aluminum alloy stringers of equal stiffness. The bolted stringers reduced the crack growth rate significantly below that for an equally stressed unstiffened panel, whereas the integral stringers had no significant effect.

A71-35157

Fracture tests were conducted on precracked panels reinforced with various crack stoppers. Motion pictures and continuous graphical records of load and local strains were taken during the tests. The purpose of these tests was to study variables affecting residual strength of reinforced panels. Results show that, for 2024-T3 aluminum skin panels reinforced with riveted or bonded flat straps made of various alloys, the residual strength increases with the product of reinforcement area and reinforcement strength. Reinforcement stiffness, which is of primary importance for other classes of panel configurations, was found not to be a significant variable for the panel configurations tested. A crack opening displacement model is proposed to illustrate the influence of the reinforcements, the skin fracture toughness, and the slow stable tear characteristics on the arrest of a stably propagating crack. The model helps to elucidate the interactions between skin variables and reinforcement variables.

A71-35159

Full scale fatigue tests were conducted on the F-100 wing. Service connected fatigue failure data were collected and compared with test results. Test lives to initiate fatigue cracks are compared with predicted lives using Miner's rule of linear cumulative damage.
The development of air traffic control systems and air transport automatic landing systems in the U.S. and Western Europe is summarized. Information display systems are described, as well as automated air traffic control systems and various electronic devices for controlling air traffic. The present state of development of automatic landing systems is reviewed, automatic landing systems produced in Great Britain, the U.S., and France are evaluated, and certain helicopter and V/STOL landing systems are investigated. The automation of air traffic after landing and while taxing on the airfield is considered.

A71-35160 Development of the fail-safe design features of the DC-10. T Swift (Douglas Aircraft Co., Long Beach, Calif.) In Damage tolerance in aircraft structures, American Society for Testing and Materials, Annual Meeting, 73rd, Symposium, Toronto, Canada, June 21-26, 1970, Proceedings Philadelphia, American Society for Testing and Materials (ASTM Special Technical Publication No 486), 1971, p 164-214 15 refs The degree of damage tolerance used in the design of the DC-10 fuselage pressure shell is discussed with reasons for its selection. Analysis methods are presented for the prediction of the residual strength of damaged, stiffened panels, based on the matrix force solution of an idealized structure combined with fracture mechanics equations. The results of 20 different configurations are included. A description of the development test program to verify the analytical techniques and to substantiate the fail-safe strength of the fuselage shell is given together with the results for many of the tests (Author)

A71-35161 The ballistic damage characteristics and damage tolerance of wing structural elements J E Jensen (General Dynamics Corp, Convair Div, San Diego, Calif.) In Damage tolerance in aircraft structures, American Society for Testing and Materials, Annual Meeting, 73rd, Symposium, Toronto, Canada, June 21-26, 1970, Proceedings Philadelphia, American Society for Testing and Materials (ASTM Special Technical Publication No 486), 1971, p 215-229 The damage and residual strength of 7075-T6 aluminum panels exposed to a .50 AP M2 gunfire was found to vary with projectile velocity, impact angle, and target thickness. Maximum damage occurred at low velocities and high impact angles. The strength of thin panels agreed closely with fracture theory because of their predominant cracklike flaws; conversely, the strength of thick panels was close to the material ultimate tensile strength because of the blunt flaw shapes. Damage and residual strength prediction models were developed from the test data for monolithic panels. Alternate design concepts consisting of laminated, plated, and spar cap stiffened panels were investigated. The laminated panels exhibited extensive petaling and star-type cracking and low residual strength. Planked and spar cap stiffened panels provided damage alleviation and crack arrestment with high preload stresses (Author)

A71-35163 Crack propagation in helicopter rotor blades. M J Rich (United Aircraft Corp, Sikorsky Aircraft Div, Stratford, Conn.) In Damage tolerance in aircraft structures, American Society for Testing and Materials, Annual Meeting, 73rd, Symposium, Toronto, Canada, June 21-26, 1970, Proceedings Philadelphia, American Society for Testing and Materials (ASTM Special Technical Publication No 486), 1971, p 243-261 7 refs Design criteria are presented for the residual strength and life of fatigue loaded helicopter structures. The crack propagation rate methods and data are reviewed, and a bilinear semilog method is shown to be most accurate for predicting residual life. The methods developed are compared with full scale rotor blade fatigue data. The good correlation with test data demonstrates the value of fracture mechanics analysis for fail-safe design (Author)


Fluid properties behind the reflected shock have been calculated. Surface pressures in two consecutive iterations converge to within a certain accuracy. The changes in stagnation pressure produced by movement of rows, arrays, and sheets of vortices are derived. By applying Preston's result for a single row of moving vortices to continuous vortex sheets, the time mean stagnation pressure downstream of a row of blades with fluctuating circulation is derived. It is shown that if the blade circulation varies due to the potential flow fields of the neighboring blades, then the time mean stagnation pressure may change with location.


A simple approximate relation is established between the convective flow at the critical point and the decrease in the radiation flux as a result of absorption in a cold boundary layer. In particular, it follows from this relation that when there is no flow in the boundary layer of surface-destruction products, the total heat flow (radiative plus convective) is essentially independent of the optical properties of the gas in the boundary layer.

Aeronautical Quarterly, vol 22, Aug 1971, p 207-224 11 refs

The changes in stagnation pressure produced by movement of rows, arrays, and sheets of vortices are derived. By applying Preston's result for a single row of moving vortices to continuous vortex sheets, the time mean stagnation pressure downstream of a row of blades with fluctuating circulation is derived. It is shown that if the blade circulation varies due to the potential flow fields of the neighboring blades, then the time mean stagnation pressure may change with location.


The changes in stagnation pressure produced by movement of rows, arrays, and sheets of vortices are derived. By applying Preston's result for a single row of moving vortices to continuous vortex sheets, the time mean stagnation pressure downstream of a row of blades with fluctuating circulation is derived. It is shown that if the blade circulation varies due to the potential flow fields of the neighboring blades, then the time mean stagnation pressure may change with location.


For caret waversiders at the design condition the attached shock wave in the plane of the leading edges may correspond to either a strong or a weak oblique shock wave when viewed normal to the edges. In cases where the design shock wave corresponds to the strong oblique shock the off-design behavior of the wing is not completely understood. In this note some measured results are analyzed in an attempt to understand this off-design behavior.

Aeronautical Quarterly, vol 22, Aug 1971, p 233-256 14 refs

The method of characteristics and an implicit finite-difference scheme are used to investigate the interaction between the internal flowfield and laminar boundary layer in ducts of circular cross-section under conditions of high Mach number and low Reynolds number. The displacement thickness is added on to the body to form a new 'effective body shape' which is used to calculate the inviscid flow. Iterations are performed, and a solution is obtained when the surface pressures in two consecutive iterations converge to within a specified tolerance. The results are computed for constant wall temperature. The type of shock-wave interaction near the axis of symmetry is determined and the computation terminates after the fluid properties behind the reflected shock have been calculated.


The natural frequencies and mode shapes of vibration of cantilever aerofoil cross-section blades of pre-twist angle in the range 0 to 90 deg are obtained. The beams are 152 4 mm long and the width/thickness ratio is such that they may be regarded as slender. Theoretical frequency ratios and mode shapes of vibration, neglecting shear and rotary inertia effects, are obtained for two sets of beams, one with clockwise pre-twist relative to the root cross-section and the other with anti-clockwise pre-twist. The effect of variation in the value of the center-of-flexure coordinates upon the natural frequency ratios and mode shapes of vibration is investigated. The theoretical results are compared to corresponding experimental results.


Derivation of a closed-form expression which gives an approximate solution to the lift generated on a two-dimensional thin airfoil in incompressible flow. The inaccuracy of the solution when compared with other published work is compensated by the simplicity of the final expression, particularly if the result is required for the calculation of the sound power radiated by an airfoil in a turbulent flow.


The interpretation of interferometric fringe patterns can be a complicated process, but the single underlying relationship that governs the pattern is relatively simple. A few observations concerning this relationship lead to certain approaches that improve both the threshold and the resolution of the holographic method. One such approach is described in this paper, along with the results of interferometric measurements made to determine the stability of a precision gyro. The principle of interference is reviewed briefly, and the relevant characteristics of the holographic image are discussed.


Outline of lubrication techniques that may enable bearings to operate at more than twice their present speed and still have their inherent ability to carry heavy loads. Such bearings find application for helicopter transmissions, since there is a weight saving and the statistical reliability of two bearings is much greater than that of three bearings. By redirecting the lubricant flow through the bearing or by introducing a second source of lubricant directly to the critical contact area, tapered roller bearings can be run at speeds up to 20,000 fpm cone velocity. Test results on a CH-47 Boeing helicopter transmission are discussed.

Strength and stability of thin-walled aircraft structures (Prochnost' i ustochest' tonkostennych avionnnykh konstruktsii). Edited by I F Obraztsov Moscow, Izdatel'tvo Mashinostroenie (Moskovskii Aviatsionnyi Institut, Trudy, No 180), 1971 299 p In Russian

A study is made of the strength of plates and shells of aircraft structure type under various types of loading. The calculation and
design of optimal structures, and methods of calculating and analyzing the strength of shells of revolution made of composite materials are presented. Problems involving general and local loss of stability of multilayer structures are investigated, taking into account the filler rigidity.

- Individual items are abstracted in this issue


A procedure for mathematically processing structural fatigue data, using methods in probability theory, mathematical statistics, and correlation and regression analysis. The results obtained by this method for various panels are used to study the influence of technological and structural factors on the fatigue life of airframe panels. General relations for calculating the endurance of panels under cyclic loading are proposed.


Consideration of the problem of constrained torsion of a spar box fastened along isolated parts of the contour. Vlasov's displacement variational method is employed in the calculations. It is shown that the tangential stress distribution does not follow beam theory. The tangential stress distributions along the wing span have maxima which can lead to the failure of the structure.


Description of the development and performance capability of a small radio-controlled aircraft as a versatile measurement platform along with the required radio control and meteorological sensing instrumentation. Experience with the system in several extended field tests has shown that controlled soundings to 4000 ft are possible with the unaided eye. For flights above this altitude, simple optical aids have been developed and soundings to 10,000 ft have been made.

A71-35336 \# Closed-die forgings for the aircraft industry. II. J A Carver, Special Steels Review, Spring 1971, p 8-14

Carbon and low-alloy steels are forged at temperatures up to 1250 C. Forgings in vacuum remelted steels have greatly improved transverse ductility and microcleanness as compared with those from air-melted stock. Problems with maraging steels and precipitation hardening stainless steels are discussed. Giving attention to the dependence of metallurgical qualities of forgings on forging practice, nickel alloys and superalloys are considered. The forging of titanium alloys is described, taking into account beta alloys, alpha alloys, and alpha-beta alloys. The forgeability and mechanical properties of titanium alloys are not influenced to any marked degree by variations in the metallic alloying elements, but they are affected by variations in interstitial elements such as oxygen, nitrogen, and carbon. G R


Discussion of the limitations of techniques already commonly applied, and of the more promising points of application for new technology in navigation surveillance and traffic control. Some of the current trends in other fields, particularly aircraft design, are considered. Emphasis is placed on the efficient use of land at airports, in view of the strength of feelings aroused in the community by the questions of apportionment and exploitation of land resources. It is pointed out that, as compared with techniques of navigation surveillance and traffic control, changes in basic aircraft characteristics are potentially a much more powerful means of increasing land productivity and ameliorating problems of noise and vortices.


Discussion of criteria and problems incident on the provision of ATC from the standpoint of the user. Particular requirements presented by the pupil pilot, ultra-light aircraft, gliders, clubs and small private aircraft, business aircraft and air taxi, military aircraft, the test pilot, and airline pilots, are considered. It is pointed out that a possible weakness in present ATC methods is that the controller may have to off-load some of his responsibilities onto the pilot. Perhaps in the distant future the high density ATC system will not only allocate aircraft headings, heights and speeds, but also continuously monitor lateral, vertical and longitudinal operation. Pilots would not then be obliged to maintain track, flight level and airspeed with great precision all the time, but only when it really was necessary to do so in the interests of safety.


Examination of means for improving the present ATC system by the use of area navigation. The following typical benefits are provided by area navigation: (1) dual or multitracks for omnidirectional traffic flow, (2) improved economical alignment of routes, (3) dual or multitracks to allow segregation of traffic according to speed or flight configuration, (4) tracks bypassing congested areas, (5) optimum location and size of holding patterns, and (6) procedures designed for STOL and helicopter operation. Potential suppliers are offering area navigation computer equipments of varying sophistication and range in price from about $2500 to over $150,000. It is concluded that there is a high degree of unanimity between pilots and controllers for early implementation of an area navigation system.


Brief survey of military and civil aircraft navigation, with emphasis on self-contained systems, and a brief reference to external
How the courts look at wake turbulence

Review of the history of lawsuits arising from accidents related to wake turbulence, with assessment of the state of the law today. The issue in such litigation is whether the accident was the fault of the pilot of the crashed plane or the fault of the air traffic controller in not maintaining sufficient separation between the two aircraft. In general, recent cases seem to set a trend extending and broadening the government's liability where the controller's act is judged to be negligent.


Description of typical performance characteristics of jet engines equipped with an afterburner as a means of temporary thrust enhancement, and survey of the structural characteristics of some currently used afterburner designs. Problems of combustion, flame stabilization, and outlet-nozzle regulation are considered, together with operational cost aspects.


Case histories of damage sustained by aircraft due to wind acting on airport surfaces. The frequency of occurrence and directional statistical of high-velocity winds at Warsaw's Okecie airport are analyzed, and recommendations are given for wind and hail protection during landing, parking, and maintenance operations.


Analysis of factors affecting the service life of gas-turbine engine components, on the basis of modern concepts concerning the summation of material defects under the action of physical and thermal static and variable loads. Formulas for evaluating the equivalent service life of materials and components are proposed.


Discussion of fatigue and creep tests performed with two nickel-base turbine-engine alloys (EP109VD and EI961) at operational temperatures and durations from 100 to 10,000 hr. The laws governing the changes in the dispersion of heat-resistance characteristic are determined as a function of the temperature and service life. The laws obtained make it possible to increase the reliability of strength and performance estimates for turbine-engine materials.
A71-35455


Development of a method of evaluating the service life of solid and hollow turbine guide vanes, which is based on calculating the heat transfer coefficients and the temperature and stress fields, and evaluating the heat resistance of the vanes. The possibility of increasing the service life of uncooled vanes by optimal selection of the cavity geometry is demonstrated. V P

A71-35456


Translation.

Analysis of the fatigue characteristics (obtained in laboratory tests) of aircraft alloys and of their applicability to the evaluation of component endurance. It is shown that for samples of various dimensions and stress concentrations, there exists a common fatigue curve in relative coordinates. Using this curve, the fatigue characteristics of structural elements can be determined on the basis of test data. V P

A71-35460


Discussion of possibilities for shortening the test time required to increase the service life of aircraft engines. It is proposed to conduct an equivalent test along a program constructed on the basis of an analysis of factors which influence the service life of the individual units and components of an engine. Factors which affect the service life of engine components and lend themselves to quantitative evaluation include failure by fatigue, creep, stress relaxation, heat resistance, wear, and contact endurance. Special tests (not included in equivalent testing) should be conducted to determine the influence on service life of such factors as fuel and lubricant coking, erosion, and contamination of components, and random accidental damage (such as of blade edges). V P

A71-35467

Coherence criteria for supersonic compressor tests (Critères de cohérence pour essais de compresseurs supersoniques). Christian Capillon and Jean Reboux (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) La Recherche Aérospatiale, May-June 1971, p. 139-149

In French

Establishment of coherence criteria for measurements used in judging the effectiveness of tests carried out. This is necessary in order to determine various aerodynamic and thermodynamic magnitudes essential for the detailed understanding of complex processes arising in a compressor where the flow passes several times from the supersonic to the subsonic region. These criteria have been defined and perfected on an experimental freon compressor with low blade height and a cylindrical test section, accurately representing a mobile supersonic annular cascade. It appears that elementary compression processes can be achieved with such a compressor, which is also suitable for flow visualization, and is also an excellent model for investigation of a cylindrical section of a long blade supersonic compressor. F R L

A71-35468

Linearized theory of the unsteady subsonic flow in a two-dimensional straight cascade (Théorie linéarisée de l'écoulement subsonique instationnaire dans une grille droite bidimensionnelle). Jacques Leclerc (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) La Recherche Aérospatiale, May-June 1971, p. 151-163

In French

Consideration of the general problem of the blade stability of a mobile wheel, assuming a light dispersion of the mechanical characteristics of the blade, taking rotor inertia into account in the overall rotational vibration. The problem of an unsteady local lift calculation is treated for two configurations, considering the wheel as an infinite two-dimensional cascade with any pitch and angular setting. In the first case the blade vibration is assumed to be harmonic, synchronous, and identical except for its phase from one blade to the next. In the second case all blades but one are assumed to be fixed. Poisson's method is used. The series directly defining the pressure kernel is replaced by a simpler and more rapidly converging series obtained by a Poisson transform. The effects of blade profile camber and of steady angle of attack, when these are moderate, are taken into consideration by introducing a supplementary term which depends linearly on the steady circulation. F R L

A71-35470

Calculation of aircraft, helicopter blade, or turbine blade airflow for the exact compressibility law (Calcul de profils d'ailes d'avions, de pales d'hélicoptères ou d'aubes de turbomachines pour la loi de compressibilité exacte). Robert Legendre (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France) La Recherche Aérospatiale, May-June 1971, p. 167, 168

In French

Development of a method simpler than that of Cauchois-Fredholm for solving the Dirichlet problem in the plane of the hodograph of the plane flow of a compressible fluid. The method has the advantage of directly furnishing the potential, psi, of the flow, and generalizes the method which is applicable to harmonic functions. F R L

A71-35488


Description of the assembly design, indicator system, bench testing, and 600-hour engine testing of the three-micron absolute main oil filter developed for the T53 gas turbine. The new disposable elements, running approximately 300 hours without clogging, provide a much cleaner lubrication system and have eliminated requirements for 25 hour filter inspections and 100 hour oil drains. One of the benefits of the new filter consists in that wear caused by the abrasive action of oil containing one to five micron particles is prevented through removal of these particles. The other benefit is the marked absence of oil degradation with clean oil over long drain intervals. M V E

A71-35526


Members, $1.50, nonmembers, $2.00

The flights which mark the progress made with the Concorde are examined, and aspects of the training of the official pilots are considered. The structure of the French organization for aircraft development certification and the Concorde flight test organization are shown. The functions of the CEV are discussed giving particular attention to their work in connection with the Concorde. A table is presented showing Concorde flying hours up to certification. G R
The goals of the Gulfstream II acoustic program were to assure that the aircraft could meet the FAA's noise certification standards. The program focused on reducing noise levels from various sources, including the engines, APU (Auxiliary Power Unit), and inverter. The cabin was designed to minimize noise levels, with special attention given to the windows, air conditioning, and isolation mountings for major vibration sources like the engines. The noise levels achieved in the Gulfstream II were compared to those in other aircraft, demonstrating a significant improvement.

A special in-flight simulator was developed to test the capabilities of the aircraft. This simulator allowed for the testing of various flight scenarios and was used to assess the performance of the aircraft in real-world conditions. The capabilities of the simulator were significant, allowing for the testing of various flight paths and navigation scenarios.

The Gulfstream II also featured variable stability, which allowed the aircraft to change its flying qualities in all six degrees of freedom. This feature was unique among aircraft at the time and provided significant operational advantages. The variable stability system was designed to enhance combat effectiveness and improve operational capabilities.

The design and test of an integrally armored cockpit was another significant feature of the Gulfstream II. This design was developed to provide protection against enemy fire and meet the needs of close air support operations. The design criteria for the armor were developed and demonstrated in full-scale experiments, showing promise for enhancing combat effectiveness.

The Gulfstream II was a significant advance in aircraft design, combining high performance with the capability to vary its flying qualities. The design and testing of this aircraft contributed to the advancement of variable stability and aerodynamics, setting the stage for future developments in aircraft design.
A71-35582

Utilization and development prospects of satellites for the civil aviation and merchant marine (Perspectives d'utilisation et de développement des satellites pour l'aviation civile et la marine marchande). Bertrand Manuel (Centre National d'Etudes Spatiales, Paris, France) "Navigatian" (Paris), vol 19, July 1971, p 299-315 5 refs In French

The nature and magnitude are assessed of aircraft and seacraft location and communication needs of civil aviation and merchant marine management that a satellite system could meet effectively, and a preliminary definition is attempted of the essential characteristics such that a satellite system should possess. An evaluation of the global number of high-grade communication channels the civil aviation and merchant marine is likely to need is followed by a review of the implications of aircraft and seacraft antenna characteristics and of present modulation techniques for optimum communication channel frequencies between satellites and seacraft and aircraft, as well as between satellites and ground stations. The operational utilization prospects of an Atlantic-Pacific three-satellite system is then discussed, along with the technical and economic potentials of a first satellite generation.

M V E

A71-35604


The stability of a gyrocompass is analyzed, taking into account the vertical inertia component of its translational motion. This component is shown to exert an appreciable effect on the oscillations of the sensitive element of the system. Relations are obtained to calculate the stability characteristics of a gyrocompass during circulations and arbitrary periodic maneuvers of the ship.

V Z

A71-35608

The problem of errors of a gyro device mounted on a mobile platform (K voprosu o pogreshnostakh giroskopicheskogo prybora, ustanovlennogo na podvzkhonoi platforme) V F Kulakov and Iv V Osetinskii Akademiia Nauk SSSR, Izvestia, Mekhanika Tverdogo Tela, May-June 1971, p 61, 62 In Russian

The effect of rotor asymmetry on the performance of a two-degree-of-freedom gyro device mounted on a dynamic platform is discussed. It is shown that an insignificant rotor asymmetry with respect to the rotation axis can cause appreciable errors in the measurements of angular velocities and rotation angles.

V Z

A71-35625


Propulsion systems as they exist today and some trends that are anticipated for aircraft that might be flying in the 1980's are presented. The number one trend for commercial engines is to quiet them to a level no louder than the normal background noise level of the environment in which they will operate. In military engines that are not so severely noise constrained, the possibility of stochometric gas turbine engines is within reach, and will probably come into being whenever a military requirement provides sufficient motivation to develop such an engine. Very high bypass ratio engines are likely to find application in V/STOL aircraft while the evolution of variable geometry inlets and exhaust nozzles receives its impetus from supersonic airplanes. Both supersonic and V/STOL aircraft are prime candidates for digital computer control systems that will integrate the control of the propulsion system, the airplane, and its flight path.

Multimode propulsion systems and supersonic combustion ramjets may one day be utilized in hypersonic cruise and boost aircraft while the first nuclear propelled aircraft most likely will fly at subsonic speeds.

A71-35629

Flow behind the boundary layer separation point in supersonic flow (Techenie za tochkoi otryva pogranichnogo sloia v sverkhzvukovom potokе) V Ia Neland Akademiia Nauk SSSR, Izvestia, Mekhanika Zhidkosti i Gaza, May-June 1971, p 19-25 8 refs In Russian

Theoretical study of the flow structure behind the separation point of a laminar boundary layer in supersonic flow. Analytical and numerical solutions are obtained for simple semi-infinite separation regions beginning at the leading edge or on a smooth surface. The pressure plateau in a finite-length separation region is calculated on the basis of an asymptotic theory. The behavior of the solution is analyzed in the region of free interaction and during transition into the reversed flow region. The results obtained made it possible to calculate (in the first approximation) the pressure in the plateau region and to formulate a mathematical basis for this effect. Relatively simple solutions are simultaneously obtained for semi-infinite separation regions.

T M

A71-35630

Calculation of the interaction of a supersonic jet with a turbulent near wake behind a step (Raschet uziimodestvia sverkhzvukovoi strui s turbulentnym blizhnim sledom za ustupom) L V Gogish and L V El'nikova Akademiia Nauk SSSR, Izvestia, Mekhanika Zhidkosti i Gaza, May-June 1971, p 26-32 In Russian

Investigation of plane and axisymmetric flow behind the butt face of a body placed in a supersonic jet flow. The interaction of the supersonic jet and the turbulent wake is described by a system of eight first-order differential equations. Two of these equations pertain to a single-parameter wake, while the remaining ones describe the flow in a quasi-one-dimensional inviscid jet. Flow in the near wake corresponds to a singular solution of the equations, which passes through a saddle singular point (the neck of the wake) Initial conditions for the interaction flow are determined from integral conditions for the joining of this flow with the mixing flow in the isobaric base region. The calculations are in satisfactory agreement with experimental data obtained by measuring pressures along the wake and at the butt face for a plane Mach-2 3 jet.

A71-35631

Calculation of the interaction of a turbulent boundary layer with a supersonic outer flow behind a step (Raschet vzamodestvia turbulentnogo pogranichnogo sloia s veshchnim sverkhzvukovym potokom za ustupom) A N Antonov Akademiia Nauk SSSR, Izvestia, Mekhanika Zhidkosti i Gaza, May-June 1971, p 33-40 15 refs In Russian

The proposed integral method of calculating the turbulent flow behind plane and axisymmetric bases makes it possible to determine the pressure distribution, the displacement thickness, the momentum thickness, and the friction in the region of interaction between a boundary layer and an ideal outer flow. The characteristics of an incompressible, turbulent, equilibrium boundary layer are used to calculate the flow behind the base, the flow parameters of a compressible boundary layer are related to those for an incompressible layer by the Cowles-Crocco transformation. Results are compared with experimental data.

A71-35632

Three-dimensional boundary layer on a segmented body at supersonic velocities (O prostranstvennom pogranichnom sloe na segmental'nom teile pri sverkhzvukovykh skorostakh). G N Andreev and Iv D Shevelev Akademiia Nauk SSSR, Izvestia, Mekhanika Zhidkosti i Gaza, May-June 1971, p 41-48 6 refs In Russian

Theoretical study of the flow structure behind the separation point of a laminar boundary layer in supersonic flow. Analytical and numerical solutions are obtained for simple semi-infinite separation regions beginning at the leading edge or on a smooth surface. The pressure plateau in a finite-length separation region is calculated on the basis of an asymptotic theory. The behavior of the solution is analyzed in the region of free interaction and during transition into the reversed flow region. The results obtained made it possible to calculate (in the first approximation) the pressure in the plateau region and to formulate a mathematical basis for this effect. Relatively simple solutions are simultaneously obtained for semi-infinite separation regions.

T M

A71-35633

The stability of a gyrocompass is analyzed, taking into account the vertical inertia component of its translational motion. This component is shown to exert an appreciable effect on the oscillations of the sensitive element of the system. Relations are obtained to calculate the stability characteristics of a gyrocompass during circulations and arbitrary periodic maneuvers of the ship.

V Z
The finite difference method is used to calculate the three-dimensional boundary layer arising on sphere-segment surfaces placed in supersonic flow. The strong local change in the profile curvature near the edge of the spherical surface of a body formed by the sector of a sphere makes it necessary to separate three different regions of gas flow. These regions include the flow on the spherical surface, flow near the edge of this surface, and flow along the inverted cone behind this surface. A curvilinear difference grid is constructed on the surface of the body. The difference equations approximating the initial system of differential equations are set up for the case of arbitrary nonequidistant nodes of the grid. Numerical results are given for the drag and heat flux to the body at given wall temperatures, unity Prandtl number, linear dependence of viscosity on temperature, and angles of attack between 15 and 30°.

A71-35633 # Self-similar numerical and asymptotic solutions of boundary layer equations for extensive blowing (Ob avtomodel'nykh chislennykh i asimptoticheskikh resheniiakh uravnenii pogranichnogo sloya pri bol'shikh vduvakh) E A Gershbein (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR): Akademiia Nauk SSSR, Izvestia, Mekhanika Zhidkosti i Gaza, May-June 1971, p. 49-52 6 refs. In Russian

Analysis of self-similar solutions of equations for a laminar, multicomponent, isothermal boundary layer at large rates of injection. Asymptotic velocity profiles and boundary layer thicknesses are given for different negative pressure gradients. Numerical solutions of the boundary layer equations are given for injection of a hydrogen, nitrogen, and carbon dioxide gas mixture from the surface. The asymptotic solution is compared with the numerical results and its range of validity is delineated.

A71-35636 # Investigation of the nonequilibrium condensation in supersonic jets and nozzles (Issledovanie neravnovesnoi kondensatsii v sverkhzvukovikh soplakh i streuxakh) L M Davydov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR): Akademiia Nauk SSSR, Izvestia, Mekhanika Zhidkosti i Gaza, May-June 1971, p. 66-73 7 refs. In Russian

The method of characteristics is used to calculate gas flows with allowance for equilibrium and nonequilibrium condensation processes. The proposed recurrent relationships for calculating condensation kinetics along the streamline substantially simplify the computational scheme and reduce the time required for calculation. The method is used to study the influence of the nonequilibrium of the condensation process on the flow of gas in supersonic nozzles and jets issuing into vacuum. A proposed approximate method for calculating nonequilibrium condensation is based on integration of one-dimensional equations along a streamline, using the flux density distribution along this streamline.

A71-35646 # Contribution to the theory of transonic flows (K teorii dvumennykh okoloizobraznykh techenii) N G Bol'man (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR): Akademiia Nauk SSSR, Izvestia, Mekhanika Zhidkosti i Gaza, May-June 1971, p. 178, 179 5 refs. In Russian

The Navier-Stokes equations describing two-dimensional steady transonic flows of a viscous gas are reduced to a system of quasi-linear equations which in turn lead to a linear equation. The conditions for the uniqueness of solutions to boundary value problems for the linear equation are established for flows past bodies of revolution and for two-dimensional bodies. A variety of boundary conditions for which the uniqueness of the solution can be proved by the method proposed are examined.


A method, in which the stationary solution is obtained as the limit of the nonstationary solution, using a large number of time steps, is applied to the determination of the flow past V-shaped wings with supersonic leading edges. The 'method of establishment' is applied to the space variable with respect to which the system of equations of motion is hyperbolic, making use of Rusanov's (1968) difference scheme. The pressure distribution over the wing span is determined.


Experimental and theoretical aeroelastic analysis of the Fokker F.28 T-tail, using a flutter model and flight flutter tests. Control surface flutter and the effects of lateral gust loading were also investigated. A T-tail aircraft generally involves aerodynamic and dynamic problems due to the fact that the top-mounted stabilizer causes very low fin resonance frequencies, and involves a large mass coupling between fin bending and fin torsion, as well as an aerodynamic coupling due to interference effects. For the F.28 this already unfavorable situation was even more complicated by the low fuselage resonance frequencies as a consequence of the rear-mounted engines. It was found that aerodynamic interference is of prime importance for the calculation of lateral gust design loads and largely influences flutter behavior.

F.R.L.


Sessions cover recent developments regarding environmental qualities, aircraft wake turbulence, avionic communications, airborne reconnaissance, and navigation. Approaches to vehicle electric systems are discussed together with time frequency concepts for better aerospace utilization, microelectronics, and biocountermeasures. Other papers cover new developments in the field of computers giving attention to the development of a higher order language architecture.

G R


A review of recent findings on the structure of a vortex wake and its interactions with following aircraft is given. The review is based on results reported at the September 1970 Aircraft Wake Turbulence Symposium sponsored by the Air Force Office of Scientific Research and the Boeing Scientific Research Laboratories. Formation and disintegration processes are discussed including recently discovered instability mechanisms. Interactions between a wake and a following aircraft are shown to depend primarily on the circulation of the wake and the span of the following aircraft. Various methods suggested for reducing wake hazards are discussed. Finally areas for further research are suggested. (Author)
The high strength of the trailing vortex system produced by the new jumbo jet aircraft has renewed interest in the study of the vortex phenomenon and its effect on proximity aircraft operations. In the present study, the trailing vortex system produced by an aircraft in flight and penetration of the system by a second aircraft are modeled mathematically. The effect of turbulent mixing on the persistence of the intact trailing vortices is modeled by modifying the similar solution for adecaying laminar vortex. The correction is made by introducing an effective turbulent viscosity which is determined empirically. The vortex induced velocity is superimposed on the free stream velocity of a penetrating aircraft to determine a total velocity vector and angle of attack. Separation times and distances required for safe operation in traffic pattern conditions are predicted using a gust load formula and maximum incremental load factors. Calculations were performed for several generator/penetrator aircraft combinations.


This paper presents an analysis of data obtained by the Federal Aviation Administration related to the characteristics of trailing vortex systems generated by large jet aircraft. Difficulty was experienced in analyzing the data because of the comparatively large spacing of sensors, but some significant information and conclusions can be derived from the analysis. It was found that the velocity field around a vortex produced by a large jet aircraft is defined by a logarithmic variation of circulation with radius. For a lift coefficient of unity, the core diameter was found to be approximately 5% of the midspan chord while the maximum tangential velocity at the edge of the core was about 70% of the aircraft velocity. Both the diameter and core appear to change in proportion to the lift coefficient. Expressions are developed for predicting the velocity field produced by the trailing vortices from large aircraft. These should be used with caution, however, until additional and more precise data are obtained.


Preliminary report on a status of a development project for a three-component laser Doppler velocimeter capable of mapping velocity profiles or aircraft wake turbulence at altitudes up to 1000 ft. Optical arrangements and tests results for back-scattering and forward-scattering dual scatter systems are described, together with equipment details of prototypes velocimeter intended for measurements at 200 ft in the first phase of the development program.


The configuration stability of a vortex pair in ground effect is examined for the trailing vortex wake of a large high weight aircraft. In ground effect, the large scale motion of the vortices is adequately represented by the equations of potential theory which shows the vortex pair to descend to lower altitudes with increased separation. The stability theory indicates the vortex pair to be unstable, with the instability and time estimated for break-up shown to depend on the altitude at which the vortex pair was generated. The results of the study of the landing of a 747 shows good agreement with FAA full-scale flight tests for the behavior of the vortex wake at low altitudes.


Omega navigation being implemented by the U.S. Navy has application to general aviation operations. Flight experiments with a Beechcraft Bonanza have shown some of the capabilities provided by this system. These experiments also showed some of the deficiencies, all of which are believed surmountable with application of some creative engineering. A proposed solution for overcoming one deficiency, diurnal course shift, is presented in this paper together with experimental data indicating that the approach is a viable one. Pros and cons of Omega as applied to general aviation aircraft navigation are also presented.

- **A71-35770** Application of power conditioning to high-voltage dc electric power systems for flight vehicles. Frank L. Raposa (U.S. Department of Transportation, Transportation Systems Center, Cambridge, Mass.) In NAECON '71, Institute of Electrical and Electronics Engineers, National Aerospace Electronics Conference,
This paper discusses the functions of power conditioning for application to a high-voltage dc electric power system. Sample load profiles of an SST-type aircraft are presented, and the power conditioning needs are outlined. Present and projected power levels of power conditioners for different high-voltage dc distribution systems are discussed. The characteristics of thyristor switches are reviewed, and the technology status of thyristor power conditioners is discussed. Two classes of thyristor power amplifiers are identified for application to the flight vehicle. 


If the presently used three-phase ac transmission system on aircraft were replaced by a higher voltage dc system using a ground return, significant gains could be achieved in the weight of wiring, number of wires, and total losses. A comparison of weight advantages and anticipated disadvantages with a 345-V dc system leads to the recommendation of 230 V as a standard value for a dc system. A qualitative comparison is made between projected 230-V dc generation equipment and the presently available constant-frequency three-phase ac equipment. Little weight savings or efficiency gains are anticipated, but the simplicity of the dc system would lessen present problems in paralleling and maintenance. A comparison of utilization equipment for the two generation systems also shows little reduction in weight. Appreciable development work is anticipated before realizing utilization equipment to operate at the higher dc voltage. Although considerable weight reduction in the weight of transmission system wiring is possible, the adoption of the high-voltage dc system will not be readily accepted until proven generating and utilization equipment is available.


A conceptual real-time reconnaissance cockpit display system (RTRCDS) for airborne sensor systems is presented whose elements provide night combat sensor imagery in the cockpit of reconnaissance aircraft and on the ground at command posts. Loral studies of techniques using dark trace storage tubes for the real-time high resolution display of line scan sensor data and MTF analysis of performance are described. Uses of the real-time display as a navigation aid, for Bomb Damage Assessment, and for target detection, as well as display modes to meet human factor requirements for operator efficiency are discussed. Flight test results are assessed for reconnaissance effectiveness and are extrapolated for future improvement.


A71-35781 Integrated drive generator offers significant advantages for aircraft electrical power systems. J. K. Taulbee
A71-35782


The V-O-R indicator consists of a custom designed large scale MOS integrated circuit (IC) and several commercially available IC's to process the V-O-R measurement digitally and to present the pilot with a numeric hands-off presentation of his V-O-R radial. Since the phase of electrical signals is generally controlled, no null indicators or resolvers are required, and all scale reading errors are eliminated. Accuracy, size, weight, and cost are all comparable to, or better than, the standard design.

M M

A71-35783


Research supported by Texas Instruments, Inc.

Some aspects of the application of a random access signalling system to an aircraft control system are discussed. A model of the radio environment is described and the model parameters related to the control system requirements. The model shows that, for simple time-frequency matrix signals, the number of system accesses is optimized when individual signals are transmitted with a redundancy of 7 to 19, with maximum randomness in the signal. This optimum corresponds to a total system data rate of 0.025 bits per second per cycle of system spectrum allocation. The implications of the principle of random access signalling for the control system are discussed. The allocation of system capacity to individual terminals, the utilization of the individual terminal allocation for maximum flexibility, some technology implications of signal design parameter choice, and how the principle offers potential for control system improvements, including compatibility with existing systems.

(Author)

A71-35789


Description of a mesh method for obtaining supercritical flow when the shock wave is at the trailing edge. Essential in this method is the introduction of a transonic flow function into exact inviscid flow equations, a procedure facilitating an appropriate representation of two-dimensional and axisymmetric flow fields and, thus, the solution of transsonic flow problems. Flow patterns with a normal shock wave, or an oblique shock at the trailing edge can be treated by this method. Sample results are given for a circular arc airfoil at zero incidence.

V. Z

A71-35811


Description of methods that can be used to evaluate proposed systems. The proposal chosen as an example considers potential cost savings by using onboard weight and balance equipment in conjunction with a fully mechanized cargo pallet transfer system. This loading system is evaluated through a wide range of parameters by means of stochastic processes in computer-based simulation models. The modeling techniques described may have application to current operational analyses. These could be evaluations of comparative loadability characteristics of different aircraft, or studies of the effect of loadability due to changes in balance restrictions for a particular aircraft. Potential applications of the loadability analyses of this type should also be considered as part of overall studies of complete cargo handling systems.

(Author)

A71-35813


Description of a mesh method for obtaining supercritical flow when the shock wave is at the trailing edge. Essential in this method is the introduction of a transonic flow function into exact inviscid flow equations, a procedure facilitating an appropriate representation of two-dimensional and axisymmetric flow fields and, thus, the solution of transsonic flow problems. Flow patterns with a normal shock wave, or an oblique shock at the trailing edge can be treated by this method. Sample results are given for a circular arc airfoil at zero incidence.

V. Z

A71-35813


This paper presents the administrative techniques of a cost/weight tradeoff program for a modern jet transport airplane. It introduces the concept and philosophy of using a defined cost/weight value as part of basic design criteria and discusses the full scope of a program to assure its overall application to vehicle design. The role of Management and Weight Engineering in Weight Reduction Programs is discussed in detail. Particular emphasis is placed on the concept of generating and maintaining a large number of weight saving ideas from which Management can select the type and amount of weight reduction that appears desirable for meeting weight guarantees and the competition. Procedures for converting weight saving ideas into actual hardware weight reductions are presented in outline form. Problems associated with assuring weight optimization of subcontract and vendor products are also discussed in detail.

(Author)

Study of the sources and magnitudes of errors in Boeing 747 static aircraft weight values obtained by means of the on-board aircraft weighing system (OBAWS) and by manual calculations yielding manifest values. Sixty-two sets of data, collected from forty-eight aircraft, have been analyzed. Comparisons of OBAWS and manifest values for fifty-one sets of data, taken from thirty-six of the forty-eight aircraft, indicate that the distribution of discrepancies between OBAWS and manifest values has a standard deviation of plus or minus 1.07% of full scale, or plus or minus 7,597 pounds. Formal tests made on the 747-100 aircraft indicate that OBAWS can be expected to meet targeted accuracy requirements under normal operating conditions.


Discussion of the implementation of an idea to permit the weighing of an aircraft, utilizing load cells, while it remains on jacks during an overhaul at maintenance operation. Fixtures are threaded onto the screw extension of the standard aircraft tripod jack and become a part of the jack. When it is time to weigh the aircraft, the small jacks and load cells mounted in the fixture, the aircraft is raised slightly, approximately 1/32 inch, transferring the weight to the load cells, and the weight readings are taken.


A rapid method is described for sizing boron-epoxy laminates for purposes of preliminary design. A comparison is made of the weights of an actual wing box that was designed, fabricated and tested. On this basis, a nonoptimum factor of 1.6 is derived. This compares quite favorably with the nonoptimum factors of approximately 1.5 for aluminum and titanium wings.


The STAN/MASS system is presently installed on a USAF C-7A aircraft and an airline 727B. The MASS system provides the means of essentially eliminating landing gear strut friction without taxing the aircraft. The basic concept of Integral Weight and Balance Systems (IWBS) is discussed together with their basic design requirement and their ultimate future. The various factors examined could be of help in the decision of an airplane whether to select an IWBS.


Some basic V/STOL propulsion systems are compared with the vectored thrust concept, and special design considerations of V/STOL aircraft with respect to weight and balance, typified by the vectored thrust design are examined. The special character of these design considerations is determined by the pronounced effect of small changes in the weight and center of the gravity/lift-thrust relationship on the performance. The competitive nature of the vectored thrust V/STOL with a conventional takeoff and landing aircraft with short field capability is considered. V/STOL vectored thrust aircraft are competitive in the Close Air Support role. The lower the takeoff and landing distance becomes, the greater is the competitiveness of the V/STOL vectored thrust aircraft.


Discussion of the various applications of composites on present and future aircraft designs is intended to operate in the Mach 2 to Mach 4.5 range. Parametric comparisons for near-term and future aircraft are presented. These parametrics illustrate weight and performance results with respect to various applications of composites as compared with all-metal aircraft structural concepts and designs. All-metal aircraft for the future, which are on an equal basis with composite aircraft, are considered. Major emphasis is oriented toward the advantages of future aircraft concepts designed with composites in their initial or preliminary design stages. 10 refs.


Study of the weight reduction potential of advanced composite materials in aerospace structures. No other material combines such high strength and stiffness with ease of fabrication. Use of boron/epoxy on the F-4 rudder saved 16.2 lb of structure and 6.3 lb of balance weights for a 35% saving. Most of the hardware development programs achieved weight savings of about 30%, which is in agreement with most of the analytical studies. It is considered that maximum weight savings from composites will occur in uniaxially loaded struts and/or trusses and in stiffness-critical components. A weight estimation technique is proposed which first estimates the structural weight as though it were aluminum and then modifies the estimate through several factors, accounting for the different mechanical properties and construction techniques, to arrive at a composite material structural weight.


Description of the equipment, principle of operation, calibration data and techniques, accuracy, errors, and repeatability of the model WCG-91-2-10K mass and CG determining system. The system is the largest device ever built which uses a mechanical beam balance for measuring mass and a separate and distinct system composed mainly of two electronic load cells for measuring CG moment. The device measures mass within an accuracy of 0.02% and applied load over a range as wide as 500 through 10,000 lb. The CG of the load can be measured by this new fixture to within 0.013 in (longitudinal) and 0.005 in (lateral and vertical). The fixture is versatile, in that it will accept rocket motors in both the horizontal and vertical positions and any other object not exceeding the gross weight and dimensional limitations of the system.

551

This paper describes the design, analysis, and testing of a full-scale section of F-111 aft fuselage constructed from a variety of advanced composite materials. This work represents the first application of advanced composites to complex fuselage structure. Maximum utilization of composites was maintained in both the shell structure and substructure. A wide variety of advanced composites and their applications were evaluated in a design and fabrication effort. A 160 inch full scale static test component was designed, fabricated, and tested to destruction. Fourteen subassemblies of frames and panels were fabricated and assembled into a 920 pound component utilizing 460 pounds of advanced composite materials. Static test of the part included loading in bending with simultaneous application of internal pressure. Analytical predictions were obtained with a finite element simulation of the primary structure. Deflection gauge and strain gauge data showed excellent agreement with analytically predicted results. Weight savings of up to 29 percent were obtained on various elements of the structure. An overall weight savings of 18 percent with respect to equivalent metallic structure was realized.


This paper develops a method for estimating the weight of articulated main rotor blades. The results of the method should be suitable for use in preliminary design and weight evaluation, particularly in the case where parametric design studies are performed to study weight and performance tradeoff trends. An approximate expression for blade running weight in terms of performance and geometric parameters is presented. A method of estimating antinode weights required to achieve a specified first-mode flapwise natural frequency is included so that total blade weight may be obtained. A computer program for making a more comprehensive (but still approximate) estimate of blade weight, blade section structural proportions, and section properties useful for subsequent detailed analyses is presented. These results should be useful for establishing initial values of blade properties to use in comprehensive dynamic and structural programs necessary for final substantiation. The program is brief enough to be a practical one for use in parametric studies. The method presented is limited to articulated, shaft-driven main rotor blades having performance capabilities within current conventional helicopter limitations.


Description of the features, installation and maintenance problems, as well as requirements and testing of a strut pressure system and an axle strain gauge installed in the DeHavilland C-7A. All the systems had difficulty compensating for slope. After the hydraulic pump was modified, the strut pressure system met most of the requirements. Without some agitation to reduce strut friction error, it exceeded limits. The axle strain gauge system output was limited by shunting of the load away from the axle. It was very sensitive to weight changes and external forces, yet appeared to shift over a period of time. A need exists for weight and balance systems but it is suggested that these be carefully matched to the aircraft. It is pointed out that reliability should receive more emphasis now placed on accuracy.

Evaluation of remotely piloted vehicles (RPV), the development of which has made possible a high degree of 'pilot' participation in areas where he functions best. The RPV concept is being considered for missions such as air superiority and weapons delivery, conducted in severely hostile environments. In these applications the goal is to maintain the advantages of manned flight through use of new sensors, data links, computers, and display systems without the disadvantages, such as life support systems, physical limitations, flight safety considerations, and loss of life.


An air-cooled turbine blade was designed for the first stage turbine of a fan-jet at a turbine inlet temperature of 1150°C. The rotor blade was cooled by means of a number of straight holes. The nozzle vane was cooled by air impinging perpendicularly on the cooling surfaces. Two-dimensional cascade tests were carried out to obtain the heat transfer data, cooling efficiency, and the temperature distribution within the blade sections. It is concluded that the temperature distribution of the nozzle vane must be improved although the mean vane temperature reached the intended value.


Review of the procedures adopted within BEA in formulating and negotiating the second of the two complementary three-year agreements, the first in 1964/1965 and the second in 1968/1969. These procedures reflect current thinking concerning productivity agreements in industry which, it is felt, should be negotiated on a plant basis, and not on an industry-wide one, with the active participation of the staff in order that the deal gain acceptance and fulfill its promise. The development and negotiation of the 1969 agreement are described for each of the various categories of tradesmen and for the maintenance workers and storekeepers.


A semiempirical relationship is derived for the structural weight of wings, applicable to a wide range of subscale aircraft. 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. Appropriate factors make the result applicable to cantilever and braced wings, for passenger and general aviation aircraft.
and for freighters. An assessment of the accuracy, based on actual wing weights of 46 aircraft, indicates that a standard deviation of 9.64 per cent is achieved. The weight formula presented allows for the effects of variations in the main wing dimensions and operational limits of the airplane and is therefore suited to parametric design studies.

A71-35995


The L-1011 TriStar incorporates many design features which enhance its acceptability into the world's airport system and optimize ground handling operations. The aircraft is designed to carry from 250 to 400 passengers. Favorable economics of the aircraft permit it to be used on either short or long segments and to operate in and out of medium size airports as well as major hubs. The L-1011 is comparable in size to most of the larger aircraft in operation. It is considerably smaller in all respects than the Boeing 747.

A71-35996


France and Switzerland began the construction of provisional runways and buildings of the airport in 1946, on French territory near the Basle frontier. Since 1953 the Basle-Mulhouse airport is operated as a binational facility. Under the intergovernmental convention, the Swiss must be able to use the airport as if it were a Swiss airport, and the French as if it were a French one. The traffic structure of the airport is examined, and an account of the new buildings is given. Questions of future development are discussed giving attention to a lengthening of the runway.

A71-35997


An intensive survey of 20 possible sites for a second international airport was carried out in 1965. In July 1966 the government finally designated the new airport site at Sannzuka, by the city of Narita. Problems connected with the distance of the airport from the city center of Tokyo will be solved by the development of faster transportation. The runway system will comprise two parallel runways 13,100 ft and 8,200 ft long, and a 10,500-ft crosswind runway intersecting the main runway. Each runway will have two parallel taxiways in order to permit high-speed handling of aircraft on the ground. Air navigation aids such as ILS, VOR-DME, NDB, ASR/SSR, lighting and other visual aids will be installed. Aspects of passenger and aircraft handling are discussed, and questions of ATC, access to the airport and freight handling are considered.

A71-35998


It was necessary, in the interests of flight safety, to create separate traffic zones in which the various aircraft covered by a common control system could operate. This led to the establishment of controlled and uncontrolled airspace. It is pointed out that because of air traffic growth rates very careful planning of effective

procedures and systems will be needed if the air traffic volume of the coming decades is to be handled with at least the present degree of safety. Plans for taking steps to cope with the increased air traffic are discussed. A systems analysis which is initially based on the structure of the airspace is considered, and possible means of increasing capacity are examined giving particular attention to Western Europe and the Atlantic area. Requirements for an ILS successor are discussed together with the advantages of area navigation.

A71-36000


It is pointed out that analytical methods of design have been restricted to the effects of single wheels. It is doubtful whether existing methods are now acceptable in connection with the designing of pavements for new multihull aircraft. To meet the need for a more realistic method of assessing the stress distribution below the wheel arrangements of these aircraft, Shell has developed a computer program named BISTRO. Probably the most widely accepted method of pavement design is based on the CBR (California Bearing Ratio) of the soil. However, this approach does not take into account the effect of stress distribution within the structure of using construction materials other than unbound aggregates. A more fundamental method to overcome these shortcomings is discussed, giving attention to a three-layer system.

A71-36017


Review of the design and operation of the heater and Mach 6 nozzle of the S4MA wind tunnel, and description of the modifications the heater and nozzle underwent in their adaptation for testing a supersonic combustion chamber of a hydrogen burning ramjet engine. These modifications are shown to include the replacement of the aerodynamic noise by the combustion chamber to be tested. The chamber is supplied through a duct in such a manner that velocity, temperature, and pressure conditions at the engine inlet are the same as those in operation in a ramjet flying at Mach 6 at 30 km altitude.

A71-36020


Experimental study of the transonic buffetting environment of a cone-cylinder-cone missile-type body in the Mach number range between about 0.7 to about 1.1. The experiments were conducted in the S2MA transonic wind tunnel at ONERA to determine the distribution of static and fluctuating pressures on the walls of two perfectly rigid and fixed models of different scale. Spectral analysis of the data and visualization of the near flow field by shadowgraphs were performed. High intensity fluctuating pressures were found at the rear of the models, mainly at high subsonic Mach number (about 0.9). This is due to the separation of the flow and the instability of the shock wave position. RMS levels of the order of 168 dB and an
A71-36021

increase of the low frequency content were then obtained. The
effects of model scale, angle of attack, dynamic pressure, and
Reynolds number were studied. Generalized nondimensional spectra
make it possible to put confidence in the application of these results
to such full-scale missiles.

F.R.L.

A71-36021 # Transonic testing of the air intake and afterbody of an engine nacelle (Entrée d'air et arrière-corps de fuselage
moteur en transsonique). Jacky Leynaert (ONERA, Chatillon-sous-
Bagneux, Hauts-de-Seine, France) (NATO, AGARD, Facilities and
Techniques for Aerodynamic Testing of Transonic Speeds and High
Reynolds Numbers, Göttingen, West Germany, Apr. 26-28, 1971.)

Study of a double-flux engine nacelle at high subsonic Mach numbers and high Reynolds numbers, using separate models for the
air intake and the afterbody. The afterbody test shows that the
conditions of variable jets do not react significantly on the upstream
flow around the nacelle intake except in the immediate vicinity of the
exhaust. This justifies the large-scale study of the air intake with a
model supported downstream by a cylindrical tube replacing the
jet. Similarly, mass-flow rate variations of the air intake do not react
on the flow around the afterbody. This allows study of the afterbody
mounted on a sting located upstream.

F.R.L.

A71-36037 * # Sting-free drag measurements on ellipsoidal cylinders at transition Reynolds numbers. M. Judd, M. Vlajinac, and
E. E. Covert (MIT, Cambridge, Mass.) Journal of Fluid Mechanics,

The drag coefficient for a family of axially symmetric ellipses of
finesse ratio 4, 5, and 8 was measured for Reynolds numbers up to
1,000,000. The drag data reported were obtained by suspending
ellipsoidal models in a subsonic wind tunnel by means of a magnetic
balance and suspension system. The wind tunnel interference effects
were determined by cross plotting the measured drag coefficient,
at constant Reynolds number, against model size. All the models had
a similar smooth finish.

G.R.

A71-36061 Some considerations in the development of a holographic display for a blind landing system. William A. Shapiro,
Ernest J. Lademann, and Charles J. Kramer (Bendix Corp., Navigation
and Control Div., Teterboro, N.J.). In Photo-optical in-
strumentation for the 70's, Society of Photo-optical Instrumentation
Engineers, Annual Technical Symposium, 15th, Anaheim, Calif.,
September 14-17, 1970, Proceedings.

Symposium co-sponsored by the U.S. Air Force and the U.S. Army,
Redondo Beach, Calif., Society of Photo-optical Instrumentation
Engineers (SPIE Annual Technical Symposium Proceedings Volume
3), 1971, p. 123-128

Description of a holographic system which provides an image
perspective variable over a wide field of view. The image is
two-dimensional and can be used as the input in optical systems
corrected for only one plane. The method used for hologram
manipulation is very effective in achieving maximum hologram
efficiency in that it uses a fixed relation of reference wave inclination
and shape to the hologram surface. The use of narrow-beam
reconstruction facilitates the matching of the reference wavefront
and permits the applications of either a collimated laser beam with
an 'unrolled' hologram or a cylindrical-section beam with constant
parameters.

V.Z

A71-36118 # Interaction between an underexpanded jet and an oncoming rated supersonic jet (Vziainodeistvie nedorasshirennoi
strui so vstrechnoi sverkhzvukovoi raschetnoi struei). O. S. Zelenkov

In Gasdynamics and heat transfer Number 2 (Gazodynamika i teploobmen Number 2). Edited by I. P
Ginzburg Lensingrad, Izdatet'svo Leningradskogo Universiteta
(Leningradskii Gosudarstvennyi Universitet, Uchenye Zapiski,
No. 357, Seria Matematicheskikh Nauk, No. 46), 1970, p. 81-91 In
Russian.

Photographic study of colliding underexpanded and normally expanded supersonic jets in a two-wind-tunnel assembly with a static
working pressure equal to the atmospheric pressure. Axisymmetrical conical nozzles with a small aperture half-angle are used for obtaining
underexpanded jets. Expressions are given for the Mach number on
underexpanded jet axes in front of central shock waves and for positions of the shock waves. It is shown that in the general case
the contact surface represents a portion of a spherical surface whose
curvature is a function of the ratio between the maximum
underexpanded jet diameter and the rated jet diameter.

