AERONAUTICAL ENGINEERING

A SPECIAL BIBLIOGRAPHY
WITH INDEXES
Supplement 15

FEBRUARY 1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
# Previous Bibliographies in This Series

<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>
<tr>
<td>NASA SP-7037 (10)</td>
<td>October 1971</td>
<td>September 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (11)</td>
<td>November 1971</td>
<td>October 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (12)</td>
<td>December 1971</td>
<td>November 1971</td>
</tr>
<tr>
<td>NASA SP-7037 (13)</td>
<td>January 1972</td>
<td>December 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 15

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in January 1972 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 363 reports, journal articles, and other documents originally announced in January 1972 in Scientific and Technical Aerospace Reports (STAR) or in International Aerospace Abstracts (IAA). For previous bibliographies in this series, see inside of front cover.

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

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 (A72-10000 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., A72-10969, when requesting publications.

STAR ENTRIES (N72-10000 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., N72-11045#) 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 copy.

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 as many as 60 to 98 pages of information reduced to micro images (not to exceed 24:1 reduction)
Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc., (PHI), Redwood City, California. The U.S. price (including a service charge) is given, or a conversion table may be obtained from PHI.

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/documentation 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.
ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics
Technical Information Service
750 Third Ave.
New York, N.Y. 10017

Commissioner of Patents
U.S. Patent Office
Washington, D.C. 20231

ESRO/ELDO Space Documentation Service
European Space Research Organization
114. av. de Neuilly
92-Neuilly-sur-Seine, France

Her Majesty’s Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information Facility
P.O. Box 33
College Park, Maryland 20740

National Aeronautics and Space Administration
Scientific and Technical Information Office (KSI)
Washington, D.C. 20546

National Lending Library for Science and Technology
Boston Spa, Yorkshire, England

National Technical Information Service
Springfield, Virginia 22151

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms, Inc.
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Inc.
Tylers Green
London, England

U.S. Atomic Energy Commission
Division of Technical Information
P.O. Box 62
Oak Ridge, Tennessee 37830

Zentralstelle für Luftfahrtdocumentation und-Information
8 München 86
Postfach 880
Federal Republic of Germany
TABLE OF CONTENTS

IAA Entries .................................................. 1
STAR Entries .................................................. 27
Subject Index .................................................. A-1
Personal Author Index ....................................... B-1
Contract Number Index ....................................... C-1

TYPICAL CITATION AND ABSTRACT FROM STAR

NASA SPONSORED DOCUMENT
ACCESSION NUMBER N72-10043*
TITLE STUDY AND DEVELOPMENT OF ACOUSTIC TREATMENT FOR JET ENGINE TAILPIPES
REPORT NUMBER NASA SPONSORED DOCUMENT
CONTRACT OR GRANT CONTRACT NAS1-9622
PUBLICATION DATE Nov. 1971
COSATI CODE (NASA-CR-1853; D3-8535)
AVAILABILITY SOURCE Avail: NTIS CSCL 01 B

A study and development program was accomplished to attenuate turbine noise generated in the JT/3D turbofan engine. Analytical studies were used to design an acoustic liner for the tailpipe. Engine ground tests defined the tailpipe environmental factors and laboratory tests were used to support the analytical studies. Furnace-brazed, stainless steel, perforated sheet acoustic liners were designed, fabricated, installed, and ground tested in the tailpipe of a JT3D engine. Test results showed the turbine tones were suppressed below the level of the jet exhaust for most far field polar angles.

TYPICAL CITATION AND ABSTRACT FROM IAA

NASA SPONSORED DOCUMENT
ACCESSION NUMBER A72-10160
TITLE Jet-noise reduction through liquid-base foam injection

An experimental investigation has been made of the sound-absorbing properties of liquid-base foams and of their ability to reduce jet noise. Protein, detergent, and polymer foaming agents were used in water solutions. A method of foam generation was developed to permit systematic variation of the foam density. The investigation included measurements of sound-absorption coefficients for both plane normal incidence waves and diffuse sound fields. The intrinsic acoustic properties of foam, e.g., the characteristic impedance and the propagation constant, were also determined. The sound emitted by a 1-in.-diam cold nitrogen jet was measured for subsonic (300 m/sec) and supersonic (422 m/sec) jets, with and without foam injection. Noise reductions up to 10 PNdB were measured.

Analysis of the limits of the classical navigation systems, the progress achieved in the field of automated inertial navigation devices, and the advantages and urgency of using the latter on board passenger aircraft. Attention is paid to accelerometer and gyroscope design and construction as major devices in inertial systems. By computing the aircraft's coordinates continuously and automatically, inertial systems lighten and simplify the crew's work.


Use of models to permit three-dimensional recording of radiation patterns under relative free-space conditions, thus facilitating trial antenna relocations. The aircraft and antenna are scaled down, requiring an upward scaling of test frequencies to maintain aircraft size-to-wavelength ratio. A polar recorder, synchronized via a synchro-servo drive with the model rotator, plots the pattern semi-automatically. A saving of more than 90% in flight costs has been realized. In addition, resolution is improved with almost continuous data in contrast to 24 discrete data points.


Discussion of all-elastomeric-bearing rotors developed by the U.S. Army and Bell Helicopter Co., which should virtually eliminate the need for replacing bearings and related parts, thus greatly reducing the down time and cost of unscheduled helicopter maintenance. Another advantage of elastomeric bearings is that the appearance of the elastomer can be used as an indicator of the severity of previous rotor oscillatory loads and motions. Endurance tests conducted on flapping bearings for both main and tail rotors have shown that their service life can be expected to be in excess of 2000 hr.


Portable equipment for the detection and recording of noise in the frequency range from 2 to 500 Hz is described, together with typical results obtained in an automobile, railroad car, engine room, and helicopters. Factors responsible for peaks appearing at various frequencies are identified, and research on the subjective effects of infrasonic noise is indicated.


An experimental investigation has been made of the sound-absorbing properties of liquid-base foams and of their ability to reduce jet noise. Protein, detergent, and polymer foaming agents were used in water solutions. A method of foam generation was developed to permit systematic variation of the foam density. The investigation included measurements of sound-absorption coefficients for both plane normal incidence waves and diffuse sound fields. The intrinsic acoustic properties of foam, e.g., the characteristic impedance and the propagation constant, were also determined. The sound emitted by a 1-in.-diam cold nitrogen jet was measured for subsonic (300 m/sec) and supersonic (422 m/sec) jets, with and without foam injection. Noise reductions up to 10 PNdB were measured.


Examination of the manner in which navigation capability, ATC systems and the general ATC environment have been interlinked in the development of adequate separation values. Only safe separation standards are considered, and not spacing criteria, although inevitably the two are interrelated. Errors in navigation in a typical long-range oceanic environment are discussed, together with errors in navigation during flight on airways and other continental controlled airspace, and ATC intervention capability as related to the development of separation minima. Positive measures that are being taken to explore the means by which separation values can be derived from the direct measurement of navigational and ATC performance during current operations are indicated.

A72-10178 Mathematical studies on separation standards. D. E. Lloyd (Royal Aircraft Establishment, Farnborough, Hants.,
A72-10179


Brief description of the mathematical theory of navigational collision risk for parallel tracks. The results of calculations made in 1967 on the required spacing between the center lines of opposite-direction twin airways carrying, mainly, climbing and descending traffic leaving and entering a terminal area are tabulated. For the radar monitored cases, the spacing was assumed to be determined by controller workload, represented by the 'intervention rate' which was defined as the ratio between the number of interventions and the number of flights along the sector.


Discussion of some of the features of a statistical analysis of data on track-keeping recently collected along Green 1 Airway near the Strumble VOR. All values quoted are illustrative only and have no firm validity at this time but illustrate the numbers involved in determining acceptable separation standards for the lateral navigation case in a typical 'continental' environment. The statistical data suggest that a spacing of 6 nm would increase the risk about 30 times without surveillance; hence the surveillance system must prevent all but 1 in 30 of the potential collisions - namely, be 97% effective - for the same safety level.

A72-10180


Discussion of the areas in which improved avionics could, in the relatively near future, contribute to overcoming the limitations described by Reich (1966) and Dickie. The constraints under which the airspace planners must operate are considered, together with the contribution which good electronic design might make to breaking the decision-taking bottleneck. The important areas in which improved avionics techniques may be expected to ease the problems resulting from rising traffic are listed as: (1) navigational and control techniques which better exploit the potentialities of airborne computers; (2) the evolution of a compatible SSR (secondary surveillance radar) with discrete addressing; (3) correlation protected computers; (2) the evolution of a compatible SSR (secondary surveillance radar) with discrete addressing; (3) correlation protected computers; (4) problem-solving computers for ATC.


The secant-expansion of the grid overprint on the Global Navigation Chart GNC 1N Transverse Mercator allows a new look at polar navigation. A navigator can operate his latitude/longitude GPI (ground position indicator) up to 90 deg earth latitude and plot accurately on the GNC 1N. Operation in a FALSE LAT./LONG. mode with a FALSE equator established through the pole means that the gyro transport correction term is small. The 'meridian difference' angle (MERDIF) involved in this technique is analogous to, and no more difficult to handle than, the convergence angle which applies to more traditional 'grid' techniques. Adoption of the method could mean that many aircraft will be able to conduct their polar flight on one chart; the need to change 'grids' can be avoided. The technique does as well as traditional grid methods in reducing the effect of longitude error being reflected as astro heading error.


The effect of ATC is often to bring the aircraft below the optimum profile; the controller likes to get the aircraft down too early rather than too late because too late may entail descent in holding patterns which takes up extra airspace and disrupts sequencing. It is pointed out that information on areas and safe heights where aircraft descend under radar control should be provided to pilots and navigators. The areas should be defined by lines easily discerned by the aircraft, for instance, solid red or DME distances. While following radar instructions they could then easily check terrain clearance.


Surface strain measurements were made under field loading conditions on an airport apron rigid pavement. Theoretical calculations for the same loading conditions were carried out using finite element method and pavement structure properties as determined by laboratory tests on materials sampled from the test site. It was found that theoretical prediction considered. Previous studies are in fair agreement with field pavement strain measurements under parking aircraft. Dynamic effects in field measurements due to aircraft vibration and load shifts were found to be insignificant in the cases studied. It was found that careful consideration must be given to gauge size and placement when using strain rosettes to predict stresses at a point near a wheel load.


The effect of variations in density altitude - i.e., altitude in the standard atmosphere to which the actual density corresponds - on required airport runway lengths and takeoff weights is investigated. It is shown that the necessity of accurate knowledge of changing meteorological conditions, particularly air temperature and pressure altitude, at departure airports was recognized prior to the introduction of jumbo-jet aircraft, for instance. poids loads are in fair agreement with field pavement strain measurements under parking aircraft. Dynamic effects in field measurements due to aircraft vibration and load shifts were found to be insignificant in the cases studied. It was found that careful consideration must be given to gauge size and placement when using strain rosettes to predict stresses at a point near a wheel load.


The effect of variations in density altitude - i.e., altitude in the standard atmosphere to which the actual density corresponds - on required airport runway lengths and takeoff weights is investigated. It is shown that the necessity of accurate knowledge of changing meteorological conditions, particularly air temperature and pressure altitude, at departure airports was recognized prior to the introduction of jumbo-jet aircraft, for instance. poids loads are in fair agreement with field pavement strain measurements under parking aircraft. Dynamic effects in field measurements due to aircraft vibration and load shifts were found to be insignificant in the cases studied. It was found that careful consideration must be given to gauge size and placement when using strain rosettes to predict stresses at a point near a wheel load.

A72-10216


Measurement of the acoustic power radiated by an aircraft fuselage structure exposed to a turbulent boundary layer pressure field at two flight Mach numbers. For a single fuselage panel the radiated power is approximately 90 and 70 dB relative to 10 the the minus 13th W at Mach 0.85 and 0.55, respectively. Damping tape and rubber wedge treatments applied to the structure reduce the acoustic radiation, but they are more effective at Mach 0.85 than at Mach 0.55.

The unsteady flow about two-dimensional aerofoils has been examined experimentally to determine the surface pressure fluctuations induced by turbulent boundary layers. The measured pressures are described in terms of the boundary layer steady state flow parameters and on this basis the magnitude of the fluctuations are approximately 15 dB greater than the pressures beneath an equivalent wall boundary layer. The difference is attributed to greater flow intermittency in the aerofoil boundary layers and cross-correlations between the surface pressures and the turbulent velocities are examined to test the validity of this conclusion.


A finite element method is formulated for determining the transient response of a box-type structure to a traveling, arbitrarily shaped pressure wave. The method is illustrated by considering an example of practical concern - the sonic boom. The acceleration-time histories of a closed box are compared with those obtained experimentally from a simulated boom. Satisfactory agreement is obtained with only four rectangular elements per individual face and a simplified loading of the box.


The theory of sound radiation from helicopter rotors is extended to axial flow fans running in turbulent flow. The inlet turbulence is treated as gusts superposed on the mean flow. The fluctuating lift on the rotor blades due to the incident gusts is evaluated from the two-dimensional analysis. Then the expression for the sound radiated is evaluated. The analysis is compared with the experimental results.


The development of a method is described for reducing the approach-landing noise of commercial jet transports by means of acoustic linings for attenuating the noise generated by the fan-compressor in turbofan engines and radiated from the intake and fan-exit ducts. The method is applied in particular to the Pratt & Whitney JT3D engine powering the Boeing 707 and the Douglas DC-8 aircraft. A brief discussion is given on the general characteristics of aircraft subjective noise spectra, engine noise reduction techniques, results of research and development on acoustic linings, and full scale engine testing. Finally, a summary of areas of lining research and technology requiring further investigation is given.


This paper describes some aspects of aircraft productivity at The Boeing Company, and discusses the functions of Design Engineering and Manufacturing organizations in achieving a producible airplane. The makeup and function of the product team prior to Corporate go-ahead, as well as their objectives and timing, are defined. Productivity aspects in both preliminary design and production phases of the aircraft program are identified and described. Specifically, productivity considerations during the preliminary design phase in the provisioning of facilities, subcontracting, and scheduling, as well as production-phase design verification, production planning, subcontractor coordination, materials handling, and plant layout and equipment, are discussed. The effects of design changes on productivity are noted. A discussion of motivation as a factor in productivity is included.


Discussion of aspects of productivity, a concept defined as an input to aircraft design techniques which is aimed at the reduction of production cost and the enhancement of product profitability. Under this concept, a joint engineering and manufacturing team continuously analyzes fabrication methods and materials to minimize production cost and optimize product performance. This analysis is concurrent with all stages of design and can have strong influence on aircraft design. Applications of this concept to cast canopy frames, wing carry-through members, split cockpit sections, forgings, and castings are considered.


This paper identifies some future aircraft design trends by reviewing the projected traffic forecast, current transports and their potential derivatives, new technology, and some possible new programs. New airplanes examined include two versions (0.84M and 0.98M) for transcontinental and international use and a STOL version for short-haul operation. In addition, a special-purpose resource air carrier is discussed to indicate the degree to which an aircraft designer is able to accommodate unique requirements. For each new aircraft, the purpose of the design and the associated technology challenges are discussed.

A72-10250


From an analysis of a typical large airport and its growth problems, it is concluded that STOL aircraft systems are needed now - with or without high-speed ground transportation systems. It is also shown that the needed first-generation STOL aircraft can be in operation in 1975. These contemporary STOL aircraft will, however, be only a step in the evolution to improved aircraft of the future. The needs for technological improvements are discussed, and some new prospects in STOL technology are described. (Author)

A72-10251


Major differences in the 747-200 vs compared with the 747-100 include provisions for the higher thrust JT9D-7 engines, increased fuel capacity, increased maximum taxi weight and maximum flight weights, and a nacelle modification to meet the noise rule. Areas which could be improved by revised rules are considered together with certain problems encountered in connection with the overall 747 program. G.R.

A72-10252


A new commercial jet transport capable of expanding the current limits of operating efficiency, reliability and safety was the goal of the TriStar program in its design phase. Now, all indications are that the flight test phase of the program will result in the timely certification of such a plane and a prompt start of deliveries to airline customers. Flight time in the test program is ahead of schedule, and test results to date indicate that the TriStar will meet or exceed guarantees to the airlines. The latter case holds true particularly in respect to performance of certain advanced systems, such as the Autoland. G.R.

A72-10253

The airworthiness certification of Concorde. N. Harpur (British Aircraft Corp., Ltd., London, England). Society of Automotive Engineers, National Aeronautic and Space Engineer-

A72-10254


The development of the aircraft has progressed to the point where the design of the modifications to the de Havilland C-8A Buffalo is complete and the engines are being tested. The predicted performance shows that the aircraft will be able to take off and land in less than 1500 ft. Simulation studies indicate that the handling qualities of the aircraft, with stability augmentation, will be acceptable for STOL research missions. Special techniques were required, however, for flight path control and transition from cruise to landing configuration. G.R.

A72-10255


An industry-assisted, state-of-the-art assessment of STOL tactical transport technology has been conducted by the Air Force. The assessment indicated that three turbofan concepts possessed the highest potential for satisfying the Air Force medium STOL transport mission. These concepts are the externally blown jet flap, internally blown jet flap, and mechanical flap with vectored cruise thrust. The Air Force has constructed a program to identify and fill the gaps in the technology, thereby reducing future system development risk. The program will also identify areas requiring future research. The program is in three phases, with the first phase primarily small-scale wind tunnel tests, analyses, and ground-based simulation. Phase II consists of larger-scale wind tunnel testing, critical component testing, and further simulation. Phase III is scheduled to be development of a technology demonstrator vehicle. Inasmuch as approval has only been granted for phase I, detailed task descriptions for only that phase are given in this paper. (Author)

A72-10256


This paper deals with a comparison, on a common basis, between quiet, point-design, turbofan, prop-fan, and turboprop intercity STOL transports as a means of possibly accelerating convergence toward a preferred system. Results indicate the high
speed turboprop aircraft is superior in terms of minimum gross weight, and therefore superior in direct operating cost and ticket cost. It is probably also the safest of the three aircraft because of the greatest thrust margin and least thrust asymmetry during wave-off.

(Author)


Supercritical airfoil technology offers the potential of efficient commercial flight at or near the speed of sound. This paper reviews a recent internal study by Pratt and Whitney to define the optimum propulsion system characteristics for a commercial transport designed to fly at Mach 0.95. The impact on aircraft gross weight of propulsion cycle characteristics such as bypass ratio, overall pressure ratio, turbine temperature, nacelle weight and drag as well as the important criteria of noise is reviewed. In addition, the implications of flying at very high initial cruise altitudes above the majority of current traffic is discussed.

(Author)


This paper endeavors to identify some of the requirements for the propulsion system of the advanced technology transport. These requirements lie in the areas of design, material selections, accessibility and maintainability of the system, and noise and emission control. The design should provide for adequate stall margins for the compressor, maximum reliability, mechanical and operational simplicity whenever possible, and a modular type of assembly to facilitate on-line and on-wing maintenance. The airframe manufacturer must engineer the powerplant installation to provide maximum accessibility to the engine gas path hardware and the engine accessories. The engine designers must strive for noise levels within the state-of-the-art and preferably below the FAR 36 compliance requirements. The engine should be optimized to minimize the possible amount of noxious gases, particulates, and unburned hydrocarbons.

(Author)


Initial work indicates that a viable aircraft family can be designed for higher subsonic cruise speeds. Studies to date suggest that the propulsion system/nacelle design and the incorporation of noise attenuation into this design will have more influence on the choice of an optimum engine than engine weight and fuel consumption. These studies also suggest the payoff resulting from the incorporation of new technology items such as the internal engine generator and new structural cowl concepts because of the greater sensitivity to drag. These factors, plus the greater interdependency of the transonic aircraft and its propulsion system, point up the importance of a total system approach to propulsion system optimization and design.

G.R.


A status summary is given for the development at General Electric's engine test facility at Peebles, Ohio, of a graphite fiber composite fan blade design suitable for flight application. Used in subsonic turbofan engines, the fan blade design provides substantial potential reductions in weight for both the fan rotor and the containment structure as well as reduces sensitivity to fatigue failure from foreign object damage. A composite system containing 60% Modmor Type 2 fibers and 40% E293 epoxy resin was selected as the material for the blade design. The various phases of processing and testing the composite fans are described. At the present development stage the graphite composite fan can take the impact of twelve 1 and 2-in. iceballs fired at 400 knots without damage.

V.Z.


The NASA Quiet Engine Program will incorporate all available noise-reduction technology into a propulsion system suitable for subsonic civil transport aircraft. Full-scale experimental hardware is being built and tested primarily for noise performance. The program is in process, and component tests to date indicate that it is possible to achieve or exceed noise reduction objectives of 15-20 PNdB below the levels of 707/DC-8 long-range transport aircraft.

(Author)


Most of the important technical aspects of the two prototype Concordes and of their Olympus 593 powerplants have been explored and the aeroplanes are flying regularly at Mach 2.0 over long distances. The current status of the powerplant performance, further performance development, the engine and intake control systems, the reheater and exhaust systems, engine/intake compatibility, bench and flight engine development program, the environment and service experience, are reviewed. Convincing performance demonstration have been made and active discussions with airlines are in hand regarding production versions of the aeroplane.

(Author)


A new approach in the design of small turbofan aircraft propulsion engines is directed toward providing executive type aircraft with coast-to-coast capability. The Garrett ATF3 turbofan engine employs a unique three-spool design concept using advanced component technology, provides an efficiency comparable to the largest turbofan engines, has low emissions, and is easily maintained.

(Author)
A72-10269  

A discussion of a single-team approach to the development of the jumbo tri-jet and its power-plant installation. According to it, the manufacturers and operators of the airframe and the engine are organized into a single team to produce a power-plant installation with an operational efficiency in keeping with the jumbo tri-jet mission requirements.  
V.Z.

A72-10270  

A new concept of intimate customer participation evolved during the design, development, and test phases of the DC-10 propulsion system. This concept was resolved into the Airline Propulsion Team approach which took full advantage of the unique contributions to design available from the customer. The design of the DC-10 propulsion system incorporates customer contributions based on his experience and expertise in such areas as operation, maintenance, and overhaul. This paper discusses the methods and operation of the Airline Propulsion Team as well as the immediate and projected benefits resulting from customer participation.  
(Author)

A72-10271  

Description of improved design concepts incorporated in the CF6 engine to meet new requirements in performance, operational characteristics, environmental considerations, dispatch reliability and utilization, and heavy maintenance. Improvements described involve fuel consumption, thrust-weight ratio, starter air requirements, noise levels, smoke emission, maintenance schedules, monitoring capabilities, and accessory replacement procedures.  
T.M.

A72-10280  
Control of warpage during machining. C. L. Bennett (General Dynamics Corp., Convair Aerospace Div., San Diego, Calif.). Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Sept. 28-30, 1971, Paper 710801. 7 p. Members, $1.00; nonmembers, $1.50.

The increased use of large aluminum-alloy forgings for structural components of the jumbo jet air transport brought attention to bear on the costly distortion problem associated with machining these forgings. This paper discusses one warpage problem - the floor beam - and its solution. Investigation showed that distortion is due primarily to the relief of residual quenching stresses by machining, and that the amount of distortion depends upon the magnitude, distribution, and locations of these stresses within the part. Control of this condition and improved packing and storage methods resulted in a greatly reduced distortion incidence.  
(Author)

A72-10301  

Following a review of parachute applications and some associated research problems, the symposium deals with escape from aircraft, parachute design, supply dropping, braking of aircraft, and the stabilization and retardation of weapons and other armament stores. Three-component measurements for rigid parachute models, parachute research and development, testing, observations on breathing and related phenomena, high and low speed parachute research, aerodynamic inflation of parachutes, supersonic and transonic deployment of ribbon parachutes, materials, and mechanisms of failure are among the subjects treated.  
F.R.L.