V.Z

A71-36122 # Acoustic emission of a supersonic jet toward the nozzle exit section for various ratios of active to passive pressure
(Akusticheskoe izluchenie sverkhzvukovoi strui v storonu sreza sopla
pri razlichnykh razhimbakh neraschitnosti). V. D. Belenkov In
Gasdynamics and heat transfer. Number 2. (Gazodynamika i
teploobmen Number 2). Edited by I. P Ginzburg Lensingrad, Izdatel'stvo Leningradskogo Universiteta
(Leningradskii Gosudarstvennyi Universitet, Uchenye Zapiski,
No. 357, Seria Matematicheskikh Nauk, No. 46), 1970, p 119-124 In
Russian.

Pressure pulsations at points close to the nozzle exit section
were studied in an open-jet wind tunnel, at a Mach number of 2 at
the nozzle. The nozzle diameter was 16 mm, and the ratio of active
to passive pressure varied between 0.9 and 6.2. The pressure
pulsations at the points investigated are caused by sound radiation of the jet. This radiation has the nature of a discrete tone, whose source
is localized at the initial portion of the jet. The frequency of the
discrete tone is plotted for various conditions at the nozzle exit section. Diagrams showing the level of the pressure pulsations as a
function of the ratio of active to passive pressure are presented.

V.P

A71-36134 # Investigation of supersonic flow around delta wings with forced asymmetry, taking into account flow separation
at the leading edges (Studii scurgerii supersonice in jurul arpiilor delta
cu antisemtrie foratga ținând seama de deșprinderea curentului la
bordurile de atac). St. Stanciu (București, Institutul Politehnic
Gheorghe Gheorghiu-Dej, Bucharest, Rumania) Studii P cercetari de
Mecanica Aplicată, vol. 30, no. 2, 1971, p. 431-452 12 refs In
Rumanian.

The asymmetric distribution of the incidences or vertical
velocities corresponds to that of a forced asymmetrical curved delta
wing according to a linear function or asymmetric deflection
Considering a slender fictitious wing equivalent to a real wing from
the aerodynamic standpoint, the pressures distribution and aero-
dynamic characteristics of the wing are determined.

M.M

A71-36175 Safety in air transportation over the years

Review of the processes by which the current high level of air
transport safety has been achieved, the best assurance for continued
safety being the determination of aviation personnel that nothing
will be left undone. Better knowledge of weather formation has been
of major importance. Developments in instrumentation, radio aids,
aircraft structures, and powerplants are outlined. An appendix
discusses aircraft icing, the problems of the piston engine, fire
hazards, metal fatigue, and training.

F.R.L
The flow of a laminar, incompressible jet along a parabola in the absence of an external stream is analyzed using the techniques of second-order boundary-layer theory. The first-order solution is the Gla cantt lift-jet solution. Second-order corrections to the effects of curvature and displacement are obtained numerically after the external flow is corrected to account for the displacement effect. The shear stress at the wall is calculated and it appears that for values of the Reynolds number at which the governing equations are valid the jet does not separate from the parabola.

A71-36273


The relationship between wing area and lift engine bypass ratios is examined. It is pointed out that large bypass ratio lift engines or fans, although preferable from ground erosion and noise abatement standpoint, must be accompanied by relatively low wing loadings or sophisticated high-lift systems to permit transition to wingborne flight at low speeds or before the ram drag from the vertical lift package becomes prohibitive. The wing aspect ratio and sweepback are other considerations that impact terminal area operations. Low aspect ratios and delta wings generally can be flown at higher angles of attack and, consequently, permit VTOL airplanes to make steeper approaches to landings. It is concluded that a safe and economical hybrid jet-lift V/STOL transport could be produced with the current technological basis. This airplane would incorporate lift jets or turbofans for lift augmentation during takeoffs and landings, using separate powerplants for cruise.

A71-36310


Topics cover numerical techniques, flow field calculations, and shock waves and aspects of turbulence including a nonlinear analysis of the shock profile in difference schemes and a heuristic approach to three-dimensional boundary layers. Methods for solving Navier-Stokes equations are also considered together with papers concerned with the investigation of incompressible flows.
A procedure is described for calculating the dynamic parameters of a supersonic flow incident on a conical body at large angles of attack. A solution is obtained for the flowfield with the exception of a region above the body. It is shown that the entropy distribution around a circular cone undergoes changes when the angle of flow incidence is increased so that the entropy layers vanish when the incidence angles are very large. It is further shown that the strength of the arising conical shock wave depends on the cone geometry.

V.Z.


Exploration of the possibility of using Dorodnitsyn's method of integral relations (MIR) to treat the classical nonlinear flow problem of subsonic airfoils. The chief advantage of MIR is that, because a relatively coarse mesh can be taken across the flow field, useful solutions can be obtained with less computer time than might be required by other methods. In the study the MIR is programmed for an arbitrary number of strips, and solutions up to five strips have been obtained in order to investigate the convergence properties of the method. The work reported is restricted to the subcritical and critical cases only.

F R L


Considerations of supersonic and hypersonic flow past a V-shaped conical wing with a shock attached to the leading edge. Two approaches are developed for solution of the general problem. In the first a time-dependent method is used in which the difference scheme contains an artificial viscosity and the role of time is played by one of the space coordinates with respect to which the stationary system of the equations is hyperbolic. In the second approach a recently developed analytical method for investigation of hypersonic flow past triangular wings with supersonic leading edges is used.

F R L


The systems approach is applied to the problem of creating new airfields and modifying existing ones to handle bigger and heavier aircraft which may be expected to be in service by 1985. It is shown that present design techniques do not permit an aircraft/pavement economic tradeoff, nor do they explicitly consider all the functional requirements of the user. Lifetime management of the pavement can be planned and controlled with the aid of current modeling technology. The systems approach holds the key to an integrated plan for design, construction, operation, and maintenance of airfield pavements.

V P

The relative merits of aircraft designed for field lengths from a few to 3000 ft are assessed with respect to direct operating cost, indirect operating cost, and V/STOL port amortization combined into a total ticket cost for profitable operation. A daily traffic flow of roughly 900 passengers arriving at a suburban terminal and 12,000 passengers arriving at a city terminal is considered. It is shown that ticket cost will not be greatly influenced by the number or length of runways or vehicle type for suburban operations alone, and that the number and length of runways is a considerable impact on ticket cost for close to city center operations, there being a distinct advantage for aircraft with less than 1000 ft takeoff and landing distance.

A71-36348 * # STOL passenger demand in underdeveloped areas. Jason C Yu (Virginia Polytechnic Institute and State University, Blacksburg, Va.) ASCE, Transportation Engineering Journal, vol 97, Aug 1971, p 475-490 13 refs Grant No NGR-49-001-012

The possibility of implementing an air transportation system that would boost the economy of underdeveloped areas (where ground transportation facilities are too costly owing to the rugged terrain) is considered. A travel demand model is employed to predict the passenger market potential of a preliminary STOL system. The results indicate that passenger service demand for a STOL system will be limited. However, greater demand will obviously come through lower system operating costs and improved terminal accessibility.


Equipment and techniques are discussed, using which a 10,000 ft long 150 ft wide runway and a parallel taxiway were removed and replaced in just 40 calendrier days. The old runways consisted of a 9-in concrete pavement over a 6-in stone subbase. The new runway consists of a 16 to 20 in concrete pavement over a 6-in compacted aggregate subbase and 6 in of cement stabilized subgrade soil. The new system includes a longitudinal and herringbone underdrain system.


Description of a multispectral scanner which is being developed for a NASA C-130 earth-resources survey aircraft. The scanner will be capable of simultaneously viewing 24 wavelength bands in the range between 0.34 and 13 micrometers, it will have a spatial resolution of 2 mrad and an active scan of 80 deg. The spectral bands are formed by detector arrays in the focal plane of two grating spectrometers. All bands are radiometrically calibrated using field-filling sources that are viewed during the inactive part of the scan cycle. The scanner has been installed and test flown during the latter part of 1970, and will be delivered to NASA in the summer of 1971.


The fundamentals of designing a hypersonic aircraft which at Mach numbers between 10 and 16 can serve as a space shuttle and at lower Mach numbers as a transport aircraft are examined. The direct method of designing such an aircraft is shown to depend on the accuracy of the determination of the aerodynamic coefficients of a given hypersonic configuration and on the capability of obtaining an exact solution to the Navier-Stokes partial differential equations by a numerical difference technique for high Reynolds numbers (in order to determine the pressure and shear-stress distributions), neither of which is possible at this point. The determination of the aerodynamic behavior of a wave-rider by the indirect method in the case of viscous flow is examined, using the Caret-wing as an example. Three-component measurements performed with six different wings in a hypersonic wind tunnel are compared, and the pressure distributions and flow fields are examined. The temperature problem of a hypersonic aircraft is analyzed.


Review of the functions, design, and makeup of a maintenance control system (MCS) based on a modular development plan. MCS is a management information system that incorporates all the control functions of maintenance into an integrated operation. MCS encompasses 12 major functional subsystems supporting scheduling, forecasting, performance evaluation, modifications, and improvement functions at all levels of maintenance management from the production foreman to the vice-president. The objective of MCS is to develop a cost-effective system which links the functional entities of maintenance into a unified management control system and makes use of common data in its operation.


Discussion of techniques for the dissipation of fog consisting of liquid drops, either in a supercooled or in a 'warm' state. Operational programs conducted by U.S. commercial and military agencies in the dissipation of supercooled fog are shown to involve airborne
A71-36464 Thermal ground testing of Concorde and Veras
or improvement in French test methods and facilities. G. L. Leroy, N'Guyen (Société Nationale Industrielle Aérospatiale, Paris, France), M. Perrais (CEAT, France), and E. Loiseau (ONERA, Chatillon-sous-Bagneux, Hauts-de-Seine, France). In Technology today and tomorrow, Canaveral Council of Technical Societies, Space Congress, 8th, Cocoa Beach, Fla., April 19-23, 1971, Proceedings Volume 1, edited by N. A. Stein Cape Canaveral, Canaveral Council of Technical Societies, 1971, p. 7-31 to 7-60.

Review of the two ground test programs of the Concorde and Veras Emphasis is placed on the facility implementations due respectively to the static and fatigue testing of the Concorde in the heat environment and to the dynamic testing of Veras in high-level and transient-temperature conditions. Problems presented by the necessity that the ground testing facilities include most of the simulation requirements together in order to approximate in-flight behavior are discussed, together with future needs in the fields of cryogenics, acoustics, and automation. M. M.


Analysis of the level of redundancy of line replaceable units (LRUs) required for the Space Shuttle avionics system. A total cost to the program of each added LRU is calculated and the configuration that results in the lowest program cost is selected. The analysis includes the costs of developing and procuring hardware, and the annual maintenance expense. Improvement in reliability is quantified in terms of the reduced costs due to fewer lost vehicles and fewer missions where the payload cannot be delivered. The analysis allows a choice of high-reliability or low-reliability procurement policies for each LRU. The results show that triply redundant booster equipment and triply redundant orbiter equipment are most cost-effective, except for one additional inertial platform and central computer in the orbiter. F.R.L.


Attempts to relate certain areas of similarity between space shuttle operation and airline operation. Airline experience indicates that the major areas which must be considered during preliminary design are fault detection and isolation, redundancy, maintainability, and a comprehensive maintenance program. The space shuttle must have as a design goal inclusion of on-board self-test equipment in all systems and components if maintenance cost and down time are to be minimized. System reliability through redundancy with a lower order of reliability can result in a lower acquisition and maintenance cost. F.R.L.


Discussion of the advisability and possibilities of providing overrun protection to landing space shuttle vehicles through application of emergency arrestment aids. The potential for an overrun of a landing space shuttle vehicle is believed to exist, and it is pointed out that the art of arresting an aircraft on a runway is highly developed and that equipment is available which is capable of arresting either the orbiter or the booster portions of the space shuttle. Three engagement methods (tailhook/cable, net, and landing gear/cable) are shown to be applicable, and the advantages and disadvantages of each are reviewed. It is concluded that an evaluation of the merits of overrun arrestment should be made as a part of the space shuttle system's planning effort. M. V. E.


Discussion of advanced navigation and air traffic control requirements and possibilities. Because of significant advances in space technology and avionics, satellite-based systems to provide position-fixing data by means of ranging and range-differencing techniques, and to provide communications capability, are shown to be feasible and attractive. To use unique technical and operational advantages from a satellite and data processing point of view, it appears feasible to implement in the early 1980s a system which could provide surveillance data to the order of 100 feet in three dimensions, an emergency communications capability corresponding to the operational notion of intermittent positive control, and data for accurate autonomous navigation and blind landing. These capabilities would be available to any aircraft to an extent depending on its investment in avionics. M. V. E.


An axial flow compressor operating at relative tip speeds in excess of the speed of sound generates a multiple tone acoustic field. A theory is presented which explains this tone field in terms of the production and propagation of the shock waves associated with the supersonic elements of the blade. It is shown how the strengths and positions of these shock waves are sensitive to the small blade-to-blade differences found in practical builds. This causes the complete shock pattern to be unique to each compressor. The propagation of the shock waves along the inlet ducting is analyzed. This indicates that whilst the overall strength of the shock system decays, the relative differences between the shock waves are magnified in the propagation process. Ultimately, all similarity of the shock system to its original form is lost, and the steady rotation of the new shock system results in the multiple tone field. The analysis shows how features of the compressor design, as well as the degree of nonuniformity in the blade geometries, can influence the level and character of the radiated field.
A71-36498 Noise due to interaction of inlet turbulence with isolated stators and rotors. R Mani (Massachusetts, University, Amherst, Mass.) Journal of Sound and Vibration, vol. 17, July 22, 1971, p. 251-260 6 refs. NSF Grant No. GK-5215

Analytical study of the problem of sound generation due to free stream turbulence incident on a rotor or stator row. A linearized analysis is carried out with the blade rows being modeled as a cascade of flat plates. Only the dipole effect is considered. Expressions are obtained for the intensity spectrum of noise radiated upstream and downstream. The turbulence is assumed to be homogeneous, isotropic and stationary (weak), and characterized by a longitudinal velocity-correlation function of type $\exp(-r/L)$. The sound spectrum is found to depend on the intensity of turbulent kinetic energy incident on the row, axial flow Mach number, wheel tip Mach number, row solidity, and most importantly on the ratio of the length scale $L$ of the turbulence to the transverse spacing $D$ between the blades. The spectra for rotors are sharply peaked at the blade-pass frequency and its higher harmonics so long as $L/D$ exceeds about 0.5. Below these values of $L/D$ the spectra start broadening noticeably. Also for rotors, the sound power levels themselves increase with decreasing $L/D$. The spectra for stators simply exhibit the dominant turbulent frequency. Noise levels for scattering by a rotor are higher than for those by a stator. (Author)

A71-36508 Radio tracking of aircraft by means of two geostationary satellites (Localisation radioélectrique des aéronefs au moyen de deux satellites géostationnaires). J. Bensimon and M. Toussaint (Société d'Étude et d'Intégration de Systèmes Spatiaux, Courbevoie, Hauts-de-Seine, France). In: Space and communication


Description of the ESRO part of a joint air traffic control communication experiment for future L-band satellite use. The satellite-to-aircraft geometry was approximated by the use of stratospheric balloons to carry the signal repeater to an altitude of 38 km. The results of tests of some of the candidate analog communication systems which have been proposed for an L-band satellite ATC system for oceanic control are cited, including tests on techniques of voice transmission, data transmission, and distance measurement. (A. B. K.)

A71-36510 Air traffic control satellite simulation experiment. D. L. Brown (ESRO, European Space Research and Technology Centre, Noordwijk, Netherlands). In: Space and communication


Study of the accuracy with which the ground terminal can know at any moment the location of an aircraft by means of radio signals emitted by the terminal and retransmitted by the aircraft via two geostationary satellites. The basic technique considered is that of 'tone ranging'. The location of the aircraft is determined from two distance measurements and one altitude measurement. After a description of the measurement and navigation errors, a parametric study is made of the tracking accuracy with the aid of the Kalman filter technique. (A. B. K.)


Description of experiments in simulating a satellite-to-aircraft radio link using Dioscures equipment in aircraft-to-aircraft and aircraft-to-balloon tests. Results from both types of tests are presented involving an evaluation of the operation of an electronic scanning antenna, measurements of the intelligibility of the audio links, measurements of the rate of data transmission, an evaluation of distance measurement accuracy, and an evaluation of signal variations due to multiple-pass phenomena. (A. B. K.)

A71-36513 Synchronizations of a time multiplex for air traffic control (Les synchronisations d'un multiplex temporel pour la gestion du trafic aérien). G. David and M. Duquenne (Télécom-


The optics of some airborne navigational instruments are described, with emphasis on the design of the high aperture, wide angle lenses required for these devices. Most of the instruments considered are of the moving map projection type mounted in the aircraft instrument panel and thus used in a head down rather than head up mode by the pilot. Additionally, some special features of an optical system for accurate projection of a marker representing aircraft position and direction onto a standard navigator's paper map are outlined. T. M.


Description of a practical and cost-effective trajectory plotting system for gunnery range instrumentation. The system, which is accurate, easy to operate and maintain, and allows a simple analysis of recorded data, uses three measurements to define a single point or the trajectory relative to a straight line between the gun and the target; these are range and two coordinate measurements. The system is designed to acquire this information and also to give velocity information. For some projectiles, velocities can approach 1500 m/sec. The principle of this projectile plotting system can be applied to recording the path of aircraft coming in to land under the control of automatic landing equipment. M. M.


The majority of the Electric Discharge Machining (E.D.M.) applications involve small wires for air cooling holes, special slotting for expansion joints that produce final assembly dimensions of finished assemblies, and contours for through and blind pocket configurations. Automatic and modified standard E.D.M. production applications are evaluated in detail. It is found that the best results are obtained from automated closed cycle equipment by controlling the parameters of the E.D.M. process. Various factors which must be considered for every repetitive operation are listed together with the production aids to be used. G. R.

The Air Force is continually looking for new or improved processes that can make aerospace configurations more economically and that can make them more reliable and with higher mechanical properties. Diffusion bonding is one of these processes. All of the problems have not been solved and even when they are, the process will not be a manufacturer's panacea. However, diffusion bonding will have many applications in the manufacture of aerospace parts, particularly those made of titanium. Recognizing this potential the Air Force has spent considerable time and money to help make diffusion bonding a usable manufacturing method. (Author)


The growth of air travel for three typical travel markets during the last two decades is examined. It is pointed out that a large mass market exists for general short-haul travel. The potential of service by air not only for airport access but for all travel in the zone served by the long and medium-haul air terminal is examined. A quantitative assessment of the total transport concept is attempted, analyzing the market to be served, the economic factors which will eventually determine the viability of an air system, the environmental factors of noise and pollution, and the important factors of safety, convenience, and dispatch reliability. New vehicle concepts evolve from such a systems study for both short- and long-haul travel. The potential gains in travel time from any point to another on the globe are examined G.R.


The aircraft as an autopilot problem is considered, and questions of the choice of autopilot are examined. Taking into account the PB 20 and the 2000 series autopilot. The G-ASYD Cat 2 program is discussed, together with the 2100 and 2200 series (Cat 2) autopilots. Various difficulties during the development work are reported. Initial failures were followed by great instrumentation breakthrough during the latter part of 1969. Co-Co, a unique Computer Compatible system, became operational. This system involves a digital representation of the airborne flight test data, produced on tape which can then be transferred directly to ground computers. After changes to the azimuth the autopilot was flown in 1970 and performed very well G.R.


The philosophy evolved for ensuring high standards and quality levels in the design, development, production, inspection, and product support of a civil aircraft is discussed. Quality responsibilities and control systems of all sections were collected and written down in a single production and quality manual. This made it possible to reveal areas where minor changes were necessary to ensure proper operation of quality control and coordination of all quality functions. V.P.


The problem of predicting the response of aircraft during taxiing on rough runways and the associated dynamic loads and fatigue damage is examined. An analysis by Kirk and Perry (1971) of the random response of a flexible aircraft to forces transmitted through the main undercarriage is extended to a rigid aircraft, with allowance for nonlinearities in damping in the main and nose undercarriages. It is shown how this response can be computed with the aid of power spectral techniques. V.P.


The relationship between the age of aircraft, scrapping, and reordering is studied on the basis of a detailed analysis of aircraft histories, the date and age of aircraft scrapping, crashes, and reordering. The analysis also provides information on aircraft sales and their relationship to aircraft deliveries. An estimatable model of used aircraft prices is constructed and is applied to the collected data. The effects of technological changes on airline profits (in the form of the replacement of propeller aircraft by jets) and the ability of airlines to adjust their depreciation policies in order to account for these changes are examined. V.P.


Comparison of the results of the exact linearized theory, the extended slender body theory, and the theory of very slender bodies with each other and with measurement results. Of particular interest is the nature of the transition from subsonic to supersonic leading edges, the magnitude of the suction force on the leading edge, the influence of viscosity on the flow past a wing, and nonlinear effects due to increasing Mach number and increasing angle of attack. A detailed study was made of these factors for eight wings with various slenderness ratios and planforms. The investigations were carried out in a large supersonic wind tunnel in the Mach number range from 1.5 to 4.0. The Reynolds number based on the maximum wing chord was held constant for each wing model at values between 1 $\times 10^6$ to 7 and 2.4 $\times 10^7$ to the 7th power A.B.K.


An automatic titration apparatus was used for determining the pH values of turbine oils. The preliminary tests with pure substances showed the influence of solvents and their mixtures on the titration curve and inflection point. Tetrabutyl ammonium hydroxide was used as a titrating agent. Optimum results were obtained with chlorobenzene/dimethylsulfoxide and toluene/dimethylsulfoxide at the ratio 3:1. The relationship between the acid number and the size of sample was studied for various aircraft oils. Good repeatability and satisfactory accuracy of results were obtained. Z.W.
A71-36752 Some new results of flight dynamics. I (Quelques résultats nouveaux de la mécanique du vol I) Werner Schulz (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Porz-Wahn, West Germany) and Peter Hamel (Hamburger Flugezeugbau GmbH, Hamburg, West Germany) (Association Française des Ingénieurs et Techniciens de l'Aéronautique et de l'Espace and Deutsche Gesellschaft für Luft- und Raumfahrt, Journée Otto Lilienthal, 11th, Paris, France, Dec 16, 1970.) L'Aéronautique et l'Astronautique, no 29, 1971, p 5-16 34 refs In French After appreciating the methodical change of theoretical considerations and experimental investigations, with which Otto Lilienthal tried to approach the solution of the problem of the free flight of man, three topics are discussed, to the treatment of which flight dynamics can be useful the problem of flight noise, the decrease of the influence of gusts on aircraft, and the problem of dynamic stability of parachute-load systems A reduction of noise annoyance on the ground, particularly after the take-off of V/STOL aircraft, may be obtained by the determination of noise optimal flight profiles. For gust decrease, the method of 'tuned lift control', the lift due to automatic control attacking in the neutral point of the aircraft, proves to be the most advantageous The analytical treatment of the greatly nonlinear problem of dynamic stability of parachute-load systems succeeds well by employing the theory of describing function, as comparison with results obtained by numerical integration shows (Author)

A71-36754 Experimental study of the near wake of a slender cone at angle of attack and at freestream Mach number of 7 (Étude expérimentale du sillage proche d'un cône slancé en incidence à freestream Mach number equals 7). Jacques Marcellat (Aix-Marseille, Université, Marseille, Centre de Documentation de l'Armement, Paris, France) L'Aéronautique et l'Astronautique, no 29, 1971, p 49-58. 24 refs In French Research supported by the Office National d'Études et de Recherches Aérospatiales Wind tunnel study of the streamline configuration of the near wake in the symmetry plane of a cone of revolution of non-zero angle of attack in supersonic flow at a freestream Mach number of 7 Experimental distribution determinations of static pressure, stagnation temperature, and stagnation pressure made it possible to establish with accuracy and completeness the configuration of the near wake of a 9-deg cone set at angles of attack ranging from 0 to 15 deg, for a freestream Reynolds number of 110,000 per cm. Through integration of the mass flow rate, it has been possible to obtain the streamline pattern in the symmetry plane. M V E

A71-36756 Wakes of inclined wedges in rarefied hypersonic flows (Sillages de dièdres en écoulements hypersoniques rares) J Allegre (Société d'Études de Constructions de Souf-
General conditions of carriage in international air traffic were specified in a conference of the International Air Transport Association (IATA) in Honolulu in 1970. These conditions of carriage were to become effective as Recommended Practice 1013 on April 1, 1971. A number of legal relationships between passenger and carrier are discussed, giving attention to differences between the new regulations and the previous versions. Similar recommendations had been developed for the first time within the framework of the International Air Traffic Association in 1927. The further history of these international regulations is examined. Questions of applicability are considered together with problems involving charter regulations. Other legal questions discussed are related to tickets, fare, meals, and liability.


The Warsaw Convention as amended at The Hague in 1955 has been changed at an international conference at Guatemala in 1971. The regulations in their new form are presented. There are five chapters dealing with the operational state of the aircraft, qualifications and authority of aircraft personnel, construction and operation of airports, and the occurrence of special incidents.


The Warsaw Convention as amended at The Hague in 1955 has been changed at a international conference at Guatemala in accordance with the Protocol of Mar. 8, 1971. The regulations in their new form are presented. There are five chapters dealing with the subject of the convention, documents such as the ticket and their new form are presented. There are five chapters dealing with the operational state of the aircraft, qualifications and authority of aircraft personnel, construction and operation of airports, and the occurrence of special incidents.

The Warsaw Convention as amended at The Hague in 1955 has been changed at an international conference at Guatemala in accordance with the Protocol of Mar. 8, 1971. The regulations in their new form are presented. There are five chapters dealing with the subject of the convention, documents such as the ticket and their new form are presented. There are five chapters dealing with the operational state of the aircraft, qualifications and authority of aircraft personnel, construction and operation of airports, and the occurrence of special incidents.


The regulations of the law presented are contained in two sections. The first section is concerned with the objective and the applicability of the law, the area which is to be protected, financial questions concerning protective measures in the construction of houses, and obligations of airport authorities to provide information to the government. The second section discusses changes in the air traffic law.


Although a great deal of attention has been given to the role of water vapor from supersonic transport (SST) exhaust in the stratosphere, oxides of nitrogen from SST exhaust pose a much greater threat to the ozone shield than does an increase in water. The projected increase in stratospheric oxides of nitrogen could reduce the ozone shield by about a factor of 2, thus permitting the harsh radiation below 300 nanometers to permeate the lower atmosphere.


The generation of impulsive sound, commonly called blade slap, due to blade-vortex interaction for helicopter rotors is discussed. The unsteady lift on the blades is calculated using linear unsteady aerodynamic theory for an oblique gust model of the blade-vortex interaction. A theoretical model for the radiated sound due to the transient lift fluctuations is presented. Expressions for the directivity, frequency spectrum, transient signal, and total power of the acoustic signal are derived. Typical results are presented and discussed. Calculations of the transient signal are presented in comparison with recent experimental results. The agreement is very good.


The glossary presented provides definitions of the most common terms of commercial air traffic taking into consideration words in German as used in the German Democratic Republic and expressions of international usage in English. The English equivalent term is frequently supplied together with a German expression listed. A list of commonly used abbreviations of German terms is also provided.


Description of the highly sophisticated 747 simulator which incorporates a six-degree-of-motion system to provide a high degree of realism A major component is the Malfunction Insertion and Display Unit (MIDU), a large screen on which 48 slides can be projected. MIDU makes it possible simultaneously to train engineers and pilots, using different sets of data. The simulator can be 'initialized' to any of hundreds of possibly places in flight or on the ground. The Variable Anamorphic Motion Picture (VAMP) system, soon to be installed, is described.


Description of the BOAC digital computer type simulator, the computer system of which has a capacity of 56 K words with 16 bits to a word. Four degrees of movement are provided. Full simulation of all systems is obtained with the exception of an actual picture on the weather radar screens. The simulator is used for pilot and flight engineer conversion training, pilot and flight engineer check flights, and training of maintenance engineers in system checks and engine ground running procedures.

Computer-based twin-radar air traffic control system (Eine Anlage zur rechnergestützten Luftraumbeobachtung mit Hilfe von zwei Radargeräten). Eberhard Hanle (Forschungs-
An experimental study of computer-based multiradar aircraft tracking is conducted with the aid of a twin radar air traffic control system in operation. Its crucial components are described: digital plot extractors for primary radar responses using sliding-window detectors, and transmitters feeding the radar data to a computer. The overall operation of the system is discussed.

M.V.E.


The installations described include an ultrasonic system for finding defects in valves and a fluorescent particle system for detecting cracks in a variety of aircraft parts. The first installation consists of an ultrasonic pulse unit, plus a special fixture and transducer assembly. The transducer is sensitive enough to find breaks as small as 0.005 in. wide, 0.006 in. deep, and 3/8 in. long. A valve is inspected in less than a minute. The fluorescent particle system consists of a series of processing stations connected by a heavy-duty roller conveyer. Items tested for surface defects include all nonferrous engine cases, landing gears, and ground-handling equipment.

Z.W.
Donald W Blincow Feb 1971 138 p refs (Contract AT(04-3)-B05) (SAN-B05-1) Avail NTIS
The development of a nucleonic instrumentation system for continuous on-board indication of helicopter lift capability and the testing of a prototype system in a realistic environment are described. The system uses X-ray backscatter from a Kr-85 source and a temperature sensor to measure ambient air density and temperature outside the vehicle and computes gross lift capability in an all-digital computer. Combining the lift capability output with helicopter start gross weight and present fuel quantity provides the pilot with a real-time readout of his lift margin at maximum rotor speed before he commits the vehicle to take off or other critical maneuver.

UNSTEADY AIRFOIL STALL AND STALL FLUTTER
The unsteady airfoil stall characteristics are described analytically using static experimental data as an input. It is found that the dynamic overshoot of static stall does not in itself generate any time lag above the Karman-Sears wake lag. In the latter case, a graphical method for modulation of the separation induced phase lag gives improved agreement with experimental data. The effects of compressibility and shock-induced boundary layer separation are included in the analysis, and it is shown that the experimentally determined stall flutter boundaries of a space shuttle wing can be predicted using only static data as an input.

MARKS PREPARED FOR DELIVERY BY THE HONORABLE SECOR D. BROWNE, CHAIRMAN, CIVIL AERONAUTICS BOARD, BEFORE THE AVIATION DAY LUNCHEON, SEATTLE CHAMBER OF COMMERCE
Air carriers' problems and areas where the Civil Aeronautics Board and the carriers can take corrective steps are discussed. Capacity, fare increases, the expense which would result from retrofitting if required for protecting the environment, the necessity to improve controls for preventing hijacking, and uncoordinated access transportation are considered, and areas in which the carriers might cut costs are indicated. The problems of local airline service and subsidy, and of supplemental air carriers are described. The impact of the carriers' financial health on the aircraft industry and the need to have a strong R and D program for advanced aircraft such as the SST and short-haul aircraft are also covered.

To evaluate the concept of a simple head-up display (HUD) as an aid to noninstrument-rated pilots encountering reduced flight visibility conditions, two versions of such a display were flown by six pilots. The subject pilots were pretested to insure that they could not perform standard maneuvers when outside visual reference and panel attitude instruments were obscured leaving only the altimeter, airspeed indicator, gyroscopic direction indicator, gyroscopic rate-of-turn/slip-skid indicator and clock. Given either of the HUD instruments and a partial panel of basic instruments, plus a brief indoctrination in the use of the HUD, the pilots showed marked improvement in preservation of aircraft control. The opinions of expert observers suggest that, with a few hours of additional training, inexperienced pilots would be able to employ a simple HUD with a further improvement of aircraft safety when penetrating adverse weather.

POTENTIAL SITES VOLUME 2: POTENTIAL SITES
POTENTIAL SITES. VOLUME 1: BUSINESS TRAFFIC AND POTENTIAL SITES. VOLUME 2: POTENTIAL SITES
Southampton Univ (England) Transportation Research Group
The surveys and analyses which were made of business travel from establishments in eight urban areas in the United Kingdom are presented. The studies were undertaken to determine the economic feasibility of establishing a vertical takeoff and landing airline operation. The basic trip characteristics of business travelers and the relationships of trip generation and distribution are discussed.

N71-29285# National Aviation Facilities Experimental Center, Atlantic City, N J
To evaluate the concept of a simple head-up display (HUD) as an aid to noninstrument-rated pilots encountering reduced flight visibility conditions, two versions of such a display were flown by six pilots. The subject pilots were pretested to insure that they could not perform standard maneuvers when outside visual reference and panel attitude instruments were obscured leaving only the altimeter, airspeed indicator, gyroscopic direction indicator, gyroscopic rate-of-turn/slip-skid indicator and clock. Given either of the HUD instruments and a partial panel of basic instruments, plus a brief indoctrination in the use of the HUD, the pilots showed marked improvement in preservation of aircraft control. The opinions of expert observers suggest that, with a few hours of additional training, inexperienced pilots would be able to employ a simple HUD with a further improvement of aircraft safety when penetrating adverse weather.

N71-29286# South Hampton Univ (England) Transportation Research Group
INTER-CITY VTOL STUDIES (UK) BUSINESS TRAFFIC AND POTENTIAL SITES. VOLUME 2: POTENTIAL SITES
Feasibility studies and analyses associated with potential sites for VTOL terminals in eight selected urban areas within the United Kingdom are presented. Analyses were made of the proposed land use patterns, population, employment, communications, and traffic to identify a number of possible VTOL sites. It is concluded that a number of potential sites for VTOL terminals are available and that VTOL commercial air transportation is feasible.

N71-29256# Civil Aeronautics Board, Washington, D C
REMARKS PREPARED FOR DELIVERY BY THE HONORABLE SECOR D. BROWNE, CHAIRMAN, CIVIL AERONAUTICS BOARD, BEFORE THE AVIATION DAY LUNCHEON, SEATTLE CHAMBER OF COMMERCE
Air carriers' problems and areas where the Civil Aeronautics Board and the carriers can take corrective steps are discussed. Capacity, fare increases, the expense which would result from retrofitting if required for protecting the environment, the necessity to improve controls for preventing hijacking, and uncoordinated
To determine the minimum system of chevron markings that would give warning to potentially deceptive, non-load-bearing paved areas before a runway threshold, 20 pilots were given systematic exposure in a flight simulator to narrowed and more widely spaced chevron patterns, and also to the present U.S. Standard. The judgments made by these pilots were that both the conventional pattern of full-width chevrons spaced 100 feet apart and a pattern of standard-width chevrons spaced 200 feet apart provided distinct and unambiguous warning of the non-load-bearing surface. Further, they reported that these two patterns were not confusable with other markings such as the runway threshold stripes. Pilot judgments of the two patterns with narrowed chevrons were mixed. While a majority reported the narrowed chevrons not confusable, there was a marked increase in the number reporting absence of distinct and unambiguous guidance, particularly when the markings were viewed from a position low on glide slope and offset from the centerline.

**N71-29307#**  IIT Research Inst., Chicago, III

**STUDY OF VISIBLE EXHAUST SMOKE FROM AIRCRAFT JET ENGINES**

Final Report

John Stockham and Howard Betz

Jun 1971 75 p refs

(Contract DOT-F60WA-2208)

The visibility of inflight jet exhaust is compared to the SAE smoke number. A method based on photographic photometry was developed for measuring the optical density of smoke plumes. This method was related to visibility and to the smoke number through transmissometer measurements and visibility theory. A portable transmissometer, capable of operating over a wide range of optical path lengths and under varying ambient light conditions, was fabricated for use on this study. The mathematical expression relating the transmission measurements to the smoke number was derived. Luminous visibility requirements of smoke trails, developed from light scattering theory, correlated with actual visual observations and the transmissometer and photometry measurements. Author

**N71-29309#**  Little (Arthur D.), Inc., Cambridge, Mass

**AN APPROACH TO THE ESTABLISHMENT OF PRACTICAL AIR TRAFFIC CONTROL SAFETY GOALS**

Interim Report

S. F. Lister and G. Raisbeck

May 1971 60 p refs

(Contract DOT-F60WA-2141)

This report shows how a knowledge of the incidence of fatal aircraft accidents in the recent past can be combined with an estimate of the overall risk in various types of human activity, which have been found socially acceptable, to produce rational, quantitative goals for the risk associated with air traffic control. Fatal accidents over an eight-year period, from 1961 to 1968 inclusive, are categorized in 36 groups based on 6 phases of flight and 6 type-cause categories. The improvement in overall air transportation safety which could be achieved by reducing or eliminating all sources of accident which are, in any way, related to air traffic control is examined. Inasmuch as the majority of fatalities cannot, by the most generous reckoning, be associated with air traffic control, the total possible improvement is not impressive. When, on the other hand, proportional reduction in risk from all causes is assumed, a set of mutually compatible risk goals for each of the 36 groups can be stated. Author

**N71-29333#**  Advisory Group for Aerospace Research and Development, Paris (France)

**SYMPOSIUM ON UNSTEADY AERODYNAMICS FOR AEROELASTIC ANALYSES OF INTERFERING SURFACES, PART 1**

April 1971 92 p refs Held at Tonsberg, Norway, 3–4 Nov 1970

(AGARD-CP-80-71) Aval NTIS

**CONTENTS**

1 SOME CONSIDERATIONS RELATIVE TO THE PREDICTION OF UNSTEADY AIR LOADS ON INTERFERING SURFACES

H. Ashley (Stanford Univ.) 22 p refs

2 CALCULATION METHODS FOR UNSTEADY AIRFORCES OF TANDEM SURFACES AND T-TAILS IN SUBSONIC FLOW

D. E. Davis (Royal Aircraft Estab., Farnborough, England) 22 p refs

3 REPRESENTATION OF A WING IN THE LIFTING LINE, AND OF THE INTERACTION CALCULATIONS OF TWO WINGS IN TANDEM

R. Dat and Y. Akamatsu (Office Natl. D'Etudes et de Recherches Aerospatiales, Paris, France) 17 p refs

4 A SUPERSONIC BOX COLLOCATION METHOD FOR THE CALCULATION OF UNSTEADY AIRFORCES OF TANDEM SURFACES

D. L. Woodcock and E. J. York (Royal Aircraft Estab., Farnborough, England) 26 p refs

**N71-29334#**  Stanford Univ., Calif

**SOME CONSIDERATIONS RELATIVE TO THE PREDICTION OF UNSTEADY AIR LOADS ON INTERFERING SURFACES**

H. Ashley In AGARD Symp on Unsteady Aerodynamics for Aerelastic Analyses of Interfering Surfaces, Part 1 Apr 1971 22 p refs Aval NTIS

Loading singularities inherent in linearized potential theory are classified as local, in the sense that both the nature and magnitude of the singularity are determined by boundary conditions in the inner field, or global, in the sense that the entire boundary value problem must be solved to determine their details. Available results are reviewed relative to discontinuities in surface slope, planform shape, dihedral angle, etc., and suggestions are offered for combining them into numerical solution schemes. With respect to the analysis of interfering lifting surfaces, selected recent activity in the United States on continuous solution of various subsonic and supersonic cases is described. Regarding the area-element or box approach to the latter, it is recommended that an element in the form of a trapezium, similar to that employed by Woodward for steady flow, will also improve the behavior of predicted loads for oscillatory motion of interacting surfaces. Formulas for certain of the required influence coefficients are developed. Some nonlinear effects are examined which are felt to have greater significance for interference problems than for isolated lifting wings. The phenomena include the normal displacement and self-deformation of wakes which induce loads on aft surfaces, the local influences of profile thickness, and displacement due to boundary layer growth.

**N71-29336#**  Royal Aircraft Establishment, Farnborough (England)

**CALCULATION METHODS FOR UNSTEADY AIRFORCES OF TANDEM SURFACES AND T-TAILS IN SUBSONIC FLOW**

D. E. Davis In AGARD Symp on Unsteady Aerodynamics for Aerelastic Analyses of Interfering Surfaces, Part 1 Apr 1971 22 p refs Aval NTIS

The basis of numerical methods, using continuous distributions of loading, for evaluating oscillatory generalised airforce coefficients...
for interfering and intersecting surfaces inclined everywhere at small angles to a subsonic mainstream flow is described. Particular application to tandem surfaces and T-tails is discussed briefly.

Author

N71-29336# Office National d’Etudes et de Recherches Aérospatiales, Paris (France)
REPRESENTATION OF A WING IN THE LIFTING LINE; APPLICATION OF THE INTERACTION CALCULATIONS OF TWO WINGS IN TANDEM [REPRÉSENTATION D’UNE AILE PAR DES LIGNES PORTANTES; APPLICATION AU CALCUL DE L’INTERACTION DE DEUX AILES EN TANDEM]
R Dat and Y Akamatsu In AGARD Symp on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfaces, Part 1 Apr 1971 17 p refs. In FRENCH, ENGLISH summary

Avail NTIS

The simulation of wings by a lattice of lifting lines is summarized for the computation of unsteady aerodynamic forces on combinations including several lifting surfaces, such as wing-horizontal tail or fin-horizontal tail. It can be considered as a compromise between the doublet lattice method which is advantageous for its flexibility, and the so called lifting surface method whose results are more accurate for a given number of collocation points. A numerical program was developed for the application to wings lying in two parallel planes. The particular features of the method of calculation are presented, as well as some numerical results.

Author

N71-29337# Royal Aircraft Establishment, Farnborough (England)
A SUPERSONIC BOX COLLOCATION METHOD FOR THE CALCULATION OF UNSTEADY AIRFORCES OF TANDEM SURFACES
D L Woodcock and E J York In AGARD Symp on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfaces, Part 1 Apr 1971 26 p refs

Avail NTIS

A box collocation method is developed for the determination of the airfoils on a pair of tandem surfaces (not necessarily coplanar) undergoing small oscillatory displacements in a supersonic flow. The perturbation velocity potential is evaluated at the vertices of a lattice of Mach lines on each wing. The results of the application of the method to a wing-tailplane configuration each of triangular planform, are given.

Author

N71-29338# Advisory Group for Aerospace Research and Development, Paris (France)
SYMPOSIUM ON UNSTEADY AERODYNAMICS FOR AEREOELASTIC ANALYSES OF INTERFERING SURFACES, PART 2
Apr 1971 234 p refs Held at Tonsberg, Norway, 3-4 Nov 1970 (AGARD-CP-80-71) Avail NTIS

CONTENTS
1. SUBSONIC UNSTEADY AIRLOADS ON MULTIPLE LIFTING SURFACES G Boehm and H Schmid (Vereinigte Flugtechnische Werk-Fokker G mb H, Munich, West Germany) 28 p refs


Author

3. APPLICATION OF AFFDL UNSTEADY LOAD PREDICTION METHOD TO INTERFERING SURFACES W J Myktyow, J J Olsen, and S J Pollock (AFSC, Wright-Patterson AFB, Ohio) 24 p refs

4. APPLICATION OF UNSTEADY AIRFORCE CALCULATION METHODS TO AGARD INTERFERENCE CONFIGURATIONS D E Davies (RAE, Farnborough, England) 18 p refs

5. MEASUREMENT OF UNSTEADY AIR LOADS OF INTERACTION BETWEEN LIFTING SURFACES IN TANDEM A Destuynder (Office Nat d’Etudes et de Recherches Aérospatiales, Paris, France) 12 p refs

6. T-TAIL AERODYNAMICS FOR FOKKER F 28 J Yff and R J Zwaan (Vereinigte Flugtechnische Werke-Fokker G mb H, Munich, West Germany) 15 p refs

7. SOME RECENT INVESTIGATIONS ON FLUTTER IN SUBSONIC FLOW, CAUSED BY INTERFERENCE AERODYNAMIC FORCES BETWEEN WING AND TAIL OF A VARIABLE GEOMETRY AIRCRAFT W Svidel and O Sensburg (Messerschmitt-Bölkow-Blohm G mb H, Munich, West Germany) 10 p refs

8. UNSTEADY AERODYNAMICS FOR WINGS WITH CONTROL SURFACES H Tijdeman and R J Zwaan (Natl Aeronautronic Res Inst.) 15 p refs

9. APPLICATION OF LIFTING SURFACE THEORY TO WINGS PROVIDED WITH CONTROL SURFACES B Darras and R Dat (Office Nat d’Etudes et de Recherches Aérospatiales, Paris, France) 14 p refs

10. UNSTEADY AIRFORCES FOR WINGS WITH CONTROL SURFACES PART 1 LOADING FUNCTIONS B L Hewitt (British Aircraft Corp., Warton, England) 26 p refs

11. UNSTEADY AIRFORCES FOR WINGS WITH CONTROL SURFACES PART 2 CALCULATION METHODS B L Hewitt (British Aircraft Corp., Warton, England) 24 p refs

12. PRESSURE MEASUREMENTS ON AN HARMONICALLY OSCILLATING SWEEP WING WITH TWO CONTROL SURFACES IN INCOMPRESSIBLE FLOW H Forschung, H Triebstein, and J Wagener (Deutsche Forschungsund Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen, West Germany) 15 p refs

N71-29339# Vereinigte Flugtechnische Werk-Fokker G mb H, Munich (West Germany)
SUBSONIC UNSTEADY AIRLOADS ON MULTIPLE LIFTING SURFACES
G Boehm and H Schmid In AGARD Symp on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfacing, Part 2 Apr 1971 28 p refs

Avail NTIS

A survey is presented of the main features of lifting lattice methods and particularly of lifting surface methods. Ways to extend existing methods to arbitrary lifting surface configurations are also discussed. The following is a short description of these fundamentals and a detailed discussion of the numerical methods as established by the authors. Results obtained will be presented and compared with other theories.

Author

N71-29340# Douglas Aircraft Co., Inc., Long Beach, Calif
NEW DEVELOPMENTS AND APPLICATIONS OF THE SUBSONIC DOUBLE-LATTICE METHOD FOR NONPLANAR CONFIGURATIONS
W P Rodden, J P Giesing, and T P Kalman In AGARD Symp

Author
on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfaces, Part 2 Apr 1971 28 p refs
Available NTIS

Procedures for calculating the normal wash induced by a doublet line in nonplanar configurations and for calculating the interference between wings and bodies are given. Applications are made to a non-coplanar wing-tail combination, a number of empennage configurations, a wing-fuselage and a wing-nacelle combination. Also considered is the calculation of velocity components in the flow field during oscillatory motion and the calculation of the distribution of induced drag in steady flow. Examples of both calculations are also presented.

Author

N71-29341
Air Force Systems Command, Wright-Patterson AFB, Ohio, Flight Dynamics Lab.
APPLICATION OF AFFDL UNSTEADY LOAD PREDICTION METHOD TO INTERFERING SURFACES
Available NTIS

The results of engineering applications of subsonic and supersonic lifting surface methods to some of the AGARD configurations and other interesting configurations, are presented. The subsonic kernel function program is applied to several aspects of the wing-tail interaction problem. The subsonic double lattice method is also applied to the problem. Results are also presented for a supersonic Mach box program developed for T-tails and cruciform tails along with comparisons with piston theory. Comparison between the subsonic kernel function and the double lattice method is generally quite good. While the double lattice method usually required greater computing times for the same accuracy as the kernel function method, it has some advantages in its favor such as ease of application and extension to more complicated configurations. The supersonic results presented here appear to be of the proper order of magnitude when compared with piston theory, however, more applications and careful checking are indicated.

Author

N71-29342
Royal Aircraft Establishment, Farnborough (England)
APPLICATIONS OF UNSTEADY AIRFORCE CALCULATION METHODS TO AGARD INTERERENCE CONFIGURATIONS
D.E. Davies In AGARD Symp on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfaces, Part 2 Apr 1971 18 p
Available NTIS

Calculations of generalised airforce coefficients were carried out for the configurations of wing and horizontal tail and of fin and horizontal tail oscillating in subsonic flow in prescribed modes at given frequencies.

Author

N71-29343
Office National d'Études et de Recherches Aerospatiales, Paris (France)
MEASUREMENT OF UNSTEADY AIR LOADS OF INTERACTION BETWEEN LIFTING SURFACES IN TANDEM [MESURES DES FORCES INSTATIONNAIRES D'INTERACTION ENTRE SURFACES PORTANTES EN TANDEM]
A. Destuynder In AGARD Symp on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfaces, Part 2 Apr 1971 12 p refs In FRENCH, ENGLISH summary
Available NTIS

A series of wind tunnel tests were performed in view of analyzing the influence of several parameters on the aerodynamic interference between two lifting surfaces in tandem. The aim was to determine the magnitude of the coupling terms in order to provide a theoretical explanation of the flutter instabilities occurring on variable sweep airplanes. The tests were limited to two types of motion: pure translation and pure pitching oscillation of one wing. The model consisted of two rectangular or swept wings whose relative position could be adjusted continuously in the horizontal as well as in the vertical direction. Some comparisons between theory and experiment are given.

Author

N71-29344
Verenigde Flugtechnische Werke-Fokker Gmb H, Munich (West Germany)
T-TAIL AEROELASTIC ANALYSIS FOR FOKKER F.28
Available NTIS

Data from an aerelastic and flutter analysis are presented. The data include lateral gust loading, aircraft designs, and mission analyses. The results indicate that mass balancing of the rudder and aileron may be deleted. Testing time for high speed flutter may be reduced, and the risks of extensive modifications to the design may be reduced. The tests also achieved the certification of the aircraft.

Author

N71-29345
Messerschmitt-Boelkow-Blohm Gmb H., Munich (West Germany)
SOME RECENT INVESTIGATIONS ON FLUTTER IN SUBSONIC FLOW, CAUSED BY INTERFERENCE AERODYNAMIC FORCES BETWEEN WING AND TAIL OF A VARIABLE GEOMETRY AIRCRAFT
W. Sendel and O. Sensburg In AGARD Symp on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfaces, Part 2 Apr 1971 10 p refs
Available NTIS

A method for routine flutter calculations utilizing interference aerodynamic forces between wing and tail is presented. The elastomechanic system of the aircraft is described by branch modes and the airforces for these branch modes are produced by superposing air forces for arbitrary polynomials. The air forces are calculated for a distinct vertical offset between wing and tail with the exact kernel functions. A large variety of stiffness parameter variations was performed such as wing stiffness, fuselage stiffness, and tailplane connection stiffness in order to get a better understanding of the flutter phenomenon involved and to find a cure for solving the problem. Some of the results are compared with results from wind tunnel model tests to establish the validity of the analytical method used.

Author

N71-29346
National Aero- and Astronautical Research Inst., Amsterdam (Netherlands)
UNSTEADY AERODYNAMICS FOR WINGS WITH CONTROL SURFACES
H. Tijdeman and R. J. Zwaan In AGARD Symp on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfaces, Part 2 Apr 1971 15 p refs
Available NTIS

A kernel function method to calculate pressure distributions over wings with harmonically oscillating control surfaces in subsonic flow is briefly discussed. Comparisons of calculated and measured pressure distributions are given for different planforms, Mach
APPLICATION OF LIFTING SURFACE THEORY TO WINGS described, is extended here to an arbitrary planform. The comparison of the logarithmic singularity of the pressure field and an analysis for Aeroelastic Analyses of Interfering Surfaces. Part 2 Apr 1971 B Darras and R Dat In AGARD Symp on Unsteady Aerodynamics. Aerospatiales Paris (France) N71-29347# Office National d'Etudes et de Recherches AEROSPAZIALE Paris (France) APPLICATION OF LIFTING SURFACE THEORY TO WINGS PROVIDED WITH CONTROL SURFACES [APPLICATION DE LA THEORIE DE LA SURFACE PORTANTE A DES AILES MUNIES DE GOUVERNEMENT] B Darras and R Dat In AGARD Symp on Unsteady Aerodynamics for Aeroelastic Analyses of Interfering Surfaces, Part 2 Apr 1971 14 p refs In FRENCH, ENGLISH summary Available NTIS A method for solving the problem of control surfaces in subsonic unsteady flow is considered. It is based on the exploitation of the logarithmic singularity of the pressure field and on an analysis of the usual matrix solution of the integral equation. This method, whose application to a rectangular wing has already been described, is extended here to an arbitrary planform. The comparison of experimental and theoretical results obtained for the rectangular wing is also shown. An attempt was made, through the use of matched asymptotic expansion techniques, to define methods for finding the inner singular pressure loading functions associated with a wide variety of interaction effects on wings with unbalanced control surfaces. The work is basic in that it facilitates the construction of adequate loading functions which are necessary before attempting to obtain convergent lifting surface theory solutions. It extends the practical scope of Landahl’s work and gives, as a result, sound reasons for modifying the loading recipes. Introduction to the physical fundamentals of compressor noise. Dieter Lohmann Dec 1970 222 p refs In GERMAN, ENGLISH summary (DLR-FB-70-74) Available NTIS, ZDLI Munich 31.50 DM A survey of a large number of reports on noise generated by fans and compressors is presented. A comprehensive review is given of the fundamentals of compressor aeracoustics and the origins of compressor noise. Possibilities for reducing compressor noise are discussed. Aeronautical Research Inst of Sweden, Stockholm (Sweden) FFA STRUCTURAL RESEARCH AND TEST FACILITIES 1970 64 p (FFA-MEMO-61) Available NTIS Main activities of test facilities on structural engineering at FFA, Sweden, are described as well as the test equipment. Other facilities serving the FFA Structures Department are reviewed. A method for solving the problem of control surfaces in subsonic unsteady flow is considered. It is based on the exploitation of the logarithmic singularity of the pressure field and on an analysis of the usual matrix solution of the integral equation. This method, whose application to a rectangular wing has already been described, is extended here to an arbitrary planform. The comparison of experimental and theoretical results obtained for the rectangular wing is also shown. An attempt was made, through the use of matched asymptotic expansion techniques, to define methods for finding the inner singular pressure loading functions associated with a wide variety of interaction effects on wings with unbalanced control surfaces. The work is basic in that it facilitates the construction of adequate loading functions which are necessary before attempting to obtain convergent lifting surface theory solutions. It extends the practical scope of Landahl’s work and gives, as a result, sound reasons for modifying the loading recipes. Introduction to the physical fundamentals of compressor noise. Dieter Lohmann Dec 1970 222 p refs In GERMAN, ENGLISH summary (DLR-FB-70-74) Available NTIS, ZDLI Munich 31.50 DM A survey of a large number of reports on noise generated by fans and compressors is presented. A comprehensive review is given of the fundamentals of compressor aeracoustics and the origins of compressor noise. Possibilities for reducing compressor noise are discussed. Aeronautical Research Inst of Sweden, Stockholm (Sweden) FFA STRUCTURAL RESEARCH AND TEST FACILITIES 1970 64 p (FFA-MEMO-61) Available NTIS Main activities of test facilities on structural engineering at FFA, Sweden, are described as well as the test equipment. Other facilities serving the FFA Structures Department are reviewed. ESRO. A method for solving the problem of control surfaces in subsonic unsteady flow is considered. It is based on the exploitation of the logarithmic singularity of the pressure field and on an analysis of the usual matrix solution of the integral equation. This method, whose application to a rectangular wing has already been described, is extended here to an arbitrary planform. The comparison of experimental and theoretical results obtained for the rectangular wing is also shown. An attempt was made, through the use of matched asymptotic expansion techniques, to define methods for finding the inner singular pressure loading functions associated with a wide variety of interaction effects on wings with unbalanced control surfaces. The work is basic in that it facilitates the construction of adequate loading functions which are necessary before attempting to obtain convergent lifting surface theory solutions. It extends the practical scope of Landahl’s work and gives, as a result, sound reasons for modifying the loading recipes. Introduction to the physical fundamentals of compressor noise. Dieter Lohmann Dec 1970 222 p refs In GERMAN, ENGLISH summary (DLR-FB-70-74) Available NTIS, ZDLI Munich 31.50 DM A survey of a large number of reports on noise generated by fans and compressors is presented. A comprehensive review is given of the fundamentals of compressor aeracoustics and the origins of compressor noise. Possibilities for reducing compressor noise are discussed. Aeronautical Research Inst of Sweden, Stockholm (Sweden) FFA STRUCTURAL RESEARCH AND TEST FACILITIES 1970 64 p (FFA-MEMO-61) Available NTIS Main activities of test facilities on structural engineering at FFA, Sweden, are described as well as the test equipment. Other facilities serving the FFA Structures Department are reviewed. ESRO. A method for solving the problem of control surfaces in subsonic unsteady flow is considered. It is based on the exploitation of the logarithmic singularity of the pressure field and on an analysis of the usual matrix solution of the integral equation. This method, whose application to a rectangular wing has already been described, is extended here to an arbitrary planform. The comparison of experimental and theoretical results obtained for the rectangular wing is also shown. An attempt was made, through the use of matched asymptotic expansion techniques, to define methods for finding the inner singular pressure loading functions associated with a wide variety of interaction effects on wings with unbalanced control surfaces. The work is basic in that it facilitates the construction of adequate loading functions which are necessary before attempting to obtain convergent lifting surface theory solutions. It extends the practical scope of Landahl’s work and gives, as a result, sound reasons for modifying the loading recipes. Introduction to the physical fundamentals of compressor noise. Dieter Lohmann Dec 1970 222 p refs In GERMAN, ENGLISH summary (DLR-FB-70-74) Available NTIS, ZDLI Munich 31.50 DM A survey of a large number of reports on noise generated by fans and compressors is presented. A comprehensive review is given of the fundamentals of compressor aeracoustics and the origins of compressor noise. Possibilities for reducing compressor noise are discussed. Aeronautical Research Inst of Sweden, Stockholm (Sweden) FFA STRUCTURAL RESEARCH AND TEST FACILITIES 1970 64 p (FFA-MEMO-61) Available NTIS Main activities of test facilities on structural engineering at FFA, Sweden, are described as well as the test equipment. Other facilities serving the FFA Structures Department are reviewed. ESRO.
A brief survey on different methods of rotor downwash analyses, according to several publications dealing with this problem, is presented. From the multitude of existing theories a simple and a rather difficult method are selected, improved, and compared.

The results of an experimental study of the pressure singularities occurring along the control surface edges of a harmonically oscillating swept wing control surface system in incompressible flow are presented and discussed. The two control surfaces ranged along the whole span of the wing and could be excited so that alternatively the inner or the outer flap or even both were oscillating with different phases and amplitudes relative to each other and relative to the wing.

Three different types of disturbances are distinguished: the wind, atmospheric turbulence, and the noise contained in the ILS signals. The model is thought to be applicable to altitudes between ground level and 250 m. The basic material from which the model has been constructed has been compiled from available literature.

The book examines the design operating process, principles of control and operational characteristics of jet engines of various types used in civil aviation (including turbojet, turboprop and turbofan). The classification of the engines is given. Special attention is given to the analysis of peculiarities of throttle and high-altitude operation of jet engines. The results show that landing performance in flight is almost unaffected by loss of peripheral vision, even in poor visibility.

An exact cubic equation is derived for locating the reflection point position. Possible extensions of these techniques to other aircraft height ratio cases are indicated.

Three different types of disturbances are distinguished: the wind, atmospheric turbulence, and the noise contained in the ILS signals. The model is thought to be applicable to altitudes between ground level and 250 m.
The method of transfer matrices allows a relatively clear and simple solution of the problems of rotor blade vibrations, especially by use of digital computers. The uncoupled flapwise chordwise and torsional vibrations are dealt with. For the flapwise bending vibration, the interharmonic coupling effects owing to aerodynamic damping are taken into account. A built-in cone angle for hingeless rotors is considered for flapwise vibrations. The transfer matrix method is compared with other theoretical methods and experimental results. 


N71-29553 Department of Trade and Industry, London (England) Telecommunications Engineering Headquarters MOVEMENT OF EMERGENCY VEHICLES IN REDUCED VISIBILITY CONDITIONS REPORT ON ASMI/TRANSPONDER TRIALS AT HEATHROW AIRPORT. SEPTEMBER 1970 A R Hillier and A P Fuggle 1970 28 p its Tels R3A Note 2/70, Issue 1 Avail NTIS The ASMI/Transponder tests for moving emergency service vehicles on airfields during poor visibility conditions are evaluated. The transponder was tested on a Nubian fire tender. Signals from the ASMI were used to interrogate the transponder at Q band, and by transmission of the ASMI ppi picture to the vehicle via the microwave link. It is concluded that the simplest and cheapest arrangement is the provision of transponders on selected vehicles, and requires continuous guidance information to the vehicle by ATC Transponder cover from all areas of the airfield could be provided F O S

N71-29554 Electro magnetic Compatibility Analysis Center, Annapolis, Md Federal Aviation Agency, Washington, D C

N71-29555 Environmental Science Services Administration, Boulder, Colo MODULATION CHARACTERISTICS CRITICAL TO FREQUENCY PLANNING FOR THE AERONAUTICAL SERVICES R W Hubbard, D V Glen, and W J Hartman Apr 1970 191 p refs (Contract FA-67-WAI-134) (ESSA-TM-ERL-ITS-232) Avail NTIS The fundamental characteristics of basic analog and digital modulation processes used in the Air Traffic Control (ATC) communication system are summarized. These characteristics have been condensed into a format in which they may be readily applied to the spectrum planning phases of ATC system design. Single channel modes of transmission are primarily considered for voice and data signals, but many of the aspects considered are also useful in describing the baseband signal structure for multichannel systems in which multiplex transmission modes are used. The purpose is to provide a basic set of signal descriptors and characteristics at several stages in a total ATC communication circuit. The tabulated characteristics may be applied systematically to help determine the initial channel spacing, allocation and power requirements for a particular system in a given frequency band. 

N71-29557 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div USING A HELICOPTER FOR DUSTING FOREST SOURCES OF TICK-BORNE ENCEPHALITIS V A Nabokov et al 20 Feb 1970 7 p refs Transl into ENGLISH from Med Parazitol i Parazitarn Bolezi (Moscow), v 33, no 1, 1964 p 64–68 (AD-703998, FTD-HT-23-644-69) Avail NTIS The MU 1HX helicopter was tested for spray dusting with a 10 percent DDT dust in tick borne encephalitis foci. During the period of spraying the flight speed of the craft was kept within limits of 30 to 35 km per hour. The improved precipitation of the chemical poison permitted it to reduce its consumption rate down to 20 kg per hectare, as compared with that (50 kg per hectare) accepted for the plane AH 2. The treatment remained highly effective. In addition to considerable savings of the poisonous material the reduction of consumption rates brought with it a substantial improvement of the present economic indices. This warrants the new mode of the treatment for a wide scale field application in the foci of tick borne encephalitis. 


571
The application of hydraulic systems to the operation of aircraft is discussed. Subjects presented are (1) fundamentals of hydraulics, (2) fundamental equations of hydraulics, (3) relative and nonsteady motion of fluid in pipes, (4) hydraulic drives and hydraulic transmissions, (5) design of hydraulic equipment for aircraft use, and (6) characteristics of centrifugal pumps.

**N71-29607**

*General Electric Co., Philadelphia, Pa*

**H2 FUEL SYSTEM INVESTIGATION**


Progress in designing and developing an air breathing engine system for space shuttle application is reported. Tasks included a parametric evaluation of various engine cycles employing hydrogen fuel, an engine design study, engine development plan and cost estimate, and performance specification. All work is completed, and a derivative of the F-101 engine was recommended and used as the referenced engine. While the hydrogen versus jet propulsion fuel evaluation is not yet complete it appears that the use of hydrogen requires additional development in the fuel handling system and related control and accessory areas. No basic technological barriers were identified, however for fitting an engine of this type to the desired application.

**N71-29622**

*National Lending Library for Science and Technology, Boston Spa (England)*

**NOISE DUE TO FLUID FLOW**

19 Jan 1971 4 p. Available for reproduction NTIS Lending Library, Boston Spa, England. A summary of the various forms and causes of flow induced noise is presented. The causes of noise associated with discharge effects, propellers, blowers, jet engines, boundary layers, water pipes, and supersonic aircraft are described and, where possible, empirical formulas for the expected acoustic power are given. A theoretical treatment of flow induced noise is included.

**N71-29635**

*Federal Aviation Administration, Oklahoma City, Okla National Flight Inspection Div*

**EVALUATION OF IFR DEPARTURE PROCEDURE, ALBUQUERQUE, N M., RUNWAY 08** Final Report


A flight simulator study was made of an IFR departure procedure from a runway. Hot day temperature and calm surface winds were used for initial tests. Normal values were used to simulate actual ABQ conditions for easterly wind flows. 64 departures were made by 5 qualified pilots in the Boeing 720 flight simulator. A statistical analysis was made of recorded flight tracks to determine the average maximum distances and to calculate the 95 and 99 percent confidence limits of these averages. Left and right turns were flown with specified turning heights of 400 and 700 feet above ground level. Statistically derived 99 percent upper limits of the average maximum flight track distances were obtained.

**N71-29657**

*Air Force Systems Command, Wright-Patterson AFB, Ohio, Foreign Technology Div*

**ANALYTICAL METHODS FOR PROJECTED CONSTRUCTION OF WINGS**


This book contains an investigation of two interrelated problems: finding optimal material distribution in the wing structure and selecting the structural-technological solutions. The optimal law of material distribution is found by the methods of nonlinear programming. On the basis of replacing a variable function by a set of discrete parameters, the calculational relations (criteria functions, conditions, restrictions) corresponding to the numerical and analytical methods of solving the design problem and various calculational schemes for the wing are obtained. First, the simplest cases are presented - single load system, absence of heating, isotropic structure, etc. On the basis of these cases, general relations are derived permitting consideration of the effect of aerodynamic heating, the load spectrum, and pliability of the wing fastening. The transition from the calculational scheme to the structural scheme and selection of the optimal structural-technological version of the wing are carried out on the basis of analyzing the additional weight, sources of which are the stability of the structural elements, reliability, technological factors and operating conditions.

**N71-29660**

*Matrix Research Co., Falls Church, Va*

**DESIGN OF A COMPUTER ASSISTED COASTAL INFORMATION SYSTEM, PHASE 3: MODELING THE NAVY ECOSYSTEM** Final Report, 12 Jan 1970~21 Apr 1971

Robert D. Campbell and A. L. Roark. 21 Apr 1971 74 p. Available NTIS CSCL 15/4

In this research, our effort has been to determine what kind of information system about coastal areas would meet some large spectrum of Navy needs. In previous reports we reached the conclusion that to accomplish this goal we need to construct some kind of model of the Navy ecosystem. We suggested that the bases for such a model be real information from the Navys record of interactions among coastal environments, Navy weapons systems, and basic Navy functions. We therefore used as source data the reports and publications of Navy activities associated with design, development, test, and evaluation of weapons systems and their components. Our objective was to describe the Navy ecosystem in vigorous enough fashion that our model would provide the logic for a coastal information system. Our model is therefore expressed in three ways - verbally, mathematically, and in information systems terms. The purpose of all these expressions of the same model is to provide the bases for an aggregating, integrating process which will relate environment to naval weapons systems in terms of naval functions. We believe that the structure we have described provides the framework for information systems not only for Navy but also for a wide gamut of evaluation and design activities which concern the man-environment interaction.

**N71-29690**

*Technische Univ., Berlin (West Germany), Fakultat fuer Maschinenwesen*

**CONTRIBUTION TO THE THEORETICAL TREATMENT OF THE HUB EFFECT IN PROPELLER DESIGN [BEITRAG ZUR THEORETISCHEN BEHANDLUNG DAS NABENEINFLUSSES BEIM PROPELLERENTWURF]**


The displacement effect of the propeller hub in the potential wake flow produces pronounced changes in the flow field of the propeller blade. Computer calculations for effective propeller design.
using the lift line model to provide optimal boundary conditions for the circulation distribution around the hub, showed that the theory is not sufficient to describe all hydrodynamic processes around a propeller. Transl by G G

AN AIRPORT STUDY FOR VIGO COUNTY, INDIANA

APPROACH GUIDANCE SYSTEM FOR SIDE-FIRING TACTICAL AIRCRAFT

AN AIRPORT STUDY FOR VIGO COUNTY, INDIANA

EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF FAST NORMAL SHOCK POSITION CONTROLS FOR A MACH 2.5 MIXED-COMPRESSION INLET

THE USE OF AERODYNAMIC LIFT FOR APPLICATION TO HIGH SPEED GROUND TRANSPORTATION

AN AIRPORT STUDY FOR LANE COUNTY, OREGON

THE USE OF AERODYNAMIC LIFT FOR APPLICATION TO HIGH SPEED GROUND TRANSPORTATION

ACHIEVING A HARMONIOUS AND EFFECTIVE AIRPORT-NEIGHBORING ENVIRONMENT RELATIONSHIP

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

 Expanding and analyzing the relationships between airports and comprehensive planning. Land use planning and transportation planning processes are interpreted according to their relevance in achieving a harmonious and effective airport-neighboring relationship.

Author (GRA)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Airports in Lane County are also examined. The report identifies the public airports in Lane County, Oregon. The only commercial airport in the county, Mahlon Sweet Field, is examined as a regional and local airport facility. Projections of passenger and aircraft operations have been made at five year intervals through 1990. The development of the airport and the subsequent impact on land use is examined. The six general aviation airports in Lane County are also examined. Pilot, aircraft, and population distribution and land use are discussed prior to making recommendations for these airports.

Author (GRA)

MASSACHUSETTS INST. OF TECH., CAMBRIDGE

Fluid Dynamics Research Lab

The problem of a wing flying in very close proximity to a solid boundary, the so-called ram wing, is reviewed and a new solution is found using the method of matched asymptotic expansions. The effect of the wing upper and lower surface coordinates on the resulting pressure distribution is shown explicitly for the case of a two-dimensional airfoil. It is shown that for very small clearance ratios a very simple expression is valid for the lift coefficient. On the basis of this simplification an analytic solution is obtained for the case of a flatplate airfoil operating above a sinusoidal ground plane, which gives the forces and moments due to ground bumps. The longitudinal dynamics of a tracked vehicle designed to utilize aerodynamic lift are then investigated. Dissert Abst

Author (GRA)

LCCN 79-40344

INDEX TO GOVERNMENT PUBLICATIONS AND SERIALS
POTENTIAL FLOW SOLUTION FOR A STOL WING PROPULSION SYSTEM
James A Albers and Merle C Potter Washington Jul 1971 35 p refs
(NASA-TN-D-6394, E-6132) Avail NTIS CSCL 01C

The analysis considers a two-dimensional wing-fan system which consists of an airfoil with flap, the fans, which have a distributed suction at their inlet and a jet at their exit, and a jet sheet leaving the flap trailing edge. The solution provides the incompressible potential flow for any value of fan or engine mass flow coefficient, the thrust coefficient for the propulsion system exhaust, and the wing and flap angle of attack. Flow fields, pressure distributions, and lift coefficients for a particular, externally blown flap, high-lift configuration are presented

SUBSONIC STATIC CHARACTERISTICS OF SLENDER WING CONFIGURATIONS USING A MAGNETIC SUSPENSION AND BALANCE SYSTEM
(NASA-CR-1796. TR-168) Avail NTIS CSCL 01A

Aerodynamic forces and moments on three low-aspect-ratio wing planforms were obtained using a magnetic suspension and balance system. Comparison of the present data with both theory and experimental results obtained elsewhere is presented and shown to be in close agreement

NOISE EXPOSURE FORECAST CONTOURS FOR EXPECTED 1985 AND 1990 OPERATIONS AT SEVEN US AIRPORTS
Jan 1971 93 p refs
(AD-722365, BBN-2076) Avail NTIS CSCL 20/1

The report summarizes a study of the probable impact of future supersonic transport (SST) aircraft operations on the noise environment around seven airports in the United States. The noise environment is depicted in terms of Noise Exposure Forecast (NEF) contours of NEF 30 and 40 values for projected 1985 and 1990 operations at the following seven airports: Anchorage International Airport (ANC), Logan International Airport (BOS), Honolulu International Airport (HNL), John F. Kennedy International Airport New York (JFK), Los Angeles International Airport (LAX), Seattle-Tacoma International Airport (SEA), San Francisco International Airport (SFO). Sets of noise contours are given for each airport for the two projections

RELIABILITY Final Report
10 Mar 1971 18 p
(AD-722721, MTP-7-3-508) Avail NTIS CSCL 14/4

The procedure defines methodology for evaluating the reliability of aircraft and related subsystems and allied equipment

INTERNAL/EXTERNAL LIGHTING Final Report
12 Mar 1971 9 p refs
(AD-723034, MTP-7-3-527) Avail NTIS CSCL 1/3

Procedures are described for determining the functional suitability of internal/external lighting systems for US Army aircraft

DUAL MODE SYMMETRICAL HIGH FREQUENCY ANTENNA FOR AIRBORNE USE
D. V. Campbell, J. Arnold, H. Inslerman, T. Wilson Mar 1971 42 p refs
(AD-722736, ECOM-3404) Avail NTIS CSCL 9/5

A compact, self-contained symmetrical antenna (experimental) for airborne use at high frequencies has been developed and tested. Provisions for tuning are integrated with the radiating elements. A four-port hybrid is incorporated enabling the antenna to function in two independent modes for both transmission and reception. When symmetrically installed on a helicopter and operated in the antiphase mode, excitation of the aircraft is minimized, and a dipole pattern which is predominantly horizontally polarized obtains. When operated in the inphase mode the resulting pattern is omnidirectional and the polarization predominantly vertical. Radiation patterns are highly predictable and the rotor effect minimal. At frequencies in the lower HF range the noval antenna has somewhat greater gain than the much larger conventional wire antenna

THEORETICAL ANALYSIS OF THE BOUNDARY LAYER IN THE NOZZLE
Neal Tetervm 26 Feb 1971 45 p refs
(AD-722348, NOLTR-71-7) Avail NTIS CSCL 14/2

The equations used to calculate the boundary layer properties for use in the design of the Mach 10, 15, and 20 axisymmetric nozzles of the hypervelocity wind tunnel at NOL are derived. One equation is the integral moment-of-momentum differential equation for the boundary layer velocity profile shape parameter, the form of the equation is valid for a real gas. This equation is used with an axisymmetric integral momentum equation that is valid for thick as well as for thin boundary layers to calculate the total thickness and the displacement effect of the boundary layer

AERODYNAMIC DESIGN
E. Leroy Harris and Walter J Glowiacki 26 Feb 1971 64 p refs
The NOL hypervelocity wind tunnel will provide a high Reynolds number turbulent flow simulation in the Mach number range 10 to 20. This facility, much needed for large-scale testing of hypersonic vehicles, is under construction and will be operational late in 1972. Supply pressures up to 40,000 psi will be maintained constant for 1 to 4 seconds during which stable, condensation-free flow conditions will prevail. Very high Reynolds numbers are obtained by operating with nitrogen at temperatures just sufficient to avoid test section condensation. The facility, which operates in a blowdown mode, has separate legs for the three design Mach numbers 10, 15, and 20. Each leg is fitted with its own storage heater, diaphragm assembly, contoured nozzle, and diffuser. The three legs share a common gas storage supply, test cell and model support system, and vacuum sphere. The report highlights the more significant considerations leading to the aerodynamic design of the facility and includes discussions of the need for the facility, the initial requirements imposed on its design, and brief descriptions of the layout and operation of the facility.

Author (GRA)

N71-30032#

Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 181

22 June 1971 37 p. refs Transl into English from Polish, Rumanian, and Yugoslavian reports (JPRS-53428) Avail NTIS

A review of scientific developments in East European countries is presented. Subjects discussed are (1) Polish geological exploration, (2) Soviet space technology findings, (3) development of ultrasonic flow detector, (4) operation of computer, (5) development of science in Romania, and (6) description of tactical aircraft used in European countries.

P F

N71-30040#

Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany) Abteilung Aerodynamik

CALCULATION OF THE INDUCED VELOCITY DISTRIBUTION OF A ROTOR IN STATIONARY FORWARD FLIGHT [BERECHNUNG DER INDUIZIERTEN GESCHWINDIGKEITSVERTEILUNG EINES ROTORS IM STATIONAEREN VORWARTSFLUG]

Jost Wilhelm Fuhr and Alfred Kussmann Mar 1970 53 p refs In GERMAN, ENGLISH summary (DLR-MIT 70-22) Avail NTIS, ZLDI Munich 10.50 DM

A simplified method of rotor downwash calculation is described. The rotor wake system is substituted by discrete vortex lines according to the lifting line theory. A separation in a near wake system consisting of semi-infinite vortex lines and a far wake system with fore and aft infinite vortex lines is introduced for calculation. The digital computer program is described and analytical results are presented.

Author (ESRO)

N71-30040#

Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany) Abteilung Aerodynamik

PARAMETRIC STUDIES OF ROTOR DOWNWASH CALCULATION. INFLUENCE ON FIXED WING FLOW [PARAMETERUNTERSUCHUNGEN ZUR ROTORBILDUNG BERECHNUNG. EINFLUSS AUF DIE UMSTROMUNG EINES FLUGELES]

Hans Bergmann and Jost W Fuhr Dec 1970 79 p refs In GERMAN, ENGLISH summary (DLR-FB 70-62) Avail NTIS, ZLDI Munich 13 DM

N71-30040#

Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany) Abteilung Aerodynamik

PARAMETRIC STUDIES OF ROTOR DOWNWASH CALCULATION. INFLUENCE ON FIXED WING FLOW [PARAMETERUNTERSUCHUNGEN ZUR ROTORBILDUNG BERECHNUNG. EINFLUSS AUF DIE UMSTROMUNG EINES FLUGELES]

Hans Bergmann and Jost W Fuhr Dec 1970 79 p refs In GERMAN, ENGLISH summary (DLR-FB 70-62) Avail NTIS, ZLDI Munich 13 DM
Parametric studies have been conducted in order to determine the influence of vortex model variations on the downwash calculations of a given helicopter rotor. Additionally, a method to calculate the lift distribution of a fixed wing located in the rotor wake is presented, neglecting fuselage disturbance interactions of rotor and wing are shown. As a basis for wing aerodynamics, the lifting line theory is employed. A rigid rotor wake model with helical vortex lines is used. Calculation of induction is accomplished by finite and straight vortex segments and/or by semi-infinite and straight vortex lines. **Author (ESRO)**

**N71-30055**
National Aeronautics and Space Administration
Lewis Research Center, Cleveland, Ohio
LEWIS 9-BY-15-FOOT V/STOL WIND TUNNEL
Joseph A. Yuska, James H. Diederich, and Nestro Clough
Washington Jul 1971 48 p refs
(NASA-TM-X-2305 E-6055) Avail NTIS CSCL 14B

The V/STOL wind tunnel was built in the return leg of the 8 by 6 foot supersonic wind tunnel. The test section has a velocity range of 13 to 78 meters per second. The features of the wind tunnel are described, and the results of the initial calibrations are presented in sufficient detail to guide prospective users in designing experiments. The methods used to design the tunnel inlet section, the test section wall slot geometry, and the diffuser section are also described. **Author**

**N71-30072**
National Aeronautics and Space Administration
Lewis Research Center, Cleveland, Ohio
OPTIMAL CONTROL OF SUPERSONIC INLETS TO MINIMIZE UNSTARTS
Bruce Lehtinen, John R. Zeller, and Lucille C. Geyser
Washington Jul 1971 29 p refs
(NASA-TN-D-6408, E-6253) Avail NTIS CSCL 21E

A method for designing supersonic inlet controls based on a desire to minimize inlet unstart is described. The design problem is formulated as one in linear stochastic optimal control and estimation. However, the performance index chosen (to be minimized) is the expected frequency of unstarts. Since this index is nonquadratic, the principle of quadratic equivalence is applied, so that the control consists of linear state variable feedback. Estimates of unmeasurable and/or noisy states required for control are then generated using a Kalman filter. Results show the sensitivity of unstart frequency to nominal normal shock position, control bypass door capacity, and measurement noise level, for white noise disturbances. **Author**

**N71-30117**
National Aeronautics and Space Administration
Lewis Research Center, Cleveland, Ohio
PRELIMINARY INVESTIGATION OF GASEOUS EMISSIONS FROM JET ENGINE AFTERBURNERS
Larry A. Diehl
Washington Jul 1971 18 p refs
(NASA-TM-X-2323, E-6256) Avail NTIS CSCL 20M

Gaseous emissions from jet engine afterburners were measured over a range of fuel-air ratios. The two configurations used were a full-size turbofan engine with an afterburner and a 51-cm diameter research afterburner. Nitric oxide emission did not increase with afterburning. The maximum nitric oxide concentration measured with afterburning was 3.4 g/kg of fuel burned while the maximum measured carbon monoxide emission was 1300 g/kg of fuel burned. Appreciable quantities of unburned hydrocarbons resulted from operation at high fuel-air ratios. Nitric oxide concentrations were less than theoretical equilibrium values by as much as two orders of magnitude; concentrations of unburned products were always greater than equilibrium values. **Author**

**N71-30128**
Wetenschappelijk en Technisch Documentatie- en Informatiecentrum voor de Krijgsmacht, The Hague (Netherlands)
BIRD HAZARDS TO AIRCRAFT: A LITERATURE SURVEY
VOLUME 2: OCTOBER 1967-JANUARY 1971
H. Crop and G. A. J. Kerstens, comps
Jan 1971 16 p refs
(TDCK-56961) Avail NTIS

The literature survey covers the period October 1967 to January 1971, and contains 22 abstracts. **Author**

**N71-30164**
Committee on Commerce (U.S. Senate)
WATERFRONT AND AIRPORT COMMISSION COMPACT ACT OF 1970

Hearsings are presented on legislation which would extend the authority of the Waterfront Commission of New York Harbor to airports in the New York metropolitan area to reduce air cargo theft. The proposed bill provides the Commission with authority to license airfreightmen and airfreightman supervisor and to declare an area in an airport as an airfreight security area Arguments advanced by the opponents and rejoinders by proponents are summarized. The modus operandi in the thefts, weaknesses in the bill, and suggestions to strengthen the bill are described. **NE N**

**N71-30173**
Systems Technology, Inc., Hawthorne, Calif.
INVESTIGATION OF MEASURING SYSTEM REQUIREMENTS FOR INSTRUMENT LOW VISIBILITY APPROACH
Dunstan Graham, Warren F. Clement, and Lee Gregor Hofmann
Washington Jul 1971 120 p refs
(Contract F33615-69-C-1904)

A practical method of determining measuring system requirements for instrument low visibility approach is presented. The method is made to depend on system analysis of the airplane, its control system, and the guidance system, as well as on atmospheric turbulence inputs and radio guidance system fluctuation noise. Requirements on the system are set in terms of a low value of the accident exposure multiplier which is related to the probability of a specified approach in the assumed environment. The application of the method is demonstrated in connection with two examples: manual-flight director approach in the A-7D attack aircraft, and automatically coupled approach with an advanced windproof flight control system in the DC-8 transport aircraft. The results, including particularly the implied requirements on scan rate for a scanning beam instrument low visibility approach system, demonstrate the interconnections between scanning rate, flight control, and overall system performance. **Author (GRA)**

**N71-30174**
Center for Naval Analyses, Arlington, Va, Inst of Naval Studies
NAVAL AIRSPACE USAGE: A SURVEY OF NAVY AND MARINE CORPS FLIGHT ACTIVITY
Lawrence E. Brumbach
Feb 1971 132 p refs Its Res Contrib
(Contract N00014-68-A-0091)
(AD-722773, AFFDL-TR-70-102) Avail NTIS CSCL 1/2

A comprehensive data base is presented with detailed information on the manner in which airspace is used by Navy and Marine Corps operational squadrons. It is based on a nationwide...
survey conducted in February and March, 1970. The conduct of the survey is described, and examples of the application of selected data are given. With emphasis on the interaction between operational flight training and the Naval Airspace System, statistical data is assembled on the use of airways, the Positive Control Area, Warning Areas, Restricted Areas, and related aspects of Naval flight activity. This research contribution is one of several documents produced in support of Project Blue Air. An Analysis of Naval Airspace Usage. A complete list of these documents is given in the project report, INS Study No 34. Author (GRA)

N71-30241*# Clemson Unv., S.C. MINIMUM VARIANCE ESTIMATES OF SIGNAL DERIVATIVES: A PROBLEM IN INSTRUMENT LANDING SYSTEMS J C Martin Dec 1970 17 p refs (Grant NGR-41-001-024) (NASA-CR-111928) Avail NTIS CSCL01E As in the case for the rate of descent of an aircraft, frequently the derivative of a state cannot be observed with sufficient accuracy. The state itself can however, but, as with the radar altimeter, the signal is too noisy for differentiation. The approach presented uses the form of the Kalman filter as an observer for the derivatives of the observed signals or states. The gain matrix for the filter is derived to minimize the variance of the estimate of the derivative of the state, instead of the state itself. The derived gain matrix and the covariance of the (derivative) estimation error are related to those of the Kalman filter through the system's dynamics. A quantitative evaluation of this method's improvement over taking the derivative of the optimum filter of the state and/or augmenting the state vector, is included. The improvement over the former is shown to increase linearly with the covariance of the state's estimation error. Over augmenting the state vector, the improvement uses the lower order, observable states more directly through the system's dynamics. Author

N71-30253*# Army Test and Evaluation Command, Aberdeen Proving Ground, Md. AIRBORNE TRANSPONDERS, (IFF AND/OR AIR TRAFFIC CONTROL) Final Report 19 Mar 1971 19 p refs (AD-723028, MTP-6-3-126) Avail NTIS CSCL17/2 The test methodology procedure describes tests for evaluating airborne transponders operated in conjunction with air traffic control facilities. Tests are conducted by aircraft equipped with the airborne transponder and designated auxiliary equipment, directed and controlled by an air traffic control facility suitably equipped with compatible interrogating equipment and auxiliary equipment. Author (GRA)

N71-30258*# Army Test and Evaluation Command, Aberdeen Proving Ground, Md. GROUND SUPPORT SERVICE EQUIPMENT (AVIATION) Final Report 12 Mar 1971 54 p refs (AD-723036, MTP-7-2-055) Avail NTIS CSCL1/5 The procedure describes test methodology and testing techniques necessary to determine the technical performance and safety characteristics of ground support service aviation equipment and associated accessories. Author (GRA)


N71-30264*# Imperial Coll of Science and Technology, London (England) THE FLOW IN S-SHAPED DUCTS P Bansod and P Bradshaw Apr 1971 27 p refs (IC-71-10) Avail NTIS Measurements are presented of total pressure, static pressure, surface shear stress, and yaw angle in the flow through several S-shaped ducts, each with a thin turbulent boundary layer at entry. The results show that the region of low total pressure in the exit plane, found by previous workers, is due to a vortex-stretching mechanism which may also appear in other flows. Author

N71-30278*# Remtech, Inc., Birmingham, Ala. A STUDY OF TURBULENCE MEASUREMENTS USING LASER DOPPLER SYSTEM Interim Report, Jun. 1970–Jun. 1971 C E Fuller 27 May 1971 75 p refs (Contract NAS8-25896) (NASA-CR-119804, RTR-002-1) Avail NTIS CSCL20D The object of the wing tip vortex test is to demonstrate the extent with which the Laser Doppler Velocimeter system can be used for the measurement of gas velocities with high spatial and temporal resolution. The test was planned to provide three-dimensional, mean velocity data of the vortex pattern shed from a wing tip at an angle of attack. These measurements are being conducted at the MSFC 7 × 7 inch wind tunnel facility. The test plan and procedure as well as the measurements that were made are included. In addition, data on several measurements of the system's operating parameters which are important to these tests are also given. E M C.

N71-30282*# National Aeronautics and Space Administration Langley Research Center, Langley Station, Va. LOW SPEED WIND TUNNEL INVESTIGATION OF A SEMISPAN STOL JET TRANSPORT WING—WITH DEFLECTED THRUST AND BLOWING BOUNDARY LAYER CONTROL Robert L Henderson Washington Jul 1971 87 p refs (NASA-TN-D-6256, L-7543) Avail NTIS CSCL01A An investigation of the static longitudinal aerodynamic characteristics of a semispan swept wing with an aspect ratio of 3.92 and having deflected thrust and blowing boundary-layer control was performed mainly in a low-speed tunnel with a 3.7-m (12-ft) octagonal test section at the Langley Research Center. Thrust was provided by two pod-mounted ducted fans equipped with 60 degree exhaust deflection vanes, and boundary-layer control was provided by air blowing through a slot over a full-span planing trailing-edge flap. Author
FLIGHT INVESTIGATION OF INSTALLATION EFFECTS ON A PLUG NOZZLE INSTALLED ON AN UNDERWING NACELLE
Nick E Samanich and Roger Chamberlin Washington Jul 1971 57 p refs
(NASA-TM-X-2295, E-5546) Avail NTIS CSCL01A
Several variations of plug nozzles were tested using an F-106B aircraft in the Mach range 0.6 to 1.3. These nozzles simulated the subsonic configurations of variable-geometry plug nozzles designed for Mach 2.8 operation. The nozzles were tested with a J85-GE-13 turbojet engine and the data compared to that of 0.34-scale isolated wind tunnel models. For most of the configurations tested, no significant installation effect was measured between Mach 0.8 and 0.9. There was an adverse effect at lower speeds and at Mach numbers from 1.0 to 1.2, and a favorable effect at Mach 0.95. The major differences between the isolated and installed nozzle performance resulted from changes in pressure forces on the plug surface.

ADVERSE EFFECTS OF PRODUCING DRONE ANTISUBMARINE HELICOPTERS BEFORE COMPLETION OF DEVELOPMENT AND TESTS
Department of the Navy, B-180877: Report to Congress Emiel R Staats 31 Dec 1970 51 p refs
(Aval NTIS)
The problems encountered in operational deployment of the OH-50 drone helicopter by the US Navy are discussed. The causes for the excessive loss rate are examined and corrective actions are recommended. The primary cause for failure is reported to be the result of procuring the helicopter before completion of development and flight test.

A STATISTICAL ANALYSIS OF THE A-6A INERTIAL NAVIGATION SYSTEM
R Gran Jun 1971 21 p refs
(RM-511) Aval NTIS
A statistical analysis of the gyro-compass mode of the A-6A inertial navigation system was performed. The inertial system is assumed to have various stochastic perturbations caused by gyroscopic drifts, accelerometer drift, and a white measurement noise from the ship inertial navigation system (SINS). The result of the analysis is the variance in the estimate of the gyroscopic drift due to the assumed stochastic processes. The analysis of the system as provided by the ground support department showed that the system was unstable as it stood. A change in one of the feedback gains was made, so as to stabilize the gyro-compass loop. Then, an analysis of the resulting loop showed a maximum error of 9.9 deg/hr due to all of the assumed noises.

A LINEAR CONTROL OF SYSTEMS WITH RANDOM INPUT: APPLICATION TO GUST RESPONSE CONTROL
(In French, English summary)
A general optimization problem giving a standard linear expression of control is applied to complex, actual systems such as aircraft flying in turbulence. The first part is devoted to the axiomatic definition of physical linear systems from a functional point of view. With the help of optimal control theory, which gives a closed form expression in special cases, the problem is solved in a more general way in the normed space previously defined. An expansion of the solution is deduced. The analysis of gust response properties of a structure in flight yields the formulation and the solution for the optimal gust response control of an aircraft. By applying this method it is possible to design gust response control devices whose properties and qualities are discussed from a technical point of view.

A UNIFIED THEORY FOR LINEARIZED SHOCK-ON-SHOCK INTERACTION PROBLEMS
N L Arora Dec 1969 165 p refs
(VTH-158) Aval NTIS
A systematic and unified theory is deduced for the non-uniform flow field produced behind a plane shock of arbitrary strength when it encounters an aerodynamic obstacle moving at supersonic speed. The obstacle has a weak attached shock and a collision between the two shocks occurs. This is known as shock-shock interaction. The obstacles considered are airfoils, antisymmetric slender bodies, and three dimensional wings.

A STATISTICAL ANALYSIS, OF THE GYRO-COMPASS MODE OF THE NAVIGATION SYSTEM
A-6A OF 9.9 deg/hr DUE TO ALL OF THE ASSUMED NOISES
Author (ESRO)

MULTIPLE-BODY-PROBLEM IN SUPERSONIC FLOW
Frederich Keune, Hansgeorg Riedel, and Hans Emunds 1971 88 p refs
(In German, English summary)
The most important aerodynamic coefficients of bodies having comparable volumes and which form so-called multiple-body-systems, have been determined in the 60 x 60 sq cm supersonic wind tunnel of the DFVLR for the Mach number range from 1.56 to 4.02. Of particular interest were the differences in drag arising from possible changes in the arrangement of the body system. Differences of the order of from 10% to 20% were obtained. The gain of a markedly lower drag entails no unfavorable other aerodynamic properties.

BASIC STUDY OF THE AFTERBURNER
Yoshiyuki Ohya Washington NASA Jul 1971 44 p refs
(Contract NASSw-2035) (NASA-TT-F-13657) Aval NTIS CSCL21E
Afterburning in turbine engines, especially fan engines, has been used as an optimum means to produce both supersonic and subsonic performance of military and commercial aircraft, and is especially indispensable for supersonic flight. The major problem in
the fan burner is flame stabilization at low inlet temperatures. Flame stabilizing devices, with various configurations, have been tested at atmospheric inlet conditions. It was found that V-gutter flame holders, with injection of small amount of fuels into the flame holder wake, bring about broadening of the combustible zone of air/fuel ratio.

N71-30361# Joint Publications Research Service, Washington D.C.

**HOLOGRAPHY AND ITS APPLICATION IN AVIATION AND COSMONAUTICS**

V Frolov and Yu Soluyanov 22 Jun 1971 8 p Transl into ENGLISH from Aviats i Kosmonavt (Moscow) No 4 1971 p 44-45 (JPRS-53420) Avail NTIS

The principles of holography are briefly outlined and possible applications of light beams in three dimensional imagery for aviation and space flight are discussed. Considered are aerial holographic photography, saturation air space mapping for flight control, terrain relief mapping, holographic indicators for blind landing systems, holographic flow visualization methods, and holographic detection of camouflaged objects.

N71-30488# Massachusetts Univ., Amherst Dept of Mechanical and Aerospace Engineering

**THE CALCULATION OF THE PRESSURE DISTRIBUTION ON A CASCADE OF THICK AIRFOILS BY MEANS OF FREDHOLM INTEGRAL EQUATIONS OF THE SECOND KIND**


(NASA-TT-F-702, Rept-23) Avail NTIS CSCL 01A

Two independent linear integral equations of the second kind with continuous kernels are derived for the exact potential theory for the velocity distribution on a cascade of thick airfoils. It is shown that the corresponding homogeneous integral equations possess one and only one nontrivial solution, so that one knows the general results on the basis of the Fredholm theorems. In the limiting case of infinite separation between airfoils the equations reduce to the familiar expressions for single airfoils. In the limit of the periodicity properties which are present, one may develop a numerical calculation technique based on the solution from a system of linear equations. By selecting an adequately large number of unknowns, the desired accuracy is obtained. Examples are shown correlating the theory with an exact known solution and with measurements.

N71-30507# National Aeronautics and Space Administration, Washington, D.C.

**JOINT DOT-NASA CIVIL AVIATION RESEARCH AND DEVELOPMENT POLICY STUDY: SUPPORTING PAPERS**

Mar 1971 248 p refs Prepared in cooperation with Dept of Transportation (NASA-SP-266, DOT-TSY-10-5) Avail NTIS CSCL 01B

A variety of subjects, some technical, which relate directly to civil aviation research and development - and some nontechnical which affect the climate for technical innovation in the civil aviation industry and therefore determine whether the results of research and development will find application in the future are discussed. The specific missions performed by civil aviation and the four system elements of each of these missions are presented. Each technical section is based on analyses of the characteristics and growth to date, current problems, future requirements (demand for service), potential solutions, implication for R&D, and recommendations.

N71-30530# National Aeronautics and Space Administration Langley Research Center, Langley Station, Va.

**EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF SUBSONIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF SLENDER SHARP EDGE 74 DEG SWEP T WI NGS**


Slender sharp-edge wings having leading-edge sweep angles of 74 deg were studied at Mach numbers from 0.2 to 0.8. The wings had arrow, delta, and diamond planforms and were tested at angles of attack from -4 deg to 30 deg and angles of sideslip from -8 deg to 8 deg. The study consisted of wind-tunnel tests in the Langley high-speed 7-by-10-foot tunnel.

N71-30565# Techtran Corp., Glen Burnie, Md

**DETERMINATION OF THE AERODYNAMIC CHARACTERISTICS OF AN ELASTIC SWEPT WING IN SUBSONIC FLOW**


(NASA-TT-F-13717) Avail NTIS CSCL 01A

The aerodynamic forces are calculated and the equations derived for an elastic wing of an aircraft in steady subsonic flow with a given overload, weight, and dynamic head. The calculations are made by a method, which is not only more accurate than the lifting line and lifting zone theories, and the sequential approximation method, but also provides for determination of the pressure centers for arbitrary wing deformations in addition to the lift. It is also more convenient than the sequential approximation in that it obviates the necessity of computing the deformation-produced forces at each stage of the calculation, as well as the need to apply special measures to improve the convergence of the sequential approximation process.

N71-30689# General Electric Co., Cincinnati, Ohio

**INVESTIGATION OF A HIGHLY LOADED MULTISTAGE FAN DRIVEN TURBINE**

D C Evans Washington NASA Jul 1971 34 p
The results of a vector diagram study are presented. The effect of flowpath configuration, stage leaving swirl, work gradients nonconstant work, stage energy split, and streamline slope and curvature were investigated. Based on these studies a particular type of vector diagram calculation was selected for the turbine design.

Individual flight program tests of notched cantilever beams for preliminary design of wing attachment of VFW 614 (West Germany)

Laboratorium fuer Betriebsfestigkeit, Darmstadt

A flat plate cut from sheet metal was subjected to load programs on a testing machine, thus simulating in-flight stress on wing root structural members. The load program and the actual testing are described.

Evaluation of effects of high-altitude turbulence encounters on the XB-70 airplane

Ronald J. Wilson, Betty J. Love, and Richard R. Larson

Washington Jul 1971 85 p refs

A turbulence response investigation was conducted with the XB-70 airplane. No special turbulence penetration techniques, speeds, or other restrictions were specified for the investigation, nor were any flights made solely to obtain turbulence data. During 79 flights, turbulence was encountered, and recorded on a VGH recorder. 6.2 percent of the total flight distance at supersonic speeds above an altitude of 12,192 meters (40,000 feet). Geographical locations are given for selected turbulence encounters. For 22 flights the airplane was instrumented to measure true gust velocities and the structural acceleration response to turbulence. The turbulence intensities measured were very low in comparison with those measured at high altitudes in other investigations. Acceleration response spectra, frequency response transfer functions, and coherence functions 0.68, 1.59, and 2.35. Results are compared with calculated studies. Frequencies from the vertical and lateral structural modes, dominant in the airplane acceleration response, are compared with the natural frequencies of the human body in the vertical and lateral directions.

An optimal controller based on linear approximation of an acoustical test facility, Part B Final Report

Dennis L. Luckenbill and Allen R. Atkins, II

Jun 1971 91 p refs

The possibility of using a more sophisticated control algorithm such as one derived from the deadbeat response criterion, instead of a direct controller is studied. The control algorithm is based on a second order approximation of the entire test facility. The algorithm was tested and proved with the aid of digital simulation runs on an IBM 360-40 computer. The most important area of work is the digital controller study, and the minor area of work is modeling of the major dynamic components of the physical test facility.

A turbulence response investigation was conducted with the XB-70 airplane. No special turbulence penetration techniques, speeds, or other restrictions were specified for the investigation, nor were any flights made solely to obtain turbulence data. During 79 flights, turbulence was encountered, and recorded on a VGH recorder. 6.2 percent of the total flight distance at supersonic speeds above an altitude of 12,192 meters (40,000 feet). Geographical locations are given for selected turbulence encounters. For 22 flights the airplane was instrumented to measure true gust velocities and the structural acceleration response to turbulence. The turbulence intensities measured were very low in comparison with those measured at high altitudes in other investigations. Acceleration response spectra, frequency response transfer functions, and coherence functions 0.68, 1.59, and 2.35. Results are compared with calculated studies. Frequencies from the vertical and lateral structural modes, dominant in the airplane acceleration response, are compared with the natural frequencies of the human body in the vertical and lateral directions.

Turbulent boundary layer studies in a hypersonic gun tunnel

G. M. Elfrstrom, G. T. Coleman, and J. L. Stollery

Apr 1971 18 p refs

A hypersonic gun tunnel has been used to study the growth of a turbulent boundary layer over flat plate and compression corner models. Measurements include pressure and heat transfer rate distributions and pitot pressure profiles across the boundary layer. The results, which extend the existing range of data, are used to test some current theoretical predictions.

Evaluation of effects of high-altitude turbulence encounters on the XB-70 airplane

Ronald J. Wilson, Betty J. Love, and Richard R. Larson

Washington Jul 1971 85 p refs

A turbulence response investigation was conducted with the XB-70 airplane. No special turbulence penetration techniques, speeds, or other restrictions were specified for the investigation, nor were any flights made solely to obtain turbulence data. During 79 flights, turbulence was encountered, and recorded on a VGH recorder. 6.2 percent of the total flight distance at supersonic speeds above an altitude of 12,192 meters (40,000 feet). Geographical locations are given for selected turbulence encounters. For 22 flights the airplane was instrumented to measure true gust velocities and the structural acceleration response to turbulence. The turbulence intensities measured were very low in comparison with those measured at high altitudes in other investigations. Acceleration response spectra, frequency response transfer functions, and coherence functions 0.68, 1.59, and 2.35. Results are compared with calculated studies. Frequencies from the vertical and lateral structural modes, dominant in the airplane acceleration response, are compared with the natural frequencies of the human body in the vertical and lateral directions.

An optimal controller based on linear approximation of an acoustical test facility, Part B Final Report

Dennis L. Luckenbill and Allen R. Atkins, II

Jun 1971 91 p refs

The possibility of using a more sophisticated control algorithm such as one derived from the deadbeat response criterion, instead of a direct controller is studied. The control algorithm is based on a second order approximation of the entire test facility. The algorithm was tested and proved with the aid of digital simulation runs on an IBM 360-40 computer. The most important area of work is the digital controller study, and the minor area of work is modeling of the major dynamic components of the physical test facility.

Turbulent boundary layer studies in a hypersonic gun tunnel

G. M. Elfrstrom, G. T. Coleman, and J. L. Stollery

Apr 1971 18 p refs

A hypersonic gun tunnel has been used to study the growth of a turbulent boundary layer over flat plate and compression corner models. Measurements include pressure and heat transfer rate distributions and pitot pressure profiles across the boundary layer. The results, which extend the existing range of data, are used to test some current theoretical predictions.

A turbulence response investigation was conducted with the XB-70 airplane. No special turbulence penetration techniques, speeds, or other restrictions were specified for the investigation, nor were any flights made solely to obtain turbulence data. During 79 flights, turbulence was encountered, and recorded on a VGH recorder. 6.2 percent of the total flight distance at supersonic speeds above an altitude of 12,192 meters (40,000 feet). Geographical locations are given for selected turbulence encounters. For 22 flights the airplane was instrumented to measure true gust velocities and the structural acceleration response to turbulence. The turbulence intensities measured were very low in comparison with those measured at high altitudes in other investigations. Acceleration response spectra, frequency response transfer functions, and coherence functions 0.68, 1.59, and 2.35. Results are compared with calculated studies. Frequencies from the vertical and lateral structural modes, dominant in the airplane acceleration response, are compared with the natural frequencies of the human body in the vertical and lateral directions.

An optimal controller based on linear approximation of an acoustical test facility, Part B Final Report

Dennis L. Luckenbill and Allen R. Atkins, II

Jun 1971 91 p refs

The possibility of using a more sophisticated control algorithm such as one derived from the deadbeat response criterion, instead of a direct controller is studied. The control algorithm is based on a second order approximation of the entire test facility. The algorithm was tested and proved with the aid of digital simulation runs on an IBM 360-40 computer. The most important area of work is the digital controller study, and the minor area of work is modeling of the major dynamic components of the physical test facility.

Turbulent boundary layer studies in a hypersonic gun tunnel

G. M. Elfrstrom, G. T. Coleman, and J. L. Stollery

Apr 1971 18 p refs

A hypersonic gun tunnel has been used to study the growth of a turbulent boundary layer over flat plate and compression corner models. Measurements include pressure and heat transfer rate distributions and pitot pressure profiles across the boundary layer. The results, which extend the existing range of data, are used to test some current theoretical predictions.

An optimal controller based on linear approximation of an acoustical test facility, Part B Final Report

Dennis L. Luckenbill and Allen R. Atkins, II

Jun 1971 91 p refs

The possibility of using a more sophisticated control algorithm such as one derived from the deadbeat response criterion, instead of a direct controller is studied. The control algorithm is based on a second order approximation of the entire test facility. The algorithm was tested and proved with the aid of digital simulation runs on an IBM 360-40 computer. The most important area of work is the digital controller study, and the minor area of work is modeling of the major dynamic components of the physical test facility.

Turbulent boundary layer studies in a hypersonic gun tunnel

G. M. Elfrstrom, G. T. Coleman, and J. L. Stollery

Apr 1971 18 p refs

A hypersonic gun tunnel has been used to study the growth of a turbulent boundary layer over flat plate and compression corner models. Measurements include pressure and heat transfer rate distributions and pitot pressure profiles across the boundary layer. The results, which extend the existing range of data, are used to test some current theoretical predictions.

An optimal controller based on linear approximation of an acoustical test facility, Part B Final Report

Dennis L. Luckenbill and Allen R. Atkins, II

Jun 1971 91 p refs

The possibility of using a more sophisticated control algorithm such as one derived from the deadbeat response criterion, instead of a direct controller is studied. The control algorithm is based on a second order approximation of the entire test facility. The algorithm was tested and proved with the aid of digital simulation runs on an IBM 360-40 computer. The most important area of work is the digital controller study, and the minor area of work is modeling of the major dynamic components of the physical test facility.

Turbulent boundary layer studies in a hypersonic gun tunnel

G. M. Elfrstrom, G. T. Coleman, and J. L. Stollery

Apr 1971 18 p refs

A hypersonic gun tunnel has been used to study the growth of a turbulent boundary layer over flat plate and compression corner models. Measurements include pressure and heat transfer rate distributions and pitot pressure profiles across the boundary layer. The results, which extend the existing range of data, are used to test some current theoretical predictions.

An optimal controller based on linear approximation of an acoustical test facility, Part B Final Report

Dennis L. Luckenbill and Allen R. Atkins, II

Jun 1971 91 p refs

The possibility of using a more sophisticated control algorithm such as one derived from the deadbeat response criterion, instead of a direct controller is studied. The control algorithm is based on a second order approximation of the entire test facility. The algorithm was tested and proved with the aid of digital simulation runs on an IBM 360-40 computer. The most important area of work is the digital controller study, and the minor area of work is modeling of the major dynamic components of the physical test facility.
FACTORS AFFECTING DITCHING OF NEW TRANSPORT AIRPLANES
Lloyd J Fisher In its NASA Aircraft Safety and Operating Probl., Vol 1 1971 p 1–10
Avail NTIS HC$60 MF$0.95 CSCL01B
Investigations of aircraft ditchings using dynamic models of the C-5 aircraft are discussed. The behavior of the model with wheels up or down, and the fuselage damage during ditching are described. The major factors affecting ditching are considered to be bottom damage, landing attitude, flap setting, gear position, wave height, floor strength, and wing location. It is concluded that ditching safety can be increased by designing suitable floor structures and by wing location.

STUDY OF PROTECTION OF PASSENGERS IN AIRCRAFT CRASH FIRES
Carr B Neel and Richard H Fish In its NASA Aircraft Safety and Operating Probl., Vol 1 1971 p 11–31
Avail NTIS HC$60 MF$0.95 CSCL01B
A method for surrounding the passenger compartment with a fire-retardant shell was studied to protect the occupants long enough for a fire to burn out, or for fire fighting equipment to extinguish the fire. A lightweight foam plastic called polyisocyanurate foam, and an intumescent paint which expands to many times its original thickness were tested using an aircraft fuselage in a jet-fuel fire. Tests showed that in the protected portion of the cabin, the air temperature changed very little for the first six minutes, when the heat penetrated; the temperature rose to 150°C in 12 minutes. It is concluded that problems such as protecting the fuselage against rupture and providing protection for windows must be solved before this type system can be used for passenger protection.

IMPROVEMENT OF FIRE SAFETY IN AIRCRAFT
Mathew I Radnofsky In its NASA Aircraft Safety and Operating Probl., Vol 1 1971 p 33–47
Avail NTIS HC$60 MF$0.95 CSCL01B
Nonflammable and fire-resistant materials used within spacecraft were evaluated for applicability to commercial aircraft refurbishment. Durability and aesthetic qualities of fibrous, cellulosic, elastomeric, and composite materials were considered for commercial aircraft items including curtains, upholstery, carpets, decorative panels, cabinets, paper products, oxygen lines, and straps. Two T-39 and one NASA Gulfstream aircraft refurbishment programs applying the technological advances are outlined.

CLEAR-AIR-TURBULENCE DETECTION USING LASERS
Edwin A Weaver In its NASA Aircraft Safety and Operating Probl., Vol 1 1971 p 94–100
Avail NTIS HC$60 MF$0.95 CSCL01B
The feasibility of detecting clear-air turbulence (CAT) was investigated using a CO2 laser Doppler system. The detection of aerosols in regions of CAT by a ground based ruby laser - the laser Doppler principle, and the airborne CO2 laser Doppler system are discussed. It is concluded that CAT detection and measurement appear feasible with a CO2 pulsed laser Doppler system.

CLEAR-AIR-TURBULENCE DETECTION USING LASERS
Edwin A Weaver In its NASA Aircraft Safety and Operating Probl., Vol 1 1971 p 94–100
Avail NTIS HC$60 MF$0.95 CSCL01B
The feasibility of detecting clear-air turbulence (CAT) was investigated using a CO2 laser Doppler system. The detection of aerosols in regions of CAT by a ground based ruby laser - the laser Doppler principle, and the airborne CO2 laser Doppler system are discussed. It is concluded that CAT detection and measurement appear feasible with a CO2 pulsed laser Doppler system.

581
The effects of runway contaminants and pavement surface properties on runway slipperiness are discussed. Results show that contaminants such as water, slush, snow, ice, dust, oil, and rubber deposits on conventional pavement surfaces can produce intolerable levels of runway slipperiness in terms of safe aircraft operation. When wet, conventional surfaces vary considerably in slipperiness due to pavement surface microtexture and macrotexture. A more consistent safe level of slipperiness appears achievable with new surface treatment techniques such as runway grooving and porous asphalt overlays.