A72-10302  

Review of the major designs of parachutes that have been used and why they are used in certain particular roles. Emphasis is on the basic scientific and technical aspects. The fields of application discussed are escape systems, weapons systems, supply dropping, upper atmosphere recovery systems, braking and energy absorption, and aircraft testing and sport. An attempt is made to discuss problems rather than techniques.  
F.R.L.

A72-10303  

The results of three component measurements for two sets of nonporous rigid models are presented. Both sets consisted in a hemispherical canopy with conical skirts of different length and with suspension lines made of thin wires. The second model set differed from the first one by a small ring of brass sheet which was placed at the position of the largest projected diameter of the hemisphere. This ring predetermined the region of flow separation.  
(Author)

A72-10304  

Examination of the industrial approach to parachute research and development in the U.K., with particular reference to the management aspects. The task of the research and development department is to generate production work; its activity is divided into the areas of materials and the parachutes themselves. Technical staff requirements are outlined, and the need for close liaison between government and industry is emphasized.  
F.R.L.

A72-10305  
The testing of parachutes at supersonic speeds. A. R. Turley and J. A. I. Reid (Hunting Engineering, Ltd.). In: Two-Day Symposium on Parachutes and Related Technologies,
Results of experience in obtaining information on the performance
of small ribbon parachutes at speeds up to Mach 1.5. Trial
work was carried out in a 9 x 8 ft transonic wind tunnel, a rocket
sled track, and a water channel simulator. The rocket-propelled test
vehicle overcomes the problems in wind tunnel trials of the small size of
the specimen and the low density of the air. Initial water-channel
simulator trials determined that the largest practical model size was a parachute with a flying diameter of 3 in.

F.R.L.

The paper describes some trials that have recently been made in a wind tunnel at RAE to ascertain some of the characteristics of parachutes fitted with axial cords. The properties examined were the effect of the length of the axial cord on the drag of the parachute, on the diameter and projected area, shape, drag coefficient and stability. The drag was separated into its two components, carried respectively by the axial cord and by the main rigging lines. The opening characteristics of the parachutes were not investigated in these trials, but a number of parachutes of different shape were examined. These trials were supplemented by full-scale tests on 124 parachutes fitted with axial cords, by dropping block rubber dummies with them from these trials. The results of all these trials are given in the paper and a balloon at Cardington, and the time of opening was measured in trials were supplemented by full-scale tests on 124 parachutes fitted

F.R.L.


Study of the flow characteristics of parachutes in free descent at low airspeed, which requires taking account of the variation in drag, glide angle, and oscillation angle. Wind tunnel tests showed that the effect of the gliding angle was to make the total drag of the parachute about twice what would be expected for the same parachute following a path parallel to its axis. Flow patterns were studied in a water channel, from which it appears reasonable to assume that the section of the parachute canopy can be represented by the arc of a circle.

F.R.L.

A72-10306


The paper describes some trials that have recently been made in a wind tunnel at RAE to ascertain some of the characteristics of parachutes fitted with axial cords. The properties examined were the effect of the length of the axial cord on the drag of the parachute, on the diameter and projected area, shape, drag coefficient and stability. The drag was separated into its two components, carried respectively by the axial cord and by the main rigging lines. The opening characteristics of the parachutes were not investigated in these trials, but a number of parachutes of different shape were examined. These trials were supplemented by full-scale tests on 124 parachutes fitted with axial cords, by dropping block rubber dummies with them from a balloon at Cardington, and the time of opening was measured in these trials. The results of all these trials are given in the paper and discussed.

F.R.L.

A72-10307


Results of a series of parachute trials arranged to perform a dual function: to study the performance of several paratroop-type parachute assemblies under various store loadings, and to observe breathing oscillations, if any, in these parachutes. High speed motion picture cameras and kinetheodolites tracked the parachutes for about 15 sec during the steady part of each descent. It appears that breathing does not appear to be a priority consideration; rather, there seems to be a need to concentrate on canopy stability.

F.R.L.

A72-10308


Review of the results obtained in the aerodynamic and structural sections of a program designed to investigate problems of supersonic parachutes for release at speeds up to Mach 1.5 at low altitude. The work dealt with flat, conical and hemisflo ribbon parachutes, and was carried out in a wind tunnel and on a rocket sled. In addition to aspects of aerodynamic drag, structure, and loads in individual elements, ribbon flutter and inflation time are discussed.

F.R.L.

A72-10309


Development of a new method for calculating the inflation loads and inflation times on a variety of subsonic parachute assemblies. The method is intended to serve as an alternative to the 'filling time' method proposed by Heinrich et al. The unstable pressure distribution on a decelerating, inflating parabolic shell of revolution in the presence of an unsteady starting vortex flow is derived. If this resulting pressure distribution is used in conjunction with the structural constraints on the parachute system, then it is possible to find explicitly the opening loads and opening times. In essence, the method is a numerical solution to a nonlinear, second-order continuous system beginning with an appropriate set of initial conditions. A series of numerical examples is given to illustrate the versatility of the method.

F.R.L.

A72-10310


Outline of a method of parachute opening force and filling time calculation which is based on the time functions of aerodynamic drag, included air mass, apparent mass, and effective porosity. Using the momentum and continuity equations, an idealized canopy shape development, and a linear drag area-time relationship, expressions are obtained for the canopy volume and velocity. The calculated peak forces agree well with least mean square averages of field test results of 28-ft solid flat parachutes. It was found that forces and times change very little when figures were used which are within the presently accepted range of values.

F.R.L.

A72-10311


Results are presented for twenty-five flight tests of a 22.2-ft (6.8-m) diameter ribbon parachute (reefed for 0.5 sec) with a nominal 2000-lb (907 kg) store. The design, fabrication, and packing of the parachute system are discussed. Low altitude drop tests were made with F-4 and A-4 aircraft at Mach numbers from 0.57 to 1.22, and rocket-boosted tests were made at Mach numbers from 1.62 to
heating of the gas will be within acceptable limits. In addition, the
valve is to have a pressure sensitive closing valve to automatically
control the final pressure for a correct amount of oxygen in the
system cylinder. The pressure closing level may be manually selected
by means of adjustment dials on the valve.

T.M.

A72-10386 Pressure altimeter system minimum safe perfor-
mance standard. SAE Aerospace Standard, AS 942, June 15,
1971. 15 p.

Specification of the requirements for minimum safe perform-
ance of an altimeter system in its normal mode of operation on
subsonic aircraft. Compliance is a means of assuring that the
altimeter system will satisfactorily perform its intended function
when exposed to conditions encountered in routine operations. The
instruments specified shall accept an input of static pressure,
and in some equipment other inputs, that contribute altitude
information to provide a visual indication of pressure altitude. Test
procedures are described which apply specifically to analog type
instruments.

F.R.L.

A72-10388 Hose assemblies - Aircraft and missiles, light-
weight plastic hose, low pressure. SAE Aerospace Recommended

Physical requirements and quality assurance provisions for
lightweight plastic hose assemblies to be used in aircraft and missile
petroleum-base fuel and petroleum-base and synthetic lubricating oil
systems operating in a temperature range of -65 to +275 F at
pressures to 200 psi. Performance tests, oil resistance tests, fuel
resistance tests, flexibility and vacuum tests, qualification testing,
and preparation for delivery of the product are detailed.

T.M.

A72-10389 Flight test procedures for static pressure sys-
tems installed in subsonic transport aircraft. SAE Aerospace

Definition of the test procedures and equipment for performing
flight testing on pitot-static systems installed in subsonic transport
aircraft, the regulator documents being those of the FAA and the
SAE. Prior to flight testing of any pitot-static system, the system
should have been tested in accordance with the recommendations of
ARP 975. In the interest of standardization only the trailing cone
method of flight calibration is recommended; it exhibits very little or
no static pressure errors. In principle, the idea is to suspend a static
reference far enough behind an aircraft so that the ports are not
affected by the aerodynamic disturbances of the airframe.

F.R.L.

A72-10390 Turbine nozzle area measurement by airflow
method. SAE Aerospace Recommended Practice, ARP 1195, July

Description of a recommended practice which provides a
standard basis for airflow measurement of the relative aerodynamic
throat area of gas turbine nozzles. Methods, conditions of measure-
ment, and acceptable standards of accuracy are covered, and
equipment known to meet the general requirements is described.
Standard reference nozzles and mounting flanges are specified.

F.R.L.

A72-10506 Compensation of cross-couplings in aircraft
motion (Kompensatsiiia perekrestnykh sviazei v dvizhenii samoleta).
V. S. Mechetnyi. In: Complex control systems.
Investigation of the problem of aeroinertial interaction between the longitudinal and lateral motions (pitching and yawing) of a high-speed aircraft. The presence of cross-couplings between these motions leads to a deterioration of the dynamic properties of the aircraft and a complication of the control process. It is noted that known means of combating this phenomenon are frequently accompanied by undesirable consequences involving a disturbance of controllability, a reduction of maneuverability, and a limitation of the possibilities of a modern high-speed aircraft. A method of compensating aerodynamic cross-couplings is proposed. The laws of operation of a special cross-coupling compensation device performing this task are determined. It is shown that if the time constant of the compensation device is taken into account the aircraft/compensator system will be stable if the isolated pitching and yawing motions were stable.

A.B.K.

A72-10723 # Strength and stiffness of sandwich panels under transverse loading. M. Langley. Aircraft Engineering, vol. 43, Oct. 1971, p. 11-15. 8 refs. Description of work performed to translate Allen's (1969) theory of structural sandwich panel design into a form suitable for rapid estimation in a design office. The properties of end grain balsa were evaluated from the viewpoint of using it as the core material between metal and reinforced plastic facings. The consistency of balsa at any given density was examined as an essential property of the shear modulus; the latter quantity was evaluated and checked through a large number of beam tests. The results were used in panel testing for establishing a simple design office method of calculating the stresses and corresponding deflections in panels.

T.M.

A72-10724 # A300B European Airbus - Hydraulics and landing gear. Aircraft Engineering, vol. 43, Oct. 1971, p. 16, 17. Description of the hydraulics and landing gear of the European Airbus, demonstrating that generally known solutions are used. The landing gear was designed to have long fatigue life (32,000 flights); safety - e.g., free fall lowering and downlocking; reliability; easy maintenance - e.g., all parts of the main gear are identical and interchangeable between right and left hand; and simplicity. Maximum effort was made toward keeping weight to a minimum. Altogether the gear with its retraction jacks, but without wheels, brakes, and tires, weighs 7800 Ib, or 2.7% of the takeoff weight of the aircraft.

F.R.L.

A72-10725 # Flap and slat systems and tailplane actuator. Aircraft Engineering, vol. 43, Oct. 1971, p. 20-23. Description of the flap and slat systems and the tailplane actuator of the A300B which were designed to the highest standard of reliability combined with minimum weight. Complexity is reduced to a minimum, and maximum use is made of proven principles in an attempt to reduce development costs. The flap operating system comprises a control unit, a transmission system, and twelve ball screw jacks, and it is required to operate three slat sections in each wing. The flap operating system is basically similar. The tailplane actuator, situated in the unpressurized rear section of the fuselage, forward of the tailplane pivot center, controls the longitudinal pitch trim by setting the position of the variable incidence tailplane according to commands initiated by the pilot or autopilot.

F.R.L.

A72-10749 Tensile behavior of high-strength alloys during rapid heating. D. Hauser ( Battelle Columbus Laboratories, Columbus, Ohio) and J. W. Wright, Jr. (U.S. Army, Research and Engineering Directorate, Redstone Arsenal, Ala.). In: Space shuttle materials; Proceedings of the National Technical Conference, Huntsville, Ala., October 5-7, 1971. Azusa, Calif., Society of Aerospace Material and Process Engineers, 1971, p. 287-295. 7 refs. Contract No. N 60921-68-C-0220. Studies of tensile behavior were conducted on two grades of maraging steel, Ti-6Al-4V titanium alloy, and 7075-T6 aluminum alloy by applying a high tensile stress at room temperature that was maintained during subsequent rapid heating to failure. The results were compared to properties obtained from standard room- and elevated-temperature tensile tests. Significant differences in tensile behavior between these types of evaluations were found that demonstrate the need for developing design properties under conditions that closely simulate launch and reentry service conditions. (Author)


North Hollywood, Calif., Western Periodicals Co., 1971, p. 265-271. Review of the application of radioactive gas penetrants to jet engine manufacturing nondestructive evaluation problems and maintenance or service problems. The process is superior for the detection of porosity in complex investment castings and shows promise for measuring and evaluating high-cycle fatigue damage. Although the gas penetrant system would appear to serve only as a technique where defects are open to the surface, microstructure anomalies in most engineering materials have given a surprising degree of depth measurement capability. (Author)


A72-10816

gas turbine compressor disks. An ultrasonic device to locate cracks in affected components without removing the engine from the aircraft is described. The unit is completely portable and self-contained.

F.R.L.


Results of a comprehensive metallographic and fractographic examination of selected cracked tenons from second-stage compressor disks. The macroscopic features of the crack surfaces indicated crack initiation at points along the groove surface but did not provide any definite evidence of the fracture mechanism involved. Electron fractographic examination revealed that the crack surfaces were characterized by a predominance of a unique 'step-type' topography and only limited regions of well-defined fatigue striations. The combined observations of the metallographic and fractographic investigation established that the predominant fracture mechanism involved in the cracking of second-stage disks was high-cycle fatigue crack propagation.

F.R.L.


A method is described which enables an assessment to be made, in a broad sense, of the usefulness of a set of terminal aerodrome forecasts. The test is confined to the elements of visibility, surface wind and low cloud, and the scoring system is such that an error in the neighborhood of values critical for the landing and takeoff of aircraft is marked more harshly than an error in another part of the range. The scheme also takes into account the use of PROB, TEMPO and INTER in a way which simulates the loss of value to the customer of a reduction in the preciseness of the forecast.


Description of the electromechanical scanner, encoding and recording electronics, ground processing operations, and aircraft mounting details of a multispectral scanning system to be flown in a NASA C-130 earth resources aircraft. Scanner operation covers 24 channels assigned to bands between 0.34 and 13 microns. The energy reflected or radiated from underlying terrain is reflected from a 45-deg rotating mirror and introduced into a spectrometer followed by appropriate detectors for the different channels. Calibration sources are explained, together with the electronics equipment. T.M.


Phased array systems overcome many of the critical restraints on air traffic control. They can be used for air traffic control radar beacon systems, airport or air route surveillance radars, and ground landing systems. A microwave data link between aircraft and ground control can be incorporated in the beacon system on a time share basis, significantly alleviating the burden on voice communications. The flexibility of electronic scanning will contribute to further automation of the air traffic control system.


The role of automatic flight control in the over-all air traffic monitoring scheme is to provide precision, consistency, and automaticity, while giving flight crews more time for situation assessment and managerial duties. This role is especially crucial in the terminal area, where traffic density compounds workload and where the need for craft guidance during poor weather conditions presents the greatest challenge. Over the past five years, automatic flight control capability has been expanded to include not only landing, but also a variety of cruise modes of operation as required under specific, federally designated weather categories. The most recent automatic landing system to go into scheduled service is the 'fail-operational' system in the Boeing 747, which includes Sperry Rand's SPZ-1 autopilot-flight director system. This system has the capability of sustaining a failure while automatically guiding an aircraft to touchdown. As a result, it is the first autoland system for which a reduction in operational weather minimums has been allowed by either the United States or United Kingdom regulatory agencies. Early versions of the SPZ-1 and other automated Sperry Rand equipment have been controlling scheduled commercial aircraft to touchdown since February 1967, when one of Pan American's Boeing 727 jetliners made a fully automatic landing at JFK International Airport in New York. Since that time, other commercial aircraft have gained certification for automatic landing; in the future, all major aircraft are expected to be certified with autoland capability as a result of the safety it has added to poor-weather landings.

(Author)


Description of the automated radar terminal system, ARTS III, whose installation is either planned or underway in 62 major U.S. air terminals. It is a modularly expandable, radar-controlled, beacon-tracking system which satisfies its essential design goal: it monitors - and has the potential capability of tracking - all aircraft flying within its radar range. In essence, ARTS 'sees' all aircraft within a 55-mile radius of the terminal, and displays the tracks of all beacon-equipped aircraft. The information displayed for the controller includes identification, altitude, and ground speed. By 1980, it is expected that 200 of the most advanced terminal automation systems will be in operation, thereby enabling the traffic controller to keep pace with the increase in global air traffic.

M.V.E.
and maintenance facilities); at the same time, it must be capable of restarting with a self-contained energy source after standing unattended for long periods of time. All aircraft subsystems, designed with this same self-sufficiency potential, must be simple enough for easy maintenance and repair, yet sufficiently rugged for long life. An electromechanical nose wheel steering system developed by Sperry Rand's Vickers Division now supplies general aviation aircraft with the needed maneuverability and durability, and meets each aircraft's unique design parameters. (Author)


A three-dimensional trajectory model for missiles roll-controlled to an extent precluding any appreciable degree of roll is presented. It makes possible quite simple time-sharing digital or analog three-dimensional simulations. Motivation for the development of this missile trajectory model came from the need to overcome the limitations of single-plane simulation which restricts consideration to incoming and outgoing targets, even though crossing targets are of equal - if not greater - interest. In developing the presented trajectory model, advantage was taken of the existence of an easily computed direct transformation from wind-axis coordinates to inertial-axis coordinates for the case of a perfectly roll-controlled missile. M.V.E.


Graphite filament reinforced composites possessing significant strength and modulus to density ratios have been developed to the point where feasibility and performance potential has been definitely established. The fiber/resin combinations available provide the designer with many alternatives to mechanical performance vs cost and manufacturing technique. This multiplicity of materials systems has tended to limit the obtaining of a large amount of statistical data on any single system to date, however. A description of the various constituent materials properties is presented along with a listing of components which have been designed, fabricated and tested using graphite fiber reinforced composites as the major structural material. Selected examples of structural hardware demonstration items are used to describe the fabrication processes and the tooling concepts which were employed. (Author)


This paper describes engineering programs and methods used at McDonnell Aircraft Company (MCAIR) to develop surface integrity data for establishing process requirements for conventional machining, drilling, and grinding 300M steel and Ti-6Al-4V annealed titanium. Procedures, specimen types and test data obtained during drilling, reaming, and grinding of these materials are given. Also included is a discussion of the temper etch inspection method for steel surfaces and various methods used to improve the sensitivity of this nondestructive inspection method. Finally, methods used to control surface integrity during the fabrication of both commercial and fighter aircraft parts are described. (Author)


Description of an automatic ultrasonic testing facility for use in inspecting a new type of blade construction on the Lynx helicopter. The basic NDT problems involved in inspecting the new type of blade are outlined, and the methods employed in solving them are described. Finally, the complete test installation is discussed, including the arrangements for ultrasonic inspection, complex scanning, and facsimile recording. A.B.K.


Design of all avionic systems on future aircraft is tied to the past by MIL-STD-704. Despite dramatic advances in performance and reliability of the avionic equipments, the power conditioning section of each subsystem must still tolerate wide frequency swings on a transient basis, long power interruptions, large voltage transients, and unbalanced phase voltages. During the past decade, General Electric has developed the variable speed constant frequency (VSCF) generation equipment under sponsorship by the U.S. Navy and Air Force. The power quality available through VSCF systems represents a significant improvement over that required by MIL-STD-704. The weapon system improvements achievable through the use of this improved power were reviewed and assessed on existing production avionic subsystems. Proposed next generation avionic systems were also assessed to determine relative benefits achievable for new designs. Parameters considered were power dissipation, weight, volume, reliability, performance and cost. Data from this study on specific equipments was extrapolated to the avionic systems of future aircraft and cost and weight projections were made for both avionics and airframes. (Author)


Possible improvements to present aircraft electrical power systems for use in future advanced types of aircraft have been investigated. The conventional power system is examined, the characteristics of electric loads are reviewed, and various methods of power generation and distribution are appraised. It is shown that a hybrid system, with variable-frequency generation and high-voltage dc distribution, could overcome some of the limitations of the conventional system. O.H.


Air law comprises the totality of legal regulations related to the use of the earth atmosphere by devices which maintain themselves in
A72-11109  


The completion status and format of the NDT Manual being developed by a team of specialists are discussed. A detailed explanation of the section/subject format and a summary of NDT methods used are given. Planned accessibility to specific areas monitored by nondestructive test methods is the key to successful maintenance inspections based on the Manual.

V.Z.

A72-111109  

The problem of determining the equilibrium configuration of a cable towed in a circular path has both mathematical and practical interest. Mathematically, this interest is generated because of the multivalued nature of the boundary value problem. Practically, this interest arises because the towed drogue, for certain ranges of the governing parameters, obtains an equilibrium position very near the axis of rotation thus enabling pinpoint deliveries of payloads from fixed-wing aircraft. In this paper, the circular towing problem for a flexible, inextensible cable is examined. The equations of equilibrium and the boundary conditions which govern the cable configuration are derived and nondimensionalized to isolate the important parameters. The significance of these parameters for modeling the towing system is discussed. Finally, extensive numerical results are obtained for a particular airborne system. This example shows that an intimate relation exists between the mathematically interesting multivalued regions of solution and the practically interesting regions for which large towline verticality and small drogue radius are simultaneously present.

(Author)

A72-11117  


Acceptable levels of risks and methods for determining appropriate safety limits are discussed. The basic principles of proper and improper use of such design characteristics as accuracy, blunder rate, reliability, redundancy, Kalman filtering, independence, integration, and flexibility are reviewed with particular reference to their effects upon safety as distinguished from efficiency of air traffic control systems. Mutually consistent definitions of these various loosely used terms are presented. The nature and role of blunders and the basic principles usable for their prevention through employment of navigation facilities and independent surveillance systems are examined.

M.V.E.

A72-11118  


Review of some of the trends in automatic flight control system development which will have a significant effect on the performance of the future air traffic control system. The higher path-control accuracies achievable with the aid of inertial measurement data will permit fully automatic flight operations under environmental conditions (wind, wind gust, and wind shear) which would be prohibitive with current technology. In addition, higher path accuracies and improved versatility will permit complex curved approach and departure paths leading to reductions in noise and air pollution while achieving maximum terminal capacity with a mix of CTOL, STOL, and VTOL aircraft.

M.V.E.

A72-11132  


Extension of the available data on the velocity structure within a trailing line vortex to large distances downstream of the generating wing. Data are presented to show the variation of both axial and tangential velocity with tunnel speed and trailing vortex strength. Specifically, data are presented at downstream distances of 10 and
A72-11136  

Description of analytical and experimental work indicating that the aerodynamic stability coefficients can be extracted from the angular motion of aircraft configurations. Using a numerical integration fitting technique applied to the differential equations of motion, it is possible to determine values for the stability coefficients without imposing limiting assumptions on the configuration or its motion. The fitting technique demonstrated a high degree of accuracy as well as establishing the nonlinearity of the stability coefficients. This technique is currently being applied to the complete pitch, yaw and roll of an aircraft configuration with primary interest in extracting the cross-coupling stability coefficients.

A72-11137  

Description of a relatively new device, an acoustic echo sounder, which has the potential of not only indicating the presence or absence of wake vortices, but of acting as a continuous monitor of other important meteorological parameters of airport environments. The device consists of a fixed, vertically pointing antenna, in conjunction with two orthogonally positioned scanning antennas, which could provide a continual real time record of the inversion height, turbulent intensity, as well as an indication of the presence of wing tip vortices, and the vertical profile of the total wind vector.

A72-11150  

The applications of EDM and ECM machines in continuous and repetitive production of aircraft jet engine components at General Electric in Evendale are discussed. The machines are used for drilling and cutting when conventional machining of the thin-cross-section machine parts made of high temperature superalloys is costlier or impractical. Production of contourd slots, cutting of power supply units, and scalloped compressor retainers are covered as particular types of EDM and ECM tooling applications. The Shaped Tube Electrolytic Machining (STEM) method, an ECM variation for drilling small holes, is also described briefly.