E H W

N71-30764** National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va
PROGRESS REPORT ON WING-TRAILING-VORTEX STUDIES
R Earl Dunham, Jr., Harry A Verstynen, Jr., and Margaret S Benner in its NASA Aircraft Safety and Operating Probl. Vol 1 1971 p 101-113
Avail NTIS HCS$0 00/MF$0 95 CSCL01A

The effect of wing-tip vortex wakes generated by large jet transport aircraft on smaller airplanes was investigated by determining the wake location relative to the generating aircraft and the strength of the vortex at points along the wake trail. The generating aircraft were a B-52, C-5A, DC-9, and a Convair 990. The gross weight varied from 78,000 Ib to 600,000 Ib, and the airplanes were flown in either clean, or landing approach configurations. The results indicate (1) At holding or landing-approach speeds, the average vertical downwash path of the vortex can extend 750 ft to 1000 ft below the flight level of the generating airplane, at a range of 10 n mi. (2) The wake strength and dissipation are predominately influenced by the generating-airplane weight and configuration. (3) The strongest wake turbulence was noted when the generating airplane was in the clean configuration. (4) The resulting upsets experienced by smaller airplanes indicate a need for a more conservative airway spacing criteria.

E H W

N71-30765** National Aeronautics and Space Administration
Flight Research Center, Edwards, Calif
AIRCRAFT RESPONSE TO THE WING TRAILING VORTICES GENERATED BY LARGE JET TRANSPORTS
Avail NTIS HCS$0 00/MF$0 95 CSCL01B

A flight-test program to evaluate the effect of the wing-tip vortex wake generated by large jet transport airplanes on a variety of smaller airplanes is reported. The resulting flight investigation was designed to obtain data essential to the determination of the wing-wake location relative to the generating aircraft and the apparent strength and dissipation of the vortex at a specified point along the wake trail. An additional objective of the investigation was to evaluate the upset potential and subsequent recovery capability of a variety of airplanes penetrating the vortex system.

N71-30766** National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va
STATUS OF RESEARCH ON RUNWAY ROUGHNESS
Avail NTIS HCS$0 00/MF$0 95 CSCL01E

Current NASA research on runway surface roughness is described. Typical data available from several programs are illustrated and discussed. The programs emphasize two areas defining roughness by measuring runway and taxiway profiles and by measuring airplane response to roughness.

N71-30767** National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va
RUNWAY SLIPPERINESS
Walter B Horne in its NASA Aircraft Safety and Operating Probl. Vol 1 1971 p 143-152
Avail NTIS HCS$0 00/MF$0 95 CSCL01E

The effects of runway contaminants and pavement surface properties on runway slipperiness are discussed. Results show that contaminants such as water, slush, snow, ice, dust, oil, and rubber deposits on conventional pavement surfaces can produce intolerable levels of runway slipperiness in terms of safe aircraft operation. When wet, conventional surfaces vary considerably in slipperiness due to pavement surface microtexture and macrotexture. A more consistent safe level of slipperiness appears achievable with new surface treatment techniques such as runway grooving and porous asphalt overlays.

E H W
indicate the vertical situation display concept shows promise. The concept also shows better flight and airspeed control and power management than with a conventional cross pointer indicator. The improved guidance and situation information provided by the display system allows more freedom in flight path management and cuts down on the work function.

N71-30771** National Aeronautics and Space Administration Flight Research Center, Edwards, Calif
HANDLING QUALITIES OF LIGHT AIRCRAFT WITH ADVANCED CONTROL SYSTEMS AND DISPLAYS Paul C Loschke, Marvin R Barber, Calvin J. Jarvis, and Einar K Enevoldson In its NASA Aircraft Safety and Operating Probl, Vol 1 1971 p 189–208 refs
Avail NTIS HCS6.00/MF$0.95 CSCL01B

Flight tests to determine the benefits of advanced control systems and displays on the handling qualities of general aviation aircraft, primarily during ILS (Instrument landing system) approaches in turbulence, have shown that very significant benefits can be achieved. The use of a flight director display and an attitude command control system in combination was shown to transform a typical light aircraft into a flying machine that borders on being perfect from a handling qualities standpoint during ILS approaches in turbulent air. The singular use of either the flight director display or the attitude-command control system provided significant benefits. A rate command control system was found to provide significantly less benefit than an attitude command control system. The command control systems tested tended to improve the poststall response of the basic aircraft, but degraded its stall warning characteristics. The control systems improved the response of the aircraft to sudden engine failures.

N71-30772** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
THE INFLUENCE OF MOTION ON THE EFFECTIVENESS OF FLIGHT SIMULATORS IN TRAINING MANEUVERS Richard S Bray, Fred J Drinkwater, III, and Emmett B Fry In its NASA Aircraft Safety and Operating Probl, Vol 1 1971 p 207–220 refs
Avail NTIS HCS6.00/MF$0.95 CSCL14B

The use of a new research flight simulator has demonstrated the value of lateral motion cues in the simulation of maneuvers required in the training of air transport pilots. The availability of very extensive lateral motion has provided the opportunity to form a tentative definition of the minimum lateral motion required to produce the desired simulation fidelity. The less extensive vertical motion capabilities of the simulator provided useful cues but did not markedly reduce the long standing problem of accurately simulating the flare and touchdown portion of the landing maneuver. The overall effectiveness of the simulator in takeoff and landing maneuvers involving lateral directional control problems suggests that the scope of simulator training tasks can be expanded beyond those currently performed in flight and simulators.

N71-30773** National Aeronautics and Space Administration Ames Research Center, Moffett Field, Calif
SAFETY CONSIDERATIONS AND POWERED-LIFT STOL AIRCRAFT Curt A Holzhauser and Robert C Innis In its NASA Aircraft Safety and Operating Probl, Vol 1 1971 p 221–231 refs
Avail NTIS HCS6.00/MF$0.95 CSCL01B

Methods for developing powered lift in commercial STOL aircraft are given. To use powered lift it is necessary that airworthiness conditions account for the propulsion system contribution to lift and control. Changes are needed for these conditions to assess the consequences of propulsion system failures during the approach mode.

N71-30774** National Aeronautics and Space Administration Langley Research Center, Langley Station, Va
Avail NTIS HCS6.00/MF$0.95 CSCL01B

Terminal area studies using various V/STOL configurations were made to develop an operational technique for managing powered lift during simulated precision approaches from cruise to landing. The results of these studies are integrated into a realistic appraisal of V/STOL instrument approach techniques. The configurations evaluated are discussed including the powered-lift concepts they represent and the powered-lift controls available to the pilot. The mechanics of a generalized powered-lift concept relative to an approach glide path are investigated and the operational aspects of powered lift are discussed with regard to stabilization requirements, conversion maneuver, glide-path control, and velocity control or deceleration schedule on the approach. The four aircraft studied include the Kestrel (a vectored jet), the XV-5B (a fan in wing), the XC-142A (a tiltwing), and the Do-31 (a mixed-propulsion jet). Each representation of the powered-lift system in each aircraft and the controls available to the pilot for managing the systems is presented.

N71-30775** National Aeronautics and Space Administration Langley Research Center, Langley Station, Va
Avail NTIS HCS6.00/MF$0.95 CSCL018

Results of analyses and experimental studies of some helicopter operating conditions are outlined. Low-speed directional-control limitations, rotor oscillatory leads in maneuvers, maneuver lift sharing of compound helicopters, and fuselage vibration and passive isolation problems are discussed along with possible solutions.

N71-30778** Virginia Univ., Charlottesville
Avail NTIS HCS6.00/MF$0.95 CSCL01E

Some aspects of elevated-STOL-port aerodynamics are considered. Two problems of concern are crosswinds and building-induced flow fields. The steady crosswind velocity profile in the landing region, flow separation, vortex shedding, and other unsteady flow phenomena which may contribute significantly to the hazards of landing an STOL craft are discussed. A possible approach to the solution of the crosswind and building-induced-flow-field problems through modifications to the elevated-STOL-port building is presented. Some quantitative measurements of dynamic pressure.
were made, but most of the observations were qualitative flow visualizations - smoke and tuft. The effect of fence structure and geometry on changes in crosswind velocity profiles was investigated.

**N71-30777** National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

**SIMULATION STUDIES FOR DEVELOPMENT OF CERTIFICATION CRITERIA APPLICABLE TO SST TAKEOFF**
Avail NTIS HCS$6 00/MS90 95 CSCL01B

A variety of airplane configurations were utilized in the test program. Nearly 2000 take-offs and 800 landings were made. Engine failure take-off testing of high-induced-drag SST designs confirmed the need for more stringent take-off-speed requirements. However, these tests demonstrated that proposed requirements intended to provide the additional protection, were overconservative and economically penalizing. New minimum requirements were defined and agreed upon during joint testing by British, French, and U S airworthiness authorities. During surprise refused take-offs, the sequence of application of deacceleration devices (throttles, brakes, and spoilers) was found to differ from that commonly assumed in the certification process of determining the accelerate-stop distance and has the effect of increasing the stopping distance. The effects of this difference could be amplified for SST airplanes.

**N71-30778** National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

**DEVELOPMENT OF TURBULENCE AND WIND SHEAR MODELS FOR SIMULATOR APPLICATION**
Avail NTIS HCS$6 00/MS90 95 CSCL14B

Information on continuing studies aimed at producing realistic models of turbulence and wind shears for handling qualities studies is presented. An evaluation of analytical models of turbulence which have non-Gaussian gust distributions, a statistical analysis of wind shears, and a brief evaluation of the effects of wind shear on aircraft operations are included.

**N71-30779** National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

**RADIATION SAFETY IN HIGH-ALTITUDE AIRPLANE TRAFFIC**
Trutz Foelsche In its NASA Aircraft Safety and Operating Probl. Vol 1 1971 p 307 – 321 refs
Avail NTIS HCS$6 00/MS90 95 CSCL01B

A brief survey of results up to 1970 of an experimental and theoretical study of biologically important radiation components and dose equivalents due to galactic and solar cosmic rays in the high atmosphere, especially at supersonic transport (SST) altitudes, is presented. The dose equivalent rate for the flight personnel flying 500 hours per year at cruise altitudes of 18.2 to 19.8 km (60,000 to 65,000 ft) in high magnetic latitudes turned out to be about 0.75 to 1 rem/yr averaged over the solar cycle. This rate is about 15 to 20 percent of the maximum permissible dose (MPD) rate for radiation workers (5 rem/yr), as established by the International Commission on Radiological Protection (ICRP) for peacetime operations. The suggested evasion measures of descending to lower altitudes is therefore sufficient to avoid overexposure of passengers in such rare cases. Proposed systems of in-flight radiation warning and monitoring are briefly discussed.

**N71-30780** National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

**PRELIMINARY STUDY OF AIRCRAFT-AUTOPILOT RESPONSE TO ATMOSPHERIC TURBULENCE**
Waldo I Oehman In its NASA Aircraft Safety and Operating Probl. Vol 1 1971 p 323 – 334
Avail NTIS HCS$6 00/MS90 95 CSCL01B

A preliminary study was made to determine how the response of a particular airplane to atmospheric turbulence would be affected by automatic controls operating in altitude-hold and attitude-hold modes. The calculations show that excursions of the response variables from their equilibrium values may be reduced by these relatively simple controls. The calculations also show that excursions in the augmented airplane altitude and normal acceleration, caused by response to atmospheric turbulence, may lead to buffeting and passenger discomfort. In order to obtain the most desirable response, the control systems should be more complex than those considered.

**N71-30781** National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

**PRELIMINARY STUDY OF EFFECT OF VIBRATION ON AIRCRAFT RIDE QUALITY**
Avail NTIS HCS$6 00/MS90 95 CSCL01B

Difficulty in developing aircraft ride criteria and/or acceptable vibration levels and problems in measuring and recording the relatively low-level vibration environment associated with passenger vehicles in the low-frequency (0 to 30 Hz) regime are considered. The portable, self-contained measuring/recording system used for this low-frequency range is described. In addition, examples of real-time data, peak accelerations, and statistical vibration results are given. The results of controlling the environmental input to a helicopter pilot are also shown.

**N71-30782** National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

**PROGRESS REPORT ON THE NASA V-G/VGH GENERAL AVIATION PROGRAM**
Joseph W Jewel, Jr In its NASA Aircraft Safety and Operating Probl. Vol 1 1971 p 347 – 350 refs
Avail NTIS HCS$6 00/MS90 95 CSCL01B

An analysis is presented of 79,000 hours of data obtained from NASA V-G and VGH flight recorders installed on 134 general aviation aircraft engaged in eight types of operations. Information is presented on typical mission characteristics, on airspeed practices, on gust accelerations and derived gust velocities encountered, on maneuvers made, and the statistical vibration results are given. The results of controlling the environmental input to a helicopter pilot are also shown.

**N71-30783** National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

**SOME FACTORS THAT AFFECT THE INSPECTION OF AIRCRAFT FOR FATIGUE DAMAGE**

584
The development of measurement units to properly represent human responses to aircraft noise is reported. Accurate units for use in the systematic design of quieter aircraft to meet noise specifications and in various aspects of aircraft noise certification are discussed. Units which are simple in concept and easy to use in connection with the prediction of community annoyance and compliant patterns, land use planning near airports, and airport traffic monitoring and control are included. The nature of the airport noise problem in communities near airports and the significant factors in noise-induced responses are indicated. The psychophysiological characteristics of people which are significant in their responses to noise are summarized as well as the physical characteristics of the aircraft noise stimuli, the nature of the airport traffic, including the use of preferential runways, the mix of aircraft types, and flight scheduling, and community environment considerations, including background noise levels, economic factors, and types of community activities are covered.
The problem of wind gust absorption by aircraft structures is discussed. Topics presented include structure of atmospheric wind gusts, effects of wind gusts on the classic plane, general characteristics of the wind gust absorber, construction, and test flights of the prototype H-100.


Three nose shapes (an ogive nose, a nose of intermediate bluntness, and a hemispherical nose) were tested at Mach numbers from 1.50 to 2.86. The model had delta wings with a leading edge sweep angle of 72 deg. The results are summarized in the form of various pertinent aerodynamic parameters as a function of Mach number. Although no detailed analysis of the results is made, a summary of results is useful in demonstrating the importance of variations in nose bluntness and should be useful in providing a source of systematic experimental data for future correlation with analytical techniques. A brief correlation was made between the theoretical and experimental values of axial-force coefficient at zero angle of attack only, and the agreement was reasonably good.


Velocity profile control tests were conducted with a short annular diffuser equipped with wall bleed capability. The diffuser area ratio was 4. and the length to inlet height ratio was 1.5. Results show that the diffuser radial exit velocity profile may be shifted towards either the inner or outer diffuser wall by, respectively, bleeding off a small fraction of the total flow through the inner or outer wall. Based on these results, application of the diffuser bleed technique to a gas turbine combustor should be considered. The advantages of such a combustor could be shorter length, reduced idle exhaust emissions, and improved altitude relight capability.


The problem of wind gust absorption by aircraft structures is discussed. Topics presented include structure of atmospheric wind gusts, effects of wind gusts on the classic plane, general characteristics of the wind gust absorber, construction, and test flights of the prototype H-100.


Measurements of wind shear in the lowest few hundred feet of the atmosphere are provided and analyzed as to their possible significance for aircraft approach. Wind shear values ranging between 3 and 6 knots per hundred feet appear to be characteristic of the lowest one hundred feet of the atmosphere under widely varying stability conditions. Extreme values of up to 10 knots per hundred feet were observed on one or two occasions. The expected upper limit of wind shear developed under some rather restrictive assumptions shows general agreement with observed values.

N71-30849# National Aeronautics and Space Administration Langley Research Center, Langley Station, Va

STUDIES AND TESTS OF A PLANE WHICH ABSORBS STRONG WIND GUSTS [ETUDES ET ESSAIS D'UN AVION ABSORBEUR DE RAFALES]


A method for the calculation of the lift distribution for wings of finite span with jet flaps is given. The method is applicable for incompressible flow and is an extension of the lifting surface theory. It can also be applied to wings of arbitrary planform (e.g., swept wings and delta wings) with an arbitrary distribution of jet momentum along the span. The jet flap characteristics of the two-dimensional airfoil theory are included. In order to obtain an essential simplification of the problem, the two-dimensional vortex distribution along the wing chord is approximated in such a way that the section-lift coefficient and the section-moment coefficient of the airfoil are the same as in the exact solution. The calculation of the lift distribution is carried out in the usual way in the lifting surface theory. The chordwise vortex distribution is determined at several spanwise sections both on the wing and in the jet sheet from which the lift and moment distribution along the wing span is obtained. Some numerical examples were calculated for a straight rectangular wing and a swept wing. The theoretical and experimental results are in very good agreement.

Author (ESRO)

N71-30887# Air Force Inst. of Tech, Wright-Patterson AFB, Ohio School of Engineering

INVESTIGATION OF GUIDE-SLOPE INFORMATION RATE REQUIREMENTS FOR A LOW-VISIBILITY AIRCRAFT LANDING

The glide-slope information rate requirement for a low-visibility landing approach is studied. The analysis uses a Kalman filter-optimal control combination to simulate the control system of a DC-8. Both noisy and noise free measurements are considered. The results consist of a measure of the probability of missing an approach, as a function of the sample rate of the scanning beam landing guidance. Results indicate a knee at 6 samples per second, with rapid changes in performance in the region from 2-6 samples per second. The position of the knee appears to be insensitive to changes in either deterministic winds or airspeed constraints.

Author (GRA)

N71-30940# Society of British Aerospace Companies Ltd., London (England)

INTO THE SEVENTIES A FUTURE PLAN FOR BRITAIN'S AEROSPACE INDUSTRY

Feb 1969 16 p

An economic appraisal is made of the recent achievements, and it is shown that it is highly important for the national economy that Government-industry cooperation continue and be strengthened.

Author
of these recordings were from short take-off and landing (STOL) aircraft. The complete set included a wide range of turbofan, turbojet, piston engine and turboprop powered aircraft in a variety of categories. The results were analyzed to test the ability of the Effective Perceived Noise Level (EPNL) and other scales to predict the subjective responses. Because the sample of aircraft sounds was unusually large in number, variety, dynamic range and duration, the test was considered to be severe. The main conclusion of the study is that the EPNL procedure performs as well for the STOL sounds as it does for the CTOL (conventional take-off and landing aircraft) sounds and may thus be used with equal confidence for rating the sounds of aircraft in both classes. When the sounds were divided into propulsion system categories it was found that EPNL in common with other scales, performed most consistently for jets, piston engined aircraft and turboprops, in that order. In general, the integrated duration correction proved superior to an approximate correction based on the 10 dB-down duration. Analysis of the results showed that the average magnitude of the tone-correction was more than 3 db and that corrections were automatically applied in practically all cases. In the case of propeller aircraft sound it is apparent that low frequency harmonics invoke tone corrections, whereas the subjective results suggest they are not required. It is recommended that the automated procedures for tone identification need some revision but that in the meantime, EPNL may be improved by ignoring tones identified at frequencies less than about 500 Hz.

N71-31092# Council for Scientific and Industrial Research, Pretoria (South Africa) 
NOTE ON THE DEVELOPMENT OF PULSE JETS WITHOUT FLAP VALVES [NOTE SUR LE DEVELOPPEMENT DES PULSO-REACTEURS SANS CLAPETS]
Avail NTIS 

The development and the methods used from the invention of pulse jets without flap valves (1944) up to the development of the most recent high speed machines are discussed. The basic principles of the Escopette, the Ecrevisse, machines streamlined for the propulsion of drones, the static pulse jet group and finally the machine without shock waves, capable of functioning at speeds approaching the speed of sound are described.

Author

587
AERODYNAMIC OF VEHICLES IN TUBES

D W Kurtz

In its JPL Quart Tech Rev., Vol 1, No 2 Jul 1971

p 9-16

Copyright Avail NTIS C_SCL 01A

A 21.5 m long, 5.3 cm diameter, vertically oriented aluminum tube utilizing gravity to propel test models is described. This tube is used to test and determine aerodynamic characteristics of models under conditions of high blockage. Some initial results on the drag and pressure signature of a traveling model are presented.

J A M
A method of wing design using lifting line theory was computerized and used to study the parameters which affect wing stall characteristics. The results of the study and the computer program are described. The effects of airfoil section variations, Reynolds number, aspect ratio, wing twist and taper ratio are presented in design chart form. The results of the study and the computer program are described. The effects of airfoil section variations, Reynolds number, aspect ratio, wing twist and taper ratio are presented in design chart form.

The flow visualization experiments and static and total pressure potential under dynamic conditions were presented in design chart form.

The investigation consists of two parts: (1) a study of potential for high speed ground transportation of the future is augmented Ram-Wind Vehicle concept flows in the gap between the model underside and the ground at present, to evaluate concept flows in the gap between the model underside and the ground at present. The flow visualization experiments and static and total pressure potential under dynamic conditions were presented in design chart form.
N71-31242*

A study is reported of the stability of the equilibrium state of a rotor in a pressurized gas bearing. The equations for the perturbed motion of the rotor are considered together with the Reynolds equations for the pressures in the lubricant layer. The conditions of equilibrium stability are established by the small perturbation method in a linear approximation. A numerical method of solving the basic equations is outlined, and the results of certain computer calculations are presented.

N71-31242*

National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

A METHOD FOR ESTIMATING SOME LONGITUDINAL AND LATERAL RIGID-BODY RESPONSES OF AIRPLANES TO CONTINUOUS ATMOSPHERIC TURBULENCE

Ellwood L Peele Washington Aug 1971 45 p refs
(NASA-TN-D-6273, L-7504) Avail NTIS CSCL01C

A method is presented for estimating some lateral and longitudinal rigid-body responses of airplanes to random atmospheric turbulence. Estimates of center-of-gravity load factors and motion responses can be made simply and easily through the use of parametric charts. Sample calculations are included to illustrate the method.

N71-31262*

Washington Univ., Seattle Aerospace Research Lab

HIGH REYNOLDS NUMBER FLOWS

David A Russell Washington NASA Jul 1971 23 p refs
(Grant NGL-48-002-057)
(NASA-CR-1838) Avail NTIS CSCL200

Available test facilities fall short of producing the full-scale Reynolds numbers of modern flight vehicles by at least an order of magnitude. A conventional facility that would meet the growing need for full simulation would be prohibitively expensive; thus quasi-steady devices should be considered. The design of these devices, their capabilities and limitations, and their use in identifying and studying flows sensitive to the Reynolds number are discussed.

N71-31288*

Northrop Corp., Hawthorne, Calif Aircraft Div

AIRPLANE FLYING CHARACTERISTICS IN TURBULENCE

Final Report, 1 Nov. 1969 – 17 Sep 1970
Edward D Onstott and Ernest P. Salmon Wright-Patterson AFB, Ohio AFFDL Feb 1971 118 p refs
(Contract F33615-70-C-1156)
(AD-722855, NOR-70-139, AFFDL-TR-70-143) Avail NTIS CSCL5/10

A method for predicting the performance of the total pilot-vehicle system has been developed for the lateral dynamics of Class 4 airplanes. This method, which is based on pilot model theory and multiloop analysis, predicts tracking errors for command tracking tasks and also for attitude hold tracking tasks in turbulence. The predictions are in terms of root mean square time domain statistics and are obtained by means of a fully automated multiloop analysis performance prediction program available from the United States Air Force. Thus, system performance can be evaluated analytically in terms of familiar time domain root mean square statistics. The validity and accuracy of this method have been ascertained by means of moving base simulation on the Northrop Large-Amplitude Flight Simulator operating in five-degree-of-freedom motion.

N71-31307*

Kaman Aviation, Burlington, Mass

STUDY OF THE CONCEPT OF INERTIALLY AIDED BAROMETRIC ALTIMETRY SYSTEM FOR SUPERSONIC AIRCRAFT

(Contract NAS12-2132)
(NASA-CR-17710, TR-65) Avail NTIS CSCL09E

Research needs are studied for providing a hybrid inertial barometric altimetry system to meet vertical separation requirements of 1000 and 2000 feet for Mach 3.5 transports cruising in altitude hold at 80,000 feet. The static pressure error of the barometric subsystem must be reduced an order of magnitude from present errors for subsonic jet aircraft systems. An off-the-shelf inertial subsystem having a 3 sigma accuracy of 0.002 g's should be satisfactory, provided the lag of the barometric system is 10 seconds or less. The height deviations from a flight level due to turbulence, atmospheric temperature variations, and variations in isotropic surface height are estimated to be negligible for a hybrid altimeter system. The deviations near the phugoid frequency are essentially eliminated by the system. Flight tests are recommended to verify that all the important factors have been accounted for adequately.

N71-31330*

National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

STATIC FORCE TESTS OF A MODEL OF A TWIN-JET FIGHTER AIRPLANE FOR ANGLES OF ATTACK FROM 10 DEG TO 110 DEG AND SIDESLIP ANGLES FROM –40 DEG TO 40 DEG

Erlin L. Angelin Washington Aug 1971 90 p refs
(NASA-TN-D-6425, L-7808) Avail NTIS CSCL01B

An investigation was conducted to obtain a set of static-force-test data for use as aerodynamic inputs to theoretical spin studies. Control-effectiveness tests were made for each control individually and for a full left pro-spin combination of controls. The results are presented without detailed analysis, but are analyzed in terms of factors which would affect their applicability for use in spin theory. Several data characteristics are indicated that are deemed to be of significance with regard to their intended use in theoretical spin studies.

N71-31333*

National Transportation Safety Board, Washington, D.C

AIRCRAFT ACCIDENT REPORT. FEDERAL AVIATION ADMINISTRATION, DOUGLAS DC-3C, N7 LA GUARDIA AIRPORT, NEW YORK, 4 JANUARY 1971

3 Jun 1971 12 p
(NTSB-AAR-71-11) Avail
A Federal Aviation Administration DC-3 aircraft accident which occurred during landing at La Guardia airport, New York, on January 4, 1971 is reported. The accident investigation board determined that the cause of the accident was the pilot’s failure to compensate for wind drift with atmospheric conditions as a mitigating circumstance.

N71-31437# Naval Postgraduate School, Monterey, Calif.
AIRCRAFT DATA ACQUISITION SYSTEM FOR ACADEMIC FLIGHT EVALUATION

Various methods for investigating the stability and control characteristics of the US2A were considered in obtaining a system that would provide a proper degree of data accuracy, data availability and system reliability yet still be instructional and functional. To this end, a photo-panel system with its various input systems was designed and incorporated into the Aeronautics Departments US2A, BUNO 136533. Installation and component check-out of this photo-panel system was achieved.

Author (GRA)

N71-31351# Texas A&M Univ., College Station
AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN MOUNTAIN-WAVE CONDITIONS AND CLEAR AIR TURBULENCE ENCOUNTERED BY THE XB-70 AIRPLANE IN THE STRATOSPHERE

The data from 36 XB-70 flights conducted over the mountainous regions of the western United States together with rawinsonde data were used to investigate relationships between conditions favorable for mountain waves and clear air turbulence. Profiles for the Scorer parameter and the gradient Richardson number were evaluated from an eight-level model. The Scorer parameter and the gradient Richardson number profiles were computed from the rawinsonde data on those days when the XB-70 flew, and these results compared to the model profiles and related to the reported turbulence. Ascent rate profiles of rawinsonde balloons were analyzed from which the presence of mountain or lee waves was inferred. From the results of this investigation, objective methods were developed for forecasting the occurrence or nonoccurrence of turbulence in the stratosphere due to mountain waves.

Author

N71-31376# Cornell Aeronautical Lab., Inc., Buffalo, N Y
FIRE FIGHTER’S EXPOSURE STUDY Final Report, Jul. – Nov. 1970

Experimental fires from pools of burning aircraft fuels were instrumented with heat meters to determine heat flux distributions for application to the design of protective clothing for firefighting personnel. The spectral distribution of infrared radiation emitted by fires was also measured. Conditions affecting the fires and the resulting heat effects that were studied were wind velocity, fuel pool area, time of burning, orientation around the fire relative to wind direction, distance from the fire, and an extraneous object in a fire. A means by which evaluation of reflective clothing can be made is described.

Author (GRA)

N71-31400# Naval Postgraduate School, Monterey, Calif
EVALUATION OF AN ELECTRONIC WIND-TUNNEL BALANCE
Steven Russell Briggs (M S Thesis) Mar 1971 61 p refs (AD-722571) Avail NTIS CSCL 14/2

A three-component electronic wind-tunnel balance installed in a 35 by 50 foot subsonic tunnel was evaluated for system problem areas. The nonlinear output of the reluctance gage transducers was analyzed and linearized using a diode function-generating circuitry. A static calibration was conducted to confirm the linearity of the circuits. Evaluation of the balance system under operating conditions pointed out other areas for future investigation.

Author (GRA)

N71-31403# Committee on Commerce (U S Senate)
AIR POLLUTION CREATED BY AIRCRAFT JET ENGINE EMISSIONS

Statements on the development of engines and devices for the control of air pollution from jet aircraft engine emissions are presented. Research allocations for the reduction of smoke emissions are discussed as well as emission standards and the relocation of airports.

Author

N71-31455# Scientific Translation Service, Santa Barbara, Calif
REQUIREMENTS OF ENGINE DYNAMICS IMPLIED BY THE THRUST MODULATION CONTROL FOR VTOL AIRCRAFT [ANFORDERUNGEN AN DIE TRIEBWERKS Dynamik BEDINGT DURCH DIE SCHMUTZMODULATIONSSTEUERUNG BEI VTOL-FLUGZEUGEN]

In the design of V/STOL high performance aircraft, the choice of the engines and the control systems plays an important role for gliding and transition flight. For the control system, and the choice of engine for thrust modulation control, there are three dynamic criteria: stabilization for small disturbances, stabilization for engine failure, and control behavior.

Author

N71-31456# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
USE OF AN AIR-ASSIST FUEL NOZZLE TO REDUCE EXHAUST EMISSIONS FROM A GAS TURBINE COMBUSTOR AT SIMULATED IDLE CONDITIONS

Tests were performed at typical engine idle conditions on a single J-57 combustor liner installed in a 30-cm-(12-in.-) diameter pipe to evaluate design modifications for reducing exhaust emissions. Using an air-assist fuel nozzle, the combustion efficiency was increased from 90 to 96 percent, and the total hydrocarbon and carbon monoxide exhaust emissions were reduced from 26 to 3 to 3.3 and from 51 to 40 g/kg of fuel burned, respectively. A corresponding increase in nitric oxide emissions from 0.8 to 1.5 g/kg of fuel burned was observed. Calculations performed for a complete landing-takeoff cycle of a typical engine indicated that the
use of an air-assist nozzle during idle could decrease the total quantity of hydrocarbon and carbon monoxide emission by 69 and 20 percent, respectively, while nitric oxide would increase by 14 percent. The required secondary nozzle airflow amounts to less than 0.5 percent of the total engine airflow at idle. Author (Contract NAS3-12432)

Airport Connector Systems found a small vehicle service to be and more frequent service. A comparison of the various Oakland connector systems was considered. The Oakland Airport Connector System was selected as more advantageous because of lower cost. A comparison of the various Oakland Airport Connector Systems found a small vehicle service to be the most attractive as far as service, flexibility, and cost. Author (GRA)

N71-31463# Advisory Group for Aerospace Research and Development, Paris (France)

TECHNICAL EVALUATION REPORT ON AGARD SPECIALISTS' MEETING ON AERODYNAMIC INTERFERENCE

David J. Peake May 1971 18 p refs Conf held at Silver Spring, Md. 28-30 Nov 1970 (AGARD-AR-34-71) Avail NTIS

A critique of topics discussed at the AGARD meeting on aerodynamic interference is presented. Discussions evaluated include wing-body and wing-body-tail interference, airframe-propulsion interactions, and airframes-stores interference. The major advance is considered to be the treatment of a lifting wing-body combination in which a sheet of trailing vorticity from a wing was coupled with the finite element method. It is recommended that a calibration model of a wing-body combination be chosen for checking various computation schemes, and some high Reynolds number wind tunnel tests be conducted to provide details of the junction pressure distributions and the three-dimensional boundary layers and wakes. F O S

N71-31459# Scott Research Labs., Inc., Plumsteadville, Pa


The exhaust emissions of light, piston engine aircraft and the phenomena of natural afterburning of the exhaust gases on contact with the ambient air were investigated. The exhaust emissions of representative aircraft were measured as they were flown in a normal manner. At the same time, the extent of afterburning was measured by sampling the exhaust plume downstream of the exhaust stack and comparing the plume composition, corrected for dilution, to the composition of the stack gases. The exhaust emissions from nine light aircraft were determined using a 9-mode takeoff-cruise-landing (TCL) cycle developed for this study. Exhaust component concentrations and fuel consumption rates were measured for each mode during ten test runs. The required secondary nozzle airflow amounts to less than 0.5 percent of the total engine airflow at idle. Author (Contract NAS3-12432)
Acoustic disturbances and high frequency-low amplitude vibrations have been studied as a means to promote early boundary layer transition in a supersonic stream. A theoretical analysis of the stability characteristics of the leading edge of a blunted delta-wing was used to guide the choice of acoustic and vibration frequencies employed in this experimental study. Air driven acoustic generators, located in the stagnation chamber of the wind tunnel, produced a strong resonant tone at 4.6 KHz, with a sound level above 148 dB. Comparison of the Reynolds number dependent flow field on a delta model at angle of attack, using an oil streak technique for flow visualization, provided an index of the effectiveness of the acoustic disturbances. Operation of the tunnel with the tunnel air supplied through the acoustic generators and with the normal air supply indicated the effective Reynolds number of the wind tunnel was increased by a factor near 1.4 by the acoustic generators. Extensive test section total pressure and flow angularity surveys and force and moment measurements on a winged body showed this increase in effective Reynolds number was produced with no degradation of flow quality. Piezoelectric vibration transducers were mounted in the supporting sting of the delta models, vibrating the models at frequencies ranging from 2.9 KHz to 82 KHz with peak-to-peak amplitudes from 49 micrometers to 0.0015 inches. These vibrations were not as efficient as surface roughness of a height comparable to the peak-to-peak vibration amplitude in stimulating boundary layer transition.
## Typical Subject Index Listing

### Accident Prevention

<table>
<thead>
<tr>
<th>SUBJECT HEADING</th>
<th>NOTATION OF CONTENT</th>
<th>REPORT NUMBER</th>
<th>NASA ACCESSION NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer program and predictor displays for solving air traffic control problems</td>
<td>[NASA-CR-111372]</td>
<td>[71-11666]</td>
<td></td>
</tr>
</tbody>
</table>

The subject heading is a key to the subject content of the document. The Notation of Content (NOC) rather than the title of the document, is used to provide a more exact description of the subject matter. The report number helps to indicate the type of document cited e.g. NASA report translation, NASA contractor report. The accession number is located beneath and to the right of the Notation of Content (NOC) rather than the title of the document, is used to provide a more exact description of the subject matter. The report number helps to indicate the type of document cited e.g. NASA report translation, NASA contractor report. The accession number is located beneath and to the right of the Notation of Content (NOC).

### A-6 Aircraft

#### A-6 Aircraft
**Statistical analysis of gyrocompass node of A-6A inertial navigation system** [BM-511] [71-30315]
**Inlet noise suppressors having perforated plate over honeycomb wall construction evaluated over range of passage heights and engine speeds using turbojet engine as noise source** [NASA-TN-D-6395] [71-31096]
**Helicopter rotor noise due to blade-vortex interaction, using linear gust model** [71-36934]
**Development of noise measurement units for airport and aircraft noise reduction and psychoacoustics studies** [71-30786]
**Optimal digital controller based on linear approximation of acoustical test facility, for determining effects of supersonic rocket engine noise on vehicle surface** [NASA-CR-115073] [71-30741]
**Birefringence holographic imagery for aviation and space flight** [JFHJ-53420] [71-30361]
**Real time reconnaissance cockpit display system for airborne sensor systems, providing sight combat imagery** [71-35772]

### Aerodynamic Balance

#### Aerodynamic Balance
**STAN/HASS system aircraft weight and balance determination, discussing basic concepts, design requirements and applications** [SAWE PAPER 896] [71-35816]
**Strut pressure and axle strain gage system testing for balance and weighing onboard De Havilland C-7a aircraft** [SAWE PAPER 889] [71-35827]

### Aerodynamic Brakes

#### Aerodynamic Brakes
**Moving long cylindrical model for aerobraking tests at high speed in drop wire facility** [71-31109]

Criteria and recommended practices for design, selection, analysis, and testing of deployable aerodynamic deceleration systems

**Hyperbolic aircraft design usable as transport or space shuttle, determining aerodynamic behavior in viscous flow** [71-36431]

Flight dynamics for aircraft noise reduction, gust effects decrease and dynamic stability of parachute load systems

Wind tunnel investigation of aerodynamic interference between two lifting surfaces in tandem

Computed aided design of wing structures and application of optimal law of material distribution

Aerodynamic characteristics of thin, highly cambered airfoils in incompressible flow

Design and characteristics of supersonic inlet controls for minimizing inlet unstarts

Wind tunnel investigation of static longitudinal aerodynamic characteristics of semi-span swept wing for STOL jet transport with deflected thrust and boundary layer control

Application of Fredholm integral equations of second kind for determining pressure distribution on cascade of thick airfoils

Experimental and analytical study of subsonic longitudinal and lateral aerodynamic characteristics of slender sharp edge 74 deg swept wings

Aerodynamic and deployment characteristics of twin keel all-flexible parawing rigged with several variations of multiusage canopy and suspension line reefing system

Aerodynamic characteristics, rocket nozzles, spacecraft propulsion, antenna design, and internal combustion engines

Aerodynamic characteristics of vehicle models in aluminum tube

Static force tests of model of twin jet fighter aircraft at various angles of attack and sideslip angles to obtain data for theoretical spin studies

Aerodynamic coefficients

Numerical analysis of aerodynamic loads and coefficients for tandem and T tail surfaces harmonically oscillating in subsonic flow

Aerodynamic Configurations

Symposium on unsteady aerodynamic forces, loads, and configurations for aeroelastic analysis of interfering surfaces

Computer program used for design criteria of stall characteristics of straight wing aircraft

Aerodynamic Drag

Sting-free aerodynamic drag measurement on ellipsoidal cylinders in subsonic wind tunnel at transition Reynolds numbers

A-1
Numerical analysis of aerodynamic loads and coefficients for tandem and T tail surfaces harmonically oscillating in subsonic flow. Wing interference lift line lattice simulation and application to aerodynamic loads on tandem wings in unsteady flow.

Box collocation method for calculating aerodynamic loads on tandem delta wings with oscillations in unsteady flow. Kinematics of subsonic unsteady airloads on multiple lifting surfaces.

Parametric turbine vector diagram calculation for design of highly loaded multistage fan driven turbine. Subsonic turbulent jet acoustic emission, calculating noise intensity in far field for various Mach numbers.

Noise generation due to inlet free stream turbulence incident on isolated rotors, using flat plate cascade blade row model. Relation of Eulerian and Lagrangian structure of pseudosound pressure and velocity fields in turbulent shear flow to aerodynamic noise generation.

Unsteady airfoil stall characteristics using static data input for predicting stall flutter boundary of space shuttle wing. Experimental and theoretical aeroelastic analysis of Fokker F-28 T tail, using flutter model and flight flutter tests.

Sympoium on unsteady aerodynamic forces, loads, and configurations for aeroelastic analysis of interacting surfaces. Critique of topics discussed at AGARD meeting on aerodynamic interference. Aerelastic and flutter analysis for T tail of Fokker F-28.
Air navigation and traffic control systems with military and civil aircraft navigation systems development, emphasizing self contained airborne equipment

Airborne communications with AM/ARC-154 transceiver in single radio, discussing extended frequency coverage, multiple operation, navigation and input/output provisions

Omega navigation application to general aviation aircraft, presenting diurnal course shift to overcome deficiencies

Air navigation and traffic control systems with application to Western Europe and Atlantic area, noting requirements for ILS successor

Satellite based position fixing data by ranging techniques, discussing application to navigation and ATC

AIRCRAFT

Senate hearings on Federal anti-skyjacking program

AIRCRAFT POLLUTION

Control equipment and engine development for air pollution control from jet aircraft engine emissions

Exhaust emission from reciprocating aircraft engines, and afterburning of exhaust gases on contact with ambient air - air pollution study

AIRCRAFT TRAFFIC

 finnish air traffic law based on international civil aviation convention, discussing regulations relative to aircraft, personnel and airports

Warm air traffic congestion agreements amended at The Hague and Guatemala, presenting air transport regulations in present form

Trends in air transportation and airline industry operations from 1970 to 1980

AIRCRAFT TRAFFIC CONTROL

ATC system models, covering surface movement, runway utilization, terminal areas and enroute traffic

ATC system improvements, presenting data acquisition upgrading and ground automation - aircraft navigation systems interface

ATC avionics equipment, discussing inertial area navigation, autopilots, airborne data acquisition, altitude reporting, collision avoidance, CAT, satellite communications, etc

Time division multiplexing system for ATC, discussing surveillance geostationary satellite feasibility, delta modulation for data transmission and aircraft equipment

Discusses communication satellite system for air traffic control and navigation, discussing aircraft antenna beam electronic scanning by computerized control

Queueing theory approach to communication satellite network design, applying to ocean air traffic control and worldwide military broadcast systems

Soviet book on air transportation covering ATC, automatic landing and information display systems

Air navigation, surveillance and traffic control technology effects on land and airspace uses at airports

ATC system safety problems from user standpoint, considering requirements by pupil, test and airlines pilots and light, private, business, taxi and military aircraft

ATC system improvement by area navigation, discussing benefits in services, safety and cost effectiveness

Military and civil aircraft navigation systems development, emphasizing self contained airborne equipment

Air navigation and traffic control systems with military and civil aircraft navigation systems development, emphasizing self contained airborne equipment

Air traffic control facilities

Queuing theory approach to communication satellite network design, applying to ocean air traffic control and worldwide military broadcast systems

AIRCRAFT ACCIDENT LITIGATION

Aircraft accident litigation related to wake turbulence concerning pilot or air traffic controller faults

Soviet book on air transportation covering ATC, automatic landing and information display systems

AIR NAVIGATION AND TRAFFIC CONTROL

Satellite navigation application to general aviation aircraft, presenting diurnal course shift to overcome deficiencies

Air navigation and traffic control systems with application to Western Europe and Atlantic area, noting requirements for ILS successor

Satellite based position fixing data by ranging techniques, discussing application to navigation and ATC

AIRCRAFT FOR INTERNATIONAL LONG HAUL

EXSO part of joint ATC communication experiment for L band satellite use, giving voice and data transmission and distance measurement techniques results

BIT AND SCANNING FIELD SYNCHRONIZATIONS OF TIME MULTIPLER FOR AIR TRAFFIC CONTROL

Computer based aircraft tracking with aid of twin radar air traffic control system, discussing components and operation

Analysis of aircraft accidents and establishment of rational, quantitative air traffic safety control goals

Third order-two signal intermodulation products for 242 frequencies between 225 and 400 MHz as used in FAA frequency assignment processes

Third order-two signal intermodulation products for 360 frequencies between 118 and 136 MHz when 50 KHz channel spacing is used as in FAA frequency assignment processes

Third order-two signal intermodulation products within 118-136 MHz band with 50 KHz spacing

Fundamental characteristics of analog and digital modulation used in ATC communication system

Evaluation of airborne transponders used for air traffic control facilities

Bilateral imagery for aviation and space flight

Systems analysis approach to airport planning and predicting terminal facility and aircraft demands in year 2000 for air traffic control systems

AIRCRAFT FOR INTERNATIONAL LONG HAUL TRANSPORTATION

Soviet book on air transportation covering ATC, automatic landing and information display systems

Aircraft for international long haul transportation, discussing criteria for selection based on environmental, operational, budgetary and policy considerations
AIRBORNE EQUIPMENT


AIRCRAFT COMMUNICATION

Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function [A71-35097]

Civil aviation and merchant marine satellites, considering aircraft and surface vessel antenna characteristics and modulation techniques for optimum communication channel frequencies [A71-35582]

Aircraft accident litigation related to wake turbulence concerning pilot or air traffic controller faults [A71-35387]

Analysis of aircraft accidents and establishment of rational, quantitative air traffic safety control goals [FAA-BD-71-36] A71-29309


Annotated bibliography on bird aircraft hazards [TEC-56961] A71-30128

Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function [A71-35097]

Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function [A71-35582]

AIRCRAFT ACCIDENTS


Annotated bibliography on bird aircraft hazards [TEC-56961] A71-30128

AIRCRAFT COMMUNICATION

Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function [A71-35097]

Civil aviation and merchant marine satellites, considering aircraft and surface vessel antenna characteristics and modulation techniques for optimum communication channel frequencies [A71-35582]

Aircraft accident litigation related to wake turbulence concerning pilot or air traffic controller faults [A71-35387]

Analysis of aircraft accidents and establishment of rational, quantitative air traffic safety control goals [FAA-BD-71-36] A71-29309


Annotated bibliography on bird aircraft hazards [TEC-56961] A71-30128

AIRCRAFT COMMUNICATION

Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function [A71-35097]

Civil aviation and merchant marine satellites, considering aircraft and surface vessel antenna characteristics and modulation techniques for optimum communication channel frequencies [A71-35582]

Aircraft accident litigation related to wake turbulence concerning pilot or air traffic controller faults [A71-35387]

Analysis of aircraft accidents and establishment of rational, quantitative air traffic safety control goals [FAA-BD-71-36] A71-29309


Annotated bibliography on bird aircraft hazards [TEC-56961] A71-30128

AIRCRAFT COMMUNICATION

Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function [A71-35097]

Civil aviation and merchant marine satellites, considering aircraft and surface vessel antenna characteristics and modulation techniques for optimum communication channel frequencies [A71-35582]

Aircraft accident litigation related to wake turbulence concerning pilot or air traffic controller faults [A71-35387]

Analysis of aircraft accidents and establishment of rational, quantitative air traffic safety control goals [FAA-BD-71-36] A71-29309


Annotated bibliography on bird aircraft hazards [TEC-56961] A71-30128

AIRCRAFT COMMUNICATION

Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function [A71-35097]

Civil aviation and merchant marine satellites, considering aircraft and surface vessel antenna characteristics and modulation techniques for optimum communication channel frequencies [A71-35582]
AIRCRAFT CONTROL

Soviet book on aircraft automatic control systems covering linear theory, design, autopilot, as well as machine performance, operation modes, etc.

Lockheed L-1011 development, discussing flying stabilizer design, direct lift control and autoland system.

Random access signaling system application to aircraft control, discussing signal redundancy requirement for access capability optimization based on radio environment model.

System analysis of aircraft, aircraft guidance and control systems, and atmospheric turbulence for low visibility instrument landing system requirements.

Evaluating analytical models of turbulence having non-Gaussian gusts distributions and effects of wind shear on aircraft operations.

Lower atmosphere wind shear determined for aircraft cockpit control from observations in different American sites.

AIRCRAFT DESIGN

VTOL transport optimal airframe/propulsion systems design, discussing thrust requirements, performance, control, cruise functions, fuel consumption and fan characteristics.

DC-10 wide body tri-jet aircraft design and development, considering sizing, number of engines and thrust optimization and selection of cruise, approach and stall speeds.

Computerized automatic control of aircraft electrical system using remote power controllers and multiplexed data bus for wiring reduction and reliability improvement.

DC-10 fuselage pressure shell fail-safe design, presenting analysis methods for residual strength prediction of damaged stiffened panels.

Total in-flight simulator/TIPS/ in variable stability C-131 aircraft, describing potential as design tool.

Total in-flight simulator/TIPS/ in variable stability C-131 aircraft, discussing potential as design tool.

Aircraft electric power system design with reliability, simplicity, low cost, weight and size, discussing autostatic circuit protection and energy power.

V/STOL aircraft with vectored thrust propulsion systems, noting weight and center of gravity-lift-thrust relationship changes effect on performance.

Composite materials effect on supersonic aircraft weight, design and performance.

Design, analysis and testing of F-111 complex fuselage full scale section of composite materials, noting weight savings.

Wing group weight prediction for subsonic aircraft design, taking into account root bending moments due to lift.

Lockheed L-1011 passenger jumbo jet layout, ground handling and servicing.

AIRCRAFT ENGINES

Hybrid V/STOL jet lift aircraft design, examining wing area-lift engine bypass ratio reduction.

Hyersonic aircraft design usable as transport or space shuttle, determining aerodynamic behavior for viscous flow.

Strategic bomber B-1A program, discussing airframe and engine contractors, design, characteristics performance, electronic equipment and armament.

Computer-aided design of wing structures and application of optimal law of material distribution.

Applications of supercritical airfoils to transport aircraft designs.

Aircraft design, flight characteristics, and atmospheric effects on sonic boom during supersonic and hypersonic flight.

Critique of topics discussed at AGARD meeting on aerodynamic interference.

Aircraft gas turbine engine components equivalent to short haul aircraft, DC-10, L-1011, etc.

Maxima temperature engine concept, definition and application to future aircraft propulsion system performance.

Linear radial loads effect on stress and strain of hyperboloidal rotor disk applied to aircraft engine compressors with two stream flow of working medium.

Aircraft gas turbine engine components equivalent testing by shortening testing time to increase service life.

Three micron absolute main oil filter for aircraft gas turbine lubrication system, discussing indicator system and bench and engine tests.

Propulsion systems trends for 1980s, discussing environmental noise levels, stoichiometric gas turbine engines for military aircraft, high bypass ratio engines for V/STOL aircraft, etc.

Integrated drive generator for aircraft electrical power systems, improving weight, life and reliability.

Transonic wind tunnel testing of air intake and afterbody of double flux engine nacelle at high subsonic Mach numbers and high Reynolds numbers.

Aircraft jet engine application of electric discharge machining for repetitive continuous production, considering automated closed cycle equipment.

Strategic bomber B-1A program, discussing airframe and engine contractors, design, characteristics performance, electronic equipment and armament.

Application of noise reduction technology to design of propulsion system for subsonic civil transport aircraft.

Exhaust emission from reciprocating aircraft engines, and afterburning of exhaust gases on...
AIRCRAFT EQUIPMENT

Contact with ambient air - air pollution study [PB-197627] N71-31569

AIRCRAFT EQUIPMENT

High voltage DC electric power transmission systems with ground return, reducing aircraft wiring weight and energy dissipation A71-35771

Methods for determining reliability of aircraft equipment [AD-722721] N71-29796

AIRCRAFT FUELS

Heat flux distributions in pools of burning aircraft fuels for design of protective clothing for firefighting personnel [AD-722776] N71-31376

AIRCRAFT GUIDANCE

STOL aircraft guidance capability with onboard digital computer, maintaining time of arrival envelope at way points along complex flight paths [AIAA PAPER 71-770] A71-35528

Systems analysis of aircraft, aircraft guidance and control systems, and atmospheric turbulence for low visibility instrument landing system requirements [AD-722773] N71-30173

Vertical situation display concept for alleviating problems of adequate guidance and display information for making steep approaches [N71-30770

AIRCRAFT HAZARDS

Aircraft ice protection problems, considering one dimensional Stefan method for cyclic deicing system A71-34850

Case histories of aircraft damage due to wind acting on airport surfaces, discussing wind and hail protection A71-35442


AIRCRAFT SWINGBY

French flight test center role in development and certification of Concorde aircraft, considering cooperation with industry [AIAA PAPER 71-784] A71-35526

Negotiations of BBA/BOAC productivity agreements in aircraft industry A71-35924

British civil aircraft airworthiness requirements, discussing aircraft industry management philosophy ensuring quality standards in design, development, production, inspection and product support A71-36573

Civil aircraft market analysis, examining replacement cycle and used aircraft market based on aircraft histories A71-36676

Aircraft industry licenses: norms and standards, describing indexing procedures, storage techniques and data rescue operations with computer A71-36610

Airline operations, costs, effects on aircraft industry, and cooperation with CAA N71-29256

Test facilities on structural engineering at FFA, Sweden [FFA-MEMO-61] N71-29378

AIRCRAFT INSTRUMENTS

Radio controlled small aircraft as measurement platform for meteorological sensors, discussing development and performance from field tests A71-35334

Military and civil aircraft navigation systems development, emphasizing self contained airborne equipment A71-35374

High aperture wide angle lens design for compact electro-optical systems of airborne soaring mapprection navigational instruments A71-36605

Development and application of heads up aircraft instrument display for improvement in aircraft safety during adverse weather [NASA-RA-71-9] N71-29305

SUBJECT INDEX

AIRCRAFT LANDING

Trailing wake hazards of large transports in takeoff and landing, examining configuration stability of vortex pair in ground effect A71-35757

Aircraft landing design for heavy multiwheel aircraft, using BISTRO computer program A71-36000

Cost effective high speed projectile trajectory plotting system for gunfire range instrumentation, applying to aircraft path recording during automatic landing control A71-36613

Determination of effectiveness of chevron type markings to indicate potentially deiceable, non-load-bearing paved areas before runway threshold [NASA-RA-71-27] N71-29306

Mathematical perturbation models of aircraft lift approach and landing [N71-159] N71-29496

Flight tests and simulation for determining effects of peripheral viewing losses on pilot performance during commercial aircraft landing [AIAA-P-70205] N71-29497


AIRCRAFT LIGHTS

Functional suitability of internal/external lighting systems for military aircraft [AD-723013] N71-29797

AIRCRAFT MAINTENANCE

Category II operations at various airports, considering ad-weather landing requirements of airborne equipment, maintenance standards, pilot training, etc [AIAA PAPER 710442] A71-34999

Aircraft weighing in place during maintenance operations, describing load cell equipped jacks design for time saving weight determination [NASA-TM-X-67858] N71-35814

Lockheed L-1011 passenger jumbo jet layout, ground handling and servicing A71-35995

Maintenance control system /MCS/, management information system encompassing subsystems supporting scheduling, forecasting, performance evaluation, modifications and improvement functions A71-36488

Lubrication by boundary, elastohydrodynamic, and fluid films, wear due to fretting, erosion, scuffing, and pitting, and friction in aircraft [NASA-TM-X-67872] N71-31134

AIRCRAFT MODELS

Evaluating analytical models of turbulence having non-Gaussian gusts distributions and effects of wind shear on aircraft operations N71-30778

AIRCRAFT NOISE

Experimental research at Building Research Station on outdoor sound propagation for building design in relation to aircraft and road traffic noise A71-35237

Gulfstream 2 acoustics program for cabin noise level reduction, compliance with FAA takeoff and landing noise certification and structure qualification against sonic fatigue [AIAA-PAPER 71-783] A71-35527

Flight dynamics for aircraft noise reduction, gust effects decrease and dynamic stability of parasite load systems A71-36752

German aircraft noise protection law of 30 March 1971, discussing objectives and applicability A71-36921

Helicopter rotor noise due to blade-vortex interaction, using linear gust model A71-36334

Development of noise measurement units for airport and aircraft noise reduction and psychoacoustic studies A71-3629

Comparison test to evaluate perceived noise level for STOL and other aircraft sounds [VR-70-9] N71-31075
Inlet noise suppressors having perforated plate over honeycomb wall construction evaluated over range of passage heights and engine speeds using turbojet engine as noise source [NASA-TN-D-6395] N71-31096

AIRCRAFT PARTS
Aircraft parts testing by NDT methods, considering ultrasonic system for valve defects and fluorescent particle system for crack detection A71-37056

AIRCRAFT PERFORMANCE
Maximum temperature engine concept, definition and application to future aircraft propulsion system performance [SAE PAPER 710651] A71-34898
L-1011 flight test program, describing aircraft design and performance [AIAA PAPER 71-789] A71-35531
V/STOL aircraft with vectored thrust propulsion systems, noting weight and center of gravity-lift-thrust relationship changes effect on performance [SAE PAPER 899] A71-35817
Composite materials effect on supersonic aircraft weight, design and performance [SAE PAPER 888] A71-35818
Flight simulation evaluation of aircraft instrument departure procedure [FAA-FS-600-2] N71-29635
Runway and taxiway profile and airplane response measurements to determine runway roughness N71-30766
Applications of supercritical airfoils to transport aircraft designs N71-30769
Analysis of 75,000 hours data obtained from NASA V-G-WGH flight recorders installed on 734 general aircraft engaged in eight types of operations N71-30782
Prediction method for performance of total pilot-vehicle system in turbulence with application to tracking tasks (AD-722855) N71-31288

AIRCRAFT PRODUCTION
Aircraft jet engine application of electric discharge machining for repetitive continuous production, considering automated closed cycle equipment [SHE PAPER RH-71-143] A71-36658

AIRCRAFT RELIABILITY
Computerized automatic control of aircraft electrical systems using remote power controllers and multiplexed data bus for wiring reduction and reliability improvement [SHE PAPER 71-71-143] A71-36658
British civil aircraft airworthiness requirements, discussing aircraft industry management philosophy ensuring quality standards in design, development, production, inspection and product support N71-36673

AIRCRAFT SAFETY
Civil aircraft arresting on runway overshoots, describing safe deceleration method by use of soft ground arresters A71-35210
ATC system safety problems from user standpoint, considering requirements by pupil, test and support A71-35232
ATC system improvement by area navigation, discussing benefits in services, safety and cost effectiveness N71-35373
Air transportation safety review covering weather knowledge, aircraft structures, instrumentation, radio aids and power plants N71-35373
Development and application of heads up aircraft instrument display for improvement in aircraft safety during adverse weather [FAA-SA-71-8] N71-29305

AIRCRAFT STRUCTURES
Analysis of aircraft accidents and establishment of rational, quantitative air traffic safety control goals [FAA-RT-71-36] N71-29309
Conference on NASA research in aircraft safety and operating problems [NASA-SP-270] N71-30756
Ditching behavior of dynamic C-5A model A71-30757
Magnitude of induced voltages and their relation to characteristics of lightning discharge and electrical properties of aircraft electrical systems N71-30761
Safety characteristics for powered lift of comersial STOL aircraft N71-30773

AIRCRAFT STABILITY
Total in-flight simulator /TIPS/ in variable stability C-131 aircraft, describing potential and design tool [AIAA PAPER 71-794] A71-35529
STAB/MASS system aircraft weight and balance determination, discussing basic concepts, design requirements and applications [SAE PAPER 896] A71-35816
Dynamic positioning stationkeeping and stability criteria for formation flight systems extended to helicopter and V/STOL transports A71-35923
High speed aircraft maneuvers stability determination by constant angular pitching/rotation velocity, angle of attack and flight speed, using Liapunov method A71-36176
Engine dynamics requirements implied by thrust modulation control for VTOL aircraft [NASA-TT-P-13755] N71-31455

AIRCRAFT STRUCTURES
Aircraft structural parameters optimization satisfying flutter velocity constraint and minimum mass, applying to box beam design N71-34874
Aircraft structures damage tolerance - ASTM Conference, Philadelphia, June 1970 A71-35151
Thickness effect on fracture toughness and crack propagation of Al alloy sheets used for aircraft skins A71-35153
Damage tolerant aircraft structures material toughness and residual strength, presenting fracture test results on precracked panels reinforced with crack stoppers A71-35157
Wing structural elements ballistic damage tolerance and residual fracture strength characteristics, discussing projectile velocity, impact angle and target thickness effects A71-35161
Soviet papers on thin walled aircraft structures strength and stability covering bending theory, circular cylindrical shells, thermal stresses of rectangular plates, etc A71-35301
Aircraft structural panels under cyclic static loads, examining fatigue life with probability theory, statistics and regression analysis A71-35312
Light alloys fatigue characteristics for aircraft components endurance evaluation A71-35456
Weight reduction potential of composite materials in aerospace structures, proposing weight estimation technique [SHE PAPER 887] A71-35819
Composite structures development, discussing wing, fuselage, aeropropulsion and missile development, weight savings of hardware and fighter empennage applications [AIAA PAPER 71-357] N71-36275
Composed design of wing structures and application of optimal law of material distribution (AD-722303) A71-39657
Fatigue crack length relationship with aircraft inspection intervals and structural reinforcement, high strength materials, and aircraft usage effects
AIRCRAFT TIRES

AIRCRAFT WHEELS
Flow field induced by aircraft trailing vortices near ground during takeoff and landing, noting experimental departure from theory.