A72-11151  

A summary is presented of the organizational structure and areas of activity of the Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt (DFVLR) during the year 1970. The distribution of activity at the various facilities operated by the DFVLR is illustrated. Research being performed and findings obtained in the fields of flow mechanics, flight mechanics and piloting, strength of materials and structures, power plants and power conversion, and electronics are summarized, as well as research in the field of physics of the atmosphere, space simulation, and flight medicine. The operations of various computer centers maintained by the DFVLR are described, and the organization of the various institutions and working groups of the DFVLR which deal with problems of aircraft and spacecraft design and propulsion is discussed. The work of a study group dealing with extraterrestrial research is cited.

A72-11153  

Travel characteristics and habits are examined in order to show how short takeoff and landing (STOL) aircraft can dramatically reduce the noise and land use problems. In particular, the following topics are discussed: airport congestion; community noise; airport location and layout; and traffic growth and airport capacity. An airport system for the United Kingdom and the London area is suggested together with a proposed STOL airliner design to meet these requirements.

A72-11154  

Corrected formulas are presented for the basic streamwise and spanwise components of perturbation velocity due to the thickness, at and near the crank, in a simplified example consisting of two seminfinite wing panels of different sweep angles joined together. Possible singularities in the flowfield in the neighborhood of the crank are examined. Finally, the implications of these formulas on the magnitude of the 'crank effect,' including the influence of freestream Mach number, are qualitatively discussed.

A72-11158  

Sonic boom pressure signatures during level overflights of F-104 aircraft (flight Mach number of 1.3 at 30,000 ft altitude) were recorded by forty-two ground-level microphones spaced equally in an 8,000-ft linear array. The variations in the signatures recorded by different microphones during the same overflight are believed to be caused primarily by atmospheric turbulence. The variations in these data were analyzed, and the results are used to partially substantiate Crow's (1969) theoretical model.

A72-11178  

The first three terms are considered in the asymptotic development of a long-distance velocity field of an arbitrary plane symmetrical obstacle. The trial of this development on a large circle...
Skin friction, are discussed. The effects of the state of the boundary turbulent boundary layer on an infinite yawed wing. The effects of nautical Quarterly, vol. 22, Nov. 1971, p. 346-362. 10 refs. A72-11395 The three-dimensional turbulent boundary layer on an infinite yawed wing. J. F. Nash and R. R. Tseng (Lockheed-Georgia Research Laboratory, Marietta, Ga.). Aeronautical Quarterly, vol. 22, Nov. 1971, p. 346-362. 10 refs. Description of the results of calculations of the incompressible turbulent boundary layer on an infinite yawed wing. The effects of increasing lift coefficient, and increasing Re...
gradients between the periphery and center of the disk reaching 500 C in alternation. Thermal and mechanical loads close to real operational loads can be obtained when this assembly is used in testing gas turbine disks.


Description of a program in which a complete STOL research aircraft (modified de Havilland C8-A Buffalo) was simulated to determine final design values for control systems and devices which augment aircraft control. Program objectives, computer requirements, and the simulation software and hardware are outlined together with the organization of the digital operations. The simulation program in combination with simulator hardware provided test pilots a realistic representation of the aircraft, with the result that various control and stability augmentation systems were evaluated using pilot handling qualities ratings. Final design parameters were then found for the aircraft which is scheduled for flight test in early 1972.


Derivation of a solution to an integrodifferential equation describing the aerodynamic behavior of this airfoil within the framework of the linear theory. Convergence of the solution is examined and the solution is extended in the form of a power series to be applicable to the airfoil configuration at the trailing edge, at infinity and at an intermediate point. Calculations are made to compare this solution with the one given by Spence (1956), showing that the latter is less effective.


Two types of successful small gas turbine aircraft engines - i.e., PT6 and JT15D - are discussed in detail. A review is presented of the PT6 and JT15D stories covering the factors which led to their overall configuration, some representative development problems, and the experience with the engine in service.


Correction of rolling moments, induced by an asymmetric loss of lift due to an engine failure, has been investigated for the case of the externally blown flap. A relatively simple technique is proposed which may be used to aid conventional controls and which yields encouraging results. The results indicate a significant measure of roll control in the event of an engine failure, provided sufficient lateral adjustment of the additional lift distribution is available.


Description of the present situation in the air transport industry, with discussion of what is needed and of what might be done to achieve the kinds of service that air transport can furnish. Attention is given to general and commercial aviation, and the roles of the FAA and CAB. Various possible policies are considered, leading to the conclusion that the Federal government must provide the leadership in making them work.

F.R.L.


Outline of the steps being taken to develop more efficient airports in order to shorten total trip time. Airports must be enlarged, boarding gates must be spread out, and the parking space must be expanded. These changes involve longer travel distances within the terminal area. Basic transport systems considered are the continuous type (private cars or taxis), and the batching type (buses and guided systems). Baggage handling, fire protection, security, monitoring of dispersed equipment, and central control are discussed.

F.R.L.


Exposition of the tasks of air traffic control, which must keep thousands of crisscrossing flights untangled. Some 16,000 air traffic controllers man the system, and are distributed between the Air Traffic Control Centers, which control traffic en route, and the terminal areas which control takeoffs, approaches, landings, and terminal-area holding patterns. The way the system works is outlined, various problems are discussed, and future improvements are described. Technological and administrative delays in correcting deficiencies are reviewed.

F.R.L.


Characterization of the needs of the short-haul air transport system, with suggestions of how future short takeoff and landing aircraft will help satisfy them. To achieve the goal aircraft, airways, and airports must be developed jointly, within the constraints of economic reality. A cruising speed of about 400 kt is desirable, as well as the ability to fly safely at low airspeed. Aircraft should be able to operate from runways less than 2000 ft long, and to climb steeply. Attention is given to navigation and landing aids, as well as to the interrelationship between short-haul airports and the community.

F.R.L.


Discussion of aircraft ride comfort, a subject of considerable importance, since about 85% of all flights take place at moderate or low altitudes, where turbulence is greatest. The main problem is due to unscheduled rising or sinking; rotational oscillation and structural
A72-11721


Attempt, beginning with 1960, to find reliable figures for dissecting civil aviation into its major contributing factors to the American economy, and estimating their worth. The overall contribution is the sum of the sales of aviation services by air carriers, plus the costs of operating business and personal aircraft. In the 1970's, civil aviation can expect benefits from population changes, particularly in age distribution. Three factors in future growth are real disposable income, airline fares, and the time-trend variable. It is suggested that the demand for air transportation will be able to support an annual increase in growth of about 15%. It is pointed out that almost as many people now travel by general aviation as by scheduled airlines.

A72-11756

Electronic displays for attack aircraft (Elektronische Displays für Kampfflugzeuge). R. Beyer (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugführung, Braunschweig, West Germany). Wertechnik, no. 6, 1971, p. 236-239. 5 refs. In German. (DFVLR-SONDOR-140)

The characteristics of modern attack aircraft, their subsystems, and the role of the pilot are described. Features of electronic displays employed in these aircraft are reviewed, and the development of suitable displays using a mission model for testing individual flight maneuvers is discussed. Basic principles of the simulation techniques are outlined, and display design criteria are examined. Recent advances in the display techniques, such as head-up and head-down displays, multisensor displays (MSD), and eyeglass displays, are reviewed. Future prospects in this field are outlined.

A72-11968


Study of the effect of fuel viscosity on the antitrust properties of a number of fuels differing in their naphthene hydrocarbon and sulfur contents. It is found that the antitrust properties of jet fuels noticeably improve with an increase in fuel viscosity only if the samples being compared do not differ in chemical composition and are obtained by similar processes. An increase in the naphthene hydrocarbon content in the fuel leads to an improvement in its antitrust properties. With an increase in the mercaptan sulfur content the antitrust properties of the fuel deteriorate. The use of an additive effectively improves antitrust properties.

A72-11972


An approximate expression is given for the thickness of weak fully dispersed shock waves. Using available data on the thermodynamic properties of air, it is shown that shocks of the strength expected in sonic bangs are fully dispersed. Estimated relaxation times for dry and humid air lead to wide variations in possible thickness, varying from millimeters to meters.

A72-11973


The paper describes an interpretation of jet-noise theory and scale-model experiments to highlight physical properties of jet-noise sources at very high speed. The study is prompted by current efforts to suppress the noise of supersonic transport aircraft. The principal noise sources are shown to be very large-scale wave-like undulations of the jet flow that travel downstream at supersonic speed for a distance of several jet diameters. These motions are relatively well ordered and are probably more akin to recognizable instabilities of a laminar flow than the confused small-scale turbulence. Because of this we postulate a model of the noise generating motions as the instability products of a jet flow of low equivalent Reynolds number. This Reynolds number is based on an eddy viscosity and can be further reduced by artificially increasing the small-scale turbulence level. This step would tend to stabilize the flow and inhibit the formation of large-scale noise producing eddies.

A72-12002


Review of a number of cases of vibration which was not predicted during the design stage or even during the experimental development stage. The cases discussed are those of the Comet and Electra aircraft and the Graf Zeppelin dirigible. Pogo vibration in large rockets, solar flutters of missile antennas, and density wave oscillations in a boiling water atomic power reactor. Factors complicating the construction of an alternating velocity precipitator designed to remove extremely small solid particles (flyash) from smokestack gas are considered.

A72-12022


Consideration of the effects of aircraft engine noise on the environs of airports and of the possibility of reducing the level of this noise. Noise measurement scales currently in use are reviewed, and the sources of engine noise are investigated, tracing a large portion of this noise to the use of turbofan engines with a low bypass ratio. It is foreseen that the problem of fan noise will be greatly mitigated by the trend toward turbofan engines with high bypass ratios which are used in jumbo jets. An estimate is made of future air traffic and of the noise level to be expected in the vicinity of some typical airports by 1975. The provisions of an Aircraft Noise Act recently enacted by the Federal Republic of Germany are reviewed.

Description of the design and testing of a new type of airport pavement (callzed pozzolanic material), consists of lime, cement, fly ash that combine with sand (and stone where needed) to form a semirigid base. The material is distinguished by the fact that it spreads like dirt, hardens like concrete, but has many of the advantages of asphalt. Also, the new material is considerably cheaper than conventional pavement materials. The new material is not as rigid as concrete and will therefore conform more readily to long-term settling of the subgrade with a minimum of stress induced in the pavement structure. At the same time, it is able to withstand more loadings without cracking or rutting than a conventional asphaltic base. Its strength increases significantly for at least five years, automatically compensating for the almost certain increase in aircraft size and weight.

A.B.K.


A unified theory is developed for supersonic and hypersonic flow with attached shock waves over the lower surface of a delta wing at an angle of attack. The flow field on the lower surface of a delta wing consists of uniform flow regions near the leading edges, where the crossflow is supersonic and a nonuniform flow region near the central part, where the crossflow is subsonic. In the nonuniform flow region, the theory is based on the assumption that the flow differs slightly from the corresponding two-dimensional flow over a flat plate. Thus a linearized perturbation on a nonlinear flow field is first calculated and then strained and corrected so that the flow is matched continuously to the uniform flow which is obtained exactly. When compared with available exact numerical solutions the theory gives, in all cases, almost identical results, except near the crossflow sonic line where existing numerical methods fail to produce a discontinuous slope in the pressure curve, whereas the present theory predicts such a discontinuity and shows that the slope has a square root singularity at the crossflow sonic line similar to that in the supersonic linear theory.

(Author)


Discussion of the STARAN (Stellar Attitude Reference and Navigation) Associative Processor which has been installed in the Knoxville TRACON (Terminal Radar Approach Control). An associative processor attains magnitudes of computational speed through the use of arithmetic and logic associated with each word in its memory array. Its strength lies in its ability to perform great numbers of calculations in parallel. STARAN performs a conflict detection function which will relieve the air traffic controllers of the responsibility for any conflict, near-miss, or collision of aircraft in flight.

F.R.L.


A system is described in which established principles of radar technology are combined in an original way to produce a radar with a range from 3 to 160 m, a 2 m resolution, and a 50 Hz picture-frequency display. Range measurements are made with a CW FM signal. Electronic angular scan is obtained with the aid of an antenna consisting of a length of waveguide with about 80 radiating holes. Undesirable side lobes in the radiation pattern are avoided by filling the waveguide with a dielectric. Mounted on a vehicle, the system allows the latter to be driven on an airfield under very poor visibility conditions.

V.P.

A72-12050  #  Two examples of application of Kalman filters to integrated navigation systems (Due esempi di applicazioni del filtro di Kalman ad equipaggiamenti integrati di navigazione). A. Ferraro and A. Lucifredi (Genova, Università, Genoa, Italy). Tecnica Italiana, vol. 36, May 1971, p. 163-168. 11 refs. in Italian.

Discussion of the application of optimal stochastic filters to navigation systems by means of two examples. The first example considers an air navigation system consisting of an inertial device (INS) and a LORAN (plus an altimeter); the measurement errors are modeled as colored noises. The second example shows the application to a system of submarine navigation; the instrument consists of an inertial device (SINS) and an OMEGA (plus a depth sensor). The measurement errors are modeled as the sum of a bias and a colored noise.

M.M.


Study of so-called thin-down hits, i.e., stopping heavy primaries, which can deposit a radiation dose of some thousand rads near the end of their trajectory, using balloon-borne stacks of cellulose nitrate, cellulose acetate, and a polycarbonate as detectors. The aim of the experiment is to determine the intensities of thin-down hits with charges Z equal to or greater than 6 for different deep layers in the plastic stack. The thin-down intensities which are measured in the deeper layers of the plastic stack can be directly compared with the intensities in the interior of the body of an SST traveler, since the fragmentation probabilities and the interaction mean free paths for heavy ions can be assumed to be equal in plastic and in human tissue.

F.R.L.


The work done so far in the United Kingdom in the field of radiological environment studies of supersonic transport aircraft (SSTs), such as the Franco-British Concorde, and the development of such instrumentation as might be required for monitoring it, is reviewed. It is shown that, as the first step, the extent was considered to which the stratospheric situation is covered by recommendations initially proposed to control exposure to ground based sources of radiation. Then a study was made of the dose and dose equivalent rates produced in the altitude band of interest by the galactic and solar cosmic radiation. To measure the dose equivalent rate from solar cosmic radiation at the Concorde cruising altitude, an instrument, referred to as the In-Flight Radiation Warning Meter (IFRWM), was developed and evaluated using the galactic cosmic radiation at altitudes up to 30 km (balloon flights) and the radiation from GeV accelerators.

O.H.

The general view of the visual display, used as an aid to the more usual digital readout for navigation. Such a display enables the latter to be monitored at a glance, and prevents gross blunders in insertion and readout of alphanumeric position information. A display system normally consists of a computer which accepts the sensor information and converts it into values to drive the map display: a control unit; the display head itself. The system should be able to work with any type of airborne navigation sensor and with combinations of these sensors. A typical pictorial navigation system, the Marconi AD670, is described, with details of the map display unit, the electronics unit, and the controller.

F.R.L.


Consideration of the B-1 strategic bomber design, which is expected to exert some influence on future aircraft. The B-1 is intended to serve for the remainder of this century as the primary manned strategic bomber of the U.S. The variable-sweep wing and its pivot is the single most complex structural aspect of the B-1. Projected operating speeds up to Mach 2.2 have dictated the requirement for variable-geometry inlets on the engine nacelles to maintain high inlet efficiency at all speeds. Attention is given to the landing gear, control system, and instrumentation.

F.R.L.


Results of measurements of aerodynamic forces and pressure distribution on a model simulating a wing-body combination. The effects of the fuselage on the flow past the wing is analyzed. The boundary layer on the upper surface of the wing, as developed under the conditions given by the outer flow, is investigated by means of a hot-wire technique and flow visualization. The results show the changes of the outer potential flow and of the boundary layer (mainly its transition to turbulence) which occur in the neighborhood of the fuselage.

A.B.K.


An area rule is obtained for the change in the lift-drag ratio of a hypersonic delta wing due to the addition on its compressive side of a conical body of arbitrary cross section. The area rule states that the change in aerodynamic efficiency of such a wing is directly proportional to the body volume and independent of its cross-sectional shape.

O.H.


A description of data comparing two different surface-impact-probe measurements for nonisobaric flow over an airfoil section in high subsonic flow. The two impact-probe devices were a Preston tube (a surface-mounted circular tube) and a Stanton tube (a segment of razor blade mounted over a static pressure orifice). The performances of these two devices are compared with each other and with theoretical calculations of the skin-friction coefficient.

M.M.


The principles of design and operation of the air-conditioning systems in pressurized cabins of transport aircraft and the oxygen equipment of such aircraft are outlined. Air-pressure, air-temperature, and air-moisture control systems are described, as well as aircraft oxygen supply systems and equipment for monitoring aircraft life-support systems. The maintenance of pressurized cabins and their high-altitude equipment is discussed, as well as the maintenance and operation of the oxygen equipment.

A.B.K.


The general design and operational principles of course-indicating systems, astronomical compasses, and navigation aids are outlined. Errors and their causes are examined along with means of improving the precision of these systems. Particular attention is given to the design and elements of the GIK-1 gyro flux gate telecompass, and the KS-6 and GMK-1 course-indicating systems. Technical servicing, maintenance, and maintenance schedules are discussed. A general method of determining the basic reliability features of aids and systems is proposed, and general principles of error analysis are studied. The book is equally well suited as a textbook and as a reference for engineers and technicians.

V.P.


Discussion of the Carrier System for Controlled Approach of Naval aircraft (C-SCAN) which provides a clear guidance for a poor-visibility landing of tactical jets on the flight deck of an aircraft carrier. The system transmits, receives, and decodes landing information with the aid of microwave scanning beams which give the pilot of an approaching jet a window to the carrier deck. The C-SCAN equipment, the shore-based installations and the reliability of the system are discussed. The fail-safe features of C-SCAN, such as SPN-41, TRN-28 monitors, ARA-63 fault detectors, and BIT circuits, are noted.

V.Z.


It has been suggested that in the conditions of lifting reentry of pilot wings are likely to have higher lift coefficients than flat-bottomed wings with the same ratio of lift to drag. Thus, for given speed and wing loading, they can reenter at higher altitudes with a consequent reduction in stagnation point heating rate. In this paper, thin-shock-layer theory is used to study the lifting properties of flat-bottomed wings and of wings with concave lower surfaces. It is found that significant gains in lift coefficient can be achieved with moderately recessed lower surfaces. These results hold for both perfect and real gas flows.

(Author)
$12.50; nonmembers, $14.50.

Digital matched filters using fast Fourier transforms, splash-detection radar digital signal processing, detection of targets in non-Rayleigh sea clutter, and radar measurement accuracy in log-normal clutter are among the topics covered in contributions concerned with results in radar signal processing. Other contributions include industrial and biomedical transducers, air traffic control, oceanographic and atmospheric technology, technical requirements and resource allocation in aerospace-borne earth resources exploration, and current problems in radar technology.


A summary is presented of the activities required over a five year time period for the development of a microwave landing system. The broad range of user operational requirements this system must satisfy has been tentatively established by Special Committee 117 of the Radio Technical Commission for Aeronautics.


A discussion of the concept, operation, and various design options for the development of an upgraded Air Traffic Control surveillance and data acquisition/communication system is presented in this paper. A review of the development, evolution, and functions of the present Air Traffic Control Radar Beacon System is presented together with a discussion of the need and concept for an upgraded Discrete Address Beacon System. The operation, functions, and critical design issues of the proposed Discrete Address Beacon System are presented and various design considerations and alternatives are developed and identified.


A summary is presented of the activities required over a five year time period for the development of a microwave landing system. The broad range of user operational requirements this system must satisfy has been tentatively established by Special Committee 117 of the Radio Technical Commission for Aeronautics.


A review of the present program requirements, technical features, and implementation plans for the UHF preoperational and operational Aeronautical Satellite Systems (AEROSAT) over the Pacific and Atlantic airspaces. Following a brief glimpse at the history, present state, and future trends of oceanic air traffic and air traffic control (ATC), the international aspects and special problems of ATC are discussed. ATC problems reviewed include: limited flight levels available, long-haul track conflicts, air speed differences in aircraft operations, differences in estimated and actual fix times, adverse weather conditions, and communication delays. Satellite national policy and present aeronautical satellite programs are considered.


An antenna system is described that is capable of electronically scanning a pencil beam more than ten beamwidths from boresight with a comparatively small number of active elements. This is accomplished by using a large inexpensive reflector to obtain aperture gain and a small phased array to provide electronic scanning. The antenna is part of a tactical aircraft landing system which must be transportable by aircraft, helicopter and ground vehicles. One of the most challenging aspects of the design was to achieve the proper balance between antenna characteristics, as they affect system performance, and tight weight and volume constraints.


The unique problems encountered in the integrated approach to aircraft and spacecraft avionics system designs are discussed with the emphasis on recent advances in telemetry as a factor facilitating the integration. A listing of subsystems planned for integration on the Space Shuttle vehicle is given, covering auxiliary pumping and propellant, crew controls and displays, computation, communications and radar, electric power, guidance, navigation and control, air-bearing engines, main engines, reaction control, and structural/mechanical elements. Considerations are given for the multiplexed data bus design applicable to integrated avionics.


Discussion of the EMR-designed system used presently by the Army Aviation Systems Activity (ASTA) for improvement of fixed and rotary wing aircraft tests. Covered are components of the Advanced Instrumentation and Data Analysis System (AIDAS), including the airborne system, the computer-controlled Central
prevailing dissociation. Two approximate closed solutions are given for estimating the nonequilibrium characteristics of the boundary condition from one with prevailing recombination to one with control the nonequilibrium level in the gas phase and in the catalytic surface reactions, and by the development of dissipative viscous condition of mass and moments of inertia. The displacement of the centers of mass of individual blade segments along the chord is taken into account together with both internal blade damping and aerodynamic damping.


Discussion of the nonequilibrium effects in a laminar three-dimensional flow at the leading edge of a swept hypersonic infinite span wing with an intensively cooled surface. A significant effect of a sweep-induced crossflow on the nonequilibrium behavior of the three-dimensional flow is demonstrated. This effect is caused by a change in the flow inviscid characteristics changing the boundary layer pattern, by an alteration of the Dahmkohler parameters which control the nonequilibrium level in the gas phase and in the catalytic surface reactions, and by the development of dissipative viscous heating which can change the nonequilibrium boundary flow condition from one with prevailing recombination to one with prevailing dissociation. Two approximate closed solutions are given for estimating the nonequilibrium characteristics of the boundary layer in terms of gasdynamics.


Description of a matrix method of calculating the aerodynamic loads (lift), transverse forces, bending moments, torques, flexural deflections, and the twist of hinged main-rotor blades in a helicopter during steady forward flight. The proposed method accounts for the influence of flexural and torsional deflections on the distribution of aerodynamic loads along the blade span as a function of time. The actual blade, representing a continuous system with a given distribution of mass and torsional and flexural rigidity, is replaced by an elastic axis with piecewise constant rigidity and a discrete distribution of mass and moments of inertia. The displacement of the centers of mass of individual blade segments along the chord is taken into account together with both internal blade damping and aerodynamic damping.

A72-12502 Externally blown flaps, aerodynamic feasibility study of a STOL-transporter. P. Kuehl and D. Welte (Dornier

A discussion of various configurations for the Aladin II noiseless STOL aircraft project. The solution envisaged consists in combining a wing equipped with adapted flaps with a convenient number of noiseless propelling units of a design similar to those imagined for the Bertin Aerotrain. Rudders relatively larger than those provided for a conventional aircraft should be used. The proposed turbojet unit is described, as well as two versions of the aircraft, one of 90 to 100 passenger capacity, the other of 45 to 50 passengers. Economic aspects and commercial activities and tasks of STOL aircraft are considered.


A consideration of the effect of jet engine efflux which, in certain cases, can give a considerable contribution to the load caused by the aircraft velocity on a deployed brake parachute. When engine disturbances appear incidently during landing it can happen that the engine speed is considerably higher than the speed corresponding to ground idle power when the brake parachute is released. The load on the parachute can thus in certain cases hazard the strength of the installation. To evaluate the load contribution from the engine efflux implies information about certain engine characteristics, aircraft velocity, and the drag coefficient of the brake parachute.