AIRCRAFT WAKE
Chevron cutting and effects of braking on wheel of aircraft tires.

AIRCRAFT WAKE
Vortex wake generated by large jet transport aircraft on smaller airplanes.

AIRFIELD SURFACE MOVEMENTS
ATC system models, covering surface movement, runway utilization, terminal areas and enroute traffic.

AIRFOIL PROFILES
Detwisted castellated airfoil cross section turbine and compressor blades vibration natural frequencies and mode shapes.

AIRFOILS
Subcritical nonlinear flow over two dimensional laminar airfoils by multistrip method of integral relations.

AIRFOILS
Unsteady airfoil stall characteristics using static data input for predicting stall flutter boundaries of space shuttle wing.

AIRFRAMES
Strategic boom B-1A program, discussing airframe and engine contractors, design, characteristics performance, electronic equipment and armament.

AIRLINE OPERATIONS
German monograph on airport role in national economy and growth and location determination for enterprises maintaining connections with foreign countries.

SUBJECT INDEX

Aircraft II operations at various airports, considering all-weather landing requirements of airborne equipment, maintenance standards, pilot training, etc.

Aircraft for international long haul transportation, discussing criteria for selection based on environmental, operational, budgetary and policy considerations.

Air transportation safety review covering weather knowledge, aircraft structures, instrumentation, radio aids and power plants.

Maintenance control system /MCS/, management information system encompassing subsystems supporting scheduling, forecasting, performance evaluation, modifications and improvement functions.

New IATA passenger and baggage international air transport conditions, discussing passenger/cargo legal relationships, with emphasis differences between new and old regulations.

Airline operations, costs, effects on aircraft industry, and cooperation with CAB.

Analysis of physical and economic factors pertaining to effective operation of vertical takeoff and landing aircraft short range commercial transportation - Vol. 1 (AR-326/021-VOL-1)

Identification and analysis of potential sites for vertical takeoff and landing aircraft facilities in Great Britain - Vol. 2 (AR-326/021-VOL-2)

Aircraft accident report of DC-9 civilian aircraft ditching near St. Croix, Virgin Islands, May 1970 following fuel exhaustion.

Review of policies affecting civil aviation, problems confronting it, and potential for future contributions to national benefit.

Conference on NASA research in aircraft safety and operating problems (NASA-SP-265).

AIRCRAFT TIRES
Approximative solution of nonlinear potential equation for small disturbance in transonic range and pressure distribution on aircraft.

AIRCRAFT TIRES

AIRCRAFT TIRES
Airfield surface behavior.

AIRCRAFT TIRES
Airfoil profiles.

AIRCRAFT TIRES
Airplane design, construction, certification and use.

AIRCRAFT TIRES
Airframe materials.

AIRCRAFT TIRES
Airframes.

AIRCRAFT TIRES
Airline operations.
<table>
<thead>
<tr>
<th>SUBJECT INDEX</th>
<th>ATMOSPHERIC TURBULENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td></td>
</tr>
<tr>
<td>[PB-197860]</td>
<td>N71-29756</td>
</tr>
<tr>
<td>Systems analysis approach to airport planning and predicting terminal facility and aircraft demands in year 2000 for air traffic control systems</td>
<td></td>
</tr>
<tr>
<td>[NASA-CR-119287]</td>
<td>N71-30800</td>
</tr>
<tr>
<td>AIRPORTS</td>
<td></td>
</tr>
<tr>
<td>Probable impact of future supersonic transport aircraft operations on noise environment around seven airports in US</td>
<td></td>
</tr>
<tr>
<td>[AD-722233]</td>
<td>N71-29777</td>
</tr>
<tr>
<td>Extension of New York Waterfront Commission to area airports and establishment of security measures to combat air cargo theft</td>
<td></td>
</tr>
<tr>
<td>[DEPT-91-1262]</td>
<td>N71-30164</td>
</tr>
<tr>
<td>Wind pressure and cross flow velocity profiles for short takeoff aircraft building roof airports</td>
<td></td>
</tr>
<tr>
<td>N71-30776</td>
<td></td>
</tr>
<tr>
<td>Analysis of transit access to Oakland International Airport, Oakland, California, and recommendations for improved service</td>
<td></td>
</tr>
<tr>
<td>[PB-197837]</td>
<td>N71-31463</td>
</tr>
<tr>
<td>ALGORITHMS</td>
<td></td>
</tr>
<tr>
<td>Optimal digital controller based on linear approximation of acoustical test facility, for determining effects of supersonic rocket engine noise on vehicle surface</td>
<td></td>
</tr>
<tr>
<td>[NASA-CR-115073]</td>
<td>N71-30741</td>
</tr>
<tr>
<td>AL-WEATHER AIR NAVIGATION</td>
<td></td>
</tr>
<tr>
<td>Category II operations at various airports, considering all-weather landing requirements of airborne equipment, maintenance standards, pilot training, etc.</td>
<td></td>
</tr>
<tr>
<td>[SAGE PAPER 710442]</td>
<td>A71-34499</td>
</tr>
<tr>
<td>ALLOYS</td>
<td></td>
</tr>
<tr>
<td>Light alloys fatigue characteristics for aircraft components endurance evaluation</td>
<td></td>
</tr>
<tr>
<td>A71-35456</td>
<td></td>
</tr>
<tr>
<td>ALTERNATORS</td>
<td></td>
</tr>
<tr>
<td>Study of constant inertially aided barometric altitmeter system to meet vertical separation requirements of 1000 and 2000 feet for Mach 3.5 aircraft in altitude hold at 80,000 feet</td>
<td></td>
</tr>
<tr>
<td>[NASA-CR-1770]</td>
<td>N71-31307</td>
</tr>
<tr>
<td>ALTITUDE SIMULATION</td>
<td></td>
</tr>
<tr>
<td>Preliminary study of airplane-autopilot response to atmospheric turbulence while operating in altitude-hold and attitude-hold modes</td>
<td></td>
</tr>
<tr>
<td>N71-30780</td>
<td></td>
</tr>
<tr>
<td>ALUMINUM</td>
<td></td>
</tr>
<tr>
<td>Aerodynamic characteristics of vehicle models in aluminum tube</td>
<td></td>
</tr>
<tr>
<td>A71-31108</td>
<td></td>
</tr>
<tr>
<td>ALUMINUM ALLOYS</td>
<td></td>
</tr>
<tr>
<td>Thickness effect on fracture toughness and crack propagation of Al alloy sheets used for aircraft skins</td>
<td></td>
</tr>
<tr>
<td>A71-35153</td>
<td></td>
</tr>
<tr>
<td>Fatigue crack propagation in Al alloy panels stiffened with bolted and integral stringers, determining stress intensity factor/crack growth rate relationship</td>
<td></td>
</tr>
<tr>
<td>A71-35156</td>
<td></td>
</tr>
<tr>
<td>ANALOG TO DIGITAL CONVERTERS</td>
<td></td>
</tr>
<tr>
<td>Large scale NOS IC digital VOR navigation converter, comparing accuracy, size, weight and cost with standard design</td>
<td></td>
</tr>
<tr>
<td>A71-35789</td>
<td></td>
</tr>
<tr>
<td>ANGLE OF ATTACK</td>
<td></td>
</tr>
<tr>
<td>High speed aircraft maneuvers stability determination by constant angular pitching/rotation velocity, angle of attack and flight speed, using Liapunov method</td>
<td></td>
</tr>
<tr>
<td>A71-36176</td>
<td></td>
</tr>
<tr>
<td>Dynamic parameters of supersonic flow incident on conical bodies at large angles of attack, considering flow field and entropy distribution</td>
<td></td>
</tr>
<tr>
<td>A71-36328</td>
<td></td>
</tr>
<tr>
<td>Jet penetration into Mach 2 airstream using sweptback injectors at angle of attack</td>
<td></td>
</tr>
<tr>
<td>ANGULAR VELOCITY</td>
<td></td>
</tr>
<tr>
<td>High speed aircraft maneuvers stability determination by constant angular pitching/rotation velocity, angle of attack and flight speed, using Liapunov method</td>
<td></td>
</tr>
<tr>
<td>A71-36176</td>
<td></td>
</tr>
<tr>
<td>A71-36917</td>
<td></td>
</tr>
<tr>
<td>ANTENNA DESIGN</td>
<td></td>
</tr>
<tr>
<td>Compact, self contained, symmetrical antenna for airborne use at high frequencies with capability to function in two independent modes for both transmission and reception</td>
<td></td>
</tr>
<tr>
<td>[AD-722736]</td>
<td>N71-29895</td>
</tr>
<tr>
<td>Aerodynamic characteristics, rocket nozzles, spacecraft propulsion, antenna design, and internal combustion engines</td>
<td></td>
</tr>
<tr>
<td>[NASA-CR-119315]</td>
<td>N71-31106</td>
</tr>
<tr>
<td>ANTENNA RADIATION PATTERNS</td>
<td></td>
</tr>
<tr>
<td>Meter wave aircraft slot antenna for Concorde air to ground communication via satellite, presenting synthetic radiation patterns</td>
<td></td>
</tr>
<tr>
<td>A71-36514</td>
<td></td>
</tr>
<tr>
<td>APPROACH CONTROL</td>
<td></td>
</tr>
<tr>
<td>Approach guidance system for side-firing tactical aircraft</td>
<td></td>
</tr>
<tr>
<td>N71-29708</td>
<td></td>
</tr>
<tr>
<td>Vertical situation display concept for alleviating problems of inadequate guidance and display information for making steep approaches</td>
<td></td>
</tr>
<tr>
<td>N71-30770</td>
<td></td>
</tr>
<tr>
<td>Terminal area studies with IC-142, IV-5, Do-31, and P 1127 aircraft to develop powered lift control techniques for instrument approach</td>
<td></td>
</tr>
<tr>
<td>N71-30774</td>
<td></td>
</tr>
<tr>
<td>ARMED FORCES</td>
<td></td>
</tr>
<tr>
<td>Statistical analysis of Navy and Marine aircraft activity and airspace usage in Feb. and Mar. 1970 as part of National Airspace Utilization System</td>
<td></td>
</tr>
<tr>
<td>N71-30174</td>
<td></td>
</tr>
<tr>
<td>ARBORE</td>
<td></td>
</tr>
<tr>
<td>Armored cockpit for attack aircraft combat effectiveness, including solid wire tumbling plates, terminal ballistic kinematics and integral structural armor</td>
<td></td>
</tr>
<tr>
<td>A71-35530</td>
<td></td>
</tr>
<tr>
<td>ARRSTERS</td>
<td></td>
</tr>
<tr>
<td>Civil aircraft arresting on runway overshoots, describing safe deceleration method by use of soft ground arresters</td>
<td></td>
</tr>
<tr>
<td>A71-35210</td>
<td></td>
</tr>
<tr>
<td>ARRESTING GEAR</td>
<td></td>
</tr>
<tr>
<td>Space shuttle vehicles landing with emergency arrestment aids, describing tailhook/cable, net and landing gear/cable engagement methods</td>
<td></td>
</tr>
<tr>
<td>A71-36688</td>
<td></td>
</tr>
<tr>
<td>ARROW WINGS</td>
<td></td>
</tr>
<tr>
<td>Experimental and analytical study of supersonic longitudinal and lateral aerodynamic characteristics of slender sharp edge 74 deg swept wings</td>
<td></td>
</tr>
<tr>
<td>A71-30530</td>
<td></td>
</tr>
<tr>
<td>ASPHALT</td>
<td></td>
</tr>
<tr>
<td>Asphalt pavement design for heavy multishore aircraft, using DISOLO computer program</td>
<td></td>
</tr>
<tr>
<td>A71-36000</td>
<td></td>
</tr>
<tr>
<td>ASTRODYNICS</td>
<td></td>
</tr>
<tr>
<td>Space shuttle avionics system redundancy, calculating costs for individual line replaceable units</td>
<td></td>
</tr>
<tr>
<td>A71-36479</td>
<td></td>
</tr>
<tr>
<td>ASTROPHYSIC METHODS</td>
<td></td>
</tr>
<tr>
<td>Self similar numerical and asymptotic solutions of laminar multidump isothermal boundary layer equations for large blowing rates</td>
<td></td>
</tr>
<tr>
<td>A71-35633</td>
<td></td>
</tr>
<tr>
<td>Asymptotic expansion techniques to define pressure loading effects on wings with unbalanced control surfaces</td>
<td></td>
</tr>
<tr>
<td>A71-29348</td>
<td></td>
</tr>
<tr>
<td>ATMOSPHERIC COMPOSITION</td>
<td></td>
</tr>
<tr>
<td>Stratospheric ozone reduction through catalytic action of nitrogen oxides from SST exhaust, discussing degrading effect on atmospheric radiation shield</td>
<td></td>
</tr>
<tr>
<td>A71-36922</td>
<td></td>
</tr>
<tr>
<td>ATMOSPHERIC TURBULENCE</td>
<td></td>
</tr>
<tr>
<td>Systems analysis of aircraft, aircraft guidance and control systems, and atmospheric turbulence for low visibility instrument landing system requirements</td>
<td></td>
</tr>
<tr>
<td>A71-36922</td>
<td></td>
</tr>
</tbody>
</table>
ATTACK AIRCRAFT

[AD-722773] W71-300173
Evaluating effects of high altitude turbulence encounters on EB-70 airplane
Flight tests to determine handling qualities of general aviation aircraft during ILS approaches in turbulent air
Evaluating analytical models of turbulence having non-Gaussian gusts distributions and effects of wind shear on aircraft operations
W71-30771
Preliminary study of airplane-autopilot response to atmospheric turbulence while operating in altitude-hold and attitude-hold modes
W71-30780
Aircraft design, flight characteristics, and atmospheric effects on sonic boom during supersonic and hypersonic flight
Approximative solution of nonlinear potential equation for small disturbance in transonic range and pressure distribution on aircraft
Estimation of lateral and longitudinal rigid body responses of aircraft structures continuous and random atmospheric turbulence
Prediction method for performance of total pilot-vehicle system in turbulence with application to tracking tasks
[AD-722855] W71-31202
ATTACK AIRCRAFT Armored cockpit for attack aircraft combat effectiveness, including sold line tumbling plates, toroidal ballistic kinematics and integral structural armor
[AAIA PAPER 71-778] A71-35530
ATTITUDE CONTROL Preliminary study of airplane-autopilot response to atmospheric turbulence while operating in altitude-hold and attitude-hold modes
W71-30780
AUTOMATIC CONTROL Computerized automatic control aircraft electrical system using remote power controllers and multiplexed data bus for wiring reduction and reliability improvement
W71-31061
Avionic and missile computer control systems, describing universal function unit design and digital processing requirements
W71-34700
Remote power controller as static circuit protection device for aircraft and spacecraft automatically controlled electrical wiring system, discussing performance improvements
W71-35702
AUTOMATIC FLIGHT CONTROL Soviet book on aircraft automatic control systems covering linear theory, design, autopilot, man machine performance, operation modes, etc
W71-34743
Preliminary study of airplane-autopilot response to atmospheric turbulence while operating in altitude-hold and attitude-hold modes
W71-30780
AUTOMATIC LANDERS CONTROL Soviet book on aircraft automatic landing coverings, automatic landing and information display systems
W71-35194
Lockheed L-1011 development, discussing flying stabilizer design, direct lift control and autoi l load system
[AAIA PAPER 71-782] A71-35532
Cost effective high speed projectile trajectory plotting system for guidance range instrumentation, applying to aircraft path recording during automatic landing control
W71-36613
AUTOMATIC PICTURE TRANSMISSION Frequency memories application to earth-satellite-aircraft UHF communications, repeater apparatus and multiple access transmission of half tone images in worldwide satellite communication
W71-36553
AUTOMATIC PILOTS
Soviet book on aircraft automatic control systems covering linear theory, design, autopilot, man machine performance, operation modes, etc
ATC avionics equipment, discussing inertial area navigation, autopilots, airborne data acquisition, altitude reporting, collision avoidance, CAT, satellite communications, etc
BAC 111 autopilot development, discussing computer compatible system for digital representation of airborne flight test data and direct transmission to ground-based computers
Preliminary study of airplane-autopilot response to atmospheric turbulence while operating in altitude-hold and attitude-hold modes
W71-30780
AVIONICS
ATC avionics equipment, discussing inertial area navigation, autopilots, airborne data acquisition, altitude reporting, collision avoidance, CAT, satellite communications, etc
Coset 4 installation and experimental program, investigating avionics systems integration techniques
AVIONICS and missile computer control systems, describing universal function unit design and digital processing requirements
Space shuttle avionics system redundancy, calculating costs for individual line replaceable units
Test methods and testing techniques for determining technical performance and safety characteristics of ground support service aviation equipment
[AD-723036] W71-30258
Magnitude of induced voltages and their relation to characteristics of lightning discharge and electrical properties of aircraft electrical systems
W71-30761
AXIAL FLOW TURBINES Siren wall in turbine axial stage due to nonuniform pressure fields behind blade cascades
W71-36180
AXISTERTIC STREAM FLOW Binary liquid boundary layer in hypersonic axisymmetric stagnation point flow with temperature dependent material properties, presenting exact and approximate calculation methods
Soviet equipment
W71-3422
Superonic jet interaction with turbulent wake, calculating plane and axisymmetric flow behind body butt face
W71-35630
B-70 AIRCRAFT
Evaluating effects of high altitude turbulence encounters on EB-70 airplane
XB-70 aircraft for investigating and predicting clear air turbulence in stratosphere caused by mountain waves
BAC 111 AIRCRAFT BAC 111 autopilot development, discussing computer compatible system for digital representation of airborne flight test data and direct transmission to ground-based computers
W71-36572
BALANCING Subsonic static characteristics of slender wing configurations using magnetic suspension and balance system
BASE FLOW Inclined wedges in rarefied hypersonic flow conditions, investigating base and wake pattern
Utilization of aerospace nonflammable cellulosic elastomeric, fibrous, and composite materials in commercial aircraft refurbishment

C-130 AIRCRAFT

[C-130 AIRCRAFT

Multipurpose scanner and data system with 24 channels for NASA C-130 earth resources survey aircraft

C-131 AIRCRAFT

Total in-flight simulator /TIFS/ in variable stability C-131 aircraft, describing potential as design tool

C-5 AIRCRAFT

Ditching behavior of dynamic C-5A model

CALCULUS OF VARIATIONS

Minimum variance estimates of signal derivatives with application to case of aircraft descent rate parameter landing systems

CARBON WINGS

Aerodynamic characteristics of thin, highly cambered airfoils in incompressible flow

CARBON FIBERS

High modulus graphite composite applications for structural weight reduction and stiffness requirement without strength loss

CARBON MONOXIDE

Reductions in smoke level and carbon monoxide emissions resulting from air-assist fuel nozzles in jet aircraft exhaust pollutant tests

CARBON STEELS

Closeout die forgings of vacuum remelted carbon and low alloy steels to improve transverse ductility and microcleanliness for aircraft industry

CARET WINGS

Design shock wave correspondence to strong oblique shock, discussing off design behavior of caret wing

Supersonic aircraft propulsion by external heat addition, discussing numerical method for suitable caret wing design

CASCADE FLOW

Stream lines construction in meridional plane of blade nozzle annular cascades of steam and gas turbines in subsonic and supersonic flow

Siren wall in turbine axial stage due to nonuniform pressure fields behind blade cascades

CASE HISTORIES

Case histories of aircraft damage due to wind acting on airport surfaces, discussing wind and related protection

CATALYTIC ACTIVITY

Stratospheric ozone reduction through catalytic action of nitrogen oxides from SST exhaust, discussing degrading effect on atmospheric radiation shield

CELLULOSE

Utilization of aerospace nonflammable cellulosic elastomeric, fibrous, and composite materials in commercial aircraft refurbishment

CENTER OF GRAVITY

V/STOL aircraft with vectored thrust propulsion systems, noting weight and center of gravity-lift- thrust relationship changes effect on performance

Mass and center of gravity determining system model, describing equipment, operation principle, calibration data and techniques accuracy and errors

CERTIFICATION

French flight test center role in development and certification of Concorde aircraft, considering cooperation with industry

C-67 HELICOPTER

Tapered collector bearing lubrication, considering application to C-67 Boeing helicopter transmission

CIRCUIT PROTECTION

Aircraft electric power system design with reliability, simplicity, low cost, weight, and size, discussing automatic circuit protection and energy power

Remote power controller as static circuit protection device for aircraft and spacecraft automatically controlled electrical wiring system, discussing performance improvement

CIRCUIT RELIABILITY

Aircraft electric power system design with reliability, simplicity, low cost, weight, and size, discussing automatic circuit protection and energy power

CIVIL AVIATION

Navigation and communication satellites development for civil aviation and shipping, examining technical, organizational, operational and cost problems

Civil aircraft arresting on runway overshoots, describing safe deacceleration method by use of soft ground arresters

Military and civil aircraft navigation systems development, emphasizing self contained airborne equipment

Civil aviation and merchant marine satellites, considering aircraft and surface vessel antenna characteristics and modulation techniques for optimum communication channel frequencies

Air transportation safety review covering weather knowledge, aircraft structures, instrumentation, radio aids and power plants

Civil aircraft market analysis, examining replacement cycle and used aircraft market based on aircraft histories

German glossary of commercial air traffic with English equivalents

Airline operations, costs, effects on aircraft industry, and cooperation with CAB

Review of policies affecting civil aviation, problems confronting it, and potential for future contributions to national benefits

Civil aviation research and development projects noting characteristics and growth to date, current problems, future requirements, potential solutions, and recommendations

Analysis of 79,000 hours data obtained from NASA V-G/VGH flight recorders installed on 731 general aircraft engaged in eight types of operations

Performance tests on liquid explosive emergency exit for civil aircraft

SUBJECT INDEX
<table>
<thead>
<tr>
<th>SUBJECT INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLEAR AIR TURBULENCE</td>
</tr>
</tbody>
</table>
ATC avionics equipment, discussing inertial area navigation, autopilots, airborne data acquisition, altitude reporting, collision avoidance, CAT, satellite communications, etc. A71-36615
Detecting clear air turbulence using CO2 laser Doppler system N71-30763
IB-70 aircraft for investigating and predicting clear air turbulence in stratosphere caused by mountain wave Nasa CR-1876 N71-31351
CLIMBING FLIGHT |
Flight simulator evaluation of aircraft instrument departure procedure [FAA-FS-600-2] N71-29635
CLOSED CYCLES |
Aircraft jet engine application of electric discharge machining for repetitive continuous production, considering automated closed cycle equipment [SPE PAPER 87-71-143] A71-3658
COASTS |
Design of computer assisted information system to provide seacoast data for military purposes [AD-722427] N71-29660
CockPits |
Armored cockpit for attack aircraft combat effectiveness, including cold line tubing plate, terminal ballistic kinematics and integral structural armor [AIAA PAPER 71-778] A71-35530
CORE |
COLLISION AVOIDANCE |
Low-cost pilot indicator for midair collision avoidance N71-30760
COLLOCATION |
Box collocation method for calculating aerodynamic loads on tandem delta wings with oscillations in supersonic flow N71-29337
COMBAT |
Armored cockpit for attack aircraft combat effectiveness, including cold line tubing plate, terminal ballistic kinematics and integral structural armor [AIAA PAPER 71-778] A71-35530
Cockpit time reconnaissance cockpit display system for airborne sensor systems, providing night combat imagery A71-35772
CONSUMPTION CHAMBERS |
Gas turbine with high velocity combustor, pure impulse compressor and turbine and isothermal burner A71-3650
Velocity profile control tests of diffuser wall bleed to control combustor inlet airflow [NASA-TW-D-6435] N71-30817
Use of air-assist fuel nozzle to reduce exhaust emissions from gas turbine combustor at simulated idle conditions - J-57 engine [NASA-TW-D-6404] N71-31456
COMET & AIRCRAFT |
Coast & installation and experimental program, investigating avionics systems integration techniques A71-35070
COMMERCIAL AIRCRAFT |
Utilization of aerospace nonflammable cellulosic elastomeric, fibrous, and composite materials in commercial aircraft refurbishment N71-30759
Senate hearings on Federal anti-skyjacking program N71-31511
Trends in air transportation and airline industry operations from 1970 to 1980 N71-31512
COMMUNICATION SATELLITES |
Navigation and communication satellites development for civil aviation and shipping, examining technical, organizational, operational and cost problems A71-3512
Compressible flow application to earth-satellite- aircraft DBF communications, repeater apparatus and multiple access transmission of half tone images in worldwide satellite communication A71-36553
Compressible Fluids |
Time division multiplexing system for APS, discussing surveillance geostationary satellite feasibility, delta modulation for data transmission and aircraft equipment A71-36520
Composites communication satellite system for airborne traffic control and navigation, discussing aircraft antenna beam electronic scanning by computerized control A71-34680
Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function A71-35097
Queueing theory approach to communication satellite network design, applying to ocean air traffic control and worldwide military broadcast systems A71-35106
Civil aviation and merchant marine satellites, considering aircraft and surface vessel antenna characteristics and modulation technique for optimum communication channel frequencies A71-35582
Radio tracking of aircraft by two geostationary satellites, discussing measurement, navigation and position errors A71-36508
ESRO part of joint ATC communication experiment for L band satellite use, giving voice and data transmission and distance measurement techniques test results A71-36510
Frequency estimation application to earth-satellite-aircraft UHF communications, repeater apparatus and multiple access transmission of half tone images in worldwide satellite communication A71-36521
Component Reliability |
Gas turbine engines materials and components equivalent service life estimation A71-35452
Integrated drive generator for aircraft electrical power systems, improving weight, life and reliability A71-35781
Cast iron by boundary, elastohydrodynamic, and fluid film, wear due to fretting, erosion, scuffing, and pitting, and friction in aircraft [NASA-TR-X-67872] N71-31134
Evaluating three component electronic wind tunnel balance installed in 3.5 by 5.0 ft subsonic tunnel [AD-722571] N71-31400
Composite Materials |
High modulus graphite composite application for structural weight reduction and stiffness requirement without strength loss A71-35201
Composite materials effect on supersonic aircraft weight, design and performance [SABE PAPER 888] A71-35818
Weight reduction potential of composite materials in aerospace structures, proposing weight estimation technique [SABE PAPER 887] A71-35819
Design, analysis and testing of F-111 complex fuselage full scale section of composite materials, noting weight savings [SABE PAPER 889] A71-35825
Utilization of aerospace nonflammable cellulosic elastomeric, fibrous, and composite materials in commercial aircraft refurbishment A71-30759
Composite Structures |
Composite structures development, discussing wing, fuselage, aeropropulsion and missile development, weight savings of hardware and fighter espionage applications [AIAA PAPER 71-367] A71-36275
Compressible Flow |
Gust loading on two dimensional thin airfoil in compressible flow, deriving closed-form lift expression A71-35285
Compressible Fluids |
Birchheit problem in hodograph plane of
COMPRESSION TESTS

compressible fluid flow from aircraft, helicopter blades or turbine blade airfoils

A71-35470

COMPRESSION TESTS

Supersonic cylindrical freestream compressor with low blade height for elementary compression and flow visualization aerodynamic and thermodynamic tests

A71-35467

COMPRESSION BLADES

Linear radial loads effect on stress and strain of hyperboloidal rotor for disk applied to aircraft engine compressors with two streams flow of working medium

A71-35457

Pre-twisted cantilever airfoil cross section turbine and compressor blades vibration natural frequencies and mode shapes

A71-35482

Multiple tone generation by axial flow transonic compressors, considering shock waves production and propagation associated with supersonic elements of blading

A71-36497

COMPUTER DESIGN

Avionic and missile computer control systems, describing universal function unit design and digital processing requirements

A71-35775

Hardware executive control with associative memory for avionic digital computer system, comparing computation speed, cost and reliability with software method

A71-35778

COMPUTER PROGRAMS

Analytical weight determination of articulated shaft drives helicopter main rotor blades, presenting computer program

A71-35826

Computer program for evaluating subsonic flow over wing-tail, wings with folded tips, T tails, and cruciform tail surfaces

A71-29341

Computer program for calculating airforce coefficients of wing-horizontal tail and fin-horizontal tail oscillating in subsonic flow

A71-29342

Computer program used for design criteria of stall characteristics of straight wing aircraft

A71-31154

COMPUTER TECHNIQUES

Computerized automatic control of aircraft electrical system using remote power controllers and multiplexed data bus for wiring reduction and reliability improvement

A71-34700

Computerized solutions of gas turbine engines motion equations, considering Euler, fourth order and fifth order Runge-Kutta, Adams, Bashforth and implicit methods

A71-36809

Aircraft industry license norms and standards, describing indexing procedures, storage techniques and data recovery operations with computer

A71-36810

Computer-based aircraft tracking with aid of twin radar air traffic control system, discussing components and operation

A71-36993

COMPRESSIBLE DESIGN

Computerized propeller design considered flow field distortion by hub

A71-29690

COMPRESSIBLE SIMULATION

Precision area navigation system, considering position and velocity continuous measurement in three dimensional space, system components and simulation program

A71-38616

Aircraft loading system consisting of onboard weight and balance equipment and fully mechanized cargo pallet transfer, using computerized simulation model for parametric evaluation

A71-35811

CONCORDE AIRCRAFT

French flight test center role in development and certification of Concorde aircraft, considering cooperation with industry

A71-35526

Thermal ground testing of Concorde and Veras, considering static and fatigue testing in heat environment

A71-36440

Meter wave aircraft slot antennas for Concorde air to ground communication via satellite, presenting synthetic radiation patterns

A71-36510

CONDENSATION

Method of characteristics application to supersonic jet and nozzle gas flow with allowance for equilibrium and nonequilibrium condensation

A71-35636

CONFERENCES

Millimeter system, devices and guided, Conference, Los Angeles, August 1970, Volume 1

A71-36401

Aircraft structures damage tolerance - ASTM Conference, Philadelphia, June 1970

A71-35151

Aerospace electronics - IEEE Conference, Dayton, Ohio, May 1971

A71-35752

Fluid dynamics numerical methods - Conference, University of California at Berkeley, September 1970

A71-36301

Symposium on unsteady aerodynamic forces, loads, and configurations for aerelastic analysis of interfering surfaces

A71-29338

Conference on NASA research in aircraft safety and operating problems

A71-30756

CONGRESS

Congressional hearings on chartered airline travel

A71-29707

Control equipment and engine development for air pollution control from jet aircraft engine emissions

A71-31403

Senate hearings on Federal anti-skyjacking program

A71-31511

CONICAL BODIES

Cone-cylinder-cone missile type body in transonic buffetting environment determining static and fluctuating wall pressure distribution

A71-36420

Dynamic parameters of supersonic flow incident on conical bodies at large angles of attack, considering flow field and entropy distribution

A71-36328

CONICAL FLOW

Dynamic parameters of supersonic flow incident on conical bodies at large angles of attack, considering flow field and entropy distribution

A71-36328

CONSTRUCTION MATERIALS

Light alloys fatigue characteristics for aircraft components endurance evaluation

A71-35456

CONTAMINANTS

Effects of runway contaminants and pavement surface properties on runway slipperiness

A71-30767

Reductions in smoke level and carbon monoxide emissions resulting from air-assist fuel nozzles in jet aircraft exhaust plume tests

A71-30784

CONTRACT NEGOTIATION

Negotiations of SEAR/BOAC productivity agreements in aircraft industry

A71-35924

CONTROL EQUIPMENT

Aircraft structure elasticity effects on control lever deflection and control forces

A71-31065

Control equipment and engine development for air pollution control from jet aircraft engine emissions

A71-31403

CONTROL SIMULATION

Analysis of glide-slope information requirements for low visibility aircraft landing approach using Kalman filter-optimal control combination to simulate DC-8 control system

A71-35470
COHTRBOL STABILITY

COHTRBOL SUBFACES

COHTRBOL UBITS (COHPUTKBS)

COHTRBOL LABILITE

COOLIHG

COST EFFECTIVENESS

COST ANALYSIS

COST REDUCTION

COSTS

CRACK INITIATION

CRACK PROPAGATION

CRACKING (FRACTURING)

CREDIBLE SHELLS

CROSS FLOW

CROSSPORN WINGS

CYCLIC LOADS

CYLINDRICAL BODIES

CYLINDRICAL SHELLS

STABILITY

SUBJECT INDEX

[AD-722655] COHTRBOL STABILITY

[AD-71-30887] CONTROL STABILITY

[AD-71-31065] Aircraft structure elasticity effects on control lever deflection and control forces

[AD-71-29346] CONTROL SURFACES

[AD-71-29347] Calculation of pressure distributions over wings with harmonic oscillating control surfaces using kernel function method

[AD-71-29348] Application of lifting surface theory to wings with control surfaces in unsteady subsonic flow

[AD-71-29349] Asymptotic expansion techniques to define pressure loading effects on wings with unbalanced control surfaces

[AD-71-29350] Unsteady pressure measurements on harmonically oscillating swept wing with two control surfaces in incompressible flow

[AD-71-29351] CONTROL UNITS (COMPUTERS)

[AD-71-35778] Hardware executive control with associative memory for avionics digital computer system, comparing computation speed, cost and reliability with software method

[AD-71-30771] CONTROLLABILITY

[AD-71-2937] Flight tests to determine handling qualities of general aviation aircraft during ILS approaches in turbulent air

[AD-71-30772] CONVECTIVE FLOW

[AD-71-35259] Convective flow at stagnation point relation to radiation flow decrease as result of absorption in cold boundary layer

[AD-71-34902] CONVECTIVE HEAT TRANSFER

[AD-71-29347] Laminar convective heat transfer rates on hemisphere cylinder in rarefied hypersonic flow, comparing experimental results with Cheng, Davis and Lee theories

[AD-71-31482] COOLING

[AD-71-34904] Heat sink capabilities of Jet-A fuel - heat transfer and cooling studies

[AD-71-31482] COOLING SYSTEMS

[AD-71-36347] Fan jet first stage turbine blade air cooling, describing design, heat transfer data, efficiency and temperature distribution

[AD-71-36348] COSMIC RAYS

[AD-71-30773] Experimental and theoretical study of biologically important radiation components and dose equivalents due to galactic and solar rays at SST in high atmosphere - summary

[AD-71-30774] COST ANALYSIS

[AD-71-36349] Operating costs and runway lengths for SST in city and suburban short haul air transportation

[AD-71-36479] Space shuttle avionics system redundancy, calculating costs for individual line replaceable units

[AD-71-36479] COST EFFECTIVENESS

[AD-71-30301] ATC system improvement by area navigation, discussing benefits in services, safety and cost effectiveness

[AD-71-30302] Investigation of adverse effects of producing QF-50 helicopters prior to completion of development and flight tests

[AD-71-30303] COST REDUCTION

[AD-71-29707] Congressional hearings on chartered airline travel

[AD-71-29708] COSTS

[AD-71-29256] Airline operations, costs, effects on aircraft industry, and cooperation with CAB

[AD-71-35159] CRACK INITIATION

[AD-71-35163] Fatigue crack initiation and growth and residual strength of graphite/epoxy composite material under fatigue loading results

[AD-71-35164] Failure data with full scale fatigue test results

[AD-71-35165] Fatigue crack propagation in 2024-T351 joint panel with bonded and integral stiffeners, determining stress intensity factor/crack growth rate relationship

[AD-71-35166] Helicopter rotor blades fail-safe design, presenting criteria for fatigue loaded structures residual strength and life based on crack propagation rate methods

[AD-71-30783] CRACK PROPAGATION

[AD-71-35453] Fatigue crack propagation in all alloy panels with bolted and integral stiffeners, determining stress intensity factor/crack growth rate relationship

[AD-71-35813] Failure data with full scale fatigue test results

[AD-71-31303] CRACKING (FRACTURING)

[AD-71-37056] Aircraft parts testing by NDT methods, considering ultrasonic system for valve defects and fluorescent particle system for crack detection

[AD-71-30776] CREDIBLE SHELLS

[AD-71-30777] Gas turbine engine steels and Ni alloys heat resistance, examining fatigue life and creep properties at various temperatures and test durations

[AD-71-30778] CRITERIA

[AD-71-30779] Slimation studies for development of certification criteria applicable to SST takeoff and engine failure

[AD-71-30780] Criteria and recommended practices for design, selection, analysis, and testing of deployable aerodynamic deceleration systems

[AD-71-30781] CROSS FLOW

[AD-71-30782] Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into cross wind

[AD-71-30783] CROSSPORN WINGS

[AD-71-30813] Effects of nose bluntness on static aerodynamic characteristics of cruciform wing missile at Mach 1.50 to 2.86

[AD-71-36020] CYCLIC LOADS

[AD-71-35312] Aircraft structural panels under cyclic static loads, examining fatigue life with probability theory, statistics and regression analysis

[AD-71-31109] CYLINDRICAL BODIES

[AD-71-36480] Cone-cylinder-cone missile type body in transonic buffetting environment determining static and fluctuating wall pressure distribution

[AD-71-31109] Moving long cylindrical model for aerobraking tests at high speed in drop wire facility

[AD-71-36480] CYLINDRICAL SHELLS

[AD-71-36480] Supersonic panel flutter and aerodynamic load stress analysis of finite cylindrical shells based on Galerkin method and aerelastic equilibrium equations

[AD-71-29707] COSTS

[AD-71-29708] Congressional hearings on chartered airline travel

[AD-71-29709] CRACK INITIATION

[AD-71-29256] Fatigue crack initiation and growth and residual strength of P-100 wing, comparing service failure data with full scale fatigue test results

[AD-71-35159] CRACK PROPAGATION

[AD-71-35163] Thickness effect on fracture toughness and crack propagation of Al alloy sheets used for aircraft skins

[AD-71-35164] Failure data with full scale fatigue test results

[AD-71-35165] Helicopter rotor blades fall-safe design, presenting criteria for fatigue loaded structures residual strength and life based on crack propagation rate methods

[AD-71-30783] CRACKING (FRACTURING)

[AD-71-30776] Gas turbine engine steels and Ni alloys heat resistance, examining fatigue life and creep properties at various temperatures and test durations

[AD-71-30777] CRITERIA

[AD-71-30778] Slimation studies for development of certification criteria applicable to SST takeoff and engine failure

[AD-71-30779] Criteria and recommended practices for design, selection, analysis, and testing of deployable aerodynamic deceleration systems

[AD-71-30780] CROSS FLOW

[AD-71-30781] Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into cross wind

[AD-71-30782] CROSSPORN WINGS

[AD-71-30813] Effects of nose bluntness on static aerodynamic characteristics of cruciform wing missile at Mach 1.50 to 2.86

[AD-71-36020] CYCLIC LOADS

[AD-71-35312] Aircraft structural panels under cyclic static loads, examining fatigue life with probability theory, statistics and regression analysis

[AD-71-31109] CYLINDRICAL BODIES

[AD-71-36480] Cone-cylinder-cone missile type body in transonic buffetting environment determining static and fluctuating wall pressure distribution

[AD-71-31109] Moving long cylindrical model for aerobraking tests at high speed in drop wire facility

[AD-71-36480] CYLINDRICAL SHELLS

[AD-71-36480] Supersonic panel flutter and aerodynamic load stress analysis of finite cylindrical shells based on Galerkin method and aerelastic equilibrium equations
DECELBBATION

DATALLINES

Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function

Satellite to aircraft radio link simulation, evaluating electronic scanning antenna operation, intelligibility, data transmission rate and distance measurement accuracy

DATALLINKS

Airborne display and electric management system, discussing weight reduction, protective function coordination, power quality, onboard maintenance, data processing and reliability

DATA PROCESSING EQUIPMENT

Avionic and missile computer control systems, describing universal function unit design and digital processing requirements

DATE RETRIEVAL

Aircraft industry license norms and standards, describing indexing procedures, storage techniques and data recovery operations with computer

DATA TRANSMISSION

Time division multiplexing system for ATS, discussing surveillance geostationary satellite feasibility, delta modulation for data transmission and aircraft equipment

50% part of joint ATC communication experiment for L band satellite use, giving voice and data transmission and distance measurement techniques tests results

DC 10 AIRCRAFT

DC-10 wide body tri-jet aircraft design and development, considering sizing, number of engines and thrust optimization and selection of cruise, approach and stall speeds

[ AIAA PAPER 71-780]

DC-10 fuselage pressure shell fail-safe design, presenting analysis methods for residual strength prediction of damaged stiffened panels

[ NTIS-AB-71-11-1]

DC 3 AIRCRAFT

Aircraft accident involving Federal Aviation Administration DC-3 aircraft at La Guardia airport, New York in January, 1971

[NASA-SP-8066]

DC 8 AIRCRAFT

Analysis of glide-slope information requirements for low visibility aircraft landing approach using Kalman filter-optimal control combination to simulate DC-8 control system

[AD-722655]

DE HAVILLAND AIRCRAFT

Investigation of Mississippi Valley Airways De Havilland DHC-6, N956SM crash at Lacrosse, Wisconsin Nov. 9, 1970

[NASA-SP-8066]

DECELERATION

Civil aircraft arresting on runway overshoes, describing safe deceleration method by use of soft ground arresters

[ AD-722647] N71-31183

[A-16]

DEGREES OF FREEDOM

Motor asymmetry effect on errors of two degrees of freedom gyro mounted on dynamic platform

[AD-722655] N71-31183

Link 747 simulator with six degrees of motion system for engineers and pilot training

[A-16] N71-36680

Boeing 767 digital computer type flight simulator with four degrees of movement for engineer and pilot training

[A-16] N71-36680

DEICING

Aircraft ice protection problems, considering one dimensional Stefan method for cyclic deicing system

[AD-722655] N71-34850

DELTAL MODULATION

Time division multiplexing system for ATS, discussing surveillance geostationary satellite feasibility, delta modulation for data transmission and aircraft equipment

[AD-722655] N71-36680

DELTAL WINGS

Two vortex model for downwash variations in supersonic flow past thin delta wing with separation at leading edges

[AD-722655] N71-34190

Pressures, velocities and aerodynamic characteristics of supersonic flow around slender delta wings with forced asymmetry and separation at leading edges

[AD-722655] N71-36134

Supersonic flow past thin delta wings with finite velocities at leading edges, noting wing deformation to avoid corner vortices appearance

[AD-722655] N71-36180

V shaped conical wing in supersonic and hypersonic flow with shock attached to leading edge, investigating complex wave system with time dependent and analytical methods

[AD-722655] N71-36339

Box collocation method for calculating aerodynamic loads on tandem delta wings with oscillations in supersonic flow

[AD-722655] N71-29337

DEPLOYMENT

Kerodynamic and deployment characteristics of twin keel all-flexible parawing rigged with several variations of multistage canopy and suspension line reefing system

[ NASA-TP-5-5306]

[ A-16] N71-30748

DETACHMENT

Detachment prediction in turbulent incompressible plane flows on thick bodies applied to wall with disconnections and flat plate normal to wind

[AD-722655] N71-34190

DNC 6 AIRCRAFT

Stout pressure and axle strake gage system testing for balance and weighing onboard De Havilland C-7a aircraft

[SAFE PAPER 801]

DICHROICOPHOTOMETER

Using helicopter for spray dusting forests with DOT for tick borne encephalitis

[AD-703999]

[AD-722655] N71-29557

DICTIONARIES

German glossary of commerical air traffic with English equivalents

[AD-722655] N71-36962

DIFFRACTION PATTERNS

Holographic interferometry fringe patterns interpretation for small displacements measurement, considering precision gyro stability

[AD-722655] N71-35286

DIFFUSION WELDING

Diffusion bonding as economical fabrication process for aerospace applications involving Ti alloys, emphasizing mechanical properties and structural reliability improvement

[SAFE PAPER 801]

[AD-722655] N71-36661

DIGITAL COMPUTERS

Hardware executive control with associative memory for avionic digital computer system, comparing computation speed, cost and reliability with software method

[AD-722655] N71-35778
Airborne nucleonic equipment design for indicating helicopter lift capability using X-ray backscatter from Kr-85, temperature sensor, and digital computer [NASA-505-1] N71-29215

**DIGITAL SIMULATION**

Boeing 707 digital computer type flight simulator with four degrees of movement for engineer and pilot training A71-36971

**DIGITAL SYSTEMS**

Avionic and missile computer control systems, describing universal function unit design and digital processing requirements A71-35775

**DIRECTORIAL CONTROL**

Systems analysis of directional control, rotary wing vibratory loads, lift sharing, and fuselage vibration and damping during helicopter maneuvers N71-30775

**DIRICHLET PROBLEM**

Dirichlet problem is hodograph plane of compressible fluid flow from aircraft, helicopter blades or turbine blade airfoils N71-35470

**DISCRETE FUNCTIONS**

Procedures for calculating normal wash in nonplanar configurations and interference between wings and bodies N71-29340

**DISPLACEMENT MEASUREMENT**

Holographic interferometry fringe patterns interpretation for small displacements measurement, considering precision gyro stability A71-35286

**DISPLAY DEVICES**

Airborne display and electric management system, discussing weight reduction, protective function coordination, power quality, on-board maintenance, data processing and reliability A71-36061

**Soviet book on air transportation covering ATC, automatic landing and information display systems**

**DISPLAYS**

Real time reconnaissance cockpit display system for airborne sensor systems, providing night combat imagery A71-35194

**Holographic display for blind landing system with variable image perspective over wide field of view, using collimated or cylindrical laser beams**

**DOPPLER EFFECT**

Development and application of heads up aircraft instrument display for improvement in aircraft safety during adverse weather [FAA-MA-71-9] N71-29305

**Vortical situation display concept for alleviating problems of inadequate guidance and display information for making steep approaches** N71-30770

**DITCHING (Landing)**

Aircraft accident report of DC-9 civilian aircraft ditching near St. Croix, Virgin Islands, May 1970 following fuel exhaustion [NSR-49-71-8] N71-30029

**DIURAL VARIATIONS**

Omega navigation application to general aviation aircraft, presenting diurnal course shift to overcome deficiencies A71-35767

**DOORS**

Performance tests on liquid explosive emergency exit for civil aircraft [FAA-BD-71-33] N71-31060

**DOPPLER EFFECT**

Vortex laser Doppler velocimeter system for aircraft wake turbulence velocity profile mapping, describing optical arrangements, back and forward scattering modes and prototype design A71-35756

**DOPPLER VELOCIMETER**

Wing tip vortex test demonstrating use of Laser Doppler Velocimeter system for measuring gas velocities with high spatial and temporal resolution [NASA-CR-119804] N71-30278

**DOPPLER RADAR**

Detecting clear air turbulence using CO2 laser Doppler system N71-30763

**DOWNWASH**

Two vortex model for downwash variations in supersonic flow past thin delta wing with separation at leading edges A71-34190

**Numerical method for evaluating discontinuous downwash distribution for steady flow over swept and rectangular wings**

**Survey on different methods for lifting rotor downwash analysis [DLR-BIFT-70-22]**

**Mathematical model for induced velocity distribution of lifting rotor in horizontal flight**

**Rotary wing downwash influence on fixed wing flow using magnetic induction vortex model [IC-71-6]**

**DRAINAGE**

Atlanta airport instant runway construction using concrete pavement, compacted subbase and longitudinal/herringbone underdrain A71-36349

**DUCTED FLOW**

Hypersonic viscous-inviscid internal flow field interaction with laminar boundary layer in circular ducts, using method of characteristics and implicit finite difference scheme A71-35281

**Total pressure, static pressure, surface shear stress, and yaw angle measurements of S curved ducted flow [IC-71-10]**

**DYNAMIC RESPONSE**

Aircraft random heave-pitch response to taxiing on rough runways, analyzing dynamic loads and fatigue damage by power spectral techniques A71-36675

**Application of linear control of systems with random inputs to gust response control of aircraft guidance in atmospheric turbulence [ONERA-P-131]**

**DYNAMIC STABILITY**

Dynamic positioning stationkeeping and stability criteria for formation flight systems extended to helicopter and V/STOL transports A71-35923

**Plncar and nonplanar dynamic stability coefficient using biplanar wind tunnel, free flight system flight** N71-31107

**DYNAMIC STRUCTURAL ANALYSIS**

Evaluating effects of high altitude turbulence encounters on EB-70 airplane [NASA-TR-6-6457] N71-30718

**DYNAMIC TESTING**

Ditching behavior of dynamic C-5A model N71-30757

**E**

**HAZARDS RESOURCES SURVEY AIRCRAFT**

Multispectral scanner and data system with 2a channels for NASA C-130 earth resources survey aircraft A71-36361

**ECONOMIC ANALYSIS**

Civil aircraft market analysis, examining replacement cycle and used aircraft market based on aircraft histories A71-36676

**ECONOMY**

German monograph on airport role in national economy and growth and location determination for enterprises maintaining connections with foreign countries
A-18

SUBJECT INDEX

wiring weight and energy dissipation A71-35771

ENGINE COOLANTS
Pan jet first stage turbine blade air cooling, describing design, heat transfer data, efficiency and temperature distribution A71-35904

ENGINE DESIGN
VTOL transport optimal airframe propulsion systems design, discussing thrust requirements, performance, control, cruise functions, fuel consumption and fan characteristics [AIAA PAPER 71-764] A71-34225
Maximum temperature engine concept, definition and application to future aircraft propulsion system performance [SAE PAPER 710461] A71-34098
Propulsion systems trends for 1980s, discussing environmental noise levels, stoichiometric gas turbine engines for military aircraft, high bypass ratio engines for V/STOL aircraft, etc A71-35723

Hybrid V/STOL jet lift aircraft design, examining wing area lift engine bypass ratios relation [NASA-Th-P-13755] A71-36273
Design operating process of turbojet, turboprop, and turbofan aircraft engines [AD-722283] A71-29500
Design, development, and characteristics of pulsejet engines without flap valves [NAS-A-P-9712] A71-31102
Engine dynamics requirements implied by thrust modulation control for VTOL aircraft [NASA-Th-P-6435] A71-30817

ENGINE INJECTIONS
Design and characteristics of supersonic inlet controls for minimizing inlet unstarts [NASA-Th-P-6408] A71-30072
Velocity profile control tests of diffuser wall bleed to control combustor inlet airflow distribution [NASA-Th-P-6435] A71-30817

ENGINE NOISE
Experimental research at Building Research Station on outdoor sound propagation for building design in relation to aircraft and road traffic noise [NAS-A-P-P-9712] A71-35237
Siren wall in turbine axial stage due to nonuniform pressure fields behind blade cascades [NAS-A-P-P-9712] A71-36100
Application of noise reduction technology to design of propulsion system for subsonic civil transport aircraft [NASA-Th-X-67084] A71-31101

ENGINE PAKES
Gas turbine engine materials and components equivalent service life estimation A71-35452
Aircraft gas turbine engine components equivalent testing by shortening testing time required to increase service life A71-35460

ENGINE TESTS
Aircraft gas turbine engine components equivalent testing by shortening testing time required to increase service life A71-35460
Heater and nozzle design of NHEBA/S4HA hypersonic wind tunnel for supersonic combustion ramjet tests [NAS-A-P-P-9712] A71-36017

ENTRAINMENT
Turbulent wakes flow entrainment mechanism, investigating turbulence spreading near interface between laminar and turbulent regions A71-34899

ETHOPY
Dynamic parameters of supersonic flow incident on conical bodies at large angles of attack, considering flow field and entropy distribution A71-36320