The theoretical principles and current methods of in-flight study of the stability and controllability of aircraft in both steady and unsteady regimes are outlined. Aircraft tests in limiting regimes (limiting speed, acceleration, and angle of attack) and in special flight situations (engine failure, failure of the automatic stabilization system, and failure of the control system hydraulic amplifiers) are considered. The equations of motion and the characteristics of an aircraft as a dynamic system are presented, as well as criteria for estimating and characterizing stability and controllability. Methods and techniques for in-flight determination of aircraft stability and controllability are described, together with methods of determining balancing curves from acceleration and speed, methods of determining aerodynamic force moments and their derivatives, methods of determining frequency characteristics and impulse and transition functions, and methods of evaluating the behavior of aircraft in limiting regimes and in special flight situations.

A72-12503 # Problems and technical aspects connected with the use of the L band in an aerial navigation aid system via satellite
A72-12645

the optimum use of such a memory and suitable treatment of the with those of the conventional systems. A computer architecture for that can be obtained by means of the new memory are compared data on air and naval traffic by means of conventional computers. A

A72-12646

A72-12647

A72-12648

A72-12649

A72-12650

A72-12705

A72-12706

A72-12707

A72-12709


An investigation of unsteady interference effects on a harmonically oscillating wing-tailplane model with a variable sweep wing in the low subsonic region (Untersuchung instationärer Interferenzeffekte an einem harmonisch schwingenden Flügel-Höhenleitwerks-Modell mit variabler Flügelzeigung im niedrigen Unterschallbereich). H. Triebstein (Aerodynamische Versuchsanstalt, Göttingen, West Germany) and J. Becker (Messerschmitt-Bölkow-

Drag and lift measurements were performed on two rectangular wings with an aspect ratio equal to 2 and with various trailing edges, in the freestream Mach number range from 0.5 to 2.2. In addition to straight trailing edges - i.e., sharp and blunt - various serrated blunt trailing edge characteristics were also examined. Some of these were found to reduce the drag remarkably. By splitting up the total drag into its components, it was possible to predict the relative magnitude of the components and the optimum trailing edge thickness.

A.G.


Free-flight simulation tests are described whose aim was to determine the adaptability of a nonlinear attitude control system developed by VFW-Fokker for the VAK 191 B aircraft to the roll and pitch control of a helicopter. The modifications which arise from this adaptation and some associated problems are examined. The Bell 47-G free-flight simulator was employed in the tests.

V.P.


Three cases of spinning have been investigated and compared. These include conventional steep and flat spins which depend on damping in yaw, and flat spins with a 'superstall' characteristic. This latter is not determined by damping in yaw, and is mostly distinguished from conventional flat spins by a lower rate of rotation. These relationships are explained by some examples.

O.H.


Description of a combined computational-experimental method of flutter analysis involving the study of specially constructed aeroelastic models. The proposed method is characterized by a considerable reduction of the risk of error and also by a reduction of the labor involved. In the proposed method appropriately constructed flutter models are investigated in a wind tunnel concurrently with the calculations in an early stage of the design process. These models are not intended to simulate the real state of the aircraft by adequate imitations of the original structure so as to make the computation superfluous, but to constitute a complementary concurrent analysis in analog form in contrast to the digitally performed calculation.

A.B.K.


Comparison of various methods of calculating the most important aerodynamic coefficients of the longitudinal, lateral, and roll motion of a wing-fuselage combination in the range of large angles of attack and small sideslip angles. The ranges of applicability and the reliabilities of the various methods are established on the basis of comparisons with the results of experimental studies of a wing-fuselage configuration in incompressible and compressible flow regions. It is found that while linear theories are useful only for angles of attack up to 5 deg, the nonlinear methods considered yield good or satisfactory results for angles of attack up to 12 deg. At larger angles of attack all the theories discussed become increasingly inapplicable.

A.B.K.


Review of the existing methods of ascertaining the flutter stability of high-speed aircraft. Methods of producing in-flight vibrations of aircraft are discussed, including pulsed excitation by solid-fuel rockets, pulsed excitation by electrically controlled rudder impacts, harmonic excitation, and sliding frequency excitation. Methods of evaluating the responses to these various types of excitation are considered, including filtering, the root-locus method, spectral decomposition, and methods based on the use of correlation functions.

A.B.K.


Based upon the slender body theory the pressure distribution is calculated numerically. The configurations investigated consist of a circular cylindrical fuselage body with a conical nose and a delta
wing with straight, cubic or sinusoidal leading edges. In particular, the influence of the fuselage and the effects of wing geometry and reduced frequency are investigated in detail. For three delta wings with straight leading edges the results were compared with the corresponding data obtained on the basis of three-dimensional lifting surface theory.

G.R.

Description of a typical Doppler system consisting of a sensor (navigation radar device), a computer unit, and a data transmitter. The navigation radar operates on the basis of the Doppler effect and provides a precise value of the aircraft’s horizontal speed, obtained through the course data and velocity relative to the ground. Such data are sent continuously to the navigation computer unit. This equipment, completely transistorized, arranges for the continuous recording of the aircraft’s position. The device can operate by means of a storage system, thus ensuring continuous performance during periods when the Doppler data may not be temporarily available.

M.M.


It is shown that aromatic hydrocarbons, particularly naphthalene derivatives and polycyclic naphtheno-aromatic hydrocarbons, comprise another (in addition to heteroorganic compounds) source of deposit formation during oxidation of jet fuels. The structure of the nonaromatic component exerts a strong influence on the degree of coagulation of the oxidation products of aromatic hydrocarbons. The maximum amount of the solid phase is observed during oxidation of a mixture of aromatic hydrocarbons with isoparaffin hydrocarbons. The minimum quantity of the solid phase is produced during oxidation of aromatic hydrocarbons mixed with bicyclic naphthenic hydrocarbons.

T.M.


Theoretical study of the effect of tip clearance on the aerodynamic force of an inviscid incompressible uniform flow about a wing. It is assumed that the vortex strength is constant across the wing span and that the downwash along the wing span is equal to its level at the center of the wing span. Expressions are derived to determine the force acting on a low aspect ratio wing with a tip clearance under the conditions studied. The expressions are based on an extension of Boltz’s results.

V.Z.


Simple exploration of tip relief, with suggestion of an empirical means of predicting its magnitude. A blade tip may be thought of as a combination of a two-dimensional airfoil and a three-dimensional body. Because of the geometric relationships, tips with thick airfoil sections have more tip relief than do tips with thin airfoil sections. For quick estimates of the tip relief, the apparent drag divergence Mach number can be computed from the two-dimensional drag divergence, Mach number, the airfoil parameters, and flight conditions.

F.R.L.

The measuring equipment and procedures, and the electronics of the data acquisition and processing systems employed at the 3-m wind tunnel and the transonic wind tunnel at Götingen are examined. Improvements in the measuring equipment made during the last decade, and an improved compressor system suitable for engine simulation are discussed. A computerized real-time data processing system is described.

V.P.

A72-12900


The concept of a disk-shaped lift engine intended to provide additional thrust during the takeoff and transition phases of V/STOL aircraft. After fulfilling this task, the engine returns to the ground, using its jet for a soft landing. The design of the engine, characterized by an unconventional arrangement of compressor, turbine, and combustion chamber is described. The recovery process is controlled solely by the strong gyroscopic properties of the engine rotor. V.P.
Page intentionally left blank
Static and dynamic stability characteristics of a cruciform, slotted fin configuration are presented. Aerodynamic coefficients are extracted from single degree of freedom, free oscillation wind tunnel tests employing nonlinear least squares procedures. The linear and nonlinear variations with angle of attack of the restoring and damping moment coefficients are presented for various fin slot sizes at subsonic speeds. Results indicate that, as slot size increases, the nonlinear contributions decrease in magnitude to a greater extent than the linear terms. Based on the signs of the various moment contributions, it was found that, while stability is reduced at small angles of attack due to increased slot size, greater stability is affected at moderate angles of attack.

Properties of wings positioned above the jet nozzle

W. Baumert and L. Harms (DFVLR, Goettingen, West Ger.) 20 p refs

7. The influence of an inclined jet on the aerodynamic characteristics of a control surface

M. Seidel (DFVLR, Brunswick) 28 p refs

8. Force and downwash measurements with jet simulation on models of the European Airbus in a low speed wind tunnel, W. Geissler (DFVLR, Goettingen, West Ger.) 37 p refs

9. Investigations of exhaust jets of TL-engine models E. Schwantes (DFVLR, Brunswick) 33 p refs

10. Calculation of the pressure distribution on an aircraft fuselage with emerging lifting jets using singularities G. Schulz (DFVLR, Porz, West Ger.) 38 p refs

11. Aerodynamic calculations for the interference of several propeller-jets with an aerofoil G. Loebert (Ver. Flugtech. Werke Fokker, Munich) 43 p refs

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

Possibilities for jet simulation in the 3m-wind tunnel of the DFVLR-AVA Goettingen [MOEGLICHKEITEN ZUR STRAHLSIMULATION IM 3M-WINDKANAL DER DFVLR-AVA GOETTINGEN]

E. Melzer and R. Wulf In DGLR Aerodyn. Interference Between Aircraft and Engine Jet, Apr. 1971 28 p refs In GERMAN; ENGLISH summary

Avail: NTIS HC $6.00/MF $0.95: ZLDI Munich: 54 DM

Experiments were carried out in a low speed wind tunnel to determine jet aircraft/engine interference with several aircraft models. After a discussion of the similarity parameters of engine intake and exhaust models, some possibilities of jet generation and control are explained, including compressed air, motor-driven fans or propellers, and the use of compressed air for ejection of engines. The power plants involved are described, and their possibilities and limitations are discussed.

ESRO
WITH HIGH PRESSURE EJECTORS FOR SUBSONIC WIND TUNNEL MEASUREMENTS ON A FIGHTER AIRCRAFT MODEL WITH VERTICAL TAKEOFF CHARACTERISTICS [TECHNIK DER TRIEBWERKSSIMULATION MIT HOCHDRUCKJEKTOREN BEI UNTERSCHWINDKANALMESSUNGEN AM MODELL EINES SENKRECHTSTARTFAHIGEN KAMMPFLUGZEUGES]

W. Heinzerling / In DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 22 p In GERMAN (See Avail: NTIS HC $6.00/ MF $0.95; ZLDI Munich: 54 DM

A wind tunnel model of a vertical takeoff fighter aircraft was designed to cater for the normal 8 component measurements in addition to jet interference measurements. The model's engines were high pressure ejectors, driven by compressed air. A survey is given of the measurements performed to determine aerodynamic characteristics with and without interference drag.

The results suggest that the lift-dependent drag of such an installation may be significantly larger than that of a conventional installation below the wing.

Author (ESRO)

N72-10010# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aerodynamik.

INFLUENCE OF A JET ON THE AERODYNAMIC PROPERTIES OF WINGS POSITIONED ABOVE THE JET NOZZLE [EINFLUSS EINES DUESENSTRAHLS AUF DIE AERODYNAMISCHEN BEWERTEN VON UEBER DER STRAHLDUSE ANGEBOTTEN FLUGELN]


Avail: NTIS HC $6.00/ MF $0.95; ZLDI Munich: 54 DM

Rectangular and swept wings were investigated; position, inclination and velocity of the jet were varied. Wing and nacelle were mounted separately so that the wind tunnel balance did not measure jet thrust. A simple determination of jet interference was possible with this arrangement. The jet decreased wing lift, for the ratio of jet velocity and free stream velocity from 2 to 17 the lift loss increased linearly with the velocity ratio. The lift loss also increased with jet angle. The induced pitching moment is dependent on velocity ratio and varies with position of the jet.

ESRO

N72-10008# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

TURBULENT AND LAMINAR JET PROPAGATION IN ROTATING SYSTEMS AND ITS APPLICATION TO JET MIXING IN THE WAKE OF REACTION DRIVEN ROTORS [TURBULENT UND LAMINARE STRAHLAUSREITUNG IN ROTIERENDEN SYSTEMEN UND IHRE ANWENDUNG AUF DIE STRAHLMISCHUNG IM ABWINDFELD VON ROTOREN MIT REAKTIONSANTRIEBEN]


Avail: NTIS HC $6.00/ MF $0.95; ZLDI Munich: 54 DM

The kinematics and dynamic laws governing the propagation of a jet emerging from a rotating arm tip are derived for a fixed coordinate system. Using typical mixing laws for rectilinear jet propagation as an approximation, the cases of plane and round laminar and turbulent jets are compared. The spatial deviation of jet propagation in rotating systems are experimentally investigated using smoke photographs.

ESRO

N72-10009# Royal Aircraft Establishment, Farnborough (England).

SOME EXPERIMENTS ON AN ENGINE INSTALLATION ABOVE THE WING OF A SWEEP-WINGED AIRCRAFT

J. A. Bagley / In DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 20 p refs

(RAE-TM-AERO-1271) Avail: NTIS HC $6.00/ MF $0.95; ZLDI Munich: 54 DM

Experiments are described for a possible large diameter turbofan engine nacelle installation above the wing of a transport aircraft. The current generation of turbofan engines for transport aircraft have nacelle diameters of about 3m, and as engine bypass ratio increases, the nacelles will become even larger. To fit such engines in the conventional position below the wings will be increasingly difficult. Tests were first made on a partial model of the wing and nacelle with the jet represented by blowing from an external supply. Interference between the jet and wing was investigated by measuring pressures on the wing, by surveys of the total-head distribution in the jet, and by schlieren and oil-flow photography. These tests were followed by force measurements in a low-speed wind tunnel on a model of a swept wing and fuselage, fitted with a pair of free-flow nacelles.

The variations in lift of a freestanding control surface due to a round, cold, engine jet were investigated. The most important parameter in VTOL longitudinal stability is the inclination of the jet engine to the flow direction. The measurements show that inclined incident jets result in lift losses of the control surface and thus are generally unfavorable to longitudinal stability. An empirical formula is derived for the estimation of lift loss due to jet impingement.

ESRO


THE INFLUENCE OF AN INCLINED JET ON THE AERODYNAMIC CHARACTERISTICS OF A CONTROL SURFACE [DER EINFLUSS EINES GENEIGTEN STRAHLS AUF DIE AERODYNAMISCHEN EIGENSCHAFTEN EINES LEITWERKS]

M. Seidel / In DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 28 p refs In GERMAN

Avail: NTIS HC $6.00/ MF $0.95; ZLDI Munich: 54 DM

The results suggest that the lift-dependent drag of such an installation may be significantly larger than that of a conventional installation below the wing.

Author (ESRO)

N72-10012# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aerodynamik.

FORCE AND DOWNWASH MEASUREMENTS WITH JET SIMULATION ON MODELS OF THE EUROPEAN AIRBUS IN A LOW SPEED WIND TUNNEL [KRAFT- UND ABWINDMESSUNGEN MIT TRIEBWERKSSIMULATION AN MODellen DES EUROPAEISCHEN AIRBUS IM NIEDERGESCHWINDIGKEITSBEREICH]


Avail: NTIS HC $6.00/ MF $0.95; ZLDI Munich: 54 DM
Extensive wind tunnel measurements of the European airbus, including jet simulation, are reported. The jet interference influence on longitudinal stability led to repositioning of the nacelles. Simulation with the improved engine position did not indicate any reduction in jet interference, whilst bypass jet simulation showed further stability deterioration. Near ground, on the other hand, a clear improvement of longitudinal stability was observed. Further investigation at higher Reynolds numbers is necessary.

The suitability of the lifting surface theory for V/STOL aircraft for the calculation of the aerodynamics of a wing immersed in one or more propeller slipstreams was investigated by comparison with experimental results. The comparison was conducted on the basis of lift, drag, pitching moment, normal-force distribution, and wake characteristics. The impact pressure distribution and field of direction in the airfoil wake are discussed. The influence of the main propeller-wing interference characteristics on the descent capability of propeller driven V/STOL aircraft is investigated.

A systematic investigation of hot gas free jets, with an excess temperature of 550°C, with critical nozzle pressure, and five differently shaped convergent nozzles is described. Large differences were noted with free jet measurements at lower nozzle Mach number. The exhaust jet emerged from the convergent nozzle with very high static overpressure, and accelerated to hypersonic speed within a core of approximately five nozzle diameters. The jet disintegration and the spatial jet propagation angle is almost the same for hot and cold jets, but thermal lifting forces resulted in a deformation of the circular cross section for horizontal hot gas jets.


Formulas are given for the streamwise and spanwise components of perturbation velocity due to thickness, as predicted by subsonic linearized theory, in the neighborhood of the crank formed by the junction of two semi-infinite swept wings of different sweep angles. The implications of these formulas for the magnitude of the crank effect are discussed qualitatively, including the influence of free stream Mach number.

The measurements were made on a 76 deg swept delta wing in a 400 mm (16 in) shock tunnel and the free stream Reynolds number was 49,000 cm (125,000 in) for stagnation conditions of 150 atmospheres and 2000 K. A series of schlieren photographs of the established separated flow, induced by spanwise steps and wedges fixed at the rear of the model, were taken in monochrome and color. The technique, equipment, and the relative merits of the two systems are discussed in detail.

Venaigte Flugtechnische Werke-Fokker G.m.b.H., Munich (West Germany).

AERODYNAMIC CALCULATIONS FOR THE INTERFERENCE OF SEVERAL PROPELLER-JETS WITH AN AEROFOIL [BERECHNUNG DER AERODYNAMIK DES VON MEHREREEN STRAHLEN BEAUFSCHALGTEN TRAGFLUG-ELBS] G. Loebert In DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 43 p refs In GERMAN; ENGLISH summary

The measurements were made on a 76 deg swept delta wing in a 400 mm (16 in) shock tunnel and the free stream Reynolds number was 49,000 cm (125,000 in) for stagnation conditions of 150 atmospheres and 2000 K. A series of schlieren photographs of the established separated flow, induced by spanwise steps and wedges fixed at the rear of the model, were taken in monochrome and color. The technique, equipment, and the relative merits of the two systems are discussed in detail.

Author (ESRO)

AЁTEN

AERODYNAMIC CALCULATIONS FOR THE INTERFERENCE OF SEVERAL PROPELLER-JETS WITH AN AEROFOIL [BERECHNUNG DER AERODYNAMIK DES VON MEHREREEN STRAHLEN BEAUFSCHALGTEN TRAGFLUG-ELBS] G. Loebert In DGLR Aerodyn. Interference between Aircraft and Engine Jet Apr. 1971 43 p refs In GERMAN; ENGLISH summary

The suitability of the lifting surface theory for V/STOL aircraft for the calculation of the aerodynamics of a wing immersed in one or more propeller slipstreams was investigated by comparison with experimental results. The comparison was conducted on the basis of lift, drag, pitching moment, normal-force distribution, and wake characteristics. The impact pressure distribution and field of direction in the airfoil wake are discussed. The influence of the main propeller-wing interference characteristics on the descent capability of propeller driven V/STOL aircraft is investigated.
N72-10023

The Mechanical Design of an Adjustable Nozzle for the NPL 26 in By 20 in (636 mm By 508 mm) Transonic Wind Tunnel
N. G. Marcus Sep. 1970 20 prefs
(NPL-AERO-NOTE-1098; ARC-32400) Avail: NTIS

A description is given of the mechanical engineering design of a pair of steel flexible liners. These are positioned by simple motorized jack systems which easily adjust the flexible nozzle to control the tunnel Mach number. The aerodynamic loading, calculations, and design features are discussed. Author (ESRO)

N72-10026#

National Aeronautics and Space Administration. Lewis Research Center, Moffett Field, Calif.
Effect of Casing Treatment on Overall and Blade Element Performance of a Compressor Rotor
Royce D. Moore, George Kovich, and Robert J. Blade Washington Nov. 1971 65 p+ refs
(NASA-TN-D-6538; E-6119) Avail: NTIS CSCL 20D

An axial flow compressor rotor was tested at design speed with six different casing treatments across the rotor tip. Radial surveys of pressure, temperature, and flow angle were taken at the rotor inlet and outlet. Surveys were taken at several weight flows for each treatment. All the casings treatments decreased the weight flow at stall over that for the solid casing. Radial surveys indicate that the performance over the entire radial span of the blade is affected by the treatment across the rotor tip.

Author

N72-10031#

National Aeronautics and Space Administration. Ames Research Center, Cleveland, Ohio.
Full-Scale Wind-Tunnel Tests of a Small Unpowered Jet Aircraft with a T-Tail
(NASA-TN-D-6573; A-3138) Avail: NTIS CSCL 01A

The aerodynamic characteristics of a full scale executive type jet transport aircraft with a T-Tail were investigated in a 40 x 80 ft (12.2 by 24.4 meter) wind tunnel (subsonic). Static, longitudinal, and lateral stability, and control characteristics were determined at angles of attack from -2 deg to +42 deg. The aircraft wing had 13 deg of sweep and an aspect ratio of 6.02. The aircraft was tested power off with various wing leading- and trailing-edge high lift devices. The basic configuration had static longitudinal stability through initial stall. Severe pitch-up, resulting in a rapid, uncontrolled stall, occurred during initial testing.

Author

N72-10034#


A special takeoff and landing procedure, termed RVTOL (rolling vertical takeoff and landing), was developed for the VTOL aircraft VJ 101 C-X2. The RVTOL technique is believed to be an answer with this type of aircraft to the problems of recirculation, ground erosion, airframe thermal stress, and controllability. Almost complete independence from conventional ground equipment is claimed, due to the reliable operation of the three-channel flight control system.

Author (ESRO)

N72-10036#

National Physical Lab., Teddington (England). Environmental Unit.
A New Basis for Aircraft Noise Rating
D. W. Robinson Mar. 1971 23 p refs
(NPL-AERO-Ac-49) Avail: NTIS

Starting with the definition of noise pollution level, it is shown that the incremental value of this quantity due to the occurrence of an aircraft noise provides a logical basis for rating the noise. This measure has simple additive properties which permit the same definition to be extended to an arbitrary series of events, including the background noise and its fluctuations. By specifying reference values of certain parameters, a formula is evolved which is suitable for aircraft noise certification purposes; the relation of this measure to effective perceived noise level is discussed.

Author (ESRO)

N72-10038#

(AD-724850; DDC-TAS-71-26-1) Avail: NTIS CSCL 20/1

The annotated bibliography is an unclassified compilation of references on airplane noise pollution in a series of bibliographies on environmental pollution. References deal primarily with effects of noise exposure on hearing, speech, communications and community/airport noise. Computer-generated indexes for corporate author-monitoring agency, subject, and title are included, requesting AD-722 810.

Author (GRA)

N72-10037#

Naval Ship Research and Development Center, Washington, D.C. Aviation and Surface Effects Ratoes.
Theoretical Performance of a Pure Jet Flap Rotator at High Advance Ratios

Author
The theoretical performance of a jet flap rotor at advance ratios greater than 1.0 is examined. The rotor is four bladed with purely elliptical airfoils of fifteen percent thickness ratio. The leading and trailing edge on the retreating side of the azimuth and both the ratio greater than 1.0 is examined. The rotor operates in cruise at advance ratios greater than unity so that the retreating blade is immersed in reverse flow. The lift and moments are controlled by ejecting a jet sheet out of the trailing edge on the advancing side of the azimuth and both the leading and trailing edge on the retreating side of the azimuth. Standard blade element theory is used to calculate jet flap rotor performance thrust coefficients representative of actual full-scale rotor operation. It is shown that good performance can be obtained using the jet flap and that substantially better performance can be achieved using a circulation control airfoil.

Author (GRA)


BRIEFS OF ACCIDENTS INVOLVING AMATEUR/HOME BUILT AIRCRAFT: US GENERAL AVIATION.

Jun. 1971 44 p
(PB-201438; NTSB-AMM-71-2) Avail: NTIS CSCL 01B

The publication contains statistical, cause/factor, and injury variables, accident rates and the briefs of accidents involving amateur built aircraft.

Author (GRA)


BRIEFS OF ACCIDENTS INVOLVING WEATHER AS A CAUSE RELATED FACTOR: US GENERAL AVIATION.

Jun. 1971 198 p
(PB-201437; NTSB-AMM-71-1) Avail: NTIS CSCL 01B

The publication contains statistical, cause/factor, and injury variables, accident rates and the briefs of accidents involving weather.

Author (GRA)

N72-10040#/ Quality Assurance Directorate (Materials), London (England).

THE INFRA-RED ANALYSIS OF AIRCRAFT CABIN-GAS ATMOSPHERES.

(QAD-MATS-174) Avail: NTIS

The analysis of the air-bleed cabin gas produced by Olympus and Pegasus engines has been carried out by infra-red spectrometry. The method utilizes a conventional double beam recording infra-red spectrophotometer equipped with a pair of multirefraction long path cells. The lower limits of detection of the various contaminants listed in the specification have been determined both individually and in conjunction with large amounts of other impurities. This method has also been extended to cover air-bleed cabin gas samples which have been taken from development engines in which malfunctions of the engine components have been simulated.

Author (ESRO)


BRIEFS OF AIRCRAFT ACCIDENTS INVOLVING MISSING AIRCRAFT: US GENERAL AVIATION.

Jun. 1971 92 p
(NTSB-AMM-71-4; PB-201440) Avail: NTIS CSCL 01B

The publication contains statistical cause/factor and injury variables, accident rates and the briefs of accidents involving missing aircraft.

Author (GRA)

N72-10042#/ Louisiana State Univ., Baton Rouge, Dept. of Chemical Engineering.

OPTIMIZATION STUDIES OF AIRCRAFT CONTROL
formation grouping, although trajectory-following yielded better performance and pursuit guidance was easier to mechanize.

Author (GRA)

N72-10045# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif. AERODYNAMIC CHARACTERISTICS OF AN ALL-BODY HYPERSONIC AIRCRAFT CONFIGURATION AT MACH NUMBERS FROM 0.65 TO 10.6 Walter P. Nelms, Jr. and Charles L. Thomas Washington Nov. 1971 100 p refs (NASA-TN-D-6577; A-4017) Avail: NTIS CSCL 018

Aerodynamic characteristics of a model designed to represent an all-body, hypersonic cruise aircraft were presented for Mach numbers from 0.65 to 10.6. The configuration had a delta planform with an elliptic cone forebody and an afterbody of elliptic cross section. Detailed effects of varying angle of attack (-2 to +15 deg), angle of sideslip (-2 to +8 deg), Mach number, and configuration buildup were considered. In addition, the effectiveness of horizontal tail, vertical tail, and canard angles of attack, stabilizing and control surfaces was investigated. The results indicate that all configurations were longitudinally stable near maximum lift drag ratio. The configurations with vertical tails were directionally stable at all angles of attack. Trim penalties were small at hypersonic speeds for a center of gravity location representative of the airplane, but because of the large rearward travel of the aerodynamic center, trim penalties were severe at transonic Mach numbers.

Author


The principles of helicopter flight, special characteristics of the main rotor and its function in autorotation, axial and oblique flow, regimes of vertical and horizontal flight, climb and descent, takeoff and landing, bellows, steady, and control of the helicopter and their acting aerodynamic forces are presented.

Author (GRA)


The report describes the computer programs described in Volume I of this report entitled ‘An Automated Procedure for the Optimization of Practical Aerospace Structures’ (AD-726112). Both the main structural optimization program and the shell dynamics program are written in Fortran 4 language. This manual contains a description at all angles of attack, data set arrangement, and subroutines of both programs. Author (GRA)


The document describes a four year effort which led to the adoption of a new military specification MIL-F-83300, 'Flying Qualities of Piloted V/STOL Aircraft', and the publication of a supporting document, 'Background Information and User Guide for MIL-F-83300', 'Military Specification - Flying Qualities of Piloted V/STOL Aircraft' (AFFDL-TR-70-88). Included in the report is an assessment of the status of V/STOL flying qualities research and recommendations for future work. Author (GRA)


On February 17, 1971, DC-9-15 aircraft struck an electric transmission line static cable during a VOR approach to Runway 31 at the Gulfport, Mississippi, Municipal Airport. A successful missed approach was accomplished, and the aircraft landed at Gulfport. Of the seven passengers and four crew aboard the aircraft, the only reported injury was a passenger's scratched hand. The aircraft received substantial damage to the left main landing gear, left wing, left fuselage, and the left engine. There was no fire. The weather was a partial obscuration with visibility 3/4 mile in fog. The probable cause of this accident was inadequate monitoring of the approach. The captain was preoccupied with the prelanding checklist during the final approach, and the first officer, who was flying the aircraft, was devoting his attention to an attempt to establish visual contact with the runway in low visibility. These activities resulted in an improperly executed VOR/DME approach during which the aircraft descended below the minimum descent altitude before the crew acquired visual contact with the runway environment.

Author


The report is an analysis of the relationship between noise generated by aircraft operations and the use of affected land surrounding the airport in Melbourne, Florida. It includes a presentation of current land use information and the prospects for change. Proposals were developed to encourage and enable the federal governments involved to achieve compatible development through cooperative intergovernmental measures: comprehensive planning, capital improvement programming, mapping, zoning, annexation, land acquisition. The ecological impact is considered in a separate section. Author (GRA)


The unique tasks, requirements, and demands upon attack helicopter crews, and the effects of the environment upon the performance of these tasks are analyzed. Night operations under low ceilings, reduced visibility, high or low speeds, nap-of-the-earth flight profiles and a threat of sophisticated antiaircraft weaponry is defined as the 'worst-credible-environment' for the NATO theater. In this environment, the attack helicopter and its crew will be expected to fly a large percentage of its missions and deliver its ordnance with a high degree of accuracy. Task performance is outlined in a detailed matrix. Collective tasks are grouped into functional task clusters. The effects of climatic conditions, the hostile threat, social and civil factors upon performance of these task clusters are discussed. The effects of
the machine/mission created environment are presented and include hypoxia, toxic products, temperature extremes, visual and optical problems, acoustics, vibration, and human factors. 

Author (GRA)

N72-102127# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. 
Jerry D. Speckman and Justis F. Rose, Jr. Mar. 1971 206 p refs 
(AF PROJ. 7231) (AD-727023; AMRL-TR-71-12) Avail: NTIS CSCL 06/19 
Measurements were made of the pilot station vibration environment experienced in the B-52 aircraft during low-altitude, high-speed flight. Data were obtained of the longitudinal, lateral and vertical linear accelerations and the roll axis angular velocities and accelerations. The terrain contour following flights at 500-900 feet above the flat to semi-mountainous regions of Louisiana and Arkansas were made at 350 knots true airspeed. Data analyses included probability density and distribution and the auto-power spectral density functions in addition to tests for stationarity, randomness and normality. The individual degree-of-freedom results are presented in graphical and tabular form and in general indicate that the pilot station vibration environment produced by the combination of gust response and maneuvering: (1) is stationary for up to 590 seconds; (2) is a random phenomena that does not satisfy the chi-square goodness-of-fit test for Gaussian distribution; (3) cannot be adequately simulated in the laboratory for human biomedical tolerance and/or psycho-physiological performance studies using only vertical axis motion; (4) is remarkably in agreement with those PSD's calculated for the lateral and vertical axes using an aircraft transfer function experimentally derived on another program and the Dryden gust input spectrum. Author (GRA)

N72-10171# Federal Aviation Administration, Washington, D.C. 
AERONAUTICAL TELECOMMUNICATIONS IN SOUTHEAST ASIA: INDONESIA, LAOS, MALAYSIA AND THAILAND 1970 262 p 
Avail: NTIS 
Descriptions of existing airway operations systems, conclusions and recommendations, equipment requirements, proposed courses of action, and economic and financial factors in aeronautical telecommunications are presented and discussed for Indonesia, Laos, Malaysia, and Thailand. The background and regional aspects of the study including objectives, scope, and methodology are summarized. J.M.

N72-10173# National Aviation Facilities Experimental Center, Atlantic City, N.J. 
Louis A. Dvorsky Nov. 1971 98 p 
(Proj. 341-004-03X) (FAA-NA-71-29) Avail: NTIS 
Ground and air tests of a flight inspection marker beacon receiving system were made to identify and correct variations in marker pattern measurement from time to time and from aircraft to aircraft. The tests were made with both the T-29 Convair and DC-3 aircraft. Based on the flight test results, new receiver calibration and antenna system ramp calibration procedures were devised. Author

N72-10184# National Physical Lab., Teddington (England). 
Aerodynamics Div. 
POSSIBLE DEVELOPMENTS OF A WIND TUNNEL COMPUTER SYSTEM 
R. J. Young Sep. 1970 9 p 
(NPL-AERO-1326; ARC-32398; Comp-FM-218) Avail: NTIS 
Ways for developing the computer system with a view to providing multiple on-line facilities are explored. The function and applicability of available operating systems and hardware are discussed. The possibilities of a system using a sophisticated real-time executive program are compared with those of a system using a second computer. Author (ESRO)

N72-10232# Metropolitan Washington Council of Governments, D.C. 
Short term airport access improvements in the Baltimore-Washington area, are studied with the design and implementation of a suitable access services brochure. Current access services at the region's airports and at nonregion airports; functional requirements for information dissemination; brochure contents; distribution possibilities; and financial and management aspects of brochure development, maintenance, and dissemination are considered. 

N72-10233# National Aviation Facilities Experimental Center, Atlantic City, N.J. 
TEST AND EVALUATION OF A DAYTIME COCKPIT FOG SIMULATOR Final Report, Apr. 1969 - May 1971 
Morris Ritter Nov. 1971 35 p refs 
(Proj. 073-323-04X) (FAA-NA-71-44; FAA-RD-71-82) Avail: NTIS 
An evaluation was conducted to determine the suitability of a daytime cockpit fog simulator to accurately and realistically simulate Category II and Category III weather conditions to the pilot during flight approaches. Thirteen pilots, using a DC-7 aircraft, participated in the program. The fog simulator was evaluated during atmospheric meteorological visibilities ranging from 1.5 to over 12 miles. Technical data, as well as completed pilot questionnaires, comprised the data analyzed. Although the simulator shows merit insofar as projecting realism, a redesign of the unit is necessary to correct deficiencies in various optical, electronic, and mechanical areas. 

N72-10245# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium). 
TURBULENT JET FLOWS 1971 343 p refs 
(VKI-LS-36) Avail: NTIS 

contents: 
1. A REVIEW OF THEORETICAL AND EXPERIMENTAL WORK ON THE DEVELOPMENT OF TURBULENT JETS L. J. S. Bradbury (Surrey Univ.) 38 p refs 
2. TURBULENCE SIMILARITY IN A PLANE JET IN A MOVING AIRSTREAM L. J. S.,Bradbury (Surrey Univ.) 21 p refs 
3. REMARKS ON TURBULENT FLOWS WITH FREE STREAM BOUNDARIES J. Mathieu 69 p refs 
4. WALL JETS AND THEIR APPLICATION TO BOUNDARY LAYER CONTROL I. S. Gartshore 35 p refs 
5. SELF-PRESERVING FLOWS I. S. Gartshore 26 p refs 
6. HOT-WIRE MEASUREMENT TECHNIQUE: SOME BASIC PROBLEMS J. D. Vagt (Technische Univ., Berlin, West Germany) 53 p refs 
7. TRANSMISSION OF LOW FREQUENCY JET PIPE SOUND THROUGH A NOZZLE FLOW J. E. FowkesWilliams (Imp. Coll. of Sci. and Technol.) 8 p 
8. JET NOISE AT VERY LOW AND VERY HIGH SPEED J. E. FowkesWilliams (Imp. Coll. of Sci. and Technol.) 9 p refs
JET NOISE AT VERY LOW AND VERY HIGH SPEED

Techno!, and W. Smith In von Karman Inst. for Fluid Dyn. examined according to Lighthill's theory. The theory is applied to description of the turbulent flow without recourse to the more basic flow model is subsonic jet of velocity V sub 2 formed by expanding a hot jet pipe flow of mean velocity V sub 1 and static pressure p sub 1 in a jet pipe of cross sectional area A sub 1 through a nozzle down to the ambient pressure p sub 0. The jet flows in the direction + x. Superimposed on this basic flow is a low frequency sound wave of pressure p(x,t) incident from x less than 0. The meaning of the low frequency in this context is that the nozzle scale is much smaller than the wavelength in both the jet stream and the environment. The problem is to determine the unsteady conditions at the nozzle exit and the sound field radiated to the static homogeneous environment exterior to the jet. It is shown that the influence of the nozzle transmission properties on the velocity depends on the velocity of the aerodynamic sound; aerodynamic sources contained within the jet but positioned many wavelengths upstream of the nozzle generate sound depending on jet velocity in precisely the same way as if the sources were in direct communication with the nozzle exterior.

FLOW THAT TRAVELS DOWNSTREAM AT SUPersonic SPEED FOR A DISTANCE OF Several jet diameters. These motions are relatively well-ordered and are probably more akin to recognizable instabilities of a laminar flow than the confused small scale turbulence. A model of the noise generating motions as the instability products of a jet flow of low equivalent Reynolds number is formulated. This Reynolds number is based on an eddy viscosity and can be further reduced by artificially increasing the small scale turbulence level. This step stabilizes the flow and inhibits the formation of large scale noise producing eddies.

Author

EXECUTION OF LARGE SCALE JET Pipe SOUND THROUGH A NOZZLE FLOW


The basic flow model is subsonic jet of velocity V sub 2 formed by expanding a hot jet pipe flow of mean velocity V sub 1 and static pressure p sub 1 in a jet pipe of cross sectional area A sub 1 through a nozzle down to the ambient pressure p sub 0. The jet flows in the direction + x. Superimposed on this basic flow is a low frequency sound wave of pressure p(x,t) incident from x less than 0. The meaning of the low frequency in this context is that the nozzle scale is much smaller than the wavelength in both the jet stream and the environment. The problem is to determine the unsteady conditions at the nozzle exit and the sound field radiated to the static homogeneous environment exterior to the jet. It is shown that the influence of the nozzle transmission properties on the velocity depends on the velocity of the aerodynamic sound; aerodynamic sources contained within the jet but positioned many wavelengths upstream of the nozzle generate sound depending on jet velocity in precisely the same way as if the sources were in direct communication with the nozzle exterior.

A DESCRIPTION OF THE POSSIBLE SOURCES OF SOUND THAT CAN BE MET IN LOW Mach number jet flows, and their strength is given in terms of flow parameters. Considered is jet noise at very low speed where nozzle exit turbulence may be a major contributor. Lighthill's theory is briefly summarized and used to estimate the sound of jets at moderate speeds. It is shown that very high Mach number situations where it is argued that the role of Mach waves and shock waves needs further study. Finally, reasonable estimates of the field can be achieved from a crude communication with the nozzle exterior.

G.G.
computer simulations were used extensively for verification of their parameters were obtained from laboratory tests. Analog pressure transducers, and telemetry systems were derived and (NASA-CR-1788; AVSD-0263-70-CR) Avail: NTIS CSCL 01D output signals and a computer program was prepared. Author M. R. Weinberger Washington NASA Sep. 1971 260 p refs [Contract NAS1-8541]. Mathematical models of rate gyros, servo accelerometers, pressure transducers, and telemetry systems were derived and their parameters were obtained from laboratory tests. Analog computer simulations were used extensively for verification of the validity for fast and large input signals. An optimal inversion method was derived to reconstruct input signals from noisy output signals and a computer program was prepared. Author (GSA)

N72-10426# General Dynamics/Fort Worth, Tex.

The objective of the research was to develop and fabricate a numerically controlled prototype tape laying machine for performing layup operations required by airframe structural components of filament reinforced resin matrix composites. Mechanical functions of the machine as related to airframe component design requirements were investigated and defined. These included machine head variables of roller type, head and pressure application, laying rates, tape feed mechanisms, shearing methods, disposal of cutoffs and tape specifications. In addition, compound contour requirements were considered. These included tilting vertical axis, pivot rollers, self-shaping rollers, and draping of flat layups to contours. It was determined that 75 percent of the airframe surfaces could be laid while using either the self-shaping roller or drape to shape approach, thereby eliminating the complexity factor of a 5-axis tilting head and the association of high production costs. A major problem has been tolerance of fiber placement on the carrier. The contract has provided an improved manufacturing technology through development of an NC tape laying machine that will apply fiber reinforced tape up to 3 inches wide, to a part along a preprogrammed path.

Author (GRA)

N72-10489# Naval Air Development Center, Johnsville, Pa.
AERO MATERIALS Div.

A sprayable urethane sealant, AMO-P-28A was developed for protection of exterior fastener areas. This sealant in laboratory testing does not crack around fastener heads during -60F cyclic fatigue loading (1,000-11,000 lbs) even after a heating of 20 hours at 260F plus one hour at 325F, which simulates the frictional heating of F14A aircraft during a single PAR cycle.

Author (GRA)

N72-10601# Louisiana State Univ., Baton Rouge. Coll. of Engineering

The objective of this work was to determine, through a frequency analysis approach, an appropriate range of values for the parameters which could be used to provide for an effective auto-pilot coupler transfer function. The power spectral density function for random data, describing the general frequency composition of the data in terms of the density of its mean square value was used in this analysis. Spectral plots of data generated by a digital simulation were compared to those of an actual flight test case used as a reference to determine when the appropriate range has been found. In the development a spectral analysis program was written that incorporates the Cooksey-Tukay fast Fourier transfer, allowing the conversion of the data sets from the time domain to the frequency domain. This resulted in a range of values for the parameters of gain and lead in two channels of a model of the human pilot operator in an attacker-evader simulation.

Author (GRA)

N72-10539# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

Target signal requirements for aircraft navigation systems that use radiometric receivers which map thermally emitted power radiated by terrain or power radiated by ground-based beacons are discussed. For selected millimeter wavelength bands, microwaves suffer relatively little degradation by absorption or scattering on passage through the atmosphere, despite extreme weather variations. Interest centers on 8-millimeter waves because of component availability, portability (small size), high image resolution, and all-weather capability at this wavelength. The idea of radiometric airborne navigation is introduced. Elements of radiometry, terrain radiation, and atmospheric transmission characteristics are reviewed. Data pertaining to these elements at 8 mm wavelength are collected. Calculation of radiometric contrasts is discussed for some simple models of terrain targets.

Author (GRA)


The report discusses the activities under way in Division 4 that are funded mainly by the Air Force. The progress on two other ATC tasks, namely, the preparation of a Technical Development Plan for the Discrete Address Beacon System for the FAA OSEM and studies relating to Fourth Generation ATC System Concepts for the DOT transportation Systems Center, are reported separately. A highlight of this quarter was the successful conclusion of the testing phase of a laser warning system for Logan Airport.

Author (GRA)

N72-10589# National Physical Lab., Teddington (England). Acoustics Section

This bibliography on acoustics comprises reports, separate publications, papers in scientific journals and contributions to published symposia. The works are listed in chronological order and are referred to in the subject index and author index by means of serial numbers.

Author (ESRO)

N72-10824# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A variable-orifice system that is responsive to compressor inlet pressure and temperature, compressor discharge pressure,
and rotational speed of a gas turbine engine is incorporated into a hydraulic circuit. The circuit includes a zero gradient pump driven at a speed proportional to the speed of the engine. The resulting system provides control of fuel rate for starting, steady running, acceleration, and deceleration under varying altitudes and flight speeds. NASA

N72-10828# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmenbericht Flugzeuge. BASIC INVESTIGATIONS OF REIRCULATION WITH CONFIGURATIONS CONSISTING OF 1 TO 6 JETS (UNDSATZUNTERSUCHUNGEN ZUR REZIRKULATION AN 1- BIS 6 STRAHLANORDNUNGEN) F. Aulehla, W. Eder, and V. Zeidler Bonn Bundeswehramt 1971 60 p. In German; English summary. Sponsored by Bundesmin. fuer Verteidigung (BMVg-FBW-171-12) Avail: NTIS; Bundeswehramt, Bonn: 25 DM Analyses of the fundamental factors were performed and model tests were carried out to determine the mechanism of recirculation in jet powered V/STOL aircraft and to devise methods for preventing or reducing the occurrence of thrust loss, engine surge and flame-out for differing engine configurations. Preliminary studies of the correlation between model measurements and full-size operation, and flow effects from forward, aft and the sides of a lift thrust configuration, are separated. EHS

N72-10830# Mitre Corp., McLean, Va. A SURVEY OF PROPULSION SYSTEMS FOR LOW EMISSION URBAN VEHICLES W. E. Fraize and R. K. Lay. Sep. 1970 116 p. refs. Sponsored by DOT (Contract F19828-68-C-0385) (PB-200144; UMTA-TRD-52-70-2; M70-45) Avail: NTIS CSCL 13F An overview is presented of low and negligible emission urban vehicle technology. Propulsion systems suitable for low emission urban vehicles are described. The state-of-the-art of low emission systems is surveyed by direct contact with active development efforts in industry; the more promising areas for future development are reviewed. Exhaust emissions for fossil-fueled heat engines are summarized. A computer program was developed to demonstrate the effect of the various route cycle and vehicle parameters on required power and vehicle speed; results are presented for a typical small urban bus. Author (GRA)


N72-10884# Lockheed-California Co., Burbank. Science and Engineering Branch. STUDY OF AIRCRAFT IN INTRAURBAN TRANSPORTATION SYSTEMS, VOLUME 1 Final Report, Jun. 1970 - May 1971 E. G. Stout, P. H. Kesling, H. C. Matteson, D. E. Sherwood, W. R. Tuck, Jr., and L. A. Vaughn. Jun. 1971 173 p. 4 Vol. (Contract NASA-5889) (NASA-CR-114340) Avail: NTIS CSCL 05C An analysis of an effective short range, high density computer transportation system for intraurban systems is presented. The seven county Detroit, Michigan, metropolitan area, was chosen as the scenario for the analysis. The study consisted of an analysis and forecast of the Detroit market through 1985, a parametric analysis of appropriate short haul aircraft concepts and associated ground systems, and a preliminary overall economic analysis of a simple computer system designed to evaluate the candidate vehicles and select the most promising VTOL and STOL aircraft. Data are also included on the impact of advanced technology on the system, the sensitivity of mission performance to changes in aircraft characteristics and system operations, and identification of key problem areas that may be improved by additional research. The approach, logic, and computer models used are adaptable to other intraurban or interurban areas. E.H.W.


COST GROWTH AND PRODUCTIVITY IN EUROPEAN AEROSPACE DEVELOPMENT PROGRAMS
Rolf Piekarz and Susan McIntosh Dec. 1970 74 p refs
(Contract DADC15-67-C-0011)
(AD-725478; RP-P-684; IDA/HQ-71-12268; T-73) Avail: NTIS CSCL 05/3

The paper reports on an exploratory study to obtain tentative estimates about two aspects of European aerospace systems development costs in comparison to the U.S. experience: the percentage cost growth occurring during the program, and the absolute costs in dollar terms of foreign projects relative to costs of comparable U.S. projects. Eight major European commercial and military aerospace programs were investigated during the 1962-1969 period, and the cost outcomes of these programs were compared to the overall U.S. experience. The tentative findings suggest that proposals to adopt foreign organization, such as nationalization, to improve U.S. military technology development performance are unlikely to solve U.S. difficulties, and that applying U.S. cost models to evaluate foreign military RDT and E efforts is not recommended for estimating the outputs and size of foreign programs.

Author

SOME RESULTS ON GUST ALLEVATION
(NLRE-TP-925) Avail: NTIS

The mathematical search for a linear functional law which defines longitudinal response of delta wing aircraft to turbulence is discussed. Turbulence is measured in real time, aboard the aircraft with the help of information given by vanes, gyrometers, and accelerometers. The results indicate that with the help of the Wiener and Laguerre methods, gust alleviation can be provided without change to the flight mechanics of the aircraft. An analog computer analysis of the method and flight test results is also given.