ENVIRONMENT MODELS
Random access signaling system application to aircraft control, discussing signal redundancy requirement for access capability optimization based on radio environment model A71-35783

ENVIRONMENTAL TESTS
Environmental effects on SST structural materials A71-35771
fatigue, discussing Ti alloys studies involving temperature effects, crack propagation and residual strength

EPOXY RESINS
Monograph on fiber-resin composites covering glass, boron and carbon fibers and epoxy matrix materials tensile and thermosetastic properties

EQUILIBRIUM EQUATIONS
Boron-epoxy composite wing box beam design, describing preliminary weight estimation from layouts

Equations of Motion
Computerized solutions of gas turbine engines action equations, considering Euler, fourth order and fifth order Runge-Kutta, Adams, Bashforth and implicit methods

EQUILIBRIUM FLOW
Integral equations of motion and momentum for hypervelocity wind tunnel nozzle design

ERROR ANALYSIS
Integrals of equilibrated and momentum for hypervelocity wind tunnel nozzle design

EUROPEAN SPACE PROGRAMS
Evaluating three component electronic wind tunnel balance installed in 3.5 by 5.0 ft subsonic tunnel

EXHAUST GASES
Increased exhausts of oxygen from exhausts, discussing degrading effect on atmospheric radiation shield

FIGHTER AIRCRAFT
P-100 AIRCRAFT
Fatigue crack initiation and growth and residual strength of P-100 wing, comparing service failure data with full scale fatigue test results

P-111 AIRCRAFT
Performance evaluation of variable geometry external fuel tank prototypes by static structural tests, wind tunnel tests and flight tests on F-111 aircraft

F-20 TRANSPORT AIRCRAFT
Experimental and theoretical aeroelastic analysis of Fokker F-20 T tail, using flutter model and flight flutter tests

FUEL SAFETY SYSTEMS
DC-10 fuselage pressure shell fail-safe design, presenting analysis methods for residual strength prediction of damaged stiffened panels

FATIGUE LIFE
Fatigue crack initiation and growth and residual strength of P-100 wing, comparing service failure data with full scale fatigue test results

FATIGUE TESTS
Fatigue crack initiation and growth and residual strength of P-100 wing, comparing service failure data with full scale fatigue test results

FEEDBACK CONTROL
Soviet book on radio control of various flight vehicles covering closed loop synthesis, missile guidance, spacecraft trajectory correction and air traffic control

FIBERS
Utilization of aerospace nonflammable cellulosic elastomeric, fiberglass, and composite materials in commercial aircraft refurbishment

FIGHTER AIRCRAFT
Static force tests of model of twin jet fighter aircraft at various angles of attack and
FINITE DIFFERENCE THEORY

side slip angles to obtain data for theoretical
analytical studies [NASA-TR-D-6625] A71-31330

FINITE DIFFERENCE THEORY

Finite difference method application to three
dimensional boundary layer calculation on
sphere-segment surfaces in supersonic flow
A71-35632

Supersonic flow field computation for wing-body
combinations by shock-capturing finite
difference techniques, discussing improvement
based on Runge-Kutta method A71-36303

Small disturbance transonic flows potential
equations numerical solutions, using mixed
finite difference theory A71-36325

Hypersonic and supersonic angle of attack flow
about asymmetric and axisymmetric blunt bodies
based on time-dependent finite difference theory
and method of characteristics [NASA-TR-D-6283] A71-31207

FIXES

Computer program for calculating airflow
coefficients of wing-horizontal tail and fin-
horizontal tail oscillating in subsonic flow
A71-29342

FLAMES

Heat flux distributions in pools of burning
aircraft fuels for design of protective clothing
for firefighting personnel [AD-722774] A71-31376

FLAPED WINGS

Rotary wing downwash influence on fixed wing flow
using magnetic induction vortex model
[DLR-Fb-70-62] A71-30040

FLAPホールデン

Afterburning flame stabilization in turbofan
engines [NASA-TP-P-13657] A71-30350

FLAP STABILITY

Afterburning flame stabilization in turbofan
engines [NASA-TP-P-13657] A71-30350

FLAPS (CONTROL SURFACES)

Pressure measurements of harmonically oscillating
sweepback wing with two flaps in incompressible
flow [DLR-Fb-70-47] A71-29433

Potential flow solution for STOL wing propulsion
system presenting flow fields, pressure
distribution, and lift coefficient for externally blown flap, high-lift configuration

FLAT PLATES

Detachment prediction in turbulent incompressible
plane flows on thick bodies applied to wall with
disconnections and flat plate normal to wind
A71-31419

Flow visualization and hot-wire measurements,
showing vortex shedding association with
turbulent air jet issuing from flat plate into
cross wind A71-31459

Two dimensional laminar incompressible fluid flow
past flat plate at various angles of attack,
studying vortex shedding characteristics
A71-36311

Note sensitivity of flat plates used as
structural members in aircraft wings tested on
load testing machine [TB-89] A71-30675

Turbulent boundary layer over flat plate as
compression corner models studied in hypersonic
tunnel [FIC/71/11] A71-30747

FLATNESS

Planar and nonplanar dynamic stability coefficient
using biplanar wind tunnel, free flight system
A71-31107

FLIGHT ALTITUDE

Experimental and theoretical study of biologically
important radiation components and dose
equivalents due to galactic and solar rays at
SST in high atmosphere - summary A71-30779

FLIGHT CHARACTERISTICS

High speed aircraft maneuvres stability
determination by constant angular
pitching/rotation velocity, angle of attack and
flight speed, using Liapunov method
A71-36176

Flight dynamics for aircraft noise reduction, gust
effects decrease and dynamic stability of
parachute load systems A71-36752

Aircraft design, flight characteristics, and
atmospheric effects on sonic boom during
supersonic and hypersonic flight A71-30787

FLIGHT CONTROL

Theory of controllability for parabolic and second
order hyperbolic systems and for hereditary
differential systems applied to stabilization of
high speed aircraft in gust load disturbances
[AD-722072] A71-29930

Approximative solution of nonlinear potential
equation for small disturbance in transonic
range and pressure distribution on airplane
A71-31061

FLIGHT INSTRUMENTS

Holographic imagery for aviation and space flight
[JPEG-53420] A71-30361

FLIGHT PATHS

STOL aircraft guidance capability with onboard
digital computer, maintaining time of arrival
equations at way points along complex flight
paths [AIAA PAPEB 71-770] A71-35528

Omega navigation application to general aviation
aircraft, presenting diurnal course shift to
overcome deficiencies A71-35767

Dynamic positioning stationkeeping and stability
criteria for formation flight systems extended
to helicopter and STOL transports
A71-35923

Cost effective high speed projectile trajectory
plotting system for gunnery range
instrumentation, applying to aircraft path
recording during automatic landing control
A71-36613

Approach guidance system for side-firing tactical
aircraft [AD-722412] A71-29708

Statistical analysis of Navy and Marine aircraft
activity and airspace usage in Feb. and Mar.
1970 as part of National Airspace Utilization
System [AD-722698] A71-30174

FLIGHT RECORDERS

Analysis of 79,000 hours data obtained from NASA
W-5/GGH flight recorders installed on 734
general aircraft engaged in eight types of
operations A71-30782

FLIGHT SAFETY

ATC system safety problems from user standpoint,
considering requirements by pupil, test and
airline pilots and light, private, business,
taxi and military aircraft A71-35372

FLIGHT SIMULATION

Simulation studies for development of
certification criteria applicable to SST takeoff
and engine failure A71-30777

FLIGHT SIMULATORS

Total in-flight simulator /TIFS/ in variable
stability C-131 aircraft, describing potential
as design tool [AIAA PAPEB 71-794] A71-35529

Link 747 simulator with six degrees of motion
system for engineers and pilot training
A71-36070

Boeing 747 digital computer type flight simulator
with four degrees of freedom for engineer and
pilot training A71-36971

Influence of lateral motion on effectiveness of
flight simulators in training air transport
pilots A71-30772

FLIGHT TESTS

French flight test center role in development and
certification of Concorde aircraft, considering
cooperation with industry [AIAA PAPEB 71-784] A71-35526

A-20
velocities with high spatial and temporal resolution
[NASA-CR-119806] A71-30278

GAS JETS
Shock standoff distance and Mach disk diameter measurements in underexpanded sonic jets, using nitrogen dioxide-tetroxide working fluid
[A71-34895]

Jet penetration into Mach 2 airstream using sweptback injectors at angle of attack

GAS TURBINE ENGINES
Soviet book on subsonic gas turbine passenger planes power supply systems covering Boeing 747, short haul aircraft, DC-10, L-1011, etc
[A71-38472]

Gas turbine with high velocity combustor, pure impulse compressor and turbine and isothermal burner
[A71-34590]

Gas turbine engine materials and components equivalent service life estimation
[A71-35452]

Gas turbine engine steels and Hi alloys heat resistance, examining fatigue life and creep properties at various temperatures and test durations
[A71-35453]

Gas turbine engine nozzle guide vanes under pulsed thermal operation, discussing service life evaluation and increase
[A71-35455]

Aircraft gas turbine engine components equivalent testing by shortening testing time required to increase service life
[A71-35460]

Three micron absolute main oil filter for aircraft gas turbine lubrication system, discussing indicator system and bench and engine tests
[A71-35468]

Propulsion systems trends for 1980s, discussing environmental noise levels, stoichiometric gas turbine engines for military aircraft, high bypass ratio engines for Y/STOL aircraft, etc
[A71-35625]

Computerized solutions of gas turbine engines motion equations, considering Euler, fourth order and fifth order Bunge-Tutta, Adams, Bashforth and implicit methods
[A71-36809]

Jet aircraft noise sources and reduction from gas turbine engines including jet exhausts, fans, lift devices, and uncooled rotors
[A71-30785]

GAS TURBINES
Stream lines construction in meridional plane of blade nozzle annular cascades of steam and gas turbines in subsonic and supersonic flow
[A71-36446]

GASEOUS DIFFUSION
Gaseous fission measurements from jet engine afterburners over range of fuel-air ratios

GENERAL AVIATION AIRCRAFT
Owen navigation application to general aviation aircraft, presenting diurnal course shift to overcome deficiencies
[A71-35767]

GEOLOGY
Geological exploration, development of ultrasonic flow detector, review of scientific developments, and tactical aircraft in Eastern Europe
[JPFS-53426] A71-30033

GLIDE PATHS
Analysis of glide-slope information requirements for low visibility aircraft landing approach using Kalman filter-optical control combination to simulate DC-8 control system
[AD-722655] A71-30887

GOVERNMENT/INDUSTRY RELATIONS
French flight test center role in development and certification of Concorde aircraft, considering cooperation with industry
[AIAA PAPER 71-780] A71-35526

GRAPHITE
High modulus graphite composites application for structural weight reduction and stiffness requirement without strength loss
[A71-35526]
Using helicopter for spray dusting forests with airborne nucleonics equipment design for systems analysis of directional control, rotary helicopter rotor noise due to blade-vortex interaction, computer program for calculating airflow coefficients of wing-horizontal tail and fin-horizontal tail oscillating in subsonic flow.
SUBJECT INDEX

HYPERSONIC BOUNDARY LAYER
Binary laminar boundary layer in hypersonic axisymmetric stagnation point flow with temperature dependent material properties, presenting exact and approximate calculation methods A71-35422

HYPERSONIC FIGHT
AirHeart design, flight characteristics, and atmospheric effects on sonic boom during supersonic and hypersonic flight "H71-30787

HYPERSONIC FLOW
Laminar convective heat transfer rates on hemisphere cylinder in rarefied hypersonic flow, comparing experimental results with Cheng, Davis and Lees theories A71-34902
HyPERSONIC viscous-inviscid internal flow field interaction with laminar boundary layer in circular ducts, using method of characteristics and implicit finite difference scheme A71-35281

V shaped conical wing in supersonic and hypersonic flow with shock attached to leading edge, investigating complex wave system with time dependent and analytical methods A71-36339

Near wake streamline configuration in symmetry plane of slender cone in hypersonic flow at free stream Mach number 7 A71-36754

HYPERSONIC GLIDERS
Thermal ground testing of Concorde and Veras, considering static and fatigue testing in heat environment A71-36664

HYPERSONIC WAVES
Inclined wedges in rarefied hypersonic flow conditions, investigating base and wake pattern geometrical and aerodynamic characteristics A71-36756

HYPERSONICITY PROJECTILES
Cost effective high speed projectile trajectory planning system for gu...range instrumentation, applying to aircraft path recording during automatic landing control A71-36613

HYPERSONICITY WIND TUNNELS
Velocity determination in hypersonic low density wind tunnel based on high energy electron beam produced nitrogen low time of flight A71-34887

Heater and nozzle design of ONERA/SNIA hypersonic wind tunnel for supersonic combustion ramjet tests [ONERA TP 924] A71-36017

Integral equations of motion and momentum for hypersonic wind tunnel nozzle design [AD-72236] A71-29906

Support system and operational design of nitrogen hypersonic blowdown wind tunnel [AD-72236] A71-29907

Turbulent boundary layer over flat plate and compression corner models studied in hypersonic gun tunnel [IA/71/11] A71-30747

ICE PREVENTION
AirHeart ice protection problems, considering one dimensional Stefan method for cyclic deicing system A71-34850

IMAGING TECHNIQUES
Real time reconnaissance cockpit display system for airborne sensor systems, providing night combat imagery A71-35772

IMPACT DAMAGE
Wing structural elements ballistic damage tolerance and residual fracture strength characteristics, discussing projectile velocity, impact angle and target thickness effects A71-35161

IN-FLIGHT MONITORING
Total in-flight simulator /TIPS/ in variable stability C-131 aircraft, describing potential as design tool [AIAA PAPER 71-794] A71-35523

INCOMPRESSIONIBLE FLOW
Detachment prediction in turbulent incompressible plane flows on thick bodies applied to wall with disconnections and flat plate normal to wind A71-34189

Viscous stress distribution in isothermal incompressible turbulent boundary layer with positive pressure gradient by differ...open jet wind tunnel A71-39209

Inviscid incompressible flow past thin circular arc airfoil at zero incidence, expanding for complex potential or velocity in powers of thickness ratio A71-34678

Incompressible turbulent boundary layers at low Reynolds numbers, using eddy viscosity and mixing length concepts for computation A71-38884

Steady incompressible flow with potential vortex over flat surface under suction A71-38699

Plane laminar incompressible jet flow along parabola with no external stream, using second order boundary layer theory [AIAA PAPER 71-APP-88] A71-36268

Two dimensional laminar incompressible fluid flow past flat plate at various angles of attack, studying vortex shedding characteristics A71-36311

Unsteady pressure measurements on harmonically oscillating swept wing with two control surfaces in incompressible flow A71-29350

Pressure measurements of harmonically oscillating sweepback wing with two flaps in incompressible flow [DLR TP-70-47] A71-29433

INDEXES (DOCUMENTATION)
Aircraft industry license norms and standards, describing indexing procedures, storage techniques and data recovery operations with computer A71-36910

INDEMNITY
AirHeart study for Vigo County, Indiana with data bank of airport activity for past 10 years [PB-197309] A71-29721

INERTIAL NAVIGATION
ATC avionics equipment, discussing inertial area navigation, autopilots, airborne data acquisition, altitude reporting, collision avoidance, CAT, satellite communications, etc [US PIPER 71-PP-10] A71-34615

Statistical analysis of gyrocompass mode of A-6A inertial navigation system [BM-511] A71-30315

INLET FLOW
Noise generation due to inlet free stream turbulence incident on isolated stators and rotors, using flat plate cascade blade row model A71-36698

Design and characteristics of supersonic inlet controls for sizing inlet unstarts [NASA TP-D-6408] A71-30072

Velocity profile control tests of diffuser wall bleed to control combustor inlet airflow distribution [NASA TP-D-6435] A71-30817

INLET NOZZLES
Flight test investigation of effects of variable geometry plug nozzles installed on f-106 aircraft [NASA TP-D-2205] A71-30283

INSPECTION
Fatigue crack length relationship with aircraft inspection intervals and structural reinforcement, high strength materials, and aircraft usage effects A71-30783

INSTRUMENT APPROACH
Mathematical perturbation models of aircraft ILS approach and landing [VT-159] A71-29966

Terminal area studies with XC-142, IV-5, Do-31, and P 1127 aircraft to develop powered lift control techniques for instrument approach
INSTRUMENT ERRORS

- Bior asymmetry effect on errors of two degrees of freedom gyro mounted on dynamic platform
- Mass and center of gravity determining system model, describing equipment, operating principle, calibration data and techniques accuracy and errors
- Statistical analysis of gyrocompass mode of A-6A inertial navigation system

INSTRUMENT FLIGHT RULES
- Flight simulator evaluation of aircraft instrument departure procedures

INSTRUMENT LANDING SYSTEMS
- Air navigation and traffic control systems with application to Western Europe and Atlantic area, noting requirements for ILS successor
- Holographic display for blind landing system with variable size perspective over wide field of view, utilizing collimated or cylindrical laser beam
- Mathematical perturbation models of aircraft ILS approach and landing
- Systems analysis of aircraft, aircraft guidance and control systems, and atmospheric turbulence for low visibility instrument landing system requirements
- Minimum variance estimates of signal derivatives with application to case of aircraft descent rate in instrument landing systems

INTEGRAL EQUATIONS
- Integral equations of motion and moment for hypervelocity wind tunnel nozzle design

INTERFACE STABILITY
- Turbulent wakes flow entrainment mechanism; investigating turbulence spreading near interface between laminar and turbulent regions

INTERFERENCE LIFT
- Numerical analysis of aerodynamic loads on wing and tail surfaces with oscillations in unsteady supersonic and subsonic flow including interference lift
- Wing interference lift line lattice simulation and application to aerodynamic loads on tandem wings in unsteady flow

INTERFERENCE
- Holographic interferometry fringe patterns interpretation for small displacements measurement, considering precision gyro stability

INTERMODULATION
- Third order-two signal intermodulation products for 242 frequencies between 225 and 400 kHz as used in FAA frequency assignment processes
- Third order-two signal intermodulation products for 360 frequencies between 118 and 136 kHz when 50 kHz channel spacing is used as in FAA frequency assignment processes
- Third order-two signal intermodulation products within 118-136 MHz band with 50 MHz spacing

INTERNAL COMBUSTION ENGINES
- Aerodynamic characteristics, rocket nozzles, spacecraft propulsion, antenna design, and internal combustion engines

SUBJECT INDEX

- International Cooperation
- New IATA passenger and baggage international air transport conditions, discussing passenger/carrier legal relationships, with emphasis on differences between new and old regulations
- Finnish air traffic law based on international civil aviation convention, discussing regulations relative to aircraft, personnel and airports
- Warsaw air traffic convention agreements as amended at The Hague and Guatemala, presenting air transport regulations in present form

- Simulation studies for development of certification criteria applicable to SST takeoff and engine failure

- Inviscid Flow
- Inviscid incompressible flow past thin circular arc airfoil at zero incidence, expanding for complex potential or velocity in powers of thickness ratio
- Hypersonic viscous-inviscid internal flow field interaction with laminar boundary layer in circular ducts, using method of characteristics and implicit finite difference scheme

- Ionospheric Propagation
- Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function

- Isothermal Layers
- Viscous stress distribution in isothermal incompressible turbulent boundary layer with positive pressure gradient by diffusers in open jet wind tunnel
- Self similar numerical and asymptotic solutions of laminar multicomponent isothermal boundary layer equations for large blowing rates

- J-57 Engine
- Use of air-assist fuel nozzle to reduce exhaust emissions from gas turbine combustor at simulated idle conditions - J-57 engine

- JET AIRCRAFT
- Jumbo jet trailing vortex mathematical model for studying effect on penetrating aircraft
- Large jet transport aircraft trailing vortices, studying velocity fields, core diameters and logarithmic variations of circulation
- Administrative techniques of cost/weight tradeoff program for jet transport airplane
- Determination of relationship between visibility of in-flight jet exhaust to SAE smoke number
- Theory of controllability for parabolic and second order hyperbolic systems and for hereditary differential systems applied to stabilization of high speed aircraft in gust load disturbances
- Reductions in smoke level and carbon monoxide emissions resulting from air-assist fuel nozzles in jet aircraft exhaust pollutant tests

- JET AIRCRAFT NOISE
- Probable impact of future supersonic transport aircraft operations on noise environment around seven airports in US
Jet aircraft noise sources and reduction from gas turbine engines including jet exhausts, fans, lift devices, and unducted rotors A71-30785

Jet engines

Anticavity property assessment of piston engine and aviation jet fuels under point contact conditions, recommending ball and cylinder test technique A71-30447


Jet engines

Performance characteristics of jet engines equipped with afterburner, discussing combustion, flame stabilization, outlet nozzle regulation and operational cost A71-35439

Aircraft jet engine application of electric discharge machining for repetitive continuous production, considering automated closed cycle equipment [NASA-PB-71-143] A71-36558

Determination of relationship between visibility of in-flight jet exhaust to SAE smoke number [NASA-NA-71-24] A71-29307

Control equipment and engine development for air pollution control from jet aircraft engine emissions A71-31403

Jet exhaust

Determination of relationship between visibility of in-flight jet exhaust to SAE smoke number [NASA-NA-71-24] A71-29307

Control equipment and engine development for air pollution control from jet aircraft engine emissions A71-31403

Jet flaps

Lift force distribution calculation technique for wings with jet flaps including rectangular and swept wing examples [NASA-TP-F-13714] A71-30852

Jet flow

Plane laminar incompressible jet flow along parabola with no external stream, using second order boundary layer theory [NASA-PAPER-71-APM-88] A71-36268

Jet inflight

Supersonic jet interaction with turbulent wake, calculating plane and axisymmetric flow behind body butt face A71-35630

Jet Lift

Hybrid V/STOL jet lift aircraft design, examining wing area-lift engine bypass ratio relations [AIAA PAPER 71-767] A71-36273

K

Kalman-Schmidt filtering

Minimum variance estimates of signal derivatives with application to case of aircraft descent rate in instrument landing systems [NASA-CR-111928] A71-30241

Keels

Aerodynamic and deployment characteristics of twin keel all-flexible parawing rigged with several variations of multistage canopy and suspension line reefing system [NASA-TP-O-6305] A71-30748

Kernel function

Method for calculating flutter using interference aerodynamic forces between wing and tail A71-29305

Calculation of pressure distributions over wings with harmonic oscillating control surfaces using kernel function method A71-29346

Kinematics

Kinematics of subsonic unsteady airloads on multiple lifting surfaces A71-29339

L

L-1011 aircraft

L-1011 flight test program, describing aircraft design and performance [AIAA PAPER 71-789] A71-35531

Lockheed L-1011 development, discussing flying stabilizer design, direct lift control and autoland system [AIAA PAPER 71-782] A71-35532

Lockheed L-1011 passenger jumbo jet layout, ground handling and servicing A71-35995

Linear boundary layer

Laminar boundary layer on wing profiles and bodies of revolution, calculating flow characteristics based on integral momentum relation A71-34424

Hypersonic viscid-inviscid internal flow field interaction with laminar boundary layer in circular ducts, using method of characteristics and implicit finite difference scheme A71-35281

Flow distribution behind laminar boundary layer separation point in supersonic flow, calculating plateau region pressure A71-35629

Self similar numerical and asymptotic solutions of laminar multicomponent isothermal boundary layer equations for large blowing rates A71-35633

Linear flow

Stream lines construction in meridional plane of blade nozzle annular cascades of steam and gas turbines in subsonic and supersonic flow A71-34446

Plane laminar incompressible jet flow along parabola with no external stream, using second order boundary layer theory [ASME PAPER 71-APM-88] A71-36268

Two dimensional laminar incompressible fluid flow past flat plate at various angles of attack, studying vortex shedding characteristics A71-36311

Near wake streamline configuration in symmetry plane of slender cone in hypersonic flow at free stream Mach number 7 A71-36755

Land use

Air navigation, surveillance and traffic control technology effects on land and airspace uses at airports A71-35371

Landing sites

Determination of effectiveness of chevron type markings to indicate potentially deceptive, nonload-bearing paved areas before runway threshold [NASA-NA-71-27] A71-29306

Large scale integration

Large scale EOS IC digital VOR navigation converter, comparing accuracy, size, weight and cost with standard design A71-35789

Lasers

Vortex laser Doppler velocimeter system for aircraft wake turbulence velocity profile mapping, describing optical arrangements, back and forward scattering modes and prototype design A71-35756

Wing tip vortex test demonstrating use of Laser Doppler Velocimeter system for measuring gas velocities with high spatial and temporal resolution [NASA-CR-119804] A71-30278

Latticework (Mathematics)

Kinematics of subsonic unsteady airloads on multiple lifting surfaces A71-29339

Law (Jurisprudence)

Finnish air traffic law based on international civil aviation convention, discussing regulations relative to aircraft, personnel and airports A71-36919

German aircraft noise protection law of 30 March 1971, discussing objectives and applicability A71-36921

Leading edges

Supersonic flow past V-shaped wings with leading edges, applying method of establishment to space variable for pressure distribution A71-36939
LEGAL LIABILITY

A71-35647

Pressures, velocities and aerodynamic characteristics of supercritical flow around slender delta wings with forced asymmetry and separation at leading edges

A71-36134

Supersonic flow past thin delta wings with finite velocities at leading edges, noting wing deformation to avoid von Kármán vortex appearance

A71-36161

V shaped conical wing in supersonic and hypersonic flow with shock attached to leading edge, investigating complex wave system with time dependent and analytical methods

A71-36339

LEGAL LIABILITY

A71-35387

Air passengers and baggage international air transport conditions, discussing passenger/carrier legal relationships, with emphasis on differences between new and old regulations

A71-36918

LEN S DESIGN

A71-36605

High aperture wide angle lens design for compact electro-optical systems of airborne moving map projection navigational instruments

A71-36671

LIFT

A71-35285

Gust loading on two dimensional thin airfoil in compressible flow, deriving closed-form lift expressions

A71-35668

Rake blade stability, calculating unsteady local lift and effects of blade profile camber and steady angle of attack

A71-35925

Wing group weight prediction for subsonic aircraft design, taking into account root bending moments due to lift

A71-36770

Slender wing lift in supersonic flow, analyzing suction force on leading edge and viscosity and nonlinear effects

A71-36777

Use of aerodynamic lift for application to high speed ground transportation by two dimensional airfoils

W71-29762

Terminal area studies with VC-142, XV-5, F-111B, and P 1127 aircraft to develop powered lift control techniques for instrument approach

W71-30776

Lift force distribution calculation technique for wings with jet flaps including rectangular and swept wing examples

W71-30852

LI F T DEVICES

W71-29339

Kinematics of subsonic unsteady airloads on multiple lifting surfaces

W71-29340

Wind tunnel investigation of aerodynamic interference between two lifting surfaces in tandem

W71-29347

Application of lifting surface theory to wing with control surfaces in unsteady subsonic flow

W71-30773

Safety characteristics for powered lift of commercial STOL aircraft

W71-30777

LIFTING DEVICES

W71-29395

Survey on different methods for lifting rotor downwash analysis

W71-30039

Mathematical model for induced velocity distribution of lifting rotor in horizontal flight

W71-30764

Effect of wing-tip vortex wakes generated by large jet transport aircraft on smaller airplanes

W71-30766

Flight tests for evaluating effect of wing-tip vortex wake generated by large jet transports on smaller aircraft

W71-30777

Analysis of 79,000 hours data obtained from NASA Y-G/VGE flight recorders installed on 734 general aircraft engaged in eight types of operations

W71-30782

LIGHT BEAMS

W71-30601

Holographic display for blind landing systems with variable image perspective over wide field of view, using collimated or cylindrical laser beam

W71-30761

LIQUID-VAPOUR EQUILIBRIUM

W71-30636

Method of characteristics application to supersonic jet and nozzle gas flow with allowance for equilibrium and nonequilibrium condensation

W71-30770

LOAD DISTRIBUTION (FORCES)

W71-30811

Linear radial loads effect on stress and strain of hypersonic rotor disk applied to aircraft engine compressors with two flow stream of working medium

W71-35597

Thyrister power conditioning application to high voltage DC electric power system, presenting SST aircraft sample load profiles

W71-35770

LOADING OPERATIONS

W71-29553

Aircraft loading system consisting of onboard weight and balance equipment and fully mechanized cargo pallet transfer, using computerized simulation model for parametric evaluation

W71-35911

LOW VISIBILITY

W71-30087

Testing ASR/Transponder for moving emergency service vehicles on airfields during poor visibility conditions

W71-30173

Systems analysis of aircraft, aircraft guidance and control system, and atmospheric turbulence for low visibility instrument landing system requirements

W71-30973

Analysis of glide-slope information requirements for low visibility aircraft landing approach using Kalman filter-optimal control combination to simulate DC-6 control system

W71-32265

LOWER ATMOSPHERE

W71-30387

Lower atmosphere wind shear determined for aircraft approach control from observations in different American sites

W71-30580

LUBRICATING OILS

W71-30680

Three micrometer absolute main oil filter for aircraft gas turbine lubrication system, discussing indicator systems and bench and engine tests

W71-30706

Aircraft turbine oils acid number potentiometric determination, discussing automatic titration procedure and apparatus and solvents influence on titration curve and inflection point

W71-36680

LUBRICATION

W71-35300

Tapered roller bearing lubrication, considering application to CH-47 Boeing helicopter transmission

W71-36680

Lubrication by boundary, elastohydrodynamic, and fluid film, wear due to fretting, erosion, scuffing, and pitting, and friction in aircraft

W71-31134
LUBRICATION SYSTEMS
Three micron absolute main oil filter for aircraft
gas turbine lubrication system, discussing
indicator system and bench and engine tests
A71-35488

MACH CONES
Shock standoff distance and Mach disk diameter
measurements in underexpanded sonic jets, using
aluminum dioxide-tetrazido working fluid
A71-34895

MAGNETIC SUSPENSION
Subsonic static characteristics of slender wing
configurations using magnetic suspension and
balance system

MAN MACHINE SYSTEMS
Soviet book on aircraft automatic control systems
covering linear theory, design, autopilot, man
machine performance, operation modes, etc
A71-34473

MANAGEMENT ANALYSIS
Two British civil aircraft airworthiness requirements,
discussing aircraft industry management
philosophy ensuring quality standards in design,
development, production, inspection and product
support
A71-36673

MANUFACTURING
Semifinished product production technology
influence on heat resistant alloys mechanical
properties, considering forging, rolling,
casting, melting, diffusion welding and powder
metallurgy
A71-36725

MAH BODY PROBLEM
Aerodynamic drag of many bodies of revolution in
supersonic flow
[ DLE-PB-71-04] A71-30325

MAP WATCHING GUIDANCE
High aperture wide angle lens design for compact
electro-optical systems of airborne moving map
projection navigational instruments
A71-36605

MARKET RESEARCH
Passenger travel demand model for STOL
transportation in underdeveloped areas
A71-36300

Civil aircraft market analysis, examining
replacement cycle and used aircraft market based
on aircraft histories
A71-36676

MASS BALANCE
Aircraft loading system consisting of onboard
weight and balance equipment and fully
mechanized cargo pallet transfer, using
computerized simulation model for parametric
evaluation
[ SAE PAPER 900] A71-35811

STAB/MASS SYSTEM AIRCRAFT WEIGHT AND BALANCE
determination, discussing basic concepts, design
requirements and applications
[ SAE PAPER 896] A71-35816

MATERIALS SCIENCE
Gas turbine engine materials and components
equivalent service life estimation
A71-35452

MATHEMATICAL MODELS
Two vortex models for downwash variations in
supersonic flow past this delta wing with
separation at leading edges
A71-34990

ATC system models, covering surface movement,
ruralization, terminal areas and enroute
traffic
A71-34523

Jumbo jet trailing vortex mathematical model for
studying effect on penetrating aircraft
A71-35758

Survey on different methods for lifting rotor
downwash analysis
[ DLE-NTP-70-23] A71-29395

Mathematical perturbation models of aircraft TLS
approach and landing
[ YTH-150] A71-29496

Mathematical model for induced velocity
distribution of lifting rotor in horizontal
flight
[ DLE-NTP-70-22] A71-30309

MATHEMATICS (MATHEMATICAL)
Wing interference lift line lattice simulation and
application to aerodynamic loads on tandem wings
in unsteady flow
A71-29336

Computation of uncoupled vibrations of rotary
wings using transfer matrix method
[ DLE-PB-70-63] A71-29543

MECHANICAL DRIVES
Tapered roller bearing lubrication, considering
application to CH-47 Boeing helicopter
transmission
A71-35300

MECHANICAL PROPERTIES
Diffusion bonding as economical fabrication
process for aerospace applications involving Ti
alloy, emphasizing mechanical properties and
structural reliability improvement
[ SMR PAPER AD-71-265] A71-36661

Semifinished product production technology
influence on heat resistant alloys mechanical
properties, considering forging, rolling,
casting, melting, diffusion welding and powder
metallurgy
A71-36725

Status of research program to develop criteria for
designing aircraft protective devices from rotor
fragments
A71-30762

METAL FATIGUE
Room temperature ultrasonic frequency fatigue
behavior of Bi-base superalloy single crystals
A71-34993

Environmental effects on SST structural materials
fatigue, discussing titanium alloys studies involving
temperature effects, crack propagation and
residual strength
A71-34556

Fatigue crack propagation in all alloy panels
stiffened with bolted and integral stringers,
determining stress intensity factor/crack growth
rate relationship
A71-35156

Light alloys fatigue characteristics for aircraft
components endurance evaluation
A71-35456

METAL OXIDE SEMICONDUCTORS
Large scale MOS IC digital VOR navigation
converter, comparing accuracy, size, weight and
cost with standard design
A71-35789

METAL SHEETS
Thickness effect on fracture toughness and crack
propagation of Al alloy sheets used for aircraft
skins
A71-35153

Fatigue crack propagation in all alloy panels
stiffened with bolted and integral stringers,
determining stress intensity factor/crack growth
rate relationship
A71-35156

METEOROLOGICAL INSTRUMENTS
Radio controlled small aircraft as measurement
platform for meteorological sensors, discussing
development and performance from field tests
A71-35334

METHOD OF CHARACTERISTICS
Method of characteristics application to
supersonic jet and nozzle gas flow with
allowance for equilibrium and nonequilibrium
condensation
A71-35636

MICROWAVE EQUIPMENT
Millimeter system, devices and guides -
Conference, Los Angeles, August 1970, Volume 14
A71-34601

MILITARY AIRCRAFT
Functional suitability of internal/external
lighting systems for military aircraft
[ AD-72304] A71-29797

Statistical analysis of Navy and Marine aircraft
activity and airspace usage in Feb. and Mar.
1970 as part of National Airspace Utilization
System
[ AD-72698] A71-30174

MILITARY AVIATION
Military and civil aircraft navigation systems
MISSILE CONFIGURATIONS

development, emphasizing self contained airborne equipment 

[NTIS-71-35774]

MISSILE CONFIGURATIONS

Cone-cylinder-cone missile type body in transonic buffeting environment determining static and fluctuating wall pressure distribution

[ONERA-TP-942] A71-36020

MISSILE CONTROL

Soviet book on radio control of various flight vehicles covering closed loop synthesis, missile guidance, spacecraft trajectory correction and air traffic control

A71-35403

Avionic and missile computer control systems, describing universal function unit design and digital processing requirements

A71-35775

MISSILE STRUCTURES

Composite structures development, discussing wing, fuselage, aeropropulsion and missile development, weight savings of hardware and fighter expenditure applications

[AAAI-PAPPE 71-367] A71-36275

Effects of nose bluntness on static aerodynamic characteristics of cruciform wing missile at Mach 1.50 to 2.86

[NASA-TR-X-2299] N71-30813

MIXING LENGTH FLOW THEORY

Incompressible turbulent boundary layers at low Reynolds numbers, using eddy viscosity and mixing length concepts for computation

A71-34884

MODELS

Inlet noise suppressors having perforated plate over honeycomb wall construction evaluated over range of passage heights and engine speeds using turbojet engine as noise source

[NASA-TR-D-6395] N71-31096

MODULES OF ELASTICITY

High modulus graphite composites application for structural weight reduction and stiffness requirement without strength loss

A71-35202

MOMENT

Integral equations of motion and momentum for hypervelocity wind tunnel nozzle design

[AD-722346] N71-29906

MOTION

Influence of lateral motion on effectiveness of flight simulators in training air transport pilots

N71-30772

MULTICOMMUNICATION

Frequency memories application to earth-satellite- aircraft DUF communications, repeater apparatus and multiple access transmission of half tone images in worldwide satellite communication

A71-36553

MULTIPATH TRANSMISSION

Monograph for computing multipath effects on VHF and UHF aircraft radio communication

[RER-TE-70097] N71-29361

Calculation of divergence factor of earth surface reflected signals on aircraft radio communication, and multipath transmission between two aircraft

[RER-TE-20120] N71-29438

MULTISPECTRAL RADI SCANNES

Multispectral scanner and data system with 24 channels for NASA C-130 earth resources survey aircraft

A71-36361

MACROSCOPIC

A71-30782

APPLICATION OF NOISE REDUCTION TECHNOLOGY TO DESIGN OF PROPELLER SYSTEM FOR SUBSONIC TRANSPORT AIRCRAFT


NATIONAL AIRSPACE UTILIZATION SYSTEM

German monograph on airport role in national economy and growth and location determinations for enterprises maintaining connections with foreign countries

A71-34842

Statistical analysis of Navy and Marine aircraft activity and airspace usage in Feb. and Mar. 1970 as part of National Airspace Utilization System

[AD-722698] N71-30174

NAVIER-STOKES EQUATION

Two-dimensional steady viscous gas transonic flow

N71-35646

NATIONAL AIRSPACE UTILIZATION SYSTEM

Precision area navigation system, considering position and velocity continuous measurement in three dimensional space, system components and simulation program

A71-34616

Military and civil aircraft navigation systems development, emphasizing self contained airborne equipment

A71-35734

Marina site Tokyo international airport, discussing transportation, runways, ground handling, navigation aids, lighting, etc

N71-35997

Aircraft onboard equipment tests in air navigation aid satellite project, estimating tracking random errors

A71-36509

NAVIGATION INSTRUMENTS

ATC system improvement, presenting data acquisition upgrading and ground automation-aircraft navigation system interface

A71-34614

Large scale BDS digital VOR navigation converter, comparing accuracy, size, weight and cost with standard design

N71-35789

High aperture wide angle lens design for compact electo-optical systems of airborne moving map projection navigational instruments

A71-36605

NAVIGATION SATELLITES

Navigation and communication satellite development for civil aviation and shipping, examining technical, organizational, operational and cost problems

A71-36240

Civil aviation and merchant marine satellites, considering aircraft and surface vessel antenna characteristics and modulation techniques for optimum communication channel frequencies

A71-35552

NEW YORK

Extension of New York Waterfront Commission to area airports and establishment of security measures to combat air cargo theft

[REPT-91-1262] N71-30166

NICKEL ALLOYS

Room temperature ultrasonic frequency fatigue behavior of Ni-base superalloy single crystals

A71-34843

Gas turbine engine steels and Ni alloys heat resistance, examining fatigue life and creep properties at various temperatures and test durations

A71-35453

NITROGEN

Support systems and operational design of nitrogen hypervelocity blowdown wind tunnel

[AD-722345] N71-29907

NITROGEN IONS

Velocity determination in hypersonic low density wind tunnel based on high energy electron beam produced nitrogen ions time of flight

A71-34887

NITROGEN OXIDES

Stratospheric ozone reduction through catalytic action of nitrogen oxides from SST exhaust,
subject index

a71-36922 noise (sound) fundamentals of turbocompressor and turbofan noise and noise reduction possibilities [dlr-fb-70-74] a71-2937a form and causes of noise due to fluid flow [nrl-cp-7923-582a-9022.05] a71-29622 noise intensity subsonic turbulent jets acoustic emission, calculating noise intensity in far field for various Mach numbers a71-38213 propulsion systems trends for 1980s, discussing environmental noise levels, stoichiometric gas turbine engines for military aircraft, high bypass ratio engines for y/STOL aircraft, etc a71-35625 comparison test to evaluate perceived noise level for STOL and other aircraft sounds [W-70-9] a71-31075 noise propagation experimental research at Building Research Station on outdoor sound propagation for building design in relation to aircraft and road traffic noise a71-35237 noise reduction Gulfstream 2 acoustics program for cabin noise level reduction, compliance with FAA takeoff and landing noise certification and structure qualification against sonic fatigue [AIAA PAPER 71-783] a71-35527 flight dynamics for aircraft noise reduction, gust effects decrease and dynamic stability of parachute load systems a71-36752 fundamentals of turbocompressor and turbofan noise and noise reduction possibilities [dlr-fb-70-74] a71-2937a Jet aircraft noise sources and reduction from gas turbine engines including jet exhausts, fans, lift devices, and unducted rotors a71-30785 development of noise measurement units for aircraft and aircraft noise reduction and psychoacoustic studies a71-30786 inlet noise suppressors having perforated plate over honeycomb wall construction evaluated over range of passage heights and engine speeds using turbojet engine as noise source [NASA-TH-D-6395] a71-31096 application of noise reduction technology to design of propulsion system for subsonic civil transport aircraft [NASA-TH-T-67088] a71-31191 nondestructive tests Nondestructive tests Aircraft parts testing by NDT methods, considering ultrasonic system for valve defects and fluorescent particle system for crack detection a71-37056 nonflammable materials Utilization of aerospace nonflammable cellulosic elastomeric, fibrous, and composite materials in commercial aircraft refurbishment a71-30759 normal shock waves mesh method for supercritical transonic flow calculation with normal or oblique shock wave at trailing edge a71-35799 Normal shock control systems for supersonic mixed compression inlet using feedback loops [NASA-TH-D-6382] a71-29745 Nose cones Effects of nose bluntness on static aerodynamic characteristics of cruciform wing missile at Mach 1.5 to 2.86 [NASA-TH-I-2289] a71-30813 notch sensitivity Notch sensitivity of flat plates used as structural members in aircraft wings tested on load testing machine [TB-89] a71-30675 Noble design Heeter and nozzle design of OHRA/S0HRA hypersonic wind tunnel for supersonic combustion ramjet tests [NASA-TR-928] a71-36017 integral equations of motion and momenta for hypervelocity wind tunnel nozzle design [W-7222346] a71-29906 Flight test investigation of effects of variable geometry plug nozzles installed on f-106b aircraft [NASA-TR-7-2295] a71-30283 use of air-assist fuel nozzle to reduce exhaust emissions from gas turbine combustor at simulated idle conditions - J-57 engine [NASA-TR-D-6804] a71-31456 numerical analysis Self similar numerical and asymptotic solutions of laminar compressible isothermal boundary layer equations for large blowing rates a71-35633 Fluid dynamics numerical methods - Conference, University of California at Berkeley, September 1970 a71-36301 small disturbance transonic flows potential equations numerical solutions, using mixed finite difference theory a71-36325 numerical analysis of aerodynamic loads on wing and tail surfaces with oscillations in unsteady supersonic and subsonic flow including interference lift [AARD-CP-80-71-72-1] a71-29333 Numerical method for evaluating discontinuous downwash distribution for steady flow over swept and rectangular wings a71-29349 Oblique shock waves Design shock wave correspondence to strong oblique shock, discussing off design behavior of caret wing a71-35280 mesh method for supercritical transonic flow calculation with normal or oblique shock wave at trailing edge a71-35799 Omega navigation system Omega navigation application to general aviation aircraft, presenting diurnal course shift to overcome deficiencies a71-35767 onboard equipment Aircraft loading system consisting of onboard weight and balance equipment and fully mechanized cargo pallet transfer, using computerized simulation model for parametric evaluation [SARE PAPER 900] a71-35811 static pressure and axle strain gage systems testing for balance and weighing onboard De Havilland C-7A aircraft [SARE PAPER 881] a71-35827 operating temperature Gas turbine engine nozzle guide vanes under pulsed thermal operation, discussing service life evaluation and increase a71-35455 optical measurement Vortex laser Doppler velocimeter system for aircraft wake turbulence velocity profile mapping, describing optical arrangements, back and forward scattering modes and prototype design a71-35756 optimization Aircraft structural parameters optimization satisfying flutter velocity constraint and minimum mass, applying to box beam design a71-34874 Random access signaling system application to aircraft control, discussing signal redundancy requirement for access capability optimization based on radio environment model a71-35783
Airport development recommendations for Lane County, Oregon with projections of passenger and aircraft operations at 5 year intervals through 1980

[PB-197860] N71-29756

Stratospheric ozone reduction through catalytic action of nitrogen oxides from SST exhaust, discussing degrading effect on atmospheric radiation shield

A71-36922

P

Polyisocyanurate foam and intumescent paint for thermal protection of aircraft passengers in ground accident fires

[NI-30756]

Supersonic panel flutter and aerodynamic load stress analysis of finite cylindrical shells based on Galerkin method and aeroelastic equilibrium equations

[AD-722447] N71-31183

Aircraft structural panels under cyclic static loads, examining fatigue life with probability theory, statistics and regression analysis

A71-35312

Aerodynamic and deployment characteristics of twin keel all-flexible parawing rigged with several variations of multistage canopy and suspension line reeling system


Soviet book on subsonic gas turbine passenger planes power supply systems covering Boeing 747, short haul aircraft, DC-10, L-1011, etc

A71-34806

Lockheed L-1011 passenger jumbo jet layout, ground handling and servicing

A71-35995

Passenger travel demand model for STOL transportation in underdeveloped areas

A71-36348

Polyisocyanurate foam and intumescent paint for thermal protection of aircraft passengers in ground accident fires

A71-30750

Experimental and theoretical study of biologically important radiation components and dose equivalents due to galactic and solar rays at SST in high atmosphere - summary

A71-30779

Developing aircraft ride criteria and/or acceptable vibration levels and problems in measuring and recording low level vibration environment

A71-30781

Asphalt pavement design for heavy multilevel aircraft, using BISTRO computer program

A71-36000

Systems approach to airfield pavement for future aircraft, integrating design, construction, operation and maintenance

A71-36346

Effects of runway contaminants and pavement surface properties on runway slipperiness

A71-30767

Augmented ram wing vehicle performance and flow field for high speed ground transportation

A71-31204

Systems analysis approach to airport planning and predicting terminal facility and aircraft demands in year 2000 for air traffic control systems

[NASA-CR-119207] N71-30800

Prediction method for performance of total pilot-vehicle system in turbulence with application to tracking tasks

[AD-722855] N71-31288

Performance tests for radio controlled small aircraft as measurement platform for meteorological sensors, discussing development and performance from field tests

A71-35334

Performance evaluation of variable geometry external fuel tank prototype by static structural tests, wind tunnel tests and flight tests on F-111 aircraft

[AIAA PAPER 71-763] N71-35533

Test methods and testing techniques for determining technical performance and safety characteristics of ground support service avionics equipment

[AD-723036] N71-30258

Performance tests on liquid explosive emergency exit for civil aircraft

[FAL-RD-71-33] N71-31064

Mathematical perturbation models of aircraft ILS approach and landing

[VTX-159] N71-29496

Soviet book on automatic control systems covering linear theory, design, autopilot, man machine performance, operation modes, etc

A71-34973

Airplane accident litigation related to wake turbulence concerning pilot or air traffic controller faults

A71-35387

Flight tests and simulation for determining effects of peripheral viewing losses on pilot performance during commercial aircraft landing

[FAA-P-70-70025] N71-29497

Investigation of Mississippi Valley Airways De Havilland DHC-6, N9565M crash at LaCrosse, Wisconsin Nov. 9, 1970

[FAA-P-70-70025] N71-29914

Prediction method for performance of total pilot-vehicle system in turbulence with application to tracking tasks

[AD-722855] N71-31288

Category II operations at various airports, considering all-weather landing requirements of airborne equipment, maintenance standards, pilot training, etc

[SAE-PAPER 710442] N71-34899

Link 747 simulator with six degrees of motion for systems engineers and pilot training

A71-36970

Boeing 747 digital computer type flight simulator with four degrees of movement for engineer and pilot training

A71-36971

Influence of lateral motion on effectiveness of flight simulators in training air transport pilots

A71-36972

Remotely piloted vehicles development and limitations, considering air superiority, weapons delivery, sensors and survivability

A71-35899

Aerodynamic characteristics of vehicle models in aluminum tube

A71-31108

Antivear property assessment of piston engine and aviation jet fuels under point contact conditions, recommending ball and cylinder test technique

A71-34847

Experimental capabilities and operating conditions of hydrodynamic wind-water tunnel including flow visualization

[NASA-TT-F-13727] N71-30263

Cost effective high speed projectile trajectory plotting system for gunnery range instrumentation, applying to aircraft path recording during automatic landing control

A71-36613

Radio tracking of aircraft by two geostationary satellites, discussing measurement, navigation

A-32
and position errors

**POSITION INDICATORS**

- Precision area navigation system, considering position and velocity continuous measurement in three dimensional space. System components and simulation program
  - A71-36508

**POSITIONING**

- Dynamic positioning stationkeeping and stability criteria for formation flight systems extended to helicopter and V/STOL transports
  - A71-35923

---

**POSSIBILITY**

**POTENTIAL FLOW**

- Steady incompressible flow with potential vortex over flat surface under suction
  - A71-38089

Small disturbance transonic flows potential equations numerical solutions, using mixed finite difference theory
  - A71-36325

Subcritical nonlinear potential flows over two dimensional subsonic airfoils by multistrip method of integral relations
  - A71-36330

Potential flow solution for STOL wing propulsion systems presenting flow fields, pressure distribution, and lift coefficient for externally blown flap, high-lift configuration
  - [NASA-TN-D-6394] B71-29774

**POTENTIAL ANALYSIS**

- Aircraft turbine oils acid number potentiometric determination, discussing automatic titration procedure and apparatus and solvents influence on titration curve and inflexion point
  - [DLR-PB-70-47] B71-29433

- German monograph on pressure changes as boundary layer effect in tube wind tunnels covering test equipment and experimental design, Becker theory, pipe flow, etc
  - A71-34209

---

**POWER CONDITIONING**

- Thyristor power conditioning application to high voltage DC electric power system, presenting SST aircraft sample load profiles
  - A71-35770

**POWER EFFICIENCY**

- Safety characteristics for powered lift of commercial STOL aircraft
  - A71-30773

**POWER SUPPLIES**

- Soviet book on subsonic gas turbine passenger planes power supply systems covering Boeing 747, short haul aircraft, DC-10, L-1011, etc
  - A71-34072

**POWER TRANSMISSION**

- Tapered roller bearing lubrication, considering application to CH-47 Boeing helicopter transmission
  - A71-35300

**PREDICTIONS**

- Probable impact of future supersonic transport aircraft operations on noise environment around seven airports in US
  - [AD-722365] B71-29777

**PRESSURE DISTRIBUTION**

- Stagnation pressure changes in unsteady flow downstream of turbine blades with fluctuating circulation related to vortex sheets
  - A71-35279

Flow distribution behind laminar boundary layer separation point in supersonic flow, calculating plate region pressure
  - A71-35629

Turbulent boundary layer interaction with supersonic outer flow behind step, calculating pressure distribution, momentum thickness and friction
  - A71-35631

Supersonic flow past T-shaped wings with leading edges, applying method of establishment to space variable for pressure distribution
  - A71-35647

Siren wall in turbine axial stage due to nonuniform pressure fields due blade cascades
  - A71-36180

Calculation of pressure distributions over wings with harmonic oscillating control surfaces using kernel function method
  - [NASA-TN-D-6394] B71-29774

Asymptotic expansion techniques to define pressure loading effects on wings with unbalanced control surfaces
  - A71-36254

---

**PRESSURE MEASUREMENTS**

- Unsteady pressure measurements on harmonically oscillating sweptback wing with two flaps in incompressible flow
  - A71-35770

Pressure measurements of harmonically oscillating sweptback wing with two flaps in incompressible flow
  - [NASA-TN-D-6435] B71-29348

- Numerical method for evaluating discontinuous downstream distribution for steady flow over swept and rectangular wings
  - A71-36122

---

**PRODUCT DEVELOPMENT**

DC-10 wide body tri-jet aircraft design and development, considering mixing, number of engines and thrust optimization and selection of cruise, approach and stall speeds
  - [AIAA PAPERS 71-780]

**PROJECT ENGINEERING**

- Aircraft jet engine application of electric discharge machining for repetitive continuous production, considering automated closed cycle equipment
  - [SPE PAPER BS-71-1543]

Semifinished product production technology, influence on heat resistant alloys mechanical properties, considering forging, rolling, casting, melting, diffusion welding and powder metallurgy
  - A71-36658

**PRODUCTIVITY**

- Negotiations of BRA/BOAC productivity agreements in aircraft industry
  - A71-35924

**PROJECT MANAGEMENT**

- Administrative techniques of cost/weight tradeoff
  - A71-29346

---
<table>
<thead>
<tr>
<th>SUBJECT INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RADAR NAVIGATION</strong></td>
</tr>
<tr>
<td>Testing ASH/transponder for moving emergency service vehicles on airfields during poor visibility conditions</td>
</tr>
<tr>
<td><strong>RADAR TRACKING</strong></td>
</tr>
<tr>
<td>Computer-based aircraft tracking with aid of twin radar air traffic control system, discussing components and operation</td>
</tr>
<tr>
<td><strong>RADIANT FLUX DENSITY</strong></td>
</tr>
<tr>
<td>Convective flow at stagnation point relation to radiation flux decrease as result of absorption in cold boundary layer</td>
</tr>
<tr>
<td><strong>RADIATION HAZARDS</strong></td>
</tr>
<tr>
<td>Experimental and theoretical study of biologically important radiation components and dose equivalents due to galactic and solar rays at SST in high atmosphere — summary</td>
</tr>
<tr>
<td><strong>RADIO COMMUNICATION</strong></td>
</tr>
<tr>
<td>Airborne communications with AN/ARC-154 transceiver in single radio, discussing extended frequency coverage, multimode operation, navigation and input/output provisions</td>
</tr>
<tr>
<td>Calculation of divergence factor of earth surface reflected signals on aircraft radio communication, and multipath transmission between two aircraft</td>
</tr>
<tr>
<td>Fundamental characteristics of analog and digital modulation used in ATC communication systems (ESSA-TR-BRL-ITS-232)</td>
</tr>
<tr>
<td><strong>RADIO CONTROL</strong></td>
</tr>
<tr>
<td>Radio controlled small aircraft as measurement platforms for meteorological sensors, discussing development and performance from field tests</td>
</tr>
<tr>
<td>Soviet book on radio control of various flight vehicles covering closed loop synthesis, missile guidance, spacecraft trajectory correction and air traffic control</td>
</tr>
<tr>
<td><strong>RADIO EQUIPMENT</strong></td>
</tr>
<tr>
<td>Evaluation of airborne transponders used for air traffic control facilities (AD-723028)</td>
</tr>
<tr>
<td><strong>RADIO TRACKERS</strong></td>
</tr>
<tr>
<td>Radio tracking of aircraft by two geostationary satellites, discussing measurement, navigation and position errors</td>
</tr>
<tr>
<td><strong>RANDOM ERRORS</strong></td>
</tr>
<tr>
<td>Aircraft onboard equipment tests in air navigation aid satellite project, estimating tracking random errors</td>
</tr>
<tr>
<td><strong>RANDOM LOADS</strong></td>
</tr>
<tr>
<td>Aircraft random heave-pitch response to taxing on rough runways, analyzing dynamic loads and fatigue damage by power spectral techniques</td>
</tr>
<tr>
<td>Application of linear control of systems with random inputs to gust response control of aircraft guidance in atmospheric turbulence (ORBRA-P-131)</td>
</tr>
<tr>
<td><strong>RANDOM SIGNALS</strong></td>
</tr>
<tr>
<td>Random access signalling system application to aircraft control, discussing signal redundancy requirement for accurate capability optimization based on radio environment model</td>
</tr>
<tr>
<td><strong>RANGERFINDING</strong></td>
</tr>
<tr>
<td>Satellite based position fixing data by ranging techniques, discussing application to navigation and ATC</td>
</tr>
<tr>
<td><strong>RAREFIND GAS DYNAMICS</strong></td>
</tr>
<tr>
<td>Laminar convective heat transfer rates on hemisphere cylinder in rarefied hypersonic flow, comparing experimental results with Cheng, Davis and Lees theories</td>
</tr>
</tbody>
</table>
SUBJECT INDEX