Author

N72-11004# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
SURVEY OF DIFFERENT MODELS FOR COMPUTING THE FLOW OF A LIFTING ROTOR [UNEVERBLICK UEBER VERSCHEIDENE MODELLE ZUR BERECHNUNG DER ROTORDURCHSTROEMUNG]

2. INFLUENCE OF DIFFERENT PARAMETERS (LIKE JET CONTRACTION, VORTEX CORE DIAMETER) UPON ROTOR DOWNWASH CALCULATION. APPLICATION TO THE CASE OF AN AUXILIARY WING J. W. Fuhr (DFVLR. Stuttgart) p 76-107 refs


4. LINEAR AERODYNAMIC ROTOR THEORY S. Wagner, K. Gehr, and W. Gradl (Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn, West Ger.) p 130-174 refs

5. RECOVERY ROTOR WITH VARIABLE BLADE LENGTH W. Benner and G. Engel (Dornier-Werke G.m.b.H., Friedrichshafen, West Ger.) p 175-208 refs

6. THEORETICAL CONSIDERATIONS OF A SPRING HINGED ROTOR OF VARIABLE FLAPPING STIFFNESS AND CONSTANT PHASE SHIFT W. Kugler (Dornier-Werke G.m.b.H., Friedrichshafen, West Ger.) p 210-240 refs


Author

N72-11002# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
SURVEY OF DIFFERENT MODELS FOR COMPUTING THE FLOW OF A LIFTING ROTOR [UNEVERBLICK UEBER VERSCHEIDENE MODELLE ZUR BERECHNUNG DER ROTORDURCHSTROEMUNG]
Alfred Kussmann In DGLR Rotor Flow and Flight Mech. of Hingeless Rotors Jun. 1971 p 7-75 refs

COMPARISON BETWEEN DISCRETE AND CONTINUOUS MODELS FOR VERTICAL GUSTS
J. B. DeJonge Feb. 1971 68 p
(NLR-TR-71025U) Avail: NTIS

A number of currently existing gust load models, based either on a discrete gust concept or a continuous gust concept, have been analyzed and compared. Calculations made for three different aircraft types indicated that load spectra based on either of the two model-types show relatively small differences. How flexibility effects may be accounted for in conjunction with a discrete gust model, using a technique based on the continuous gust concept, is described.

Author

N72-11003# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).

Some changes in the geometry of a rotor wake model with helical vortex lines were introduced in order to study the influence upon rotor downwash velocity distribution by parameter variation. The parameters varied were: diameter of near field vortices, flapping, rotor speed, and contraction of rotor radius. The velocity distribution at an infinite span wing, placed in the downwash flow, is calculated, and the interaction between wing and rotor is determined by computing the velocity distribution at the rotor.

Author

N72-11004# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Munich (West Germany).
INFLUENCE OF THE WAKE GEOMETRY ON THE VELOCITY
AND LOAD DISTRIBUTION OF VTOL PROPELLERS [EINFLUSS DER NACHLAFGEOMETRIE AUF DIE GESCHWINDIGKEITS- UND LASTVERTEILUNG VON VTOL-PROPELLERN]


Avail: NTIS; ZLDI Munich: 59.65 DM

To determine the velocity and load distribution of VTOL propellers, a method was employed with discrete slipstream vortex stress. In using this method, the assumption of the length of the wake is a difficulty, this having repercussions on the exactitude of the relationships in the propeller plane. As the length of the wake determined the computing time, two examples were taken for upright and fast flight with a known three-bladed propeller. The changes of incidence, circulation distribution, thrust distribution, and the distribution of the ratios of thrust and power coefficients are compared with the results obtained from the Goldstein method.

N72-11005# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

LINEAR AERODYNAMIC ROTOR THEORY [ZUR LINEAREN AERODYNAMISCHEN ROTORTHEORIE]


Avail: NTIS; ZLDI Munich: 59.65 DM

The mathematical models of a few known linear aerodynamic rotor theories and their basic physical assumptions are discussed. The principles and vortex models of an aerodynamic lifting surface and lift line theories for helicopter rotors are examined. The computing effort and obtainable accuracy for those theories which can be treated numerically are compared. Theoretical and practical thrust distribution generally correspond, and clearly show the advantages and disadvantages of the applied vortex models. It is shown that improvements in physical characteristics are easily obtained in the numerical treatment of a theory.

N72-11007# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

THEORETICAL CONSIDERATIONS OF A SPRING, HINGED ROTOR OF VARIABLE FLAPPING STIFFNESS, AND CONSTANT PHASE SHIFT [THEORETISCHE BETRACHTUNGEN UEBER EINEN FEDERGELIKSROTOR VARIABLER SCHLAGSTEIFIGKEIT UND KONSTANTER PHASENSCHIEBUNG]


Avail: NTIS; ZLDI Munich: 59.65 DM

A rotor system with elastically attached blades in theoretically investigated for varying the flight mechanical properties while retaining constant phase shift for cyclic control. This result may be obtained if the flapping stiffness of the rotor can be reduced to relatively small values in flight when the phase shift between vibration excitation and action is changed. For good controllability of a helicopter, the obtainable moment, for a stick deviation in a certain direction, should work about the center of gravity in the same or nearly the same direction. Investigations involving the use of many parameters to obtain constant phase shift with a rotor model, and with a projected Dornier rotor system, are reported.

N72-11008# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

THE STABILITY AND CONTROL BEHAVIOR OF THE HINGELESS BOELKOW ROTOR SYSTEM [DAS STABILITATS- UND STEUERUNGSVERHALTEN DES GELIKSROTOR SYSTEM BOELKOW]


Avail: NTIS; ZLDI Munich: 59.65 DM

The controllability, vibration damping, and static and dynamic stability of helicopters with hingeless rotors are examined. The feedback effects resulting from the special construction of the blades are described. In addition to elastic feedback effects based on the direct flapping angle feedback, torsional coupling effects are explained, appearing when the center of gravity and the aerodynamic center of the blade profile are shifted. The results of parametric studies, showing the influence of such blade-integrated feedback systems on control and stability characteristics of the hingeless rotor, are given, and the obtainable variation in flight-mechanical properties of rotors is shown. Tests with the BO-105 helicopter verify the treatment developed.

N72-11010# Lockheed-Georgia Co., Marietta.

MATHEMATICAL MODEL FOR TWO-DIMENSIONAL MULTI-COMPONENT AIRFOILS IN VISCUOS FLOW


Appendices on customer utilization of card images and the program listing as used on a CDC 6600 computer are presented.

N72-11011# National Physical Lab., Teddington (England).

THE VORTEX DRAG OF A SWEEP WING WITH PART-SPAN FLAPS


Two theoretical methods of calculating the vortex drag factor from a prescribed spanwise loading and a novel third method, on the reverse-flow principle without a definitive spanwise loading, are applied to an untapered sweep wing with symmetrically deflected outboard flaps. Results are consistent within ± or • 1/2. The third method is used to study the large influence of flap span and chord.

N72-11012# National Physical Lab., Teddington (England).

CONVERGENCE OF CURRENT ROUTINES FOR EVALUATING DOWNWASH AT A LIFTING SURFACE


Subsonic lifting-surface methods are used, with increasing numbers of spanwise integration points, to calculate downwash at the center line of rectangular wings with elliptic spanwise loading; simplified formulae are derived. Each method has its pattern of convergence expressed as a single curve for arbitrary aspect ratio and chordwise position. Given a leading-edge singularity, high aspect ratio and leading-edge proximity combine to worsen the rate of convergence.

N72-11015# Royal Aircraft Establishment, Farnborough (England), Structures Dept.

SONIC BANG MEASUREMENTS DURING EXERCISE SUMMER SKY
During July 1967, a series of supersonic flights were made over three areas in southern England under the code name "Res." Council 1971 17 p

The object was to observe public reaction to sonic bangs, in order to build up some information on the consequences of overflying parts of the country with supersonic transport aircraft. The BAE was asked to participate by measuring the sonic bang pressure waveforms at selected points in each of the three areas. One of the selected points in each area was in the nominal focus area of the flight path, and for this purpose a ship was used as a monitoring station because the flight paths were arranged so that the focus areas occurred at sea. The recorded waveforms are shown and discussed, together with details of the aircraft tracks and relevant meteorological conditions.

Author (ESRO)
N72-11022
Symp. 1970 34 p
Avail: NTIS HC $6.00/MF $0.95
A discussion of methods for improving the readability of aircraft maintenance manuals is presented. Techniques for evaluating the understandability of written instructions are described. Requirements for and advantages of improved readability are discussed.

N72-11022# LTV Aerospace Corp., Dallas, Tex. Systems Effectiveness Dept.
HARNESSING THE DIGITAL COMPUTER FOR AIRCRAFT MAINTENANCE
Avail: NTIS HC $6.00/MF $0.95
The application of digital computers to the maintenance of commercial aircraft avionics systems is discussed. The specific use of computers for detection of impending failures, fault isolation, and verification of fault correction is described. It is concluded that proper use of computer techniques will result in increased availability, lower maintenance costs, and improved flight safety.

N72-11023# Boeing Co., Seattle, Wash.
FACILITIES, EQUIPMENT AND TOOLS TO SUPPORT WIND BODIED AIRPLANE MAINTENANCE IN THE SEVENTIES
Avail: NTIS HC $6.00/MF $0.95
The definition and documentation of facility, equipment, and tool requirements for maintenance of large commercial aircraft are presented. The main impact of the large aircraft is the increased magnitude of the planning task. A general review of the requirements using the 747 aircraft as an example is provided.

N72-11024# Wall Colmonoy Corp., Detroit, Mich.
REMANUFACTURING OF JET ENGINE COMPONENTS EMPLOYING BRAZING TECHNIQUES
Avail: NTIS HC $6.00/MF $0.95
The application of brazing techniques for the remanufacture of jet engine components is discussed. The benefits derived from brazing of jet engine parts are described. Welding of hot section components and precision braze repair procedures are presented.

N72-11025# Automation Industries, Inc., Danbury, Conn.
NONDESTRUCTIVE INSPECTION: AN AIRCRAFT MAINTENANCE TOOL OF THE SEVENTIES
Avail: NTIS HC $6.00/MF $0.95
The application of nondestructive techniques to maintenance of large commercial aircraft is discussed. Procedures described are: (1) radiography, (2) ultrasonic inspection, (3) eddy current, (4) magnetic particle, and (5) penetrant. Present operations and future possibilities are presented.

N72-11026# General Electric Co., Houston, Tex.
OPERATING LOGIC: NEW DATA AND TRAINING CONCEPT DEVELOPMENTS OF THE APOLLO PROGRAM
Avail: NTIS HC $6.00/MF $0.95
The application of Apollo Project data and training concepts to the maintenance of large commercial aircraft is discussed. Subjects presented are: (1) functional understanding of system and support equipment, (2) physical characteristics of system and support equipment, and (3) procedural directions for troubleshooting and fault isolation.

N72-11027# Douglas Aircraft Co., Inc., Long Beach, Calif.
MAINTENANCE FAULT ISOLATION IN THE SEVENTIES
Avail: NTIS HC $6.00/MF $0.95
The application of Cockpit Indication (PCI) system for simplified, coordinated, in-flight and on-ground fault isolation is described. Simulator tests have shown PCI to provide up to an 18 to 1 improvement over systems now in use. The principles and methods of analysis, development, simulation, and presentation are described and the benefits associated with the use of PCI by the airlines are presented.

N72-11028# Lockheed-California Co., Burbank.
STREAMLINED L-1011 FAULT ISOLATION TECHNIQUES
Avail: NTIS HC $6.00/MF $0.95
The incorporation of built-in-test equipment and condition monitoring capabilities for aircraft systems and components is discussed. The development of fault isolation and problem correction equipment used by the L-1011 aircraft is reported. The prime feature of the technique is the graphic presentation of functional check data through the medium of logic and schematic diagrams. Elimination of conventional test procedures facilitates the use of the maintenance data. Duplication of fault isolation tasks is avoided and appropriate maintenance procedures are followed.

AN APPLICATION OF MODERN MAINTENANCE CONCEPTS AND SAFETY ANALYSIS TO THE MULTI-NATIONAL CERTIFICATION OF A SUPERSONIC AIRCRAFT
Avail: NTIS HC $6.00/MF $0.95
The composition and functions of an organization for multinational certification of supersonic commercial aircraft are described. The organization is primarily concerned with establishment and enforcement of design and maintenance requirements which will promote safer aircraft operation.

N72-11030# Pratt and Whitney Aircraft, East Hartford, Conn.
MODULAR DESIGN CONCEPT IMPROVES JET ENGINE MAINTAINABILITY
Avail: NTIS HC $6.00/MF $0.95
Improvements in the maintenance of jet aircraft engines by incorporation of modular construction is discussed. In the JT9D engine, consideration was given to avoiding maintenance problems by simplification of structural features. Airliner experience in maintaining the JT9D engines is presented and comparisons are made with previous engine maintenance operations.
Accessibility: The Key to Good Powerplant Maintainability
Avail: NTIS HC $6.00/MF $0.95

Of the several design criteria required to achieve good maintainability features, accessibility is considered the key one because of its contribution to the airline operator in reducing overall maintenance costs. This contribution is provided to the operator in three major areas: (1) increased inspection accessibility and capability permitting the airlines' maintenance personnel to monitor parts condition, trouble-shoot, and isolate problem areas, (2) easy access by attachment and arrangement features to permit rapid removal and replacement of engine and aircraft accessories, and (3) modular construction of the basic engine components to permit replacement either on the airplane or off at line maintenance stations, resulting in significant reduction of the elapsed time that an engine is out of commission and is returned to spare inventory status. In addition to making a major contribution in reducing maintenance costs, good accessibility features aid in reducing overall operating costs through improved dispatch reliability and reduced airplane down time, thereby permitting increased utilization of the airplane.

Avail: NTIS HC $6.00/MF $0.95

Maintenance advantages of solid state electrical logic management and distribution of electrical power are described. The specific advantages discussed are those associated with the capabilities of the system to: (1) create a favorable power environment for avionics, (2) lower total systems maintenance by favorable interfacing of electrical signal and control functions, and (3) exploit the favorable failure delts of solid state switching. The discussions are predicated on a contemporary aircraft electrical power management and distribution system and a solid state contactless system. The possible variations of the two systems are infinite, therefore the discussions are limited to comparisons of MIL-STD-704 and a solid state system specifically concepted to operate with power sources of a MIL-STD-704 system. Military Standard 704 in this case is deemed to connotate a constant frequency generator operating from a variable speed power takeoff with the necessary control and management required to deliver electrical power to an aircraft's AC and DC buses.

A systematic investigation was conducted of STOL transport terminal area directional control characteristics to identify the significant considerations and to establish appropriate directional control criteria. The investigation consisted of an analysis of existing data and moving-base flight simulator program using the NASA S-16 Moving Cab Transport Simulator. The simulator test program covered a broad range of lateral and directional aerodynamic characteristics representative of typical STOL transport aircraft. The study revealed the existence of an appreciable interaction between the roll and the heading control tasks which suggests that roll-mode damping requirements should be specified in terms of the heading delay characteristics. Lateral control sensitivity tests were conducted which corroborated previously obtained results.

Three-Track Runway and Taxiway Profiles Measured at International Airports E and F
Albert W. Hall. Washington Nov. 1971 100 p

Three-track runway and taxiway profiles are presented for use in studies of airplane response to ground roughness. This report presents the tabulated and plotted data for two international airports (designated airports E and F).
N72-11039

Joint Publications Research Service, Washington, D.C.

SYSTEMS OF AIRCRAFT AUTOMATIC CONTROL

(JPRS-54332; UDC:697.705.001) Avail: NTIS

Methods of analysis and calculation of the basic parameters of aircraft automatic control system components are discussed. Analysis and calculation are done with the problem stated in linear form. The materials are reduced to simple, practical calculation equations. The report contains 22 bibliographic references.

Author.

N72-11040

Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.

NOISE-ABATEMENT FLIGHT PROFILES FOR CTOL AND V/STOL AIRCRAFT
P. Hamel 1971 49 p refs (DLR-FB-71-10; DK-858.517.2) Avail: NTIS; DFVLR, Porz, West Ger.: 12.50 DM

An overall survey of problems associated with noise abatement flight profiles for CTOL and V/STOL aircraft is presented. It is shown how aircraft design parameters and control variables, such as thrust vector control, power loading, and aerodynamic efficiency, influence the intensity of the noise source. The distance between noise source and observer, and the noise exposure duration may be influenced by steep climbout and over 600 manual approaches were performed using a flight simulator experiment to investigate the problems of aircraft operating in Category 2 conditions. Both military and airline pilots participated in the study. Using the crabbed approach for crosswind landings, and sidestep maneuvers in the BAC 221 slender-wing research aircraft. Using the crabbed approach for crosswind landings, and the coordinated S-turn for sidestep maneuvers, pilots found both tasks straightforward. The time required to complete a sidestep is little longer than for unswept aircraft, despite the oscillatory roll response to aileron inputs of the BAC 221. Results of similar tests performed in a ground based simulator show good qualitative agreement.

Author (ESRO)

N72-11042

Royal Aircraft Establishment, Farnborough (England).

CATEGORY 2: A SIMULATION STUDY OF LOW VISIBILITY APPROACHES AND LANDINGS AT NIGHT

The design, execution and results of a flight simulator experiment to investigate the problems of aircraft operating in Category 2 conditions. Both military and airline pilots participated and over 600 manual approaches were performed using a flight simulator. The effects of decision height, contact time, lateral offset, visual sequence and visual segment on the approach success (the ratio of landings to approaches) are examined and a curve relating this parameter to visual segment, the predominant factor, is determined. The influence of different visual sequences on pilot performance during the approach and landing is also considered and some observations are made about the crew techniques employed during the experiment; techniques which appeared to have certain deficiencies.

Author (ESRO)

N72-11043

Royal Aircraft Establishment, Farnborough (England). Structures Dept.

CIVIL AIRCRAFT AIRWORTHINESS DATA RECORDING PROGRAMME, MANOEUVRE LOADS DURING TRAINING AND TEST FLYING

Using continuous photographic trace records, the maneuver accelerations experienced in 35 hours of training flying were counted and measured to provide an estimate of the total numbers and magnitude of loads for a fleet's flying training over a five year period. These data are compared with counting accelerometer data giving the estimated total number of gust plus maneuver loads for five years of revenue flying by the same fleet. Both estimates were found to be of the same order in the number and magnitude of loads although the ratio of training to revenue flying hours was one in fifty. The particular test flight analyzed, which included an unusually large number of stalls, produced approximately as many extreme negative accelerations as one year's revenue flying.

Author (ESRO)

N72-11044


AN HYPOTHESIS FOR THE PREDICTION OF FLIGHT PENETRATION OF WING BUFFETING FROM DYNAMIC TESTS ON WIND TUNNEL MODELS

Buffeting coefficients appropriate to the maximum flight penetration of wing buffeting for both transport and fighter type aircraft are deduced from the comparison of flight observations and measurements of unsteady wing-root strain on stiff wind tunnel models. The necessary buffeting coefficients are derived rapidly from the unsteady wing-root strain measurements. The tunnel unsteadiness is used as a given level of aerodynamic excitation to calibrate the model response at the wing fundamental frequency.

Author (ESRO)

N72-11045


BRIEF FLIGHT TESTS OF CROSSWIND LANDINGS AND SIDESTEP MANOEUVRES ON THE BAC 221 AIRCRAFT

A brief flight study has been made of crosswind landings and sidestep maneuvers in the BAC 221 slender-wing research aircraft. Using the crabbed approach for crosswind landings, and the coordinated S-turn for sidestep maneuvers, pilots found both tasks straightforward. The time required to complete a sidestep is little longer than for unswept aircraft, despite the oscillatory roll response to aileron inputs of the BAC 221. Results of similar tests performed in a ground based simulator show good qualitative agreement.

Author (ESRO)

N72-11046


FLIGHT AND WIND-TUNNEL TESTS ON AN AERODYNAMICALLY COMPENSATED PITOT-STATIC HEAD FOR THE BAC 221 AIRCRAFT

The BAC 221 aircraft is fitted with a special pitot-static head, insensitive to incidence, and aerodynamically compensated on similar principles to the head fitted to the Concorde, to minimize aircraft pressure field effects. Tests have been made on the head covering the Mach number range 0.2 to 1.4 in two wind tunnels and at three altitudes in flight. The compensation significantly reduces the static pressure errors at high subsonic and transonic speeds but small errors remain at low subsonic and supersonic speeds. The sensitivity to incidence and sideslip, of the pitot and static pressures sensed, is satisfactorily low. The manufacturer's prediction of the head performance agrees with the test results.
The purpose of this program was to study the aerodynamic and aeroelastic behavior of a rigid two-bladed rotor system operating at steady-state advance ratios up to approximately 16. Also to be investigated was the operation of this rotor during periods of acceleration and deceleration which were representative of the starting/stopping sequence of a stowable rotor. The objective of the program was accomplished by conducting wind tunnel tests in the NASA-Ames 40- x 80-foot wind tunnel on a full-scale rotor. Hub forces and moments, blade pressure distributions (chordwise and spanwise), and blade flatwise, chordwise and torsional moments were measured. The experimental results were used to correlate with existing theory.

Author (GRA)
The contents of this report were prepared to give those engaged in aircraft flight test an understanding of the analysis required to arrive at standardized flight data. Toward that end, considerable attention was given to the derivation of equations. In contrast to earlier reports, simplifying assumptions were not made; rather, efforts were made to keep the derivations of all equations as nearly exact as possible. Emphasis has been placed on climbs and level accelerations since these tests, particularly for supersonic aircraft, consume a large part of a test program and require calculations which are much more lengthy than for other tests. The information in this document was the basis for the development of uniform digital computer programs which are being constructed for use in processing flight data and connecting it to standard conditions. These programs have been given the name Uniform Flight Test Analysis System (UTFAS).