Inclined wedges in rarefied hypersonic flow conditions, investigating base and wake pattern geometrical and aerodynamic characteristics
[71-36756]

REAL TIME OPERATION
Real time reconnaissance cockpit display system for airborne sensor systems, providing night combat imagery
[71-35772]

RECORDING INSTRUMENTS
Developing aircraft side criteria and/or acceptable vibration levels and problems in measuring and recording low level vibration environments
[71-30781]

RECTANGULAR WINGS
Numerical method for evaluating discontinuous downwash distribution for steady flow over swept and rectangular wings
[71-29349]

Redundancy Encoding
Random access signaling system application to aircraft control, discussing signal redundancy requirement for access capability optimization based on radio environment model
[71-35783]

REOUNDENCY COMPONENTS
Space shuttle avionics system redundancy, calculating costs for individual line replaceable units
[71-36479]

Space shuttle design concerning fault detection and isolation, redundancy and maintenance for cost and downtime minimization by application of airline methods
[71-36880]

REGULATIONS
Aircraft industry license areas and standards, describing indexing procedures, storage techniques and data recovery operations with computer
[71-36810]

New IATA passenger and baggage international air transport conditions, discussing passenger/carrier legal relationships, with emphasis on differences between new and old regulations
[71-36918]

Finnish air traffic law based on international civil aviation convention, discussing regulations relative to aircraft, personnel and airports
[71-36919]

Warsaw air traffic convention agreements as amended at The Hague and Guatemala, presenting air transport regulations in present form
[71-36920]

Extension of New York Waterfront Commission to area airports and establishment of security measures to combat air cargo theft
[REPT-91-1262] [71-30164]

REINFORCED PLASTICS
Monograph on fiber-resin composites covering glass, boron and carbon fibers and epoxy matrix materials tensile and thermoelastic properties
[71-34669]

Boron-epoxy composite wing box beam design, describing preliminary weight estimation from layouts
[SAA UPDN-891] [71-35815]

Fatigue crack propagation in all alloy panels stiffened with bolted and integral stringers, determining stress intensity factor/crack growth rate relationship
[71-35156]

Damage tolerant aircraft structures material toughness and residual strength, presenting fracture test results on precracked panels reinforced with crack stoppers
[71-35157]

REINFORCED (STRUCTURES)
Fatigue crack length relationship with aircraft inspection intervals and structural reinforcement, high strength materials, and aircraft usage effects
[71-30783]

REINFORCING FIBERS
Monograph on fiber-resin composites covering glass, boron and carbon fibers and epoxy matrix materials tensile and thermoelastic properties
[71-34669]

RELIABILITY ENGINEERING
Methods for determining reliability of aircraft equipment
[AD-727271] [71-29796]

REMOTE CONTROL
Remote power controller as static circuit protection device for aircraft and spacecraft automatically controlled electrical wiring system, discussing performance improvement
[71-35782]

Remotely piloted vehicles development and limitations, considering air superiority, weapon delivery, sensors and survivability
[71-35899]

RESEARCH AND DEVELOPMENT
Civil aviation research and development projects noting characteristics and growth to date, current problems, future requirements, potential solutions, and recommendations
[NASA-SP-266] [71-30507]

RESEARCH PROJECTS
Geological exploration, development of ultrasonic flow detector, review of scientific developments, and tactical aircraft in Eastern Europe
[JPPS-53428] [71-30033]

Review of policies affecting civil aviation, problems confronting it, and potential for future contributions to national benefits
[NASA-SP-265] [71-30506]

Civil aviation research and development projects noting characteristics and growth to date, current problems, future requirements, potential solutions, and recommendations
[NASA-SP-266] [71-30507]

RESONANT FREQUENCIES
Pretwisted cantilever airfoil cross section turbine and compressor blades vibration natural frequencies and mode shapes
[71-35282]

REYNOLDS NUMBER
Incompressible turbulent boundary layers at low Reynolds numbers, using eddy viscosity and sixine length concepts for computation
[71-34884]

Transonic wind tunnel testing of air intake and afterbody of double flux engine nozzle at high subsonic Mach numbers and high Reynolds numbers
[OBBA-SP-993] [71-36021]

Sting-free aerodynamic drag measurement on ellipsoidal cylinders in subsonic wind tunnel at transition Reynolds numbers
[71-36037]

Design and characteristics of quasi-steady devices for simulation of high Reynolds number flows
[NASA-CH-1830] [71-31262]

ROCKET ENGINE DESIGN
Design and development of air breathing engine systems for space shuttle vehicle
[71-29607]

ROCKET ENGINE NOISE
Optimal digital controller based on linear approximation of acomutal test facility, for determining effects of supersonic rocket engine noise on vehicle surface
[NASA-CH-115073] [71-30741]

ROCKET NOZZLES
Aerodynamic characteristics, rocket nozzles, spacecraft propulsion, antenna design, and internal combustion engines
[NASA-CH-119375] [71-31106]

ROLLER BEARINGS
Tapered roller bearing lubrication, considering application to CH-47 Boeing helicopter transmission
[71-35300]

ROOFS
Wind pressure and cross flow velocity profiles for short takeoff aircraft building roof airports
[71-30776]

ROOM TEMPERATURE
Room temperature ultrasonic frequency fatigue

A-35
behavior of Bi-base superalloy single crystals A71-34093

ROTOR OTOSCOPES

ROTOR WINDS

ROTOR LIFT

ROTOR BLADES

ROTOR BLADES (TURBOMACHINERY)

ROTOR LIFT

AIRBORNE AIRCRAFT

ROTOR STABILITY

HUB TREE (COMPUTERS)

HUNGE-KUTTA METHOD

RUNWAY ALIGNMENT

RUNWAY CONDITIONS

Aircraft random heave-pitch response to taxiing on rough runways, analyzing dynamic loads and fatigue damage by power spectral techniques A71-36675

Runway and taxiway profile and airplane response measurements to determine runway roughness A71-30766

Biplanar Basle-Mulhouse airport, discussing traffic structure, buildings and runway development A71-35996

Narita site Tokyo international airport, discussing transportation, runways, ground handling, navigation aids, lighting, etc A71-35997

Asphalt pavement design for heavy multiaxle aircraft, using BISTRO computer program A71-36000

Operating costs and runway lengths for V/STOL in city and suburban short haul air transportation A71-36347

Atlanta airport instant runway construction using concrete pavement, compacted subbase and longitudinal/herringbone underdrain A71-36349

Determination of effectiveness of chevron type markings to indicate potentially deceptive, nonload-bearing paved areas before runway threshold [FAA-MA-71-27] A71-29306

Effects of runway contaminants and pavement surface properties on runway slipperiness A71-30767

S

S CURVES Total pressure, static pressure, surface shear stresses, and yaw angle measurements of S curved ducted flow [IC-71-10] A71-30264

SAFETY Test methods and testing techniques for determining technical performance and safety characteristics of ground support service aviation equipment [AD-723036] A71-30258

SATELLITE COMMUNICATIONS SHIPS

SATELLITE NETWORKS

SATELLITE OBSERVATION

SATELLITE TRANSMISSION

Aircraft onboard equipment tests in air navigation aid satellite project, estimating tracking random errors A71-36509

ESRO part of joint ATC communication experiment for L band satellite use, giving voice and data transmission and distance measurement techniques tests results A71-36510

Satellite to aircraft radio link simulation, evaluating electronic scanning antenna operation, intelligibility, data transmission rate and distance measurement accuracy A71-36511

Meter wave aircraft slot antenna for Concorde air to ground communication via satellite, presenting synthetic radiation patterns A71-36514

A-36
Aerodynamic characteristics of vehicle models in aluminum tube

Scattering Function:
Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function

Separated Flow:
Two vortex model for downwash variations in supersonic flow past thin delta wing with separation at leading edges

Service Life:
Gas turbine engine materials and components equivalent service life estimation

Shock Wave Profiles:
Design shock wave correspondence to strong oblique shock, discussing off design behavior of caret wing

Shock Waves Propagation:
Multiple tone generation by axial flow transonic compressors, considering shock waves production and propagation associated with supersonic elements of blading

Short Haul Aircraft:
Low drag-conforming propeller and fanjet STOL and fanjet VTOL short haul aircraft

Short Takeoff Aircraft:
Low drag-conforming propeller application to propeller and fanjet STOL and fanjet VTOL short haul aircraft

Shaped Charges:
Performance tests on liquid explosive emergency exit for civil aircraft

Shear Flow:
Relation of Eulerian and Lagrangian structure of pseudosound pressure and velocity fields in turbulent shear flow to aerodynamic noise generation

Shear Stress:
Total pressure, static pressure, surface shear stress, and yaw angle measurements of S curved ducted flow

Shock Absorbers:
Nonlinear elastic suspension springs with symmetrically hardened behavior for shock and vibration isolation of aerospace instruments and controls

Shock Layers:
Shock standoff distance and Mach disk diameter measurements in underexpanded sonic jets, using nitrogen dioxide-tetroxide working fluid

Shock Tunnels:
German monograph on pressure changes as boundary layer effect in tube wind tunnels covering test equipment and experimental design, Becker theory, pipe flow, etc

Turbulent boundary layer over flat plate and compression corner models studied in hypersonic gun tunnel

Shock Wave Generators:
Multiple tone generation by axial flow transonic compressors, considering shock waves production and propagation associated with supersonic elements of blading

Shock Wave Interaction:
V shaped conical wing in supersonic and hypersonic flow with shock attached to leading edge, investigating complex wave systems with time dependent and analytical methods
<table>
<thead>
<tr>
<th>SLIDING</th>
<th>SUBJECT INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slender wing lift in supersonic flow, analyzing motion force on leading edge and viscosity and nonlinear effects</td>
<td>A71-36677</td>
</tr>
<tr>
<td>Subsonic static characteristics of slender wing configurations using magnetic suspension and balance system (NASA-CR-1798)</td>
<td>N71-29775</td>
</tr>
<tr>
<td>Effects of runway contaminants and pavement surface properties on runway slipperiness</td>
<td>N71-30767</td>
</tr>
<tr>
<td>SATELLITE ANTENNAS</td>
<td></td>
</tr>
<tr>
<td>Reflector aircraft slot antenna for Concorde air to ground communication via satellite, presenting synthetic radiation patterns</td>
<td>A71-36514</td>
</tr>
<tr>
<td>SMOKE</td>
<td></td>
</tr>
<tr>
<td>Determination of relationship between visibility of in-flight jet exhaust to FAR smoke number</td>
<td>N71-29307</td>
</tr>
<tr>
<td>Reductions in smoke level and carbon monoxide emissions resulting from air-assist fuel nozzles in jet aircraft exhaust pollutant tests</td>
<td>N71-30784</td>
</tr>
<tr>
<td>SATELLITE BOOKS</td>
<td></td>
</tr>
<tr>
<td>Aircraft design, flight characteristics, and atmospheric effects on sonic boom during supersonic and hypersonic flight</td>
<td>N71-30787</td>
</tr>
<tr>
<td>SOUND FIELDS</td>
<td></td>
</tr>
<tr>
<td>Fundamentals of turbocompressor and turbofan noise and noise reduction possibilities (DLR-FB-70-74A)</td>
<td>N71-29374</td>
</tr>
<tr>
<td>SOUND GENERATORS</td>
<td></td>
</tr>
<tr>
<td>Multiple tone generation by axial flow transonic compressors, considering shock wave production and propagation associated with supersonic elements of blading</td>
<td>A71-36497</td>
</tr>
<tr>
<td>SOUND PROPAGATION</td>
<td></td>
</tr>
<tr>
<td>Experimental research at Building Research Station on outdoor sound propagation for building design in relation to aircraft and road traffic noise</td>
<td>A71-35237</td>
</tr>
<tr>
<td>SOUND WAVES</td>
<td></td>
</tr>
<tr>
<td>Acoustic radiation of supersonic jet toward nozzle exit suction, plotting pressure pulsations vs active-passive pressure ratio</td>
<td>A71-36122</td>
</tr>
<tr>
<td>SPACE MAINTENANCE</td>
<td></td>
</tr>
<tr>
<td>Space shuttle design concerning fault detection and isolation, redundancy and maintenance for cost and downtime minimization by application of airline methods</td>
<td>A71-36680</td>
</tr>
<tr>
<td>SPACE SHUTTLES</td>
<td></td>
</tr>
<tr>
<td>Hypersonic aircraft design usable as transport or space shuttle, determining aerodynamic behavior in viscous flow</td>
<td>A71-36431</td>
</tr>
<tr>
<td>Space shuttle avionics system redundancy, calculating costs for individual line replaceable units</td>
<td>A71-36479</td>
</tr>
<tr>
<td>Space shuttle design concerning fault detection and isolation, redundancy and maintenance for cost and downtime minimization by application of airline methods</td>
<td>A71-36648</td>
</tr>
<tr>
<td>Space shuttle vehicles landing with emergency arrestment aids, describing tailhook/cable, net and landing gear/cable engagement methods</td>
<td>A71-36683</td>
</tr>
<tr>
<td>Unsteady airfoil stall characteristics using static data input for predicting stall flutter boundaries of space shuttle wing (NASA-CR-119315)</td>
<td>N71-29221</td>
</tr>
<tr>
<td>Design and development of air breathing engine system for space shuttle vehicle</td>
<td>N71-29607</td>
</tr>
<tr>
<td>SPACECRAFT COMMUNICATION</td>
<td></td>
</tr>
<tr>
<td>Frequency memory application to earth-satellite-aircraft UHF communications, repeater apparatus and multiple access transmission of half tone images in worldwide satellite communication</td>
<td>A71-36553</td>
</tr>
<tr>
<td>SPACECRAFT DESIGN</td>
<td></td>
</tr>
<tr>
<td>Space shuttle design concerning fault detection and isolation, redundancy and maintenance for cost and downtime minimization by application of airline methods</td>
<td>A71-36480</td>
</tr>
<tr>
<td>SPACECRAFT LANDING</td>
<td></td>
</tr>
<tr>
<td>Space shuttle vehicles landing with emergency arrestment aids, describing tailhook/cable, net and landing gear/cable engagement methods</td>
<td>A71-36488</td>
</tr>
<tr>
<td>SPACECRAFT POSITION INDICATORS</td>
<td></td>
</tr>
<tr>
<td>Satellite based position fixing data by ranging techniques, discussing application to navigation and ATC</td>
<td>A71-36693</td>
</tr>
<tr>
<td>SPACECRAFT PROPULSION</td>
<td></td>
</tr>
<tr>
<td>Aerodynamic characteristics, rocket nozzles, spacecraft propulsion, antenna design, and internal combustion engines (NASA-CR-119315)</td>
<td>N71-31106</td>
</tr>
<tr>
<td>SPACECRAFT RELIABILITY</td>
<td></td>
</tr>
<tr>
<td>Space shuttle design concerning fault detection and isolation, redundancy and maintenance for cost and downtime minimization by application of airline methods</td>
<td>A71-36480</td>
</tr>
<tr>
<td>SPACECRAFT STRUCTURES</td>
<td></td>
</tr>
<tr>
<td>Composite structures development, discussing wing, fuselage, aeropropulsion and missile development, weight savings of hardware and fighter aerospace applications (AIAA PAPER 71-367)</td>
<td>A71-36275</td>
</tr>
<tr>
<td>SPACECRAFT TRAJECTORIES</td>
<td></td>
</tr>
<tr>
<td>Rocket book on radio control of various flight vehicles covering closed loop synthesis, missile guidance, spacecraft trajectory correction and air traffic control</td>
<td>A71-35003</td>
</tr>
<tr>
<td>SPARK MACHINING</td>
<td></td>
</tr>
<tr>
<td>Aircraft jet engine application of electric discharge machining for repetitive continuous production, considering automated closed cycle equipment (SME PAPER 89-71-143)</td>
<td>A71-36658</td>
</tr>
<tr>
<td>SPHERICAL REFLECTION</td>
<td></td>
</tr>
<tr>
<td>Satellite-to-aircraft links propagation characteristics, considering specular reflected signals, diffuse scattering and scattering function</td>
<td>A71-35097</td>
</tr>
<tr>
<td>SPHERES</td>
<td></td>
</tr>
<tr>
<td>Finite difference method application to three dimensional boundary layer calculation on sphere- segment surfaces in supersonic flow</td>
<td>A71-35432</td>
</tr>
<tr>
<td>SPRINGS (ELASTIC)</td>
<td></td>
</tr>
<tr>
<td>Nonlinear elastic suspension springs with symmetrically hardened behavior for shock and vibration isolation of aerospace instruments and controls</td>
<td>A71-36890</td>
</tr>
<tr>
<td>SQUALLS</td>
<td></td>
</tr>
<tr>
<td>Approximate solution of nonlinear potential equation for squall disturbance in transonic range and pressure distribution on aircraft</td>
<td>A71-31061</td>
</tr>
<tr>
<td>STABILITY TESTS</td>
<td></td>
</tr>
<tr>
<td>Stability of equilibrium state of rotor in pressurized gas bearing (AD-722826)</td>
<td>N71-31213</td>
</tr>
<tr>
<td>STABILIZATION</td>
<td></td>
</tr>
<tr>
<td>Theory of controllability for parabolic and second order hyperbolic systems and for hereditary differential systems applied to stabilization of high speed aircraft in gust load disturbances (AD-722072)</td>
<td>N71-29930</td>
</tr>
<tr>
<td>STARTUP FLOW</td>
<td></td>
</tr>
<tr>
<td>Binary laminar boundary layer in hypersonic axisymmetric stagnation point flow with temperature dependent material properties, presenting exact and approximate calculation methods</td>
<td>A71-35622</td>
</tr>
<tr>
<td>STAGNATION POINT</td>
<td></td>
</tr>
<tr>
<td>Convective flow at stagnation point relation to radiation flux decrease as result of absorption in cold boundary layer</td>
<td>A71-35259</td>
</tr>
<tr>
<td>STAGNATION PRESSURE</td>
<td></td>
</tr>
<tr>
<td>Stagnation pressure changes in unsteady flow</td>
<td></td>
</tr>
</tbody>
</table>
STANDARDS
British civil aircraft airworthiness requirements, discussing aircraft industry management philosophy ensuring quality standards in design, development, production, inspection and product support

STATIC AERODYNAMIC CHARACTERISTICS
Effects of nose bluntness on static aerodynamic characteristics of cruciform wing missile at Mach 1.5 to 2.86 [NASA TN-D-2209] [NASA-TB-X-2289] [NASA-TB-X-2290]

STATIC LOADS
Aircraft structural panels under cyclic static loads, examining fatigue life with theory, statistics and regression analysis

Aircraft weighing in place during maintenance operations, describing load cell equipped jacks design for time saving weight determination [SAW PAPER 898]

STATIC PRESSURE
Photographic study of colliding underexpanded and normally expanded supersonic jets in two-wind-tunnel assembly with atmospheric static working pressure [NASA TN-D-6425] [NASA TN-D-6426] [NASA TN-D-6428] [NASA TN-D-6429] [NASA TN-D-6430] [NASA TN-D-6431] [NASA TN-D-6432]

STATICAL TESTS
Thermal ground testing of Concorde and Veras, considering static and fatigue testing in heat environment

Static force tests of model of twin jet fighter aircraft at various angles of attack and side-slip angles to obtain data for theoretical spin studies [NASA TN-D-6425] [NASA TN-D-6426] [NASA TN-D-6427] [NASA TN-D-6428] [NASA TN-D-6429] [NASA TN-D-6430] [NASA TN-D-6431] [NASA TN-D-6432]

STATIC TESTING
Dynamic positioning stationkeeping and stability criteria for formation flight systems extended to helicopter and V/STOL transports [NASA TN-D-6425] [NASA TN-D-6426] [NASA TN-D-6427] [NASA TN-D-6428] [NASA TN-D-6429] [NASA TN-D-6430] [NASA TN-D-6431] [NASA TN-D-6432]

STIFFNESS
Effects of nose bluntness on static aerodynamic characteristics of cruciform wing missile at Mach 1.5 to 2.86 [NASA TN-D-2209] [NASA-TB-X-2289] [NASA-TB-X-2290]

STRESS-STRAIN DIAGRAMS
Stress-strain diagrams distribution in isothermal incompressible turbulent boundary layer with positive pressure gradient by diffusers in open jet wind tunnel

STRESS CONCENTRATION
Viscous stresses distribution in isothermal incompressible turbulent boundary layer with positive pressure gradient by diffusers in open jet wind tunnel

STRESS-STRAIN DIAGRAMS
Linear radial loads effect on stress and strain of hyperboloidal roller disk applied to aircraft engine compressors with two stress flow of working medium

STRATEGIC DESIGN
Aircraft structural parameters optimization satisfying flutter velocity constraint and minimum mass, applying to box beam design [NASA TN-D-6425] [NASA TN-D-6426] [NASA TN-D-6427] [NASA TN-D-6428] [NASA TN-D-6429] [NASA TN-D-6430] [NASA TN-D-6431] [NASA TN-D-6432]
Experimental research at Building Research Station on outdoor sound propagation for building design in relation to aircraft and road traffic noise [NASA TN-D-6425] [NASA TN-D-6426] [NASA TN-D-6427] [NASA TN-D-6428] [NASA TN-D-6429] [NASA TN-D-6430] [NASA TN-D-6431] [NASA TN-D-6432]

STRUCTURAL RELIABILITY
Diffusion bonding as economical fabrication process for aerospace applications involving Ti alloys, enhancing mechanical properties and structural reliability improvement [NASA TN-D-6425] [NASA TN-D-6426] [NASA TN-D-6427] [NASA TN-D-6428] [NASA TN-D-6429] [NASA TN-D-6430] [NASA TN-D-6431] [NASA TN-D-6432]

STRUCTURAL STABILITY
Read papers on thin walled aircraft structures strength and stability covering bending theory, circular cylindrical shells, thermal stresses of rectangular plates, etc [NASA TN-D-6425] [NASA TN-D-6426] [NASA TN-D-6427] [NASA TN-D-6428] [NASA TN-D-6429] [NASA TN-D-6430] [NASA TN-D-6431] [NASA TN-D-6432]

A-39
Aerodynamic load predicting for control surfaces

Subcritical nonlinear potential flows over two

Subsonic turbulent jets acoustic emission,
numerical analysis of aerodynamic loads and

Stream lines construction in meridional plane of

Composite structures development, discussing wing,
Design, analysis and testing of F-111 complex

High voltage DC electric power transmission
systems with ground return, reducing aircraft
wiring weight and energy dissipation

Integrated drive generator for aircraft electrical
power systems, improving weight, life, and
reliability

Administrative techniques of cost/weight tradeoff
program for jet transport airplane

Statistical analysis of error sources and calculate
magnitudes in Boeing 747 weight values obtained
by onboard aircraft weighing system and by
manual calculations

Composite materials effect on supersonic aircraft
weights, design and performance

Weight reduction potential of composite materials
in aerospace structures, proposing weight
estimation technique

Design, analysis and testing of F-111 complex
fuselage full scale section of composite
materials, noting weight savings

Composite structures development, discussing wing,
fuselage, aeropropulsion and missile
development, weight savings of hardware and
fighter supersonic applications

Subcritical nonlinear potential flows over two
dimensional subsonic airfoils by multistrip
method of integral relations

Soviet book on subsonic gas turbine passenger
planes power supply systems covering Boeing 747,
short haul aircraft, DC-10, L-1011, etc

Wing group weight prediction for subsonic aircraft
design, taking into account root bending moments
due to lift

Subsonic aircraft propulsion by external heat
transfer and coking studies

Computer programs for evaluating subsonic flow
over wing-tail, wings with folded tips, T tails,
and cruciform tail surfaces

Computer programs for calculating airframe
coefficients of wing-horizontal tail and fin-
horizontal tail oscillating in subsonic flow

Application of lifting surface theory to wing with
control surfaces in unsteady subsonic flow

Aerodynamic characteristics of elastic swept wing
of aircraft in subsonic flow with given weight,
overload, and dynamic head

Transonic wind tunnel testing of air intake and
afterbody of double fine engine nacelle at high
subsonic Mach numbers and high Reynolds numbers

Subsonic static characteristics of slender wing
configurations using magnetic suspension and
balance system

Evaluating three component electronic wind tunnel
balance installed in 3.5 by 5.0 ft subsonic
tunnel

Mesh method for supercritical transonic flow
calculation with normal or oblique shock wave at
trailing edge

Applications of supercritical airfoils to
transport aircraft designs

Thyristor power conditioning application to high
voltage DC electric power system, presenting SST
aircraft sample load profiles

Composite materials effect on supersonic aircraft
weight, design and performance

Strategic bomber B-1A program, discussing airframe
and engine contractors, design, characteristics
performance, electronic equipment and armament

Experimental and theoretical study of biologically
important radiation components and dose
equivalents due to galactic and solar rays at
500 in high and earth orbit - summary

Study of concept of inertially aided barometric
altimetry system to meet vertical separation
requirements of 1000 and 2000 feet for Mach 3.5
aircraft in altitude hold at 80,000 feet

Heat sink capabilities of Jet-A fuel - heat
transfer and coking studies

Shock wave interaction between supersonic
airfoils, slender bodies, and thin wings and
plane shock wave

Heater and nozzle design of OHERA/S4BA hypersonic
wind tunnel for supersonic combustion ramjet
tests

Supersonic cylindrical freon compressor with low
blade height for elementary compression and flow
visualization aerodynamic and thermodynamic
tests

Supersonic flight

Supersonic Aircraft propulsion by external heat
addition, discussing numerical method for
suitable caret wing design

A-40
Aircraft design, flight characteristics, and atmospheric effects on sonic boom during supersonic and hypersonic flight

SUPersonic Flow

Two vortex model for downwash variations in supersonic flow past thin delta wing with separation at leading edges

A71-36190

Stream lines construction in meridional plane of blade nozzle annular cascade of steam and gas turbines in subsonic and supersonic flow

A71-39486

Negative pressure gradient effect on separation of supersonic flow over notches, comparing theory with wind tunnel determination

A71-38998

Flow distribution behind laminar boundary layer separation point in supersonic flow, calculating plates region pressure

A71-35629

Turbulent boundary layer interaction with supersonic flow flow behind step, calculating pressure distribution, momentum thickness and friction

A71-35631

Finite difference method application to three dimensional boundary layer calculation on sphere- segment surfaces in supersonic flow

A71-35632

Supersonic flow past V-shaped wings with leading edges, applying method of characteristic to space variable for pressure distribution

A71-35647

Pressures, velocities and aerodynamic characteristics of supersonic flow around slender delta wings with forced asymmetry and separation at leading edges

A71-36134

Supersonic flow past thin delta wings with finite velocities at leading edges, noting wing deformation to avoid corrugated vortices appearance

A71-36181

Supersonic flow field computation for wing-body combinations by shock-capturing finite difference techniques, discussing improvements based on Rung-Kutta method

A71-36303

Dynamic parameters of supersonic flow incident on conical bodies at large angles of attack, considering shock flow and entropy distribution

A71-36328

V shaped conical wing in supersonic and hypersonic flow with shock attached to leading edge, investigating complex wave system with time dependent and analytical methods

A71-36339

Slender wing lift in supersonic flow, analyzing suction force on leading edge and viscosity and nonlinear effects

A71-36377

Numerical analysis of aerodynamic loads on wing and tail surfaces with oscillations in unsteady supersonic and subsonic flow including interference lift

A71-29333

[AGARD-CP-80-77-P-11]

Aerodynamic load predicting for control surfaces in unsteady supersonic and subsonic flow

A71-29334

Box collocation method for calculating aerodynamic loads on slender delta wings with oscillations in supersonic flow

A71-29337

Aerodynamic drag of many bodies of revolution in supersonic flow

[DLR-PB-71-04]

A71-30325

Hypersonic and supersonic angle of attack flow about asymmetric and axisymmetric blunt bodies based on time dependent finite difference theory and method of characteristics

[NASA-TM-X-29037]

A71-32027

Influence of artificially induced turbulence upon boundary layer transition in supersonic flows

[AD-722332]

A71-31586

SUPersonic Flutter

Supersonic panel flutter and aerodynamic load stress analysis of finite cylindrical shells based on Galerkin method and aeroelastic equilibrium equations

A71-30767

[AD-722347]

A71-31183

SUPersonic Inlets

Design and characteristics of supersonic inlet control for minimizing inlet unstarts

[NASA-TH-X-04080]

A71-30072

SUPersonic Jet Flow

Supersonic jet interaction with turbulent wake, calculating plane and axisymmetric flow behind body butt face

A71-35630

Method of characteristics application to supersonic jet and nozzle gas flow with allowance for equilibrium and nonequilibrium condensation

A71-35636

Photographic study of colliding underexpanded and normally expanded supersonic jets in two-wind-tunnel assembly with atmospheric static working pressure

A71-35618

Acoustic radiation of supersonic jet toward nozzle exit section, plotting pressure pulsations vs active/passive pressure ratio

A71-36122

SUPersonic Nozzles

Method of characteristics application to supersonic jet and nozzle gas flow with allowance for equilibrium and nonequilibrium condensation

A71-35636

SUPersonic Speeds

Effects of nose bluntness on static aerodynamic characteristics of cruciform wing missile at Mach 1.50 to 2.86

[NASA-TN-X-2289]

A71-30813

SUPersonic Transports

Environmental effects on SST structural materials fatigue, discussing Ti alloys studies involving temperature effects, crack propagation and residual strength

A71-38556

Stratospheric ozone reduction through catalytic action of nitrogen oxides from SST exhaust, discussing degrading effect on atmospheric radiation shield

A71-36922

Probable impact of future supersonic transport aircraft operations on noise environment around seven airports in US

[AD-722365]

A71-29777

Simulation studies for development of certification criteria applicable to SST takeoff and engine failure

A71-30777

SUPersonic Wind Tunnels

Negative pressure gradient effect on separation of supersonic flow flow over notches, comparing theory with wind tunnel determination

A71-34898

Photographic study of colliding underexpanded and normally expanded supersonic jets in two-wind-tunnel assembly with atmospheric static working pressure

A71-36118

Lewis 9 by 15 foot V/STOL wind tunnel in return leg of supersonic wind tunnel

[NASA-TN-X-2305]

A71-30055

SUpport Systems

Support systems and operational design of nitrogen hypervelocity blowdown wind tunnel

[AD-722385]

A71-29907

SURFACE NAVIGATION

Navigation and communication satellites development for civil aviation and shipping, examining technical, organizational, operational and cost problems

A71-34240

Civil aviation and merchant marine satellites, considering aircraft and surface vessels antenna characteristics and modulation techniques for optimum communication channel frequencies

A71-35582

SURFACE Properties

Effects of runway contaminants and pavement surface properties on runway slipperiness

A71-30767

SURFACE ROUGHNESS

Runway and taxiway profile and airplane response measurements to determine runway roughness

A71-30767
Surface Vehicles

Surface Vehicles

Experimental research at Building Research Station on outdoor sound propagation for building design in relation to aircraft and road traffic noise

Testing ASR/transponder for moving emergency service vehicles on airfields during poor visibility conditions

Analysis of transit access to Oakland International Airport, Oakland, California, and recommendations for improved service

Sweptback Tails Surfaces

Jet penetration into Mach 2 airstream using sweepback injectors at angle of attack

Sweptback Wings

Pressure measurements of harmonically oscillating sweepback wing with two flaps in incompressible flow

Synchronous Satellites

Time division multiplexing system for ATS, discussing surveillance geostationary satellites, feasibility, delta modulation for data transmission and aircraft equipment

Table of Contents

Aircraft electric power system design with reliability, simplicity, low cost, weight and size, discussing automatic circuit protection and energy power

Systems Analysis

Systems approach to airfield pavement for future aircraft, integrating design, construction, operation and maintenance

Systems analysis of aircraft, aircraft guidance and control systems, and atmospheric turbulence for low visibility instrument landing system requirements

Systems analysis of directional control, rotary wing vibratory loads, lift sharing, and fuselage vibration and damping during helicopter maneuvers

Systems analysis approach to airport planning and predicting terminal facility and aircraft demands in year 2000 for air traffic control

Systems Engineering

ATC system models, covering surface movement, runway utilization, terminal areas and enroute traffic

Queuing theory approach to communication satellite network design, applying to ocean air traffic control and worldwide military broadcast systems

Support systems and operational design of nitrogen hypervelocity blowdown wind tunnel

Parametric turbine vector diagram calculation for design of highly loaded multistage fan driven turbine

T Tails Surfaces

Experimental and theoretical aeroelastic analysis of Fokker F-28 T tail, using flutter model and flight flutter tests

Numerical analysis of aerodynamic loads and coefficients for tandem and T tail surfaces harmonically oscillating in subsonic flow

Aeroelastic and flutter analysis for T tail of Fokker F-28

Tables (Data)

Computer programs for calculating airborne coefficients of wing-horizontal tail and fin-horizontal tail oscillating in subsonic flow

Tail Assemblies

Composite structures development, discussing wing, fuselage, aeropropulsion and missile development, weight savings of hardware and fighter configuration applications

Method for calculating flutter using interference aerodynamic forces between wing and tail

Tail Surfaces

Computer programs for evaluating subsonic flow over wing-tail, wings with folded tips, T tails, and cruciform tail surfaces

Tareoff

Simulation studies for development of certification criteria applicable to SST takeoff and engine failure

Tareoff Runs

Trailing wake hazards of large transports in takeoff and landing, examining configuration stability of vortex pair in ground effect

Tandem Wing Aircraft

Wing interference lift line lattice simulation and application to aerodynamic loads on tandem wings in unsteady flow

Box collocation method for calculating aerodynamic loads on tandem delta wings with oscillations in supersonic flow

Wind tunnel investigation of aerodynamic interference between two lifting surfaces in tandem

Taxing

Airframe random heave/pitch response to taxing on rough runways, analyzing dynamic loads and fatigue damage by power spectral techniques

Runway and taxiway profile and airplane response measurements to determine runway roughness

Technological Forecasting

Future air transportation concepts, discussing short haul travel market, economic, environmental, safety, convenience and reliability aspects
TIRE DEPENDENCE

Voltage DC electric power system, presenting SST aircraft sample load profiles

A71-35770

TIRE DEPENDENCE

Velocity determination in hypersonic low density wind tunnel based on high energy electron beam produced nitrogen ions time of flight

A71-34887

TIME DIVISION MULTIPLEXING

Time division multiplexing system for ATS, discussing surveillance geostationary satellite feasibility, delta modulation for data transmission and aircraft equipment

A71-34680

Bit and scanning field synchronization of time multiplex for air traffic control

A71-36513

TITANIUM ALLOYS

Environmental effects on SST structural materials fatigue, discussing Ti alloys studies involving temperature effects, crack propagation and residual strength

A71-34556

Diffusion bonding as economical fabrication process for aerospace applications involving Ti alloys, emphasizing mechanical properties and structural integrity improvement

[SSE PAPER AD-71-285]

TITRATION

Aircraft turbine oils acid number potentiometric determination, discussing automatic titration procedure and apparatus and solvents influence on titration curve and inflection point

A71-36680

TORSIONAL STRESS

Constrained torsion of spar box fastened along isolated parts of wing span, noting structural failure due to tangential stress distribution

A71-35313

TOUGHNESS

Damage tolerant aircraft structures material toughness and residual strength, presenting fracture test results on precracked panels reinforced with crack stoppers

A71-35157

TRACKING (POSITION)

Prediction method for performance of total pilot-vehicle system in turbulence with application to tracking tasks

[AD-722855]

TRADEOFFS

Administrative techniques of cost/weight tradeoff program for jet transport airplane

[SAWE PAPER 899]

TRADING EVENTS

Data acquisition system for 85-2a aircraft training flight evaluations

[AD-722851]

TRAJECTORY ANALYSIS

Cost effective high speed projectile trajectory plotting systems for gun range instrumentation, applying to aircraft path recording during automatic landing control

A71-36613

TRAJECTORY CONTROL

Soviet book on radio control of various flight vehicles covering closed loop synthesis, missile guidance, spacecraft trajectory correction and air traffic control

A71-35403

TRANSFER FUNCTIONS

Computation of uncoupled vibrations of rotary wings using transfer matrix method

[DLR-Pb-70-63]

TRANSITIONAL MOTION

Gyrocompass stability during circulations and arbitrary periodic maneuvers, taking into account transitional motion vertical inertial component

A71-35604

TRANSMITTER RECEIVERS

Airborne communications with AW/DCC-15a transceiver in single radio, discussing extended frequency coverage, multimode operation, navigation and input/output provisions

A71-35758

TRANSONIC COMPRESSORS

Multiple tone generation by axial flow transonic compressors, considering shock waves production and propagation associated with supersonic elements of blading

A71-35497

TRANSONIC FLYING

Cone-cylinder-cone missile type body in transonic buffetting environment determining static and fluctuating wall pressure distribution

A71-36020

TRANSONIC FLOW

Two dimensional steady viscous gas transonic flow Navier-Stokes equations, establishing uniqueness of solutions to boundary value problems

A71-35646

Mesh method for supercritical transonic flow calculation with normal or oblique shock wave at trailing edge

A71-35799

Small disturbance transonic flows potential equations numerical solutions, using aero finite difference theory

A71-36225

Design and characteristics of quasi-steady devices for simulation of high Reynolds number flows

A71-37262

TRANSONIC WIND TUNNELS

Transonic wind tunnel testing of air intake and afterbody of double flux engine nacelle at high subsonic Mach numbers and high Reynolds numbers

A71-36021

TRANSPONDERS

Testing ASR/transponder for moving emergency service vehicles on airfields during poor visibility conditions

A71-29553

Evaluation of airborne transponders used for air traffic control facilities

[AD-723028]

TRANSPORT AIRCRAFT

STOL transport optimal airplane/propulsion system design, discussing thrust requirements, performance, control, cruise functions, fuel consumption and fan characteristics

[AIAP PAPER 71-764]

Aircraft for international long haul transportation, discussing criteria for selection based on environmental, operational, budgetary and policy considerations

A71-35208

Gulfstream 2 acoustics program for cabin noise level reduction, compliance with FAA takeoff and landing noise certification and structure qualification against sonic fatigue

[AIAP PAPER 71-783]

Large jet transport aircraft trailing vortices, studying velocity fields, core diameters and logarithmic variations of circulation

A71-36527

Trailing wake hazards of large transports in takeoff and landing, examining configuration stability of vortex pair in ground effect

A71-35755

Large jet transport aircraft trailing vortices, studying velocity fields, core diameters and logarithmic variations of circulation

A71-37557

Aircraft design, discussing thrust requirements, performance, control, cruise functions, fuel consumption and fan characteristics

[AIAP PAPER 71-764]

Large jet transport aircraft trailing vortices, studying velocity fields, core diameters and logarithmic variations of circulation

A71-36431

Aircraft design, discussing thrust requirements, performance, control, cruise functions, fuel consumption and fan characteristics

[AIAP PAPER 899]

Hypersonic aircraft design usable as transport or space shuttle, determining aerodynamic behavior in viscous flow

A71-35412

Analysis of physical and economic factors pertaining to effective operation of vertical takeoff and landing aircraft short range commercial transportation - Vol. 1

[AE-326/021-VOL-1]

Identification and analysis of potential sites for vertical takeoff and landing, examining configuration stability of vortex pair in ground effect

A71-35285

Identification and analysis of potential sites for vertical takeoff and landing aircraft facilities in Great Britain - Vol. 2

[AE-326/021-VOL-2]

Wind tunnel investigation of static longitudinal aerodynamic characteristics of semispan swept wing for STOL jet transport with deflected thrust and boundary layer control

[ADA-78-6-6256]

Effect of wing-tip vortex wakes generated by large jet transport aircraft on smaller airplanes

A71-30768
Flight tests for evaluating effect of wing-tip vortex wake generated by large jet transports on smaller aircraft

Applications of supercritical airfoils to transport aircraft designs

Developing aircraft ride criteria and/or acceptable vibration levels and problems in measuring and recording low level vibration environment

Fatigue crack length relationship with aircraft inspection intervals and structural reinforcement, high strength materials, and aircraft usage effects

TRANSPORTATION

Use of aerodynamic lift for application to high speed ground transportation by two dimensional airfoils

Analysis of transit access to Oakland International Airport, Oakland, California, and recommendations for improved service

TURBINE BLADES

Engine turbine blades aerodynamic vibration damping calculation procedure

Pretwisted cantilever airfoil cross section turbine and compressor blades vibration natural frequencies and mode shapes

Dirichlet problem in hodograph plane of compressible fluid flow from aircraft, helicopter blades or turbine blade airfoils

Fan jet first stage turbine blade air cooling, describing design, heat transfer data, efficiency and temperature distribution

Siren wall in turbine axial stage due to nonuniform pressure fields behind blade cascades

TURBINE WHEELS

Linear radial loads effect on stress and strain of hyperboloidal rotor disk applied to aircraft engine compressors with two stream flow of working medium

TURBINES

Parametric turbine vector diagram calculation for design of highly loaded multistage fan driven turbine

TURBOCOMPRESSORS

Gas turbine with high velocity combustor, pure impulse compressor and turbine and isothermal burner

Multiple tone generation by axial flow transonic compressors, considering shock waves propagation and propagation associated with supersonic elements of blading

Fundamentals of turbocompressor and turbofan noise and noise reduction possibilities

TURBOFAN ENGINES

Fan jet first stage turbine blade air cooling, describing design, heat transfer data, efficiency and temperature distribution

Design operating process of turbojet, turboprop, and turbofan aircraft engines

Aircraft accident litigation related to wake turbulence concerning pilot or air traffic controller faults

Supersonic jet interaction with turbulent flow, calculating plane and axisymmetric flow behind step, calculating turbulent shear flow to aerodynamic noise generation

TURBULENT FLOW

Detachment prediction in turbulent incompressible plane flows on thick bodies applied to wall with disconnections and flat plate normal to wind

Relation of Kalenich and Lagrangian structure of pseudosound pressure and velocity fields in turbulent shear flow to aerodynamic noise generation

TURBULENT JETS

Subsonic turbulent jets acoustic emission, calculating noise intensity in far field for various Mach numbers

Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into cross wind

Noise generation due to inlet free stream turbulence incident on isolated stators and rotors, using flat plate cascade blade row model

TURBULENT WAKES

Turbulent wakes flow entrainment mechanism, investigating turbulence spreading near interface between laminar and turbulent regions

Aircraft accident litigation related to wake turbulence concerning pilot or air traffic controller faults

Supersonic jet interaction with turbulent flow, calculating plane and axisymmetric flow behind body butt face

Air craft vortex wake turbulence including formation, disintegration, hazards reduction, instability and interactions with following vehicles

Effect of wing-tip vortex wakes generated by large jet transport aircraft on smaller airplanes
TWO DIHEROML FLOW

TWO DIMENSIONAL FLOW

Detachment prediction in turbulent incompressible plane flows on thick bodies applied to wall with disconnections and flat plate normal to wind A71-34189

Supersonic jet interaction within turbulent wake, calculating plane and axisymmetric flow behind body butt face A71-35630

Two dimensional steady viscous gas transonic flow Navier-Stokes equations, establishing uniqueness of solutions to boundary value problems A71-35646

Plane laminar incompressible jet flow along parabola with no external stream, using second order boundary layer theory A71-36268

Two dimensional laminar incompressible fluid flow past flat plate at various angles of attack, studying vortex shedding characteristics A71-36311

ULTRASONIC TESTS

Aircraft parts testing by NDT methods, considering ultrasonic system for valve defects and fluorescent particle system for crack detection A71-37056

ULTRASONICS

Boo temperature ultrasonic frequency fatigue behavior of Ni-base superalloy single crystals A71-39493

UNCOUPLED MODES

Computation of uncoupled vibrations of rotary wings using transfer matrix method [DLR-TP-70-63] A71-29543

UNIQUENESS THEOREM

Two dimensional steady viscous gas transonic flow Navier-Stokes equations, establishing uniqueness of solutions to boundary value problems A71-35646

UNITED STATES OF AMERICA

Probable impact of future supersonic transport aircraft operations on noise environment around seven airports in US [AD-722365] A71-29777

Lever atmosphere wind shear determined for aircraft approach control from observations in different American sites A71-30837

UNITS OF MEASUREMENT

Development of noise measurement units for airport and aircraft noise reduction and psychoacoustical studies A71-30786

UNSTEADY FLOW

Stagnation pressure changes in unsteady flow downstream of turbine machine blades with fluctuating circulation related to vortex sheets A71-35279

Numerical analysis of aerodynamic loads on wing and tail surfaces with oscillations in unsteady supersonic and subsonic flow including interference lift [AGARD-CP-80-71-PT-1] A71-29333

Aerodynamic load predicting for control surfaces in unsteady supersonic and subsonic flow A71-29334

Wing interference lift line lattice simulation and application to aerodynamic loads on tandem wings in unsteady flow A71-29336

Symposium on unsteady aerodynamic forces, loads, and configurations for aeroelastic analysis of interfering surfaces [AGARD-CP-80-71-PT-2] A71-29338

Kinematics of subsonic unsteady airfoils on multiple lifting surfaces A71-29339

Unsteady pressure measurements on harmonically oscillating swept wing with two control surfaces in incompressible flow A71-29350
Identification and analysis of potential sites for large scale mid-sized digital voice navigation systems analysis of directional control, rotary wing vibrations, and fuselage vibrations during helicopter maneuvers. Design of aircraft ride criteria and/or acceptable vibration levels and problems in measuring and recording low level vibration environment. Nonlinear elastic suspension springs with symmetrical hardening behavior for shock and vibration isolation of aerospace instruments and controls. Systems analysis of directional control, rotary wing vibratory loads, lift sharing, and fuselage vibrations and damping during helicopter maneuvers. Flight tests and simulation for determining effects of peripheral viewing losses on pilot performance during commercial aircraft landing. Two vortex model for downwash variations in steady incompressible flow past thin delta wing with separation at leading edges. Viscous stresses distribution in isothermal incompressible turbulent boundary layer with positive pressure gradient by diffusers in open jet wind tunnel. Hypersonic viscid-inviscid internal flow field interaction with laminar boundary layer in circular ducts, using method of characteristics and implicit finite difference scheme. Hypersonic aircraft design usable as transport or space shuttle, determining aerodynamic behavior in viscous flow. Flight tests and simulation for determining effects of peripheral viewing losses on pilot performance during commercial aircraft landing. Viscous flow. Vortex laser Doppler velocimeter system for measuring gas velocities with high spatial and temporal resolution. Vortex and damping during helicopter maneuvers. Vibration and damping during helicopter maneuvers. Vibration damping. Vibration damping calculation procedure. Vibration effects. Vibration isolators. Vibration measurement. Vibration mode. Viscous flow. Viscous stresses distribution in isothermal incompressible turbulent boundary layer with positive pressure gradient by diffusers in open jet wind tunnel. Hypersonic viscid-inviscid internal flow field interaction with laminar boundary layer in circular ducts, using method of characteristics and implicit finite difference scheme. Hypersonic aircraft design usable as transport or space shuttle, determining aerodynamic behavior in viscous flow. Holographic display for blind landing system with variable image perspective over wide field of view, using collimated or cylindrical laser beam. Voice communications. ESBT part of Joint AGC communication experiment for L band satellite use, giving voice and data transmission and distance measurement techniques tests results. Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into crosswind. Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into crosswind. Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into crosswind. Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into crosswind. Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into crosswind. Flow visualization and hot-wire measurements, showing vortex shedding association with turbulent air jet issuing from flat plate into crosswind.
WING ROOTS
Wing group weight prediction for subsonic aircraft design, taking into account root bending moments due to lift
A71-35925

WING SPAN
Constrained torsion of spar box fastened along isolated parts of wing span, noting structural failure due to tangential stress distribution
A71-35313
Hybrid V/STOL jet lift aircraft design, examining wing area-lift engine bypass ratios relation
A71-36273

WING TIPS
Wing tip vortex test demonstrating use of Laser Doppler Velocimeter system for measuring gas velocities with high spatial and temporal resolution
A71-30278

WING-FUSELAGE STONES
Procedures for calculating normal wash in nonplanar configurations and interference between wings and bodies
N71-29340

WINGS
Fatigue crack initiation and growth and residual strength of F-100 wing, comparing service failure data with full scale fatigue test results
A71-35159
Computer programs for evaluating subsonic flow over wing-tail, wings with folded tips, T tails, and cruciform tail surfaces
A71-29341
Method for calculating flutter using interference aerodynamic forces between wing and tail
A71-29345
Calculation of pressure distributions over wings with harmonic oscillating control surfaces using kernel function method
A71-29346
Application of lifting surface theory to wing with control surfaces in unsteady subsonic flow
A71-29347
Asymptotic expansion techniques to define pressure loading effects on wings with unbalanced control surfaces
A71-29348
Computed aided design of wing structures and application of optimal law of material distribution
[AD-722303]
A71-29657

WIRING
Computerized automatic control of aircraft electrical system using remote power controllers and multiplexed data buses for wiring reduction and reliability improvement
A71-34700
High voltage DC electric power transmission systems with ground return, reducing aircraft wiring weight and energy dissipation
A71-35771
Remote power controller as static circuit protection device for aircraft and spacecraft automatically controlled electrical wiring system, discussing performance improvement
A71-35782

WISCONSIN
Investigation of Mississippi Valley Airways De Havilland DHC-6, N9565M crash at LaCrosse, Wisconsin Nov. 9, 1970
[NTSB-ARB-71-10] N71-29914

X

X RAY APPARATUS
Airborne nucleonics equipment design for indicating helicopter lift capability using X ray backscatter from Kr-85, temperature sensor, and digital computer
[SAH-805-1] N71-29215

Y

YAW
Total pressure, static pressure, surface shear stress, and yaw angle measurements of 5 curved ducted flow
[IC-71-10] N71-30264

A-99
**PERSONAL AUTHOR INDEX**

**AERONAUTICAL ENGINEERING / A Special Bibliography (Suppl. 10)**

**OCTOBER 1971**

---

**Typical Personal Author Index Listing**

<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Report Number</th>
<th>NASA Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKBBAHOVA, I. IA.</td>
<td>Constrained torsion of an incompletely fastened spar box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACKER, L. W.</td>
<td>Inlet noise suppressor performance with a turbojet engine as the noise source</td>
<td>[NASA-TN-D-6395]</td>
<td>N71-31096</td>
</tr>
<tr>
<td>ADOCK, B. D.</td>
<td>Effective perceived noise level evaluated for STOL and other aircraft sounds Final report</td>
<td>[VR-70-9]</td>
<td>N71-31075</td>
</tr>
<tr>
<td>AKAHATSU, I.</td>
<td>Representation of a wing in the lifting line, application of the interaction calculations of two wings in tandem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALDERA, J. A.</td>
<td>Potential flow solution for a STOL wing propulsion system</td>
<td>[NASA-TN-D-6394]</td>
<td>N71-29774</td>
</tr>
<tr>
<td>ALIREF, B. S.</td>
<td>Calculation of the boundaries of the region of stable equilibrium of a rotor in pressurized gas bearings</td>
<td>[AD-722828]</td>
<td>N71-31213</td>
</tr>
<tr>
<td>ALLEGEE, J.</td>
<td>Wakes of inclined wedges in rarefied hypersonic flows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALLEN, F. C.</td>
<td>Effect of thickness on the fracture toughness of 7075 aluminum in the 76 and 773 conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCONA, C.</td>
<td>A meter wave aircraft antenna for communication between Concorde and a satellite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANDERSON, R. A.</td>
<td>Age of the RPV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANDREWS, G. N.</td>
<td>Three-dimensional boundary layer on a segmented body at supersonic velocities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANDREWS, W. H.</td>
<td>Aircraft response to the wing trailing vortices generated by large jet transports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANGELIS, F. L.</td>
<td>Static force tests of a model of a twin-jet fighter airplane for angles of attack from minus 10 deg to 110 deg and sideslip angles from minus 40 deg to 40 deg</td>
<td>[NASA-TR-D-6425]</td>
<td>N71-31330</td>
</tr>
<tr>
<td>ANTONOV, A. N.</td>
<td>Calculation of the interaction of a turbulent boundary layer with a supersonic outer flow behind a step</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARSTON, D. D.</td>
<td>Flight trials to discover whether peripheral vision is needed for landing</td>
<td>[NAS-TR-70205]</td>
<td>N71-29497</td>
</tr>
<tr>
<td>ARWET, H.</td>
<td>Terms of commercial air traffic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARHOLD, J.</td>
<td>Dual mode symmetrical high frequency antennas for airborne use</td>
<td>[AD-722736]</td>
<td>N71-29895</td>
</tr>
<tr>
<td>ASHLEY, R.</td>
<td>Some considerations relative to the prediction of unsteady air loads on interfering surfaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUGUSTUS, J. M.</td>
<td>The influence of composite materials on aircraft weight, design and performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTER, T.</td>
<td>The new Finnish air traffic law</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AYERS, T. G.</td>
<td>Application of advanced aerodynamics to future transport aircraft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BADE, E.</td>
<td>Soft-ground arresting of civil aircraft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAKER, D. R.</td>
<td>Power controllers for automatically controlled electrical systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BANSOT, P.</td>
<td>The flow in 5 shaped ducts</td>
<td>[IC-71-10]</td>
<td>N71-30264</td>
</tr>
<tr>
<td>BAKER, M. R.</td>
<td>Handling qualities of light aircraft with advanced control systems and displays</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A system for recording the path of high speed moving vehicles A71-36613
An approach guidance system for side-firing tactical aircraft [AD-722412] A71-29708
Some results of calculations of flows around conical bodies at large incidence angles A71-36328
Preliminary experiments in the air navigation aid satellite project A71-36509
The influence of semifinished products production technology on the mechanical properties of heat-resistant alloys A71-36725
Tapered roller bearings take off A71-35300
Progress report on wing-trailing-vortex studies A71-30764
Radio tracking of aircraft by means of two geostationary satellites A71-36508
Calculation of the uncoupled vibrations of helicopter rotor blades using the method of transfer matrices. Effects of aerodynamic damping, a built-in cone angle and comparison with other theoretical methods and measurements [DLR-FB-70-63] A71-29543
A hardware executive control for the advanced avionic digital computer system A71-35778
Study of visible exhaust smoke from aircraft jet engines Final report [FAA-MA-71-24] A71-29307
Mechanics of entrainment in turbulent wakes A71-34899
Optimization of complex structures to satisfy flutter requirements A71-34874
The next steps in ITC system modernization A71-34614
Fan propulsion system influence on VTOL transport design [AIRPAPER 71-744] A71-34225
Some aspects of the aerodynamics of STOL ports A71-30776
Influence of semifinished products production technology on the mechanical properties of heat-resistant alloys A71-36725
The problem of protecting flight vehicles from icing A71-34850
Supersonic unsteady airloads on multiple lifting surfaces A71-29339
Contribution to the theory of transonic flows A71-35646
Time division multiplex system for air traffic control A71-34680
Some systems aspects of random access signalling A71-35783
A linear control of systems with random input - Application to gust response control [ONERA-P-131] A71-30329
Study of fluctuations of wall pressure in transonic flow on a cone-cylinder body with a narrowed rear body [ONERA-TP-942] A71-36020
Laminar convective heat-transfer rates on a hemisphere cylinder in rarefied hypersonic flow A71-34902
The flow in S shaped ducts [XC-71-10] A71-30264
Application of advanced aerodynamics to future transport aircraft A71-30769
The influence of motion on the effectiveness of flight simulators in training maneuvers A71-30772
Simulation studies for development of certification criteria applicable to SST takeoff A71-30777
Time division multiplex system for air traffic control A71-34680
Use of an air-assist fuel nozzle to reduce exhaust emissions from a gas turbine combustor at simulated idle conditions [NASA-TN-D-6404] A71-31056
Evaluation of an electronic wind-tunnel balance [AD-722571] A71-31400
A continuous wave Doppler system for aircraft collision hazard warning A71-30760
External heat addition for supersonic propulsion A71-35398
Interaction of radiation with the boundary layer at the stagnation point A71-35259
Development in airborne navigation systems A71-35374
Air traffic control satellite simulation experiment A71-36510
Remarks prepared for delivery by the Honorable
Absolute velocity determination in a hypersonic low-density flow

BOLIGIB, I. P.
The strategic bomber North American Rockwell B-1A

CABPBELL, D. V.
Closed-die forgings for the aircraft industry, II

CAVE, J. A.
The 'best' aircraft electric power system ever invented

CHAMBERS, B. M.
Flight investigation of installation effects on a plug nozzle installed on an underwater projectile [NASA-TH-X-2295] N71-30283

CHAMBERS, H. M.
Evaluation of measures of aircraft noise

CHARRAT, A. F.
Separation of a supersonic accelerated flow over notches

CHEBERH, A.
Preliminary experiments in the air navigation aid satellite project

CHESTMUT, D.
Trends in noise control for aircraft gas-turbine power plants

CHIARIETO, P. T.
Status of engine rotor burst protection program for aircraft

CHIKULIYEV, H. S.
Aircraft automatic control systems - Methods of analysis and design

CROSBY, N. J.
Experimental and analytical investigation of fast normal shock position controls for a Mach 2.5

CROSBY, N. J.
A continuous wave Doppler system for aircraft collision hazard warning

CROSBY, N. J.
Experimental and analytical investigation of fast normal shock position controls for a Mach 2.5
CROW, J. C.