Author (GRA)

N72-11056# Dynamic Science, Irvine, Calif.
Thomas C. Kovic, Laurence B. Zung, and Melvin Gerstein Mar. 1971 88 p refs
(Contract F33615-69-C-1895; AF Proj. 3048)
(A-D-72-5027; SN-166-F; A-FAP-L-TR-71-7) Avail: NTIS CSCL 13/12

Under simulated flight environments, fuel/air ratios at various locations of the ullage space were determined using in-line gas chromatograph measurement. Using the shallow tank experimental data shown that during ascent and cruise portion of the flight profile, uniform fuel/air mixtures were found to exist within the entire ullage volume. Significant fuel/air gradients existed during the descent portion of the flight profile, with mainly air near the vent inlet. Evaporation lag was observed during ascent and level flight when liquid Jet A fuel was maintained at 80 degrees F. When the liquid fuel temperature was increased to 120 degrees F, evaporation rate was found to be rapid enough that the evaporative lag phenomena was no longer observed. By vibrating the fuel tank, it greatly increased the rate of off-gassing of dissolved air in the liquid fuel. This in turn significantly changed the fuel/air ratio in the ullage space. Two separate and complementary models were developed to predict fuel/air concentrations within the ullage. Author (GRA)

N72-11057# American Nucleonics Corp., Woodland Hills, Calif.
Arthur J. Welch and Edward L. Warren Apr. 1971 190 p refs
(Contract DAAJ02-70-C-0019)
(A-D-72-5580; ANC-72-R-14; USAAVLABS-TR-71-11; Task-1F182204A13905) Avail: NTIS CSCL 01/3

The purpose of the work performed under this contract was to conduct an analytical investigation of advanced flight control systems (AFCS) requirements for light and medium size helicopters and to design a pilot assist system based on the analytical results. The pilot assist system (PAS) design goal was to develop an AFCS that is relatively light and inexpensive and that can be readily installed in a UH-1B. Author (GRA)

AIRPORT/AIRCRAFT SYSTEM COMPUTER MODELS BURROUGHS 8500-MOD 0, IBM 7094-MOD 1 Jun. 1971 56 p refs Sponsored by Dept. of Transportation (PB-201432; DOT-OST-ONA-71-4) Avail: NTIS CSCL 098

The report contains a computer listing of the airport/aircraft system computer model developed during the course of a study on transportation noise. GRA

HELICOPTER DEVELOPMENT RELIABILITY TEST REQUIREMENTS. VOLUME 1 Final Report
Kirk G. Rummel Apr. 1971 317 p (Contract DAAJ02-70-C-0039)
(AD-72-5595; D210-10207-1: USAAMRD-L-TR-71-18A; Task-1F182203A14301) Avail: NTIS CSCL 01/3

The report covers a study to identify optimum reliability problem identification and demonstration test concepts for helicopter dynamic components, in order to facilitate formulation of cost-effective reliability test programs for future helicopters. Detailed failure mode test technique problem identification capability and cost data are presented from CH-47 helicopter development experience to aid in calculating specific test costs for future development programs. Sample test plans are presented for two helicopters representing size extremes. A plan is outlined for revising selected existing design and test military specifications and supplementing them with additional handbooks and specifications. Author (GRA)

N72-11060# Oceansics, Inc., Plainview, N.Y.
MODEL STUDIES OF HELICOPTER TAIL FLOW PATTERNS IN AND OUT OF GROUND EFFECT Final Technical Report
August F. Lahman Fort Eustis, Va. Army Air Mobility Res. and Develop. Lab. Apr. 1971 32 p refs
(Contracts DAAJ02-68-C-0069; DAAJ02-68-C-0103; DA Proj. 1-F-162204-A-14232; DA Proj. 1-F-1-52204-A-14231)
(AD-725581; Rep. 70-79; USAAVLABS-TR-71-121) Avail: NTIS CSCL 01/3

Water tunnel studies of a model helicopter which entailed a visualization of the main and tail rotor wakes, the inflow patterns, and their subsequent interactions as the wind velocity and wind heading were changed resulted in a significant gain in knowledge ultimately applicable to direction control of helicopters. Of significant interest was the impingement of the main rotor wake with a ground plane, its subsequent spreading outward in a radial manner and the roll-up of the wake into a standing vortex at the outer edge of this radial expansion of the wake. Author (GRA)

SELECTING THE BASIC PARAMETERS OF CIVIL AIRCRAFT FOR SPECIFIED RANGES AND COMMERCIAL LOAD
(AD-727231; FTD-MT-24-353-70) Avail: NTIS CSCL 01/3

A digital computer method of selecting the basic parameters of aircraft, using freight charges as a criterion, is described. Author (GRA)

N72-11147 World Meteorological Organization, Geneva (Switzerland).
UTILIZATION OF METEOROLOGICAL RADAR FOR AERONAUTICS [L'UTILISATION DES RADARS METEOROLOGIQUES POUR L'AERONAUTIQUE]
The detection and identification of hail and turbulence associated with thunderstorms are discussed. The question of measuring the height of echoes observed by radar is presented. Echo height is an index of storm activity. The interpretation of echoes for different types of radar is considered. The data from weather radar depend not only on meteorological phenomena
but also, to a great extent, on the characteristics of the radar. Processing and transmission of radar information is reviewed in great detail. Transmission of radar information to aircraft in flight is also considered a subject important for aviation. New techniques for radar observations are summarized. Author


The problem of determining the small-disturbance flow about two-dimensional airfoils at transonic speeds has been successfully treated by the process of matching a numerical solution of the near field to analytic expressions for the far field. The three-dimensional problem, it would appear, can be treated in a similar way with the aid of algorithms adapted to high-speed and high-capacity computers. The far-field potential for both lifting and nonlifting three-dimensional wings at transonic speeds is developed herein for a subsonic free stream. This potential could be used for a three-dimensional-wing computation similar to the computation made for the two-dimensional wing.


Oscillatory hinge-moment derivatives and limit cycle amplitudes were measured on an airfoil-flap combination model over the Mach number range 0.78 to 0.81 within a buzz region. Stagnation pressure was varied from 100,000 N/sq m to 200,000 N/sq m. The magnitude of both derivatives and the limit cycle amplitude tended to increase with increasing Reynolds number. The effect of increasing frequency was to produce a relatively large decrease in limit cycle amplitude and the magnitude of the derivatives. Author (ESRO)


Wind tunnel measurements are described which determine the error introduced into static pressure measurements in a pipe or duct by the presence of a pitot (+) other) stem downstream of the plane of measurement. The effects measured in a uniform stream are used to calculate corresponding stem-blockage corrections in nonuniform flow. The method is applied to fully developed pipe flow measurements in circular and rectangular ducts.


Quantitative calculations of the destruction of stratospheric ozone by nitrogen oxides omitted from SST's are presented. The calculations cover the following: (1) the rate of destruction of ozone by NO(x) relative to the ozone destruction rate by the couple, O2, O3, and by free radicals derived from water, and (2) steady state calculations of the profile of ozone in the stratosphere for a wide range of uniform and nonuniform distributions of NO(x). Although special attention is given to NO(x) at 3, 7, 30, and 70 ppb, most calculations cover the complete range from zero to 100 ppb. Over the entire range of stratospheric variables, the oxides of nitrogen, NO and NO2, have a powerful effect in reducing ozone, and a quantity (30 ppb) previously accepted as negligible would reduce the ozone column by about a factor of two, according to two different methods of computation. Author (ESRO)


The design and calibration of unsteady pressure sensors used to measure aerodynamic noise are discussed. The sensitivity of the sensors under difficult environmental conditions such as high noise levels, surrounding flow, static overpressure, vibrations, and high temperature are determined. The sensors are also designed to measure the effects of turbomachine interior and jet interior on pipe flow.

CALIBRATION OF THE CONCORDE RADIATION
DETECTION INSTRUMENT AND MEASUREMENTS AT SST ALTITUDE


Performance tests were carried out on a solar cosmic radiation detection instrument developed for the Concorde SST. The instrument calibration curve was reasonably linear from 0.004 to 1 rem/hr for both gamma radiation and fast neutrons. Nonlinearity in the calibration curve was observed at dose rates below 0.003 rem/hr. The instrument responded normally after exposure to 30 rem/hr of gamma radiation. The charged particle detectors showed a directional response because of the neutron moderator. The neutron detector did not show a directional response. Measurements made with the Concorde instrument at 60,000 ft and high geomagnetic latitudes indicated a galactic cosmic radiation dose rate of 0.7-0.9 millirem/hr.

A THREE COMPONENT GUN TUNNEL BALANCE DESIGNED FOR TESTING THIN DELTA WINGS


The design, development, and performance of a three component strain gage balance system designed for testing thin wings in a gun tunnel is described. The balance was machined out of high strength steel and employed miniature silicon strain gages on tension and compression links in order to meet the difficult strength/stiffness requirements. Natural frequencies were attenuated with parallel T filters. Various problems which arose in its development were successfully overcome and some excellent results were obtained.

COMPRESSIVE BEHAVIOR OF TITANIUM ALLOY SKIN-STIFFENER SPECIMENS SELECTIVELY REINFORCED WITH BORON-ALUMINUM COMPOSITE

Harvey W. Herring, Robert L. Carr, and Rosa C. Webster. Langley Station, Va. Nov. 1971 27 p refs

A method of selectively reinforcing a conventional titanium airframe structure with unidirectional boron-aluminum composite attached by brazing was successfully demonstrated in compression tests of short skin-stiffener specimens. In a comparison with all-titanium specimens, improvements in structural performance recorded for the composite-reinforced specimens exceeded 25 percent on an equivalent-weight basis over the range from room temperature to 700 K (400 F) in terms of both initial buckling and maximum strengths. Performance at room temperature was not affected by prior exposure at 588 K (800 F) for 1000 hours in air or by 400 thermal cycles between 219 K and 588 K (0-85 F and 600 F). The experimental results were generally predictable from existing analytical procedures. No evidence of failure was observed in the brace between the boron-aluminum composite and the titanium alloy.

SOLVENT REMOVAL OF EC-2273 POTTING COMPOUND FROM F-4 AIRCRAFT ELECTRICAL COMPONENTS

Naval Ordnance Lab. White Oak, Md. 59 p refs (NOL Proj. 341/AIR-520001) (AD-728493) Avail: NTIS CSCL 13/8

A safe, fast, and effective solvent system was developed for the removal of EC-2273 encapsulant. This material, which is now showing signs of failing, is the potting compound used in several hundred components of a large number of Navy F-4 aircraft. The preferred solvent system consists of a mixture of N-methyl-2-pyrrolidone (M-Pyrrol), benzyltrimethylammonium hydroxide and methanol. Virgin, as well as deteriorated, EC-2273 is cleanly removed from a typical electrical connector simply by immersion of the component in the solution for a period of a few hours.

weather wing (1st), San Francisco, Calif. 86553

FORECASTING LOW LEVEL TURBULENCE FOR LIGHT AIRCRAFT IN HAWAII


The proposition is to forecast the intensities of turbulence below 10,000 ft MSL for aircraft weighing less than 10,000 pounds operating along the Hawaiian Island Chain during the 24 hour period beginning at 1200Z (0200 local standard time). The intensities of turbulence to be forecasted are light, moderate, and severe. Light turbulence causes slight, erratic changes in altitude, and/or attitude. Moderate turbulence is similar to light but of greater intensity while the aircraft is still in positive control. Severe turbulence causes large, abrupt changes in altitude and/or attitude and the aircraft may be momentarily out of control.

DISPLAY RESEARCH COLLISION WARNING SYSTEM


An improved head-up display for a pilot warning indicator (PW1) system is discussed. The system includes a plurality of elongated light sources which are attached to the cockpit windshield and side windows. Whenever a target in a sector, which is viewable from the cockpit, is detected by a corresponding detector at least one of the light source is illuminated. The illuminated light source (or sources) provides an indication of the sector in which the target was detected. The length of the light sources (or sources) provides a convenient indication of the sector's bearing boundaries. The novelty of the invention seems to reside in the use of elongated, rather than spot, light sources to indicate to the pilot sector bearing boundaries and thereby speed-up target detection.

NATIONAL WEATHER SERVICE, AERONAUTICAL AND SPACE RESEARCH


Papers are presented on aircraft fuels, their production, analysis, and testing. Fuel handling, fuel and fire safety, and lubricants are also discussed, using impact tests and crash simulations.

NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA, ONTARIO

JET FUEL SPECIFICATIONS

Various military and civil jet fuel specifications are compared and their differences noted, particularly with reference to different types of additives which are used on a mandatory or optional basis. Specification test procedures and their importance in relation to limits are discussed and the increased complexity of quality control for jet fuel specifications is noted. Author


The range of an airplane depends on the amount of energy used. When reservoir capacity is too limited, it is possible to extend the range by using a higher energy fuel. In this sense, high energy poly cyclic saturated hydrocarbons are possible fuels for supersonic aeronautics in the near future, especially since their thermal stability is superior to that of present fuels. Essential fuel characteristics are presented together with the results of experimentation. Industrial fabrication problems and future perspectives are considered. Transl. by K.P.D.

FUELS FOR SUPERSONIC AND HYPERSONIC AIRCRAFT A. Lewis, H. Strawson, and J. G. Kirtley, in AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 12 p refs Sponsored in part by Min. of Aviation Supply Avail: NTIS HC $6.00/MF $0.95

The first generation of supersonic aircraft is being designed to operate on existing kerosene-type fuels. The limitations of these fuels are reviewed and possibilities considered for propellants for higher-speed aircraft, serving the triple purpose of cooling the airframe, cooling engine components, and providing a propulsive energy. Problems of vapor deposition in hot fuel systems are covered and the possibilities explored of increasing the cold-sink value of the fuel by precooling or by endothermic decomposition. The calorific values of different fuels and the importance of recombination of dissociated combustion products is studied. Ways of speeding such recombination are indicated. Author

COOLING OF ADVANCED ENGINES BY ENDOTHERMIC REACTIONS OF HYDROCARBON FUELS L. E. Faith, G. H. Ackerman, and H. T. Henderson, in AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 8 p refs Sponsored by AFAPL Avail: NTIS HC $6.00/MF $0.95

The fuel used in an engine is a convenient coolant, absorbing heat as sensible heat and latent heat of vaporization. Certain hydrocarbon fuels can furnish additional heat sink in the form of endothermic reactions. Possible endothermic reactions include thermal reactions such as cracking, and catalytic reactions such as dehydrogenation, dehydrocyclization, and depolymerization. Of these, the catalytic dehydrogenation of naphthenes to aromatics is the most promising type of reaction. For example, the dehydrogenation of methylcyclohexane over platinum/alumina catalyst furnishes a reaction heat sink of approximately 1000 Btu/lb fuel, which is slightly greater than the cooling capacity due solely to sensible heat and latent heat of vaporization. This reaction is very selective and proceeds rapidly to achieve high conversion of methylcyclohexane to toluene and hydrogen. The total heat sink for such a reaction system compares favorably with that of hydrogen, when these heat sinks are normalized by the heat of combustion of the fuel. Author

LOW EMISSION FUELS AND DEVICES FOR AVIATION ENGINES L. Gardner, in AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 13 p refs Avail: NTIS HC $6.00/MF $0.95

Dual purpose filter/separators were developed which could remove both dirt and water. Improvements in the performance of filter/separators was achieved by compliance with increasingly severe specifications. Methods of determining undissolved water and dirt in fuel and their development both for filter/separator testing and field use are discussed. Fuel contamination by microorganisms and surfactants has led to serious cases of aircraft corrosion and filter plugging. Measures to control or eliminate these two contaminants are discussed. Author

AIRCRAFT FUELLING OPERATIONS AND QUALITY CONTROL G. R. Parker, in AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 12 p refs Avail: NTIS HC $6.00/MF $0.95

Air craft fuel problems are discussed, emphasizing problems associated with hydrogen treated fuels. Some of the problems were overcome by fuel system design modification, and other changes are reviewed which were instituted by refinery industries. Research on fuel sealing is also described. J.A.M.


Small-scale combustion chamber rigs are described, with which combustion characteristics of aviation fuels are being tested. The relationship of the chemical constitution of the fuels and their chemical-physical properties, and the processes during preparation and combustion of fuel is determined. Investigation is conducted at different air and fuel temperatures and at differently high pressures in the combustion chamber in a parallel flow. Temporally consecutive processes during fuel preparation and combustion may also be specially separated and thereby provide for a measurement with customary probes as well as spectroscopic methods. Author
Aviation fuelling facilities and the fuelling operation are described. Comments on the types of aircraft are restricted to those aspects directly affecting fuelling.

**N72-11679#** Esso Development Co., Ltd., Abingdon (England). Research Centre. 

**AVIATION FUEL LUBRICITY**

R. A. Vare In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 13 p refs

Avail: NTIS HC $8.00/ MF $0.95

A laboratory test rig was developed to evaluate European jet fuels with regard to lubricity. This has shown differences in the lubricity levels of different fuels. Active lubricity agents were identified as fully saturated heterocyclic compounds and polynuclear aromatics. The addition of a surface active additive such as a corrosion inhibitor also significantly improve lubricity but can incur conductivity problems in the field due to its synergistic effects with antistatic additive. The feasibility of a fuel lubricity test by chemical, physical or mechanical techniques are being studied.

**N72-11680#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**FLAME INHIBITION CHEMISTRY**

R. M. Fristrom and R. F. Sawrey In AGARD Aircraft Fuels, Lubricants, and Fire Safety refs (Grant NSF G1-12)

Avail: NTIS HC $8.00/ MF $0.95

Techniques involving diverse mechanisms are employed in extinguishing flames and fires. Mechanisms were divided into two broad categories: (1) physical mechanisms when mechanical or thermal effects are dominant, and (2) chemical mechanisms when chemical effects are involved. Flame extinguishment viewed from the standpoint of the effects on the elementary reaction processes is reviewed. A simplified hydrogen-oxygen flame chemistry is used as an illustration. The complications introduced by chemical inhibition are pointed out. The chemical kinetic information in the area of hydrogen atom scavenging and oxygen flame radical recombination is surveyed.


**FLAMMABILITY PROPERTIES OF JET FUELS AND TECHNIQUES FOR FIRE AND EXPLOSION SUPPRESSION**

B. P. Bottini In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 11 p refs

Avail: NTIS HC $8.00/ MF $0.95

Results of investigative efforts to establish the practical flammability envelopes and associated combustion damage potential for conventional jet fuels such as JP-4, JP-8 (similar to JET A-1), and JP-5 under simulated hostile operating conditions are presented. Testing included liquid-space gunfire hits to assess external fire hazard and vertical (liquid to vapor) firing trajectories to determine explosion hazard associated with projectile-induced fuel sprays and mists. All tests were performed in instrumented replica target tanks varying in volume from 15 to 90 gallons. Principal test variables were fuel temperature, pressure, fuel depth, external void specs, and internal and external air flow. All tests were conducted utilizing 0.60-caliber armor piercing incendiary projectiles. These tests indicate a considerable extension in the flammability range of all fuels compared to the equilibrium flammability limit values which are commonly utilized for fire safety analysis. In view of the fire and explosion potential exhibited by all conventional jet fuels, additional measures must be employed to achieve an effective fire-protection capability. Progress in the use of reticulated polyurethane foam, halogenated hydrocarbon chemical extinguishers, and other fuel-tankerlining techniques are also reviewed.

**N72-11683#** Princeton Univ., N.J. Guggenheim Lab.

**IGNITION OF FUELS BY A HOT PROJECTILE**

O. P. Sharma and W. A. Sirignano In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 16 p refs

Avail: NTIS HC $8.00/ MF $0.95

Theoretical investigations were performed by approximating: (1) the flow at the forward end of the projectile to a stagnation flow towards a hot axisymmetric body, (2) the flow over its surface to a laminar flow of the cold unreacted mixture with the hot combustion products. After the premixed mixture is exhausted, there is a possibility of ignition of unmixed reactants by the hot inert products which are left behind and are sandwiched between the oxidizer and the fuel. A theoretical analysis for the ignition delay time as a function of the temperature and the width of the hot gas region is also presented.

**N72-11685#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Forz (West Germany). Inst. fuer Luftfahrtechnik.

**CONTRIBUTIONS THE SELECTION OF FIRE EXTINGUISHING SYSTEMS AND AGENTS FOR AIRCRAFT FIRES**


Avail: NTIS HC $8.00/ MF $0.95

A fire extinguishing-system in aircraft is described, which uses the exhaust gases of a solid-propellant gas generator to pressurize the extinguisher bottle. The extinguishing efficiency of this hot-bottle-system is compared with that of the current extinguishing system. The amount of agent which is necessary to extinguish a diffusion flame was measured for a number of halons, dry powders, and mixtures of dry powders and halons. The ability of agents to prevent reignition of the extinguished fuel surface by hot parts was also tested.

**N72-11686#** Shell Research, Ltd., Chester (England).

**ELECTROSTATIC CHARGING IN THE HANDLING OF AVIATION FUELS**

H. Strawson and A. Lewis In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 13 p refs

Avail: NTIS HC $8.00/ MF $0.95

Electrostatic charging of the fuel during fueling can result in the possibility of incendiary sparking in aircraft tanks; some of the more recent experimental results on the different phases of this process are presented. These results confirm that, in the absence of special precautions, discharges creating a tank explosion hazard can exist during aircraft refueling in certain circumstances. Unless the fuel conductivity is controlled, however, these hazardous circumstances cannot be precisely predicted. The use of a static dissipator additive eliminates the hazard. Methods of introducing the additive and of maintaining the correct conductivity during fuel distribution are discussed, as well as possible side effects and interactions with other fuel additives. On the basis of world-wide airline use over many years, supported by many laboratory tests, it is concluded that the additive provides a safe, simple and trouble-free solution to the problem.

Author
N72-11687# National Aviation Facilities Experimental Center, Atlantic City, N.J.


Avail: NTIS HC $6.00/MF $0.95

Crash-safe fuel program, a segment of a primary mission to improve the overall crashworthiness of aircraft, is discussed. The reduction of the probability and severity of fire during aircraft ground crash situations is also examined. Author


(Contracts DAA005-70-C-0250; DAA028-69-C-0030)

Avail: NTIS HC $6.00/MF $0.95

Research and development program aimed at improving the post-crash fire safety of helicopter turbine-engine fuels is reviewed. Primary emphasis was placed on high-internal-phase-ratio aqueous emulsions. Interrelations among rheological and physical properties, composition, and fire safety characteristics of various fuel formulations are discussed. Implications of these results on the total safety envelope of rotary wing aircraft are examined. Author


FIRE HAZARD EVALUATION OF THICKENED AIRCRAFT FUELS J. M. Kuchta, J. N. Murphy, A. L. Fumo, and A. Bartkowiak In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 11 p refs

Avail: NTIS HC $6.00/MF $0.95

Various gelled or emulsified fuels were proposed for reducing the aircraft crash-fire hazard. Results are presented from bench-scale tests for screening the fuels and from large-scale drop tests for evaluating their fire hazard under simulated crash conditions. Jet A and Jet B type thickened fuels were investigated. Their minimum autoignition temperatures and burning rates varied little, whereas their flash points, volatility rates, self-spread rates, and flame spread rates varied noticeably with either the base fuel or thickening agent composition. Minimum ignition energy are also compared for liquid sprays. The performance of the thickened fuels, particularly Jet B emulsions, was not very promising under impact conditions. In fuel drops made from a 150-ft three-tower facility, the fireball size and radiation intensity varied with impact velocity, impact angle, and type of fuel container. Author

N72-11690# Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.

FIRE AND EXPLOSION PROTECTION OF FUEL TANK ULLAGE J. A. MacDonald and H. W. G. Wyeth In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 7 p refs

Avail: NTIS HC $6.00/MF $0.95

The conditions that can lead to an explosion within aircraft fuel tank ullages are examined, and the need for protection systems is reviewed. Principles employed in providing the desired degree of protection are outlined, such as oxygen reduction, vapor or mist inerting, and plastic foam filling. Comparisons were made between the various systems, and their relative merits were also discussed. It is concluded that plastic foam is an effective system provided that the material is compatible with the environment. Liquid nitrogen is also attractive from the weight aspect but could impose logistic problems. Author

N72-11691# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Post (West Germany). Inst. fuer Luftstrahlantriebe.

INVESTIGATION OF FIRE EXTINGUISHING POWDERS BY MEANS OF A NEW MEASURING PROCEDURE R. Fiels and G. Winterfeld In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 12 p refs

Avail: NTIS HC $6.00/MF $0.95

In order to optimise fire extinguishing systems it is necessary to compare the extinguishing efficiency of solid and gaseous (or liquid) extinguishing agents. A measuring procedure is described which allows this direct comparison. It makes use of the relationship between the maximum flow velocity at the burning limit of a flame-holder stabilized flame and the laminar burning velocity of the fuel-air-mixture which is given by DANKOHLER's first number. Comparative results achieved with this procedure for several fire extinguishing agents are given. Author


Avail: NTIS HC $6.00/MF $0.95

Two tests are described for assessing the fire resistance of Avtur containing polymeric additives which reduce its ability to form flammable mists. In the standard test a tank containing ten or twenty gallons of fuel is propelled on a rocket sled at speeds of 114 or 188 ft/sec and decelerated after contact with an aircraft arresting wire. Fuel is allowed to spill from a slit in the tank onto a series of ignition sources. In the run on test the tank travels at speeds up to 240 ft/sec past a series of ignition sources while spilling fuel from a slit on the leading edge. The velocities of spilled fuel relative to the surrounding air do not occur in these tests are shown to be comparable to those occurring during survivable aircraft crashes. Author

N72-11693# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

SURFACE ACTIVE CONSIDERATIONS IN FUEL FIRES Richard L. Tuve In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 4 p refs

Avail: NTIS HC $6.00/MF $0.95

The problem of efficient extinguishment of fires in burning fuels is dealt with. The use of low density water, in the form of foam, is considered as a means of achieving some solutions to the mechanical and physical needs involved. Emphasis is placed on the utilization of fluorocarbon surfactants which combine foam requirements and fuel-water interfacial activities benefitting fire extinguishing action. Recent development and test of these materials are discussed. D.L.G.