A new approach to the calculation of transonic flows

DANIELS, H.

Stagnation pressure changes in unsteady flow

DARRAS, B.

Application of lifting surface theory to wings provided with control surfaces

DAS, A.

Studies of the lift problem for slender wings in supersonic flows

Lifting surface theory for an airplane wing with a jet flap

[NASA-TT-F-13714] H71-30852

Application of lifting surface theory to wings provided with control surfaces

DABBAS, B.

Application of lifting surface theory to wings provided with control surfaces

DAS, A.

Studies of the lift problem for slender wings in supersonic flows

Lifting surface theory for an airplane wing with a jet flap

[NASA-TT-F-13714] H71-30852

Application of lifting surface theory to wings provided with control surfaces

DADDYMOH, L. B.

Investigation of the nonequilibrium condensation in supersonic jets and nozzles

DANSON, B.

Vibration characteristics of pre-twisted blades of asymmetrical aerofoil cross-section

BDECKEB, B. B.

V/STOL concepts in short haul air transport

DEKEYSER, A.

Calculation methods for unsteady airfoils of tandem surfaces and T-tails in subsonic flow

DAVIS, D. E.

Calculation methods for unsteady airfoils of tandem surfaces and T-tails in subsonic flow

DARGOM, L. H.

Investigation of the nonequilibrium condensation in supersonic jets and nozzles

DANSON, B.

Vibration characteristics of pre-twisted blades of asymmetrical aerofoil cross-section

b. B.

Calculation methods for unsteady airfoils of tandem surfaces and T-tails in subsonic flow

DABBE, B. B.

V/STOL concepts in short haul air transport

DEKEYSER, A.

Calculation methods for unsteady airfoils of tandem surfaces and T-tails in subsonic flow

DIAMOND, P. H.

The application of ranging techniques to navigation and traffic control

DICKIE, E. J.

Air traffic control and the needs of the customer

DIEDEICH, J. H.

Location of 5- by 15-foot V/STOL wind tunnel


DIEHL, L. A.

Preliminary investigation of gaseous emissions from jet engine afterburners


DITTMANN, B.

Terns of commercial air traffic

DORIER, B.

The on-board antenna of the Dioscures system — Application of electronic scanning to air navigation by satellites

DOBSON, B.

Time division multiplex system for air traffic control

DRINKWATER, P. J., III

The influence of motion on the effectiveness of flight simulators in training maneuvers

Simulation studies for development of certification criteria applicable to SST takeoff

DUGAN, J. F., Jr.

Propulsion systems trends

DUNHAM, R. E., Jr.

Progress report on wing-trailing-vortex studies

Flight evaluation of a display for steep approach

DUQUEJUNE, N.

Time division multiplex system for air traffic control

Synchronizations of a time multiplex for air traffic control

ECKEFIELD, R. C.

Airborne display and electric management system

EDGE, P. H., Jr.

Evaluation of measures of aircraft noise

EDWARDS, J. H.

Design of asphalt pavements for heavy aircraft

EIDINOV, V. H.

Aircraft automatic control systems — Methods of analysis and design

EKENBROUK, J. J.

Analysis of experimental measurements of trailing vortex systems of large jet transport aircraft

EVALL, J. C.

Material toughness and residual strength of damage tolerant aircraft structures

ELFSTROM, G. E.

Turbulent boundary layer studies in a hypersonic gun tunnel

[IC/71/11] H71-30749

ELKINS, H. C.

Flight evaluation of a display for steep approach

ELLISON, A. P.

The civil aircraft market — An examination of the replacement order cycle and the used aircraft market

ELMOKASA, L. V.

Calculation of the interaction of a supersonic jet with a turbulent near wake behind a step

EMUNDS, H.

Some experimental investigations on the multiple-body-problems in supersonic flow

[DLR-PR-71-04] H71-30325

EHEDOLOM, D. K.

Handling qualities of light aircraft with advanced control systems and displays

ERICSSON, L. E.

Unsteady airflow stall and stall flutter

[NASA-CR-111906] H71-29221

EVANS, D. C.

Investigation of a highly loaded multistage fan driven turbine

EVERETT, D.

B0AC's 747 flight simulator
FAITH, L. E.  
Heat sink capability of jet A fuel - Heat transfer and coking studies  
[NASA-CE-72751]  
N71-3482

FATKOLI, O. K.  
Influence of semifinished products protection technology on the mechanical properties of heat-resistant alloys  
A71-36725

FELLER, C. H.  
Trends in noise control for aircraft gas-turbine power plants  
N71-30785

FEBLED, C. E.  
Inlet noise suppressor performance with a turbojet engine as the noise source  
[NASA-TR-D-6395]  
N71-31096

FICHTL, G. E.  
Development of turbulence and wind shear models for simulator application  
N71-30778

FILZOV, A. E.  
Learning to live with the OANS  
[SAFE PAPER 897]  
A71-35813

FISH, B. H.  
Study of protection of passengers in aircraft crash fires  
N71-30758

FISHER, L. J.  
Factors affecting ditching of new transport airplanes  
N71-30757

FITCH, E. B., Jr.  
Initiation and growth of fatigue cracks in and residual strength of the F-100 wing  
A71-35159

FLETCHER, R. D.  
Progress in the dissipation of fog  
A71-36450

FOESCH, T.  
Radiation safety in high-altitude airplane traffic  
N71-30779

FÖRCHING, H.  
Pressure measurements on an harmonically oscillating swept wing with two control surfaces in incompressible flow  
[DLR-PB-70-47]  
N71-29433

FOREST, R. D.  
Simulation studies for development of certification criteria applicable to SST takeoff  
N71-30777

FOESCHING, H.  
Pressure measurements on an harmonically oscillating swept wing with two control surfaces in incompressible flow  
N71-29350

FOSTER, C. J.  
Aircraft jet engine application of E.D.M. for repetitive continuous production  
[SBP PAPER WR-71-143]  
A71-36658

FOUHNER, R. E.  
Effects on nose bluntness on the static aerodynamic characteristics of a cruciform wing missile at Mach numbers 1.50 to 2.06  
[NASA-TR-E-2299]  
N71-30813

FRANCIS, D. G.  
Development of a vortex laser Doppler velocimeter  
A71-35756

FROLOV, V.  
Echography and its application in aviation and cosmonautics  
[JPBB-53420]  
N71-30361

FYT, B. L.  
V/STOL concepts in short haul air transport  
A71-36347

FYT, H. B.  
The influence of motion on the effectiveness of flight simulators in training maneuvers  
N71-30772

FUGGLE, A. P.  
Movement of emergency vehicles in reduced visibility conditions. Report on ASNI/Transponder trials at Heathrow Airport, September 1970  
N71-25553

FUEH, J. F.  
Results of the theory of rotor flow according to Miller and Scully  
[DLR-BTFT-70-23]  
N71-29395

Calculation of the induced velocity distribution of a rotor in stationary forward flight  
[DLR-BTFT-70-22]  
N71-30039

Parametric studies of rotor downstream calculation. Influence on fixed wing flow  
[DLR-PB-70-62]  
N71-30040

FULLE, C. H.  
[NASA-CH-119004]  
N71-30278

FURSTON, M. L.  
A trailing vortex model and its effect on a penetrating aircraft  
A71-3575a
Some new results of flight dynamics. I

Lightning induced voltages in aircraft electrical circuits

The evolution of the DC-10 wide-body tri-jet and its impact on air transportation

Status of research on runway roughness

The vortex wake hazard of large transports in take-off and landing

Acoustics program for the Grumman Gulfstream II


VSTOL airplanes with vectored thrust propulsion systems

A statistical analysis of the A-6A inertial navigation system

Fire fighter's exposure study Final report, Jul. - Nov. 1970

Initiation and growth of fatigue cracks in and residual strength of the F-100 wing

The influence of artificially induced turbulence upon boundary layer transition in supersonic flows Final technical report, 1 Dec. 1968 - 15 Jan. 1971

Increasing responsibility for skilled men

Progress in reducing exhaust pollutants from jet aircraft

Inlet noise suppressor performance with a turbojet engine as the noise source

Some aspects of the aerodynamics of STOL ports

The art of selecting aircraft

Radio control

Lightning induced voltages in aircraft electrical circuits

The evolution of the DC-10 wide-body tri-jet and its impact on air transportation

Status of research on runway roughness

Some new results of flight dynamics. I
HIBBOK, T.
Air-cooling of a turbine blade A71-35904

HIRSCH, R.
Studies and tests of a plane which absorbs strong wind gusts [NASA-TT-F-13754] A71-30868

HODGES, J.
The design and test of an integrally armored cockpit [AIAA PAPER 71-778] A71-35530

HOFMAH, L. G.

HOLDHAM, J. D.
Preliminary investigation of diffuser wall bleed to control combusor inlet airflow distribution [NASA-TN-D-6435] A71-30817

HOLT, B.

HOLMHAUSK, C. A.
Safety considerations for powered-lift STOL aircraft A71-30773

HORLOCK, J. H.
Stagnation pressure changes in unsteady flow A71-35279

HORNE, W. B.
Runway slipperiness A71-30767

HUBBARD, R. H.
Trends in noise control for aircraft gas-turbine power plants A71-30785

HUBBARD, R. W.
Modulation characteristics critical to frequency planning for the aeronautical services [ESSA-TR-71-35] A71-29555

HUBERMANN, H.
The significance of an airport for the economy of its environment A71-34462

HUFFMAN, J. E.
Experimental and analytical investigation of supersonic longitudinal and lateral aerodynamic characteristics of slender sharp edge 74 deg swept wings [NASA-TN-D-6344] A71-30530

HUNTER, P. A.
Status of research on runway roughness A71-30766

HYNES, R. J.
4-D guidance of STOL aircraft [AIAA PAPER 71-770] A71-35528

- I -

INCHCOLL, T. F.
An investigation of the relationships between mountain-wave conditions and clear air turbulence encountered by the X-70 airplane in the stratosphere [NASA-CR-1878] A71-31351

INWIS, R. C.
Safety considerations for powered-lift STOL aircraft A71-30773

INSLEY, R.
Dual mode symmetrical high frequency antenna for airborne use [AD-722726] A71-29895

IVES, D. C.
Subcritical flows over two dimensional airfoils by a multistrip method of integral relations

IVETA, H.
Hara - Tokyo's new airport A71-35997

JADDE, E.
The significance of an airport for the economy of its environment A71-34482

JAPP, P.
A comparison between planar and nonplanar free-flight data A71-31107

JAGLOWSKI, J. J., JR.

JAHNKE, E.
Potentiometric determination of acid numbers in aircraft turbine oils A71-36680

JARVIS, C. R.
Handling qualities of light aircraft with advanced control systems and displays A71-30771

JENKINS, J. L., JR.
Analysis of some helicopter operating problems A71-30775

JENSEN, J. E.
The ballistic damage characteristics and damage tolerance of wing structural elements A71-35161

JHAN, J. W., JR.
Progress report on the NASA Y-G/YSH general aviation program A71-30782

JOHNSON, H. A.
The odyssey of diffusion bonding [SRI PAPER AD-71-245] A71-36661

JOHNSON, R. L.

JOHSTON, H.
Reduction of stratospheric ozone by nitrogen oxide catalysts from supersonic transport exhaust A71-36922

JONES, B. G.

JONES, B. H.
How the courts look at wake turbulence A71-35387

JOYNER, U. T.
Effects of airplane operations on tire wear A71-30768

JUDD, H.
Sting-free drag measurements on ellipsoidal cylinders at transition Reynolds numbers A71-36037

JUHASZ, A. J.
Preliminary investigation of diffuser wall bleed to control combustor inlet airflow distribution [NASA-TN-D-6435] A71-30817

KALMAN, Z. F.
New developments and applications of the subsonic doublet-lattice method for nonplanar configurations A71-29340

KALYAGOV, V. G.
Distribution of viscos stresses in an incompressible turbulent boundary layer A71-34209

KARMAH, A.
Vertical and short takeoffs and landings of hybrid jet-lift airplanes [AIAA PAPER 71-767] A71-36273

KARNOY, A. E.
Determination of the aerodynamic characteristics of an elastic swept wing in subsonic flow [NASA-TT-F-13717] A71-30656
The determination of avionics redundancy for minimum cost


Some experimental investigations on the multiple-body problem in supersonic flow [DLR-PB-71-04]

Aerodynamic problems of hypersonic waveriders

The random beave-pitch response of aircraft to runway roughness

A design summary of stall characteristics of a high-speed aircraft [NASA-CR-1646]

The determination of avionics redundancy for minimum cost

Theory of jet engines [AD-722283]

A small, radio-controlled aircraft as a platform for meteorological sensors

A trailing vortex model and its effect on a penetrating aircraft

An experimental 24-channel multispectral scanner system

Approximate method of calculating the laminar boundary layer on a wing and on a body of revolution

Measurement of very small displacements using holographic interferometry

Some considerations in the development of a holographic display for a blind landing system

The NASA quiet engine [NASA-TN-D-67884]

Solution of the transonic potential equation using a mixed finite difference system

Numerical solution of the equations of motion of an aircraft turbine engine

Determination of the stability conditions of composite materials of high-speed aircraft by Liapunov's direct method

The problem of errors of a gyro device mounted on a mobile platform

Terms of commercial air traffic

Development of turbulence and wind shear models for simulator application

Aerodynamics of vehicles in tubes

Calculation of the induced velocity distribution of a rotor in stationary forward flight [DLR-MITT-70-22]

Calculation of the supersonic flow past V-shaped wings by the method of establishment

The conical wing in hypersonic flow

Evaluation of effects of high-altitude turbulence encounters on the XB-70 airplane [NASA-TN-D-6457]

Aircraft response to the wing trailing vortices generated by large jet transports

Using the ONERA/SMA hypersonic wind tunnel for supersonic combustion ramjet tests [ONERA-TP-924]

Linearized theory of the unsteady subsonic flow in a two-dimensional straight cascade

Numerical calculations of the hypersonic viscous-inviscid flow inside simple ducts of circular cross-section


Calculation of aircraft, helicopter blade, or turbine blade airfoils for the exact compressibility law

Optimal control of supersonic inlets to minimize contact stress [NASA-TN-D-6408]

Thermal ground testing of Concorde and Verais or improvement in French test methods and facilities

Some factors that affect the inspection of aircraft for fatigue damage

Tranasonic testing of the air intake and afterbody of an engine nacelle [ONERA-TP-943]

An approach to the establishment of practical air traffic control safety goals Interim Report [FAA-AD-70-71-36]

Material toughness and residual strength of damage tolerant aircraft structures

Introduction to the physical fundamentals of

KATON, H.

The determination of avionics redundancy for minimum cost


Some experimental investigations on the multiple-body problem in supersonic flow [DLR-PB-71-04]

Aerodynamic problems of hypersonic waveriders

The random beave-pitch response of aircraft to runway roughness

A design summary of stall characteristics of a high-speed aircraft [NASA-CR-1646]

The determination of avionics redundancy for minimum cost

Theory of jet engines [AD-722283]

A small, radio-controlled aircraft as a platform for meteorological sensors

A trailing vortex model and its effect on a penetrating aircraft

An experimental 24-channel multispectral scanner system

Approximate method of calculating the laminar boundary layer on a wing and on a body of revolution

Measurement of very small displacements using holographic interferometry

Some considerations in the development of a holographic display for a blind landing system

The NASA quiet engine [NASA-TN-D-67884]

Solution of the transonic potential equation using a mixed finite difference system

Numerical solution of the equations of motion of an aircraft turbine engine

Determination of the stability conditions of composite materials of high-speed aircraft by Liapunov's direct method

The problem of errors of a gyro device mounted on a mobile platform

Terms of commercial air traffic

Development of turbulence and wind shear models for simulator application

Aerodynamics of vehicles in tubes

Calculation of the induced velocity distribution of a rotor in stationary forward flight [DLR-MITT-70-22]

Calculation of the supersonic flow past V-shaped wings by the method of establishment

The conical wing in hypersonic flow

Evaluation of effects of high-altitude turbulence encounters on the XB-70 airplane [NASA-TN-D-6457]

Aircraft response to the wing trailing vortices generated by large jet transports

Using the ONERA/SMA hypersonic wind tunnel for supersonic combustion ramjet tests [ONERA-TP-924]

Linearized theory of the unsteady subsonic flow in a two-dimensional straight cascade

Numerical calculations of the hypersonic viscous-inviscid flow inside simple ducts of circular cross-section


Calculation of aircraft, helicopter blade, or turbine blade airfoils for the exact compressibility law

Optimal control of supersonic inlets to minimize contact stress [NASA-TN-D-6408]

Thermal ground testing of Concorde and Verais or improvement in French test methods and facilities

Some factors that affect the inspection of aircraft for fatigue damage

Tranasonic testing of the air intake and afterbody of an engine nacelle [ONERA-TP-943]

An approach to the establishment of practical air traffic control safety goals Interim Report [FAA-AD-70-71-36]

Material toughness and residual strength of damage tolerant aircraft structures

Introduction to the physical fundamentals of
The computation of supersonic flow fields about
Testing of two integral weight and balance systems
Handling qualities of light aircraft with advanced
laminar flows past a flat plate at various angles
Lubrication, friction, and wear in aircraft
An optimal controller based on linear
Evaluation of effects of high-altitude turbulence
The development of a three-micron absolute main
Mechanism of entrainment in turbulent wakes
The development of a three-micron absolute main
A digital V-O-R navigation converter
Mechanism of entrainment in turbulent wakes
The development of a three-micron absolute main
Status of studies in sonic boom
Concepts of fiber-resin composites
The application of Omega navigation to general aviation
Development in airborne navigation systems
Vortex shedding from a turbulent jet in a
Analysis of experimental measurements of trailing vortex systems of large jet transport aircraft
Analysis of experimental measurements of trailing vortex systems of large jet transport aircraft
The art of selecting aircraft
Minimun variance estimates of signal derivatives - A problem in instrument landing systems
Testing of the strength of the jet vanes of gas turbine installations under pulsed thermal conditions
Detachement in turbulent incompressible plane flows on thick bodies
Wakes of inclined wedges in rarefied hypersonic flows
Aerodynamic and deployment characteristics of
Satellites for the civil aviation and merchant marine
Subcritical flows over two dimensional airfoils by a multistrip method of integral relations
The effect of second order elastic terms in supercritical panel flutter of finite cylindrical shells
A small, radio-controlled aircraft as a platform for meteorological sensors
Aircraft automatic control systems - Methods of analysis and design
Section data for thin, highly cambered airfoils in incompressible flow
Spurious data for thin, highly cambered airfoils in incompressible flow
The Link 747 simulator
MILLER, B. E.
Some air transportation concepts for the future A71-36671

MILLS, B. C.
Formation flight technology A71-35923

MITCHELL, S. K.

MOAVS, R.
Causes of the siren wail in the axial stage of a turboshaft A71-36180

MOBILLO, S. A.
Operational aspects of V/STOL instrument approaches A71-30774

MOBARG, E. L., JR.

MOBILLO, C. E. X., JR.
Analysis of some helicopter operating problems A71-30775

MOBILLO, J. G.
Status of research on runway roughness A71-30766

MORROW, J. H.
Third order-two signal intermodulation products for 242 frequencies between 225-400 MHz [RCAC-FP-70-018] A71-29951

MORRIS, E. L., JR.
Third order-two signal intermodulation products, 110-136 MHz - 50 kHz channel spacing indexed by intermodulation product [RCAC-FP-70-016] A71-29952

MORRIS, C. E. X., JR.
Third order-two signal intermodulation products, 110-136 MHz - 50 kHz channel spacing indexed by contributing frequencies [RCAC-FP-70-015] A71-29954

MOBILLO, G. J.
Computation of incompressible turbulent boundary layers at low Reynolds numbers A71-38884

MUGHCHE, B. D.
Gust loading on a thin aerofoil A71-35285

HUMAN, E. M.
Solution of the transonic potential equation using a mixed finite difference system A71-36325

MURPHREE, E. L., JR.
Airfield pavement systems A71-36346

MYTTIM, W. J.
Application of AFFDL unsteady load prediction method to interfering surfaces A71-29341

MABO, V. A.
Using a helicopter for dusting forest sources of tick-borne encephalitis [AD-703998] A71-29557

MANN, E.
Vortex flow over a flat surface with suction A71-34889

NAZIM, A.
Why maximum temperature [SAE PAPER 710441] A71-34898

NEHEL, C. B.
Study of protection of passengers in aircraft crash fires A71-30758

NEPP, J. R.
Analytical weight determination of articulated main rotor blades [SAE PAPER 893] A71-35826

NEILAND, V. A.
Flow behind the boundary layer separation point in supersonic flow A71-35629

NEUER, G. H.
Experimental and analytical investigation of fast normal shock position controls for a Mach 2.5 mixed-compression inlet [NASA-TN-D-5382] A71-29745

NEKROSOV, B. B.
Hydraulics and its applications on aircraft [AD-709170] A71-29562

NEILSON, B. C.
Analysis of experimental measurements of trailing vortex systems of large jet transport aircraft A71-35755

NEGUEB
Thermal ground testing of Concorde and Varas or improvement in French test methods and facilities A71-36464

NEKSOV, V. T.
On estimating the aerodynamic damping of the vibrations in turbine vanes A71-35023

NOLEPH, B. M.
CAT II's role in low minimums [SAE PAPER 710442] A71-34499

NOZHIN, V. I.
Air transport 1969 A71-35194

O

OGORIENSII, E. P.
Investigation of aircraft structural panels under repeated static loads A71-35312

OBRATZOV, Y. P.
Strength and stability of thin-walled aircraft structures A71-35301

OCORNOW, J. P.
An assessment of high-voltage dc electrical power in aircraft electrical systems A71-35771

ODORI, A. E.
Modelling for air traffic control systems A71-34523

ŒHAM, W. Z.
Preliminary study of airplane-autopilot response to atmospheric turbulence A71-30780

OSTERGAARD, C.
Contribution to the theoretical treatment of the hub effect in propeller design A71-29690

OFFERBECK, B. G.
Requirements of engine dynamics implied by the thrust modulation control for VTOL aircraft [NASA-TT-F-13755] A71-31455

GHTA, Y.
Basic study of the afterburner [NASA-TT-F-13657] A71-30350

OKROMOV, B. N.
Aircraft automatic control systems - Methods of analysis and design A71-34473

OLIVARI, A.
Utilization of frequency memory in space radiocommunication A71-36553

OLLERHEAD, J. B.
Effective perceived noise level evaluated for STOL and other aircraft sounds Final report A71-31075

OLSEN, J. K.
Aircraft wake turbulence - An expanding area of low-speed aerodynamics research A71-35753

OLSEN, J. B.
Application of AFFDL unsteady load prediction method to interfering surfaces A71-29341

OLSEN, K. B.
Implications of advanced avionics on airline operations A71-34615

OLSON, P.
Design and weight aspects of advanced composites in complex fuselage structures [SAE PAPER 889] A71-35825

OLSON, L. B.
The influence of artificially induced turbulence upon boundary layer transition in supersonic flows Final technical report, 1 Dec. 1968 - 15
PERSONAL AUTHOR INDEX

PEBSOBAL ADTHOE IBDBX

BASBECK, G.

Jan. 1971

[AD-723322] N71-31586

LABORATORY DEVELOPMENT OF SELECTED SYSTEMS IN THE LOCKHEED L-1011 TRISTAR

[AIAA PAPER 71-762] A71-35532

OSTOTOE, R. E.

Airplane flying characteristics in turbulence


[AD-722855] N71-31288

OSETINSKI, I. V.

The problem of errors of a gyro device mounted on a mobile platform

A71-35608

OSEROV, I. S.

Computing method of estimating the strength of the jet vanes of gas turbine installations under pulsed thermal conditions

A71-35455

OSOS, J.

Wind and aircraft equipment

A71-35442

OSTAPEBKO, B. A.

The conical »ing in hypersonic flow

A71-36339

Paley, A.

Real-time display system for increased reconnaissance effectiveness

A71-35772

Palfery, J. G.

Vortex shedding from a turbulent jet in a cross-wind

A71-35469

Paphiatokos, L.

Use of an air-assist fuel nozzle to reduce exhaust emissions from a gas turbine combustor at simulated idle conditions


Papenov, Y. I.

Statistical estimation of the heat-resistant characteristics of materials for gas-turbine motors. II - Dispersion of the long-term strength and creep characteristics as a function of the temperature and duration of the tests

A71-35453

Park, P.

Evaluation of IFR departure procedure, Albuquerque, N. Mex., runway 08 Final report

[PA-PS-600-2] N71-29635

Parker, R. M.

Some aspects of the aerodynamics of STOL ports

A71-30776

Parker, R. V.

Arrrestment considerations for the space shuttle

A71-36488

Parker, R. W.

An approach guidance system for side-firing tactical aircraft

[AD-722412] N71-29708

Paulina, I. G.

Airplane automatic control systems - Methods of analysis and design

A71-34473

Pavlov, V. A.

The problem of protecting flight vehicles from icing

A71-34850

Pearle, D. J.

Technical evaluation report on AGARD Specialists' Meeting on Aerodynamic Interference

[AGARD-AR-34-71] N71-31459

Pearson, L. H., Jr.

Operational aspects of V/STOL instrument approaches

A71-30774

Federer, A. H.

The design and test of an integrally armored cockpit

[AIAA PAPER 71-778] A71-35530

Pehle, R. L.

A method for estimating some longitudinal and lateral rigid-body responses of airplanes to continuous atmospheric turbulence


Penweer, S. S.

Shock standoff distances and Mach-disk diameters

in underexpanded sonic jets

A71-34895

Penazzi, M.

Thermal ground testing of Concorde and Veras or improvement in French test methods and facilities

A71-36464

Perry, F. J.

Flowfield produced by trailing vortices in the vicinity of the ground

A71-34900

Petrasik, W.

Subsonic static characteristics of slender wing configurations using a magnetic suspension and balance system

[NASA-CR-1786] N71-29775

Pestsirakov, V. B.

Radio control

A71-35403

Petersen, G. P.

Development and performance of advanced composite structures /Second Annual Structures Design Lecture/

[AIAA PAPER 71-367] A71-36275

Phillips, A. H.

Aircraft data acquisition system for academic flight evaluation

A71-31347

Filchen, I. I.

Air transport 1969

A71-35194

Pills, E.

Pressure changes in boundary layer effects in the tube wind tunnel

A71-34792

Plantier, M.

Time division multiplexer system for air traffic control

A71-35485

Results of experiments in simulating a satellite-to-aircraft radio link at 1600 MHz

A71-36511

Pleshanov, V. A.

Computing method of estimating the strength of the jet vanes of gas turbine installations under pulsed thermal conditions

A71-35455

Plotikin, A.

The flow of a laminar, incompressible jet along a parabola

[AIDP PAPER 71-APd-aH] A71-34628

Poe, C. C., Jr.

Fatigue crack propagation in stiffened panels

Some factors that affect the inspection of aircraft for fatigue damage

A71-35156

A71-30783

Pollock, S. J.

Application of AFFDL unsteady load prediction method to interfering surfaces

A71-29341

Potter, H. C.

Potential flow solution for a STOL wing propulsion system

[NASA-TN-D-6394] N71-29774

Povinelli, L. A.

Jet penetration into Mach 2 airstream using sweptback injectors at angle of attack

[NASA-TN-X-2319] N71-29920

Prueber, J. N.

The total in-flight simulator /TIPS/ - A new aircraft design tool

[AIAA PAPER 71-794] A71-35529

Q

Qutew, A. G.

A precision area navigation system

A71-34616

R

Radofsey, M. I.

Improvement of fire safety in aircraft

A71-30759

Raisbeck, G.

An approach to the establishment of practical air traffic control safety goals Interim report

[FAA-RD-71-36] I71-29309

B-11
RAPOSA, F. L.

Application of power conditioning to high-voltage dc electric power systems for flight vehicles

Raymond, P. A.

A propulsion theory approach to communication satellite network design

HEPA, L.

Flow-field and performance study of an augmented ram-wing vehicle concept

REBOUX, J.

Coherence criteria for supersonic compressor tests

Reding, J. F.

Unsteady airfoil stall and stall flutter

[NASA CR-119096]

Reed, D. L.

Design and weight aspects of advanced composites in complex fuselage structures

[SANS PAPER 889]

Reich, P. G.

Influence on land and airspace demands of control techniques in current use

Reed, G. P.

Future air traffic - A study of the terminal area

[NASA CR-119287]

RENNER, J.

Concorde and C.E.V. - Cooperation between firms and government offices or establishment in the flight test program - Certification flights

[AIAA PAPER 71-784]

Reynolds, P. A.

The total in-flight simulator /TIFS/ - A new aircraft design tool

[AIAA PAPER 71-794]

Rice, W. J.

Crack propagation in helicopter rotor blades

RICHARDS, R. R.

Evaluation of IFP departure procedure, Albuquerque, N. Mex., runway 08 Final report

[FAA-75-600-2]

RICHARDS, W. W.

Atlanta's instant runway

RICHARDSON, E. E.


[FAA-75-600-2]

Rinkel, H. D.

Some experimental investigations on the multi-body problem in supersonic flow

[CBLR-78-1-04]

Rines, D. P.

New navigation and traffic control systems

RIPPE, R. F.

Automatic control of aircraft electrical system reduces wiring and improves reliability

RIVLIN, E. P.

Computing method of estimating the strength of the jet vances of gas turbine installations under pulsed thermal conditions

Robel, A. L.


[AD-722427]

Roberts, C. F.

A preliminary analysis of some observations of wind shear in the lowest 100 feet of the atmosphere for application to the problem of the control of aircraft on approach

Roberts, L. J.

The development of the BAC One-Eleven autopilot

Robinson, G. H.

Aircraft response to the wing trailing vortices generated by large jet transports

Robinson, W. P.

Area navigation

S

SAHABY, R. Y.

Investigation of aircraft structural panels under repeated static loads

Salmons, E. P.


[AD-722855]

Salvesen, E. C.

Characteristics of satellite-to-aircraft links

SANDERS, W. R.

Flight investigation of installation effects on a plug nozzle installed on an underwing nacelle

[SANS PAPER 899]

SANDER, K. W.

Application of the low disc-loading proprotor to a series of aircraft for the short-haul market

[SANS PAPER 78-1]

SARCOLOVIĆ, G. S.

On estimating the aerodynamic damping of the vibrations in turbine vanes

Sawyer, R. H.

Flight evaluation of a display for steep approach

Scheid, H.

Subsonic unsteady airloads on multiple lifting surfaces

Scheidekk, G. W.

The administration of a cost/weight tradeoff program

[SANS PAPER 889]

Schemer, R. E.

Future air traffic - A study of the terminal area

[NASA CR-119287]

Scholes, W. H.

A review of the propagation work at NASA

Schroeder, R. H.

Studies of the lift problem for slender wings in supersonuc flows

Schroeder, R. H.

A review of the propagation work at NASA

Schroeder, R. H.

Studies of the lift problem for slender wings in supersonic flows

[NASA CR-1838]

SEARS, D. A.

High Reynolds number flows

[NASA CR-1170]

SIEGLE, D. F.

A small, radio-controlled aircraft as a platform for meteorological sensors

SIFL, A.

The new IATA conditions of carriage for passengers and baggage

[AIAA PAPER 71-31307]

SIFL, A.

The vortex wake hazard of large transports in take-off and landing

SIFL, A.

The new IATA conditions of carriage for passengers and baggage

[AIAA PAPER 71-31307]
SCHOBER, J.
Individual flight program tests of notched cantilever beams for preliminary design of wing attachment of VPW 614 [TB-89]

SCHULL, R. W.
Lockheed L-1011 - A new jumbo jet

SCHULL, W.
Some new results of flight dynamics. I

SCHEURING, J.
Mathematical model of external disturbances acting on an aircraft during an ILS approach and landing [FTH-159]

SCHUBERT, J. R.
An investigation of the relationships between mountains-wave conditions and clear air turbulence encountered by the XB-70 airplane in the stratosphere [NASA-CR-1878]

SCHULZ, M.
Some recent investigations on flutter in subsonic flow, caused by interference aerodynamic forces between wing and tail of a variable geometry aircraft

SCHUBERG, G.
Some recent investigations on flutter in subsonic flow, caused by interference aerodynamic forces between wing and tail of a variable geometry aircraft

SCHUBIN, A. S.
Statistical analysis of the fatigue characteristics of light alloys in order to facilitate a probability estimation of the strength of aircraft construction parts

SHAPIRO, R. A.
Measurement of very small displacements using holographic interferometry

Some considerations in the development of a holographic display for a blind landing system

SHERB, A. P.
A uniformly asymptotic solution for incompressible flow past thin sharp-edged aerofoils at zero incidence

SHIBLY, E. D.
Three-dimensional boundary layer on a segmented body at supersonic velocities

SHORE, T. E.
Shock and vibration isolation using a nonlinear elastic suspension

SIDOROV, A. A.
On estimating the aerodynamic damping of the vibrations in turbine vanes

SIN, G.
Laboratory development of selected systems in the Lockheed L-1011 TriStar [AIAA Paper 71-702]

SKELOM, G. E.

SKILL, C. A.
Safety in air transportation over the years /Eight Wings Club 'Sight' Lecture/

SOUTH, C. T.
Simulation studies for development of certification criteria applicable to SST takeoff

SOUTH, W. J.
Analysis of some helicopter operating problems

Preliminary study of effect of vibration on aircraft ride quality

SOLNTSEV, Yu.
Holography and its application in aviation and cosmonautics [JPPR-553820]

SONNELOCK, C. R.
A digital V-O-R navigation converter

SONTSKII, S. P.
Study of the stability of a gyrohorizoncompass

SOLLIS, C.
Using the ONERA/SMD hypersonic wind tunnel for supersonic combustion ramjet tests [ONERA-TD-924]

SPARBER, L. M.
Effects of some bluntness on the static aerodynamic characteristics of a cruciform wing missile at Mach numbers 1.50 to 2.86 [NASA-TN-1-2289]

SPEER, T. K.
Formation flight technology

SPENCER, R. W.

SQUIRES, L. C.
Experimental results for waveriders in certain off-design conditions

STAATS, R. B.
Adverse effects of producing drone antisubmarine helicopters before completion of development and tests Department of the Navy, P-160877 - Report to Congress

STATCE, S.
Comparative applications of a 'theoretical model' concerning the supersonic flow past a delta wing with flow separation at the leading edges

INVESTIGATION OF SUPERSONIC FLOW AROUND DELTA WINGS WITH FORCED ASYMMETRY, TAKING INTO ACCOUNT FLOW SEPARATION AT THE LEADING EDGES

Considerations on the thin delta wings with finite velocities at the leading edges

STALLONE, G.
Pan American's planned maintenance control system

STAUFFER, T.
Equipped for the seventies - Basle-Walhouse Airport

STEINHEUER, J.
Calculation of the binary laminar boundary layer in the hypersonic stagnation point flow with temperature-dependent material parameters

STEPHENS, T.
Subsonic static characteristics of slender wing configurations using a magnetic suspension and balance system [NASA-CR-1796]

STEPHEN, R. H.
Statistical analysis of the fatigue characteristics of light alloys in order to facilitate a probability estimation of the strength of aircraft construction parts

STEVENSON, L. B.
A-9 guidance of STOL aircraft [AIAA Paper 71-770]

STOCKER, J.
Study of visible exhaust smoke from aircraft jet engines Final report [FAA-N-71-28]

STOLLER, J. L.
Turbulent boundary layer studies in a hypersonic gun tunnel [FC/71/11]

SULZER, R. L.

Simulation study of chevron markings for areas adjacent to runway thresholds Interim report,
TATE, J. L.
Formation flight technology
A71-35923

TAYLOR, J. E.
Integrated drive generator offers significant advantages for aircraft electrical power systems
A71-35781

TAYLOR, L. S.
Weight prediction techniques and trends for composite materials structure
[SAE Paper 887] A71-35819

TEPEL, I.
The problems of squalls at Mach 1
N71-31061

TETBYVIN, N.
HOL hypervelocity wind tunnel. Report no. 3 - Theoretical analysis of the boundary layer in the normal [AD-722346]
N71-29906

TIDWELL, J. R.
Study of the concept of inertially aided barometric altimetry system for supersonic aircraft
[NASA-CS-1770] N71-31307

THUBER, K. J.
A hardware executive control for the advanced avionic digital computer system
A71-35778

TICHOPOL, V.
Effect of elasticity of an aircraft structure on the deflection of elevator control lever and on the controlling forces during stable flights
N71-31065

TIEF, J. K.
The room temperature fatigue behavior of nickel-base superalloy crystals at ultrasonic frequency
A71-34493

TILDEMA, R.
 miesią aerodynamics for wings with control surfaces
N71-29346

TIPCHEVA, L. E.
Statistical estimation of the heat-resistant characteristics of materials for gas-turbine motors. II - Dispersion of the long-term strength and creep characteristics as a function of the temperature and duration of the tests
A71-35453

TIPGVE, V. N.
Radio control
A71-35403

TONEBBEE, B.
Prediction of wing group weight for preliminary design
A71-35925

TOUSHAUT, R.
Radio tracking of aircraft by means of two geostationary satellites
A71-36508

TRICEFT, G. W.
The odyssey of diffusion bonding
[SAE Paper AD-71-245] A71-36651

TRIVESTIN, N.
Pressure measurements on an harmonically oscillating swept wing with two control surfaces in incompressible flow
N71-29350

Pressure measurements on an harmonically oscillating swept wing with two control surfaces in incompressible flow
[DLR-PB-70-47] N71-29433

TRENCE, L. D.
Computing method of estimating the strength of the jet vanes of gas turbine installations under pulsed thermal conditions
A71-35655

TRUNSH, L. I.
Statistical estimation of the heat-resistant characteristics of materials for gas-turbine motors. II - Dispersion of the long-term strength and creep characteristics as a function of the temperature and duration of the tests
A71-35453

TSEITLIN, V. I.
The problem of equivalent testing of gas turbines
A71-35652

TUTTA, A. D.
Assessment of the anti-wear property of fuels under point contact conditions
A71-38447

WALLENBERG, C. P.
Design of asphalt pavements for heavy aircraft
A71-36000

VARSHEK, R. A., JR.
Progress report on wing-trailing-vortex studies
N71-30764

VIAMENSKAYA, L. B.
Acoustic emission of subsonic turbulent jets
A71-34213

VISCENT, W. L.
Aircraft data acquisition system for academic flight evaluation
[AD-722563] N71-31347

VLADYNAC, M.
Sting-free drag measurements on ellipsoidal cylinders at transition Reynolds numbers
A71-36037

Subsonic static characteristics of slender wing configurations using a magnetic suspension and balance system
[NASA-CS-1796] N71-29775

WAGNER, J.
Pressure measurements on an harmonically oscillating swept wing with two control surfaces in incompressible flow
N71-29350

Pressure measurements on an harmonically oscillating swept wing with two control surfaces in incompressible flow
[DLR-PB-70-47] N71-29433

WARD, J. F.
Analysis of some helicopter operating problems
N71-30775

WEAR, B. L.
Clear-air-turbulence detection using lasers
N71-30763

WEHLE, B.
Survey of the experimental capabilities of the OHEA hydrodynamic tunnel, which offers flow visualization
[NASA-TT-F-13727] N71-30263

WIESNER, B.
Afterburners of modern jet engines
A71-35639

WIDNALL, S.
Helicopter noise due to blade-vortex interaction
A71-36934

WIDNALL, S. N.
[PB-197242] N71-29762

WILLIAMS, D. J.
A new design weight and center-of-gravity determining fixture
[SAE Paper 879] A71-35824

WILLIAMS, R. R.
Control of space shuttle maintenance cost by the personal author index
application of airline methods

WILSON, B. J.
An assessment of high-voltage dc electrical power in aircraft electrical systems

WILSON, C. L.
MSDS - An experimental 24-channel multispectral scanner system

WILSON, R. J.
Evaluation of effects of high-altitude turbulence encounters on the XB-70 airplane [NASA-TH-D-6457]

WILSON, T.
Dual mode symmetrical high frequency antenna for airborne use [AD-722736]

WOLF, K. G.
Testing aircraft parts by NDT methods

WOODCOCK, D. L.
A supersonic box collocation method for the calculation of unsteady airfoils of tandem surfaces

WOODHEAD, B. W.
Airfield pavement systems

WOODMAN, J. P.
L-1011 flight test program [AIAA PAPER 71-709]

WORTHMAN, R. H.
Airfield pavement systems

Y

YADF, K. L.
Approximate methods of constructing stream lines in meridional plane of blade nozzle annular cascades of steam and gas turbines in subsonic and supersonic flows

YAO, L. S.
The effect of second order elastic terms in supersonic panel flutter of finite cylindrical shells [AD-722447]

YFF, J.
T-tail aeroelastic analysis for Fokker F.28

YORI, R. J.
A supersonic box collocation method for the calculation of unsteady airfoils of tandem surfaces

YU, J. C.
STOL passenger demand in underdeveloped areas

YUSKA, J. A.
Lewis 9- by 15-foot V/STOL wind tunnel [NASA-TR-X-2305]

Z

ZAITZOV, B. D.
Investigation of glide-slope information rate requirements for a low-visibility aircraft landing

ZIAAAN, B. J.
T-tail aeroelastic analysis for Fokker F.28

ZMOSKOV, S. A.
T-tail aeroelastic analysis for Fokker F.28

ZAVICH, J. S.
Unsteady aerodynamics for wings with control surfaces

ZIOLO, E. J.
Influence of loading by linear radial forces on the stress state of a circular disk with a hyperboloidal profile

ZLOCHENSKII, V. S.
Passenger plane power supply systems
### Typical Contract Number Index Listing

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>NASA Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS3-13475</td>
<td>H71-10022</td>
</tr>
<tr>
<td>AF 04/606/-14942</td>
<td></td>
</tr>
<tr>
<td>AF 33/615/-67-C-1157</td>
<td>H71-35159</td>
</tr>
<tr>
<td>AF 33/615/-68-C-1301</td>
<td>H71-35529</td>
</tr>
<tr>
<td>AF 33/615/-69-C-1494</td>
<td>H71-35815</td>
</tr>
<tr>
<td>AF 33/615/-71-C-1110</td>
<td>H71-35529</td>
</tr>
<tr>
<td>AF 44/620/-68-C-0010</td>
<td>H71-34895</td>
</tr>
<tr>
<td>AF 44/620/-70-C-0106</td>
<td>H71-35757</td>
</tr>
<tr>
<td>AF-APOS8-0268-67</td>
<td>H71-31183</td>
</tr>
<tr>
<td>AF-APOS8-1984-70</td>
<td>H71-29430</td>
</tr>
<tr>
<td>AT/04/3/-805</td>
<td>H71-29215</td>
</tr>
<tr>
<td>CPA-22-69-129</td>
<td>H71-31569</td>
</tr>
<tr>
<td>DA-31-124-AOR/D/471</td>
<td>H71-36934</td>
</tr>
<tr>
<td>DARCOA-68-0008</td>
<td>H71-34659</td>
</tr>
<tr>
<td>DOT-C-005-65</td>
<td>H71-29762</td>
</tr>
<tr>
<td>DOT-PAG69WA-2208</td>
<td>H71-29307</td>
</tr>
<tr>
<td>DOT-PAT70WA-2161</td>
<td>H71-29309</td>
</tr>
<tr>
<td>F19628-70-C-0271</td>
<td>H71-29554</td>
</tr>
<tr>
<td>F19628-70-C-0291</td>
<td>H71-29551</td>
</tr>
<tr>
<td>F19628-70-C-0291</td>
<td>H71-29552</td>
</tr>
<tr>
<td>F33615-69-C-1266</td>
<td>H71-31586</td>
</tr>
<tr>
<td>F33615-69-C-1904</td>
<td>H71-30173</td>
</tr>
<tr>
<td>F33615-70-C-1156</td>
<td>H71-31288</td>
</tr>
<tr>
<td>F33615-70-C-1715</td>
<td>H71-31376</td>
</tr>
<tr>
<td>PA-67-WA-1731</td>
<td>H71-31075</td>
</tr>
<tr>
<td>PA-67-WAI-134</td>
<td>H71-29555</td>
</tr>
<tr>
<td>N00014-68-A-0091</td>
<td>H71-30174</td>
</tr>
<tr>
<td>N00014-70-C-0099</td>
<td>H71-39886</td>
</tr>
<tr>
<td>N00014-70-C-0215</td>
<td>H71-29660</td>
</tr>
<tr>
<td>RG2269-70-C-0314</td>
<td>H71-35778</td>
</tr>
<tr>
<td>NAS1-8389</td>
<td>H71-31156</td>
</tr>
<tr>
<td>NAS1-8423</td>
<td>H71-29893</td>
</tr>
<tr>
<td>NAS1-8658</td>
<td>H71-36037</td>
</tr>
<tr>
<td>NAS1-8685</td>
<td>H71-29775</td>
</tr>
<tr>
<td>NAS1-9987</td>
<td>H71-29221</td>
</tr>
<tr>
<td>NAS3-12432</td>
<td>H71-31482</td>
</tr>
<tr>
<td>NAS3-14034</td>
<td>H71-30669</td>
</tr>
<tr>
<td>NAS7-100</td>
<td>H71-31106</td>
</tr>
<tr>
<td>NAS8-25896</td>
<td>H71-30278</td>
</tr>
<tr>
<td>NAS8-26145</td>
<td>H71-34225</td>
</tr>
<tr>
<td>NAS9-10385</td>
<td>H71-30741</td>
</tr>
<tr>
<td>NAS12-2132</td>
<td>H71-31307</td>
</tr>
<tr>
<td>NASW-2035</td>
<td>H71-30263</td>
</tr>
<tr>
<td>NASW-2035</td>
<td>H71-30350</td>
</tr>
<tr>
<td>NASW-2037</td>
<td>H71-31455</td>
</tr>
<tr>
<td>NASW-2037</td>
<td>H71-30656</td>
</tr>
<tr>
<td>NASW-2037</td>
<td>H71-30852</td>
</tr>
<tr>
<td>RGL-48-002-057</td>
<td>H71-31262</td>
</tr>
<tr>
<td>RGR-14-005-149</td>
<td>H71-31211</td>
</tr>
<tr>
<td>RGR-21-002-266</td>
<td>H71-36268</td>
</tr>
<tr>
<td>RGR-41-001-026</td>
<td>H71-30241</td>
</tr>
<tr>
<td>RGR-41-001-027</td>
<td>H71-34874</td>
</tr>
<tr>
<td>RGR-44-001-081</td>
<td>H71-31351</td>
</tr>
<tr>
<td>RGR-49-001-1012</td>
<td>H71-36348</td>
</tr>
<tr>
<td>RGT-49-001-045</td>
<td>H71-30800</td>
</tr>
<tr>
<td>NSF GE-5215</td>
<td>H71-36498</td>
</tr>
<tr>
<td>NKG-398</td>
<td>H71-36268</td>
</tr>
<tr>
<td>PD/40/052</td>
<td>H71-29285</td>
</tr>
<tr>
<td>PD/40/052</td>
<td>H71-29286</td>
</tr>
<tr>
<td>117</td>
<td>H71-30748</td>
</tr>
<tr>
<td>126-13-10-01</td>
<td>H71-30530</td>
</tr>
<tr>
<td>126-13-10-06-23</td>
<td>H71-31154</td>
</tr>
<tr>
<td>126-15</td>
<td>H71-31456</td>
</tr>
</tbody>
</table>
This special bibliography lists 413 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1971. Emphasis is placed on engineering and theoretical aspects for design, construction, evaluation, testing, operation and performance of aircraft (including aircraft engines) and associated components, equipment and systems. Also included are entries on research and development in aeronautics and aerodynamics and research and ground support for aeronautical vehicles.
PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA deposits its technical documents and bibliographic tools in eleven Federal Regional Technical Report Centers located in the organizations listed below. Each center is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

<table>
<thead>
<tr>
<th>Region</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALIFORNIA</td>
<td>University of California, Berkeley</td>
</tr>
<tr>
<td>COLORADO</td>
<td>University of Colorado, Boulder</td>
</tr>
<tr>
<td>DISTRICT OF COLUMBIA</td>
<td>Library of Congress</td>
</tr>
<tr>
<td>GEORGIA</td>
<td>Georgia Institute of Technology, Atlanta</td>
</tr>
<tr>
<td>ILLINOIS</td>
<td>The John Crerar Library, Chicago</td>
</tr>
<tr>
<td>MASSACHUSETTS</td>
<td>Massachusetts Institute of Technology, Cambridge</td>
</tr>
<tr>
<td>MISSOURI</td>
<td>Linda Hall Library, Kansas City</td>
</tr>
<tr>
<td>NEW YORK</td>
<td>Columbia University, New York</td>
</tr>
<tr>
<td>PENNSYLVANIA</td>
<td>Carnegie Library of Pittsburgh</td>
</tr>
<tr>
<td>TEXAS</td>
<td>Southern Methodist University, Dallas</td>
</tr>
<tr>
<td>WASHINGTON</td>
<td>University of Washington, Seattle</td>
</tr>
</tbody>
</table>

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

<table>
<thead>
<tr>
<th>Region</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALIFORNIA</td>
<td>Los Angeles Public Library</td>
</tr>
<tr>
<td></td>
<td>San Diego Public Library</td>
</tr>
<tr>
<td>COLORADO</td>
<td>Denver Public Library</td>
</tr>
<tr>
<td>CONNECTICUT</td>
<td>Hartford Public Library</td>
</tr>
<tr>
<td>DELAWARE</td>
<td>Wilmington Institute Free Library, Wilmington</td>
</tr>
<tr>
<td>MARYLAND</td>
<td>Enoch Pratt Free Library, Baltimore</td>
</tr>
<tr>
<td>MASSACHUSETTS</td>
<td>Boston Public Library</td>
</tr>
<tr>
<td>MICHIGAN</td>
<td>Detroit Public Library</td>
</tr>
<tr>
<td>MINNESOTA</td>
<td>Minneapolis Public Library</td>
</tr>
<tr>
<td>ME</td>
<td>James Jerome Hill Reference Library, St Paul</td>
</tr>
<tr>
<td>MISSOURI</td>
<td>Kansas City Public Library</td>
</tr>
<tr>
<td></td>
<td>St Louis Public Library</td>
</tr>
<tr>
<td>NEW JERSEY</td>
<td>Trenton Public Library</td>
</tr>
<tr>
<td>NEW YORK</td>
<td>Brooklyn Public Library</td>
</tr>
<tr>
<td></td>
<td>Buffalo and Erie County Public Library</td>
</tr>
<tr>
<td></td>
<td>Rochester Public Library</td>
</tr>
<tr>
<td></td>
<td>New York Public Library</td>
</tr>
<tr>
<td>OHIO</td>
<td>Akron Public Library</td>
</tr>
<tr>
<td></td>
<td>Cincinnati Public Library</td>
</tr>
<tr>
<td>MICHIGAN</td>
<td>Cleveland Public Library</td>
</tr>
<tr>
<td></td>
<td>Dayton Public Library</td>
</tr>
<tr>
<td></td>
<td>Toledo Public Library</td>
</tr>
<tr>
<td>MICHIGAN</td>
<td>Oklahoma County Libraries, Oklahoma City</td>
</tr>
<tr>
<td>TENNESSEE</td>
<td>Cossitt-Goodwin Libraries, Memphis</td>
</tr>
<tr>
<td>WASHINGTON</td>
<td>Seattle Public Library</td>
</tr>
<tr>
<td>WISCONSIN</td>
<td>Milwaukee Public Library</td>
</tr>
</tbody>
</table>

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, New York, 10017.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the National Lending Library for Science and Technology, Boston Spa, Yorkshire, England. By virtue of arrangements other than with NASA, the National Lending Library also has available many of the non-NASA publications cited in STAR. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from ESRO/ELDO Space Documentation Service, European Space Research Organization, 114, av de Neuilly, 92-Neuilly-sur-Seine, France.
"The aeronautical and space activities of the United States shall be conducted so as to contribute . . . to the expansion of human knowledge of phenomena in the atmosphere and space. The Administration shall provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

— National Aeronautics and Space Act of 1958

NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to existing knowledge.

TECHNICAL NOTES: Information less broad in scope but nevertheless of importance as a contribution to existing knowledge.

TECHNICAL MEMORANDUMS: Information receiving limited distribution because of preliminary data, security classification, or other reasons.

CONTRACTOR REPORTS: Scientific and technical information generated under a NASA contract or grant and considered an important contribution to existing knowledge.

TECHNICAL TRANSLATIONS: Information published in a foreign language considered to merit NASA distribution in English.

SPECIAL PUBLICATIONS: Information derived from or of value to NASA activities. Publications include conference proceedings, monographs, data compilations, handbooks, sourcebooks, and special bibliographies.

TECHNOLOGY UTILIZATION PUBLICATIONS: Information on technology used by NASA that may be of particular interest in commercial and other non-aerospace applications. Publications include Tech Briefs, Technology Utilization Reports and Technology Surveys.

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

SCIENTIFIC AND TECHNICAL INFORMATION OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546