Sponsored in part by NASA, AFAPL, and FAA

(NASA-CR-122842) Avail: NTIS CSLC 11H

The interactions and relationships between lubricants and fuels and their properties as related to systems in aircraft gas turbine engines are dealt with. Three areas of recent research are cited to illustrate the impact of lubricant and fuels capabilities on
modern engines: (1) a study of the influence of lubricant properties on turbine engine design characteristics, especially with regard to high speed supersonic applications, (2) the development of a precise and meaningful test procedure for measuring the thermal stability of kerosene fuels, and (3) the evaluation of advanced high temperature lubricating fluids and their effects on engine bearing performance. Author

The development of ester-based synthetic aviation lubricants over the last 20 years is reviewed. Methods of assessing the high temperature stability of the lubricants are described and the main factors controlling stability are discussed. The suitability of alternative synthetic fluids is considered. Author

SYNTHESIS AND PROPERTIES OF ESTERS OF TETRAMETHYL-2.2-OCTANE DIOL-1.8
R. Robson In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 8 p refs
Avail: NTIS HC $8.00/MF $0.95

The development of ester-based synthetic aviation lubricants over the last 20 years is reviewed. Methods of assessing the high temperature stability of the lubricants are described and the main factors controlling stability are discussed. The suitability of alternative synthetic fluids is considered. Author

SOLID LUBRICATION FOR AERO PROPULSION SYSTEMS
Robert M. Schirmer and Harold T. Quigg 20 May 1971 33 p refs

Potential analytical methods for detection of changes in aircraft turbine oils in the early state are reported and their possible advantages and disadvantages as well as their informative value are discussed. In addition, the cause of premature or sudden oil changes in an aircraft engine is investigated. A test rig for simulating such oil changes and the results obtained are discussed. In conclusion, the possibilities of a simultaneous wear control of aircraft turbine oils are briefly explained. Author

N72-11701# BP Benzin und Petroleum AG, Munich (West Germany).
SYNTHETIC LUBRICANTS FOR SUPERSONIC AIRCRAFT
Avail: NTIS HC $8.00/MF $0.95

Classifications and characteristics of synthetic aero turbine oils are reviewed. These oils are classified as type 1 and type 2 lubricants. The type 1 lubricants are defined as blends of a diester base stock and an additive package. Although still being used in jet engines, their use in advanced turbines is considered to be limited by marginal resistance to thermal and oxidative stress. Type 2 lubricants, developed to meet the increased requirements of more sophisticated aircraft, are defined as blends of a hindered tri- or tetraester base stock and an additive package. The burden placed on these lubricants by sustained flight at supersonic speeds is discussed, and the development of an advance complex ester lubricant with a novel additive package for Mach 2+ engines is reported. D.L.G.

EFFECT OF VERY LOW SULFUR IN JP-5 FUEL ON HOT CORROSION
Robert M. Schirmer and Harold T. Quigg 20 May 1971 33 p refs
Presented at the 10th Natl. Conf. on Environ. Effects on
Aircraft and Propulsion Systems. Trenton. 18-20 May 1971:
Sponsored by Naval Air Propulsion Test Center (AD-725819) Avail: NTIS CSCL 20/4

The report discusses an investigation to determine whether the present limit of 0.4 percent by weight (4000 ppm) of sulfur in JP-5 fuel is a safe level for the protection of turbine-blade materials from hot corrosion in high-performance engines when operated in a marine environment. The present study shows that a 10-fold reduction in the sulfur limit to 40 ppm would not reduce hot corrosion significantly. Such reductions in the sulfur limit would drastically curtail fuel availability, since they approach the mean and the minimum of current production, and could cause critical problems in logistics. It was found that the use of an essentially sulfur-free fuel, containing only 4 ppm sulfur, significantly decreased both the surface scale on specimens and the weight loss by specimens of a wide variety of superalloys and superalloy-coating systems when exposed under conditions which simulate those in an aircraft-turbine engine ingesting air with 1 ppm sea salt. Thus, indications are that the sulfur in fuel must be below a 'threshold' concentration to improve the durability of turbine-blade materials. 

Author (GRA)

N72-11711# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
FLIGHT INVESTIGATION OF AIRFRAME INSTALLATION EFFECTS ON AN AUXILIARY INLET EJECTOR NOZZLE ON AN UNDERWING ENGINE NACELLE

The local flow field approaching an installed nozzle may vary from isolated test conditions, thereby affecting exhausting nozzle performance. An installation of general interest is a podded engine mounted near the aft lower surface of the wing. The effect of this installation on the performance of an auxiliary inlet/ejector nozzle was investigated over a Mach number range of 0.7 to 1.3 by using a modified F-106B aircraft. Both floating and fixed-open door configurations were examined. The ejector nozzle trailing-edge flaps were simulated in the closed position with rigid structure which provided a boattail angle of 15 deg. Primary nozzle area was varied as exhaust gas temperature was varied between 882.2 and 2003.3 K.

Author

N72-11713# Pratt and Whitney Aircraft, West Palm Beach, Fla. Florida Research and Development Center.

Two different sand and dust particle separator test rigs were fabricated and tested to evaluate separation efficiency, aerodynamic performance characteristics, and operation in rain and foliage ingestion conditions. The semi-reverse-flow separator utilized fixed turning vanes on a contoured hub to induce swirl in an annular duct. At design airflow of 8 lb/sec and 4000 scavenge flow, the semi-reverse-flow separator demonstrated 88.5% separation efficiency with AC contaminated test dust at an average pressure drop of 2.8 in. H2O. The powered mixed-flow separator attempted to utilize the strong centrifugal field available in a mixed-flow impeller turning at the high speeds characteristic of small gas turbine engines to achieve particle separation. At the design airflow of 8 lb/sec, it demonstrated a maximum separation efficiency of 58.7% with 8.4% scavenge flow and an average pressure rise of 6.76 psi. Both separator concepts were determined to be feasible and the semi-reverse-flow separator is considered to be superior to current engine air particle separators for the majority of aspects investigated. 

Author (GRA)

N72-11714# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

Discrete-tone noise generation by high-speed fans and compressors has been studied by applying existing theories for the flow through a rotating blade row in an infinitely long annulus. McCune's analysis for the linearized, three-dimensional, compressible flow through a nonlifting blade row and its recent extension to lifting blades have both been used to find the acoustic disturbances produced by such flows. These analyses contain the cutoff condition for the duct acoustic modes, including the effect of through flow, and relate the amplitudes of the propagating modes to the blade thickness and loading. In the present work these relationships have been evaluated for some specific thickness and loading distributions to find the pressure and velocity fields away from the blade row. Methods have been developed to calculate the sound intensity flux upstream and downstream of the blade row and results are presented which demonstrate the influence of blade geometry and operating conditions on noise generation.

Author (GRA)

N72-11803# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

An electronic strain-level counter for obtaining structural strain data on in-flight aircraft is described. The device counts the number of times the strain at a point on a structural member of the aircraft exceeds each of several preset levels. A dead band is provided at each level to prohibit the counting of small strain variations around a given preset level.

NASA

N72-11820# Grumman Aerospace Corp., Bethpage, N.Y.

The report documents the development of a new structural optimization algorithm, which is a combination of a modified fully stressed design technique and a redesign procedure based on gradients to deflection constraint surfaces. The algorithm is incorporated into a large finite element program based on the displacement method of structural analysis. Using an IBM 360/75 computer, the program is capable of obtaining near optimum distributions of material for structural idealizations consisting of up to three thousand elements and six thousand degrees of freedom, and subjected to a maximum of twenty loading conditions. Constraints may be placed on the maximum and minimum size of any of the elements, on the stresses in the elements, and on the displacements of the nodal points of the structure. Several examples of structures that were optimized are included to demonstrate the various features of the program, and to compare results with previously obtained solutions. To help make the program useful in the design of major aircraft structures, care has been taken to simplify the input and to present the program output in a form that is meaningful to the aircraft stress engineer. Results of an exploratory investigation into the optimization of dynamically loaded structures are presented, and the conversion of two existing blast-response shell codes into a unified synthesis program is documented.

Author (GRA)
The nine-county San Francisco Bay area is examined in two time periods (1975-1980 and 1986-1990) as a scenario for analyzing the characteristics of an intraurban, commuter-oriented aircraft transportation system. Aircraft have dominated the long-haul passenger market for some time, but efforts to penetrate the very-short-haul intraurban market have met with only token success. Yet, the characteristics of an aircraft transportation system—speed and flexibility—are very much needed to solve the transportation ills of our major urban areas. This study attempts to determine if the aircraft can contribute toward solving the transportation problems of major metropolitan areas and be economically viable in such an environment.

The conference explored the idea that some form of transportation planning entity should be created between two existing levels of planning—the national level and individual states or smaller jurisdictions. The issue was to consider the advantages and disadvantages, in economic and administrative terms, of conducting transportation planning on a regional basis.

The roles of time and money cost in the demand for air travel are analyzed. The first step is to construct the theory of consumer demand under a time constraint and to deduce its theorems. Then these theorems are applied to air travel through use of a total price demand function. This analysis considers the effects of fare, trip time, airport delay, schedule frequency, trip distance, traveler's wage rates, and non-wage income on the demand for air travel. Many results concerning elasticities are obtained, including a necessary relationship between the time, price, and total price elasticities of demand. Tests of the theorems are performed, the various elasticities are estimates, and the relationship between the elasticities required by the theory is used to obtain an estimate of the value of time in air travel.
## SUBJECT INDEX

**AERONAUTICAL ENGINEERING / A Special Bibliography (Suppl. 15)**

**FEBRUARY 1972**

### Typical Subject Index Listing

<table>
<thead>
<tr>
<th>Subject Heading</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCELERATION (PHYSICS)</td>
<td>Maneuver acceleration measured for estimating loads during civil aircraft testing and test flying.</td>
</tr>
<tr>
<td>ACCELEROMETERS</td>
<td>Passenger aircraft onboard inertial navigation devices, emphasizing accelerometer and gyroscope design and construction.</td>
</tr>
<tr>
<td>ACOUSTIC ATTENUATION</td>
<td>Liquid-base foam sound absorbing properties for jet aircraft noise reduction.</td>
</tr>
<tr>
<td>ACOUSTIC MEASUREMENTS</td>
<td>Portable detector-recorder for automobile, blast furnace, railroad car, engine room and helicopter intrusive noise measurements, discussing peak frequencies and subjective effects.</td>
</tr>
<tr>
<td>ACOUSTICS</td>
<td>Annotated bibliography on acoustics.</td>
</tr>
<tr>
<td>ADAPTIVE CONTROL</td>
<td>Application of linear mathematical model to represent human operator performance in controlling attacking fighter aircraft.</td>
</tr>
</tbody>
</table>

### ADDITIVES

- Viscosity and additive effects on jet engine fuel antivear properties improvement

### AERIAL RECONNAISSANCE

- Aerial expedition for studying conditions of atmospheric boundary layer over oasis and semiarid region

### AERODYNAMIC CHARACTERS\(T\)ICSTICS

- Parachute designs and applications to escape systems, paratrooping, supply dropping, aircraft braking, weapons systems stabilization, flight testing aids and sport

### AERODYNAMIC CHARACTERISTICS

- Nonporous rigid parachute models three component measurements, using low speed wind tunnel for testing skirt length effects on aerodynamic characteristics

### Aerodynamic behavior of thin jet-flapped airfoil, investigating integradoifferential equation solution

### Aircraft spin characteristics due to superstall, comparing three stall types with respect to recovery, yaw damping and rate of rotation

### Unsolved aerodynamic problems in sub- and transonic civil and military aircraft design, considering flow problems during transonic flight, takeoff and landing

### Impinging inclined jet effect on aerodynamic characteristics of control surface in VTOL longitudinal stability

### Aerodynamic characteristics of wind tunnel model of hypersonic aircraft

### Aerodynamic characteristics of helicopters and principles of helicopter flight

### Aerodynamic and aeroelastic characteristics of rigid two-bladed rotor system with full-scale rotor operating at very high advance ratios and during start/stop operation

### Analysis of helicopter tail rotor flow pattern in and out of ground effect

### Numerical analysis of transonic flow about thin lifting wings and analytic expressions for far field conditions

### Analysis of interaction of oblique shock with bow shock of blunt leading edge and application to design of hypersonic ramjet inlet

### In-flight investigation of installation effects and aerodynamic characteristics of local flow field on auxiliary inlet ejector nozzle on underlying engine nacelle

### Sand and dust particle filter tests for evaluation of separation efficiency and aerodynamic...
AERODYNAMIC COEFFICIENTS

performance [AD-725593] W72-11713

AERODYNAMIC STABILITY

Sound radiation from axial flow fans running in turbulent flow, evaluating fluctuating lift on rotor blades due to incident gusts [AD-725593] W72-10220

Aircraft stability coefficient determination by numerical integration fitting to differential equations solution [AD-725593] W72-11136

Aerofoil rule for change in lift/drag ratio of hypersonic delta wing due to conical body addition on compression side [AD-725593] W72-12270

Jet aircraft brake parachute loads under engine wake, evaluating velocity and drag coefficient influences [AD-725593] W72-12504

Wing-fuselage combination aerodynamic coefficients, comparing experimental data with subsinc line mathematical analysis [DGLR PAPER 71-115] W72-12723

Conference papers on jet and slipstream influence on aerodynamic coefficients using aircraft models [DLR-RSTZ-70-26] W72-10004

Vertical takeoff aircraft wind tunnel model with high pressure ejectors to determine jet interference on aerodynamic coefficients [DGLR PAPER 71-105] W72-10007

Influence of jet interference on aerodynamic coefficients of rectangular and swept wings mounted above the engine [AD-728016] W72-10010

AERODYNAMIC CONFIGURATIONS


Wing-fuselage combination aerodynamic coefficients, comparing experimental data with subsinc line nonlinear theoretical results [DGLR PAPER 71-115] W72-12723

Static and dynamic stability characteristics of finned bodies with cruciform, slotted fin configuration [NASA-TN-D-6508] W72-10003


Variable geometry rotor system for direct control over wake vortex [NASA-CR-149-10557] W72-11108

AERODYNAMIC DRAG

Axial cords effects on parachute drag and stability characteristic and opening time, discussing wind tunnel and balloon drop tests results [NASA-CR-149-10557] W72-10306

Parachutes flow characteristics in low speed free descent, discussing glide angle effect on total drag and water channel flow patterns studies [NASA-CR-149-10557] W72-10309

Parachute opening shock and filling time calculation based on aerodynamic drag, air mass and effective porosity time functions, using momentum and continuity equations [NASA-CR-149-10557] W72-10310

Helicopter rotor tip drag relief estimate based on two dimensional drag divergence with Mach number, airflow parameters and flight conditions [NASA-CR-149-10557] W72-12082


AERODYNAMIC FORCES

Aerodynamic forces and pressure distribution measurement on wing-body combination model, investigating boundary layer on wing upper surface [NASA-CR-149-10557] W72-12228


Aerodynamic lift characteristics of oscillating two dimensional airfoil subjected to sinusoidal gust [NASA-CR-149-10557] W72-11017

AERODYNAMIC HEATING

Constant high tensile stress and rapid aerodynamic heating effect on armoring steels and Ti alloys, evaluating test and simulation procedures for design data development [NASA-CR-149-10557] W72-10749

AERODYNAMIC LOADS

Parachute inflation loads and times, presenting calculation method based on unsteady pressure distribution on deaccelerating inflating parabolic shell of revolution with unsteady starting vortex [NASA-CR-149-10557] W72-10311

Matrix method calculation for aerodynamic loads, transverse forces, beating moments, torques and twist of hinged main rotor blades in helicopter during forward flight [NASA-CR-149-10557] W72-12400

AERODYNAMIC NOISE


Calibration of pressure sensors used to measure aerodynamic noise [NASA-CR-149-10557] W72-11038

AERODYNAMIC STABILITY

Axial cords effects on parachute drag and stability characteristic and opening time, discussing wind tunnel and balloon drop tests results [NASA-CR-149-10557] W72-10306

Paratroop type parachutes breathing oscillations and stability characteristics, using high speed cinematography and kinetheodolites to track during steady state descent [NASA-CR-149-10557] W72-10307

AERODYNAMIC STALLING

Aircraft spin characteristics due to superstall, comparing three stall types with respect to recovery, yaw damping and rate of rotation [DGLR PAPER 71-057] W72-12718

AERODYNAMIC ELASTICITY

Aeroelastic models construction for flutter analysis of aircraft design, noting error risk reduction [DGLR PAPER 71-057] W72-12722

AERONAUTICAL ENGINEERING

Theoretical performance of jet flap rotor at advance ratios greater than 1.0 [DGLR PAPER 71-057] W72-10037

AEROSPACE INDUSTRY

Industrial parachute R and D in UK, discussing management, technical staff requirements and government/industry liaison [DGLR PAPER 71-057] W72-10304

Aerospace wire and cables testing methods standards for evaluating mechanical, electrical and chemical properties, coating thicknesses, continuity flaws, flammability, geometrical characteristics, etc [DGLR PAPER 71-057] W72-10304

AEROSPACE MEDICAL

German Research and Test Institute for Aero- and Astronautics 1970 report covering flow mechanics, power conversion, aerospace medicine, atmospheric physics, etc [DGLR PAPER 71-057] W72-11151

AEROSPACE SYSTEMS


Cost analysis and economic models for European aerospace development compared to US experience [DGLR PAPER 71-057] W72-10992

AFTERBURNING

Recirculation mechanism in jet powered V/STOL aircraft [DGLR PAPER 71-057] W72-10828

AIR CONDITIONING EQUIPMENT

Soviet book on civil aircraft high altitude equipment covering air conditioning systems, oxygen equipment and cabin pressurization [DGLR PAPER 71-057] W72-12295

AIR FILTERS

Techniques for forecasting turbulent weather conditions below 10,000 feet for light aircraft operating in Hawaiian Islands [DGLR PAPER 71-057] W72-11525

A-2
AIR FLOW
Gas turbine nozzles aerodynamic throat area air flow measurement, describing accuracy, standards, reference nozzles and mounting flanges [NASP-ARP-1195] A72-10390 Real gas effects in atmosphere to make sonic bang shock wave full dispersion and thickness wide variations A72-11972

AIR NAVIGATION
ATC separation minima and navigational errors on airways in general and long range oceanic environments A72-10177 Avionics contribution to airspace decision making problems, considering navigation, surveillance radar, collision avoidance and ATC techniques A72-10180 Stellar attitude reference and navigation associative processor with high computational speed for radar approach control in ATC A72-12033 Optimal stochastic /Kalman/ filters application to integrated air and submarine navigation systems, discussing measurement errors modeling as bias and colored noise A72-12050 L band in satellite system for aerial navigation aid, discussing position accuracy, data transmission and voice communication and modulation methods A72-12642 Doppler system with navigation radar device, computer unit and data transmitter for continuous recording of aircraft position and speed A72-12748 Analysis of target signal requirements for aircraft navigation systems using millimeter wave radiometry from terrain radiation or ground-based beacons [NASA-TR-I-62082] A72-10539

AIR POLLUTION
Aircraft activity effects on air pollution in San Francisco Bay area with engine emission and climatological data A72-10361

AIR TRAFFIC
Future aircraft design trends for transcontinental and short haul operation, considering traffic forecasts, current transport aircraft and potential derivatives and technology [SAS-PAPER 71079] A72-10248 Pilot collision warning indicator performance in terminal area traffic, using computer fast-time simulation for traffic model A72-11134 German Federal Republic territorial air traffic regulations covering general, IFR and IFR rules, equipment and personnel examination and certification, safety, takeoff and landing, accidents, etc A72-12621 German book on air traffic law covering norms relative to vehicles and air space, international air law, organizations, etc A72-12622

AIR TRAFFIC CONTROL
ATC separation minima and navigational errors on airways in general and long range oceanic environments A72-10177 Avionics contribution to airspace decision making problems, considering navigation, surveillance radar, collision avoidance and ATC techniques A72-10180 Automated radar terminal system /ARTS/ for monitoring and tracking all aircraft within radar range, displaying identification, altitude and ground speed information to air traffic controller A72-10960 Phased scanning array for ATC radar beacon systems, airport or air route surveillance radars and ground landing systems A72-10962

AIR TRANSPORTATION
Inertial navigation role in automatic ATC systems, discussing path control accuracies, environmental conditions, noise and air pollution, etc A72-11119 ATC system decision making problem and future technological and administrative improvements A72-11716 Stellar attitude reference and navigation associative processor with high computational speed for radar approach control in ATC A72-12033 Discrete address ATC radar beacon system operation and design A72-12378 FAA air traffic control automation program, discussing en route stage, computer program, data processing and storage and terminal area navigation and display techniques A72-12380 Dhf aeronautical satellite system, presenting ATC trends, international aspects, available flight levels, weather conditions and long haul conflicts A72-12383 Computer-aided interactive graphic displays for ATC, discussing subsystems, data processing flow and operational capabilities A72-12420 Tactical ATC display system for airport surveillance, precision approach and landing and operator/aircraft/machine operations by using terminal area surveillance radar A72-12421 Digital computer memory system for real time processing of air and naval traffic data, discussing logic design, time comparisons and optimum use A72-12647 ATCAS air traffic control automation system emphasizing Italian situation A72-12649 Radio aids for air navigation and traffic control in Italy, discussing facilities development A72-12748 Air traffic control radar beacon systems and laser warning systems [AD-72579] A72-10543

AIR TRANSPORTATION

A-3
AIRCRAFT
Variable-orifice gas turbine system for fuel rate control in aircraft
[NASA-CASE-LW-1187-1] 472-10824

AIRCRAFT ACCIDENT INVESTIGATION
Statistical analysis of home built aircraft accidents
[PB-201438] 472-10018
Statistical analysis of weather effects in aircraft accidents
[PB-201437] 472-10019
Briefs of US general aviation accidents involving corporate/executive aircraft in 1968
[PB-201439] 472-11052

AIRCRAFT ACCIDENTS
Statistical analysis of home built aircraft accidents
[PB-201438] 472-10018
Statistical analysis of weather effects in aircraft accidents
[PB-201437] 472-10019
Reports of accidents involving missing aircraft of US general aviation for 1968
[NTSB-ANN-71-4] 472-10041
Report of aircraft accident involving DC-9 aircraft at Gulfport, Mississippi on February 17, 1971
[NTSB-AAR-71-14] 472-10049

AIRCRAFT ANTENNAS
Helicopter antenna placement, using scale models for three dimensional radiation pattern semi-automatically recording under free space conditions
A72-10149

AIRCRAFT APPROACH SPACING
ATC separation minima and navigational errors on airways in general and long range oceanic environments
A72-10177
Mathematical analysis of separation standards and aircraft navigational collision risk for parallel tracks in radar monitored systems
A72-10178
Statistical analysis of track keeping Strumble VOR data for lateral navigation separation standards and collision risk in continental environments
A72-10179
Terrain clearance during descent and approach of aircraft under radar control, discussing optimum profile, ATC, nav aids and rules
A72-10183

AIRCRAFT CARRIERS
Carrier system for controlled approach of Naval aircraft to provide pilot window to deck for tactical flight guidance for poor visibility landing
A72-12323

AIRCRAFT CONFIGURATIONS
Industry assisted state of art assessment of high lift turbofan configurations for USAF STOL tactical transport technology program
[SAE PAPER 710756] A72-10255

AIRCRAFT CONTROL
Aircraft pitching and yawing cross couplings compensation at high speed
A72-10506
European A300B airbus flap and slat systems and tailplane actuator for longitudinal pitch trim control
A72-10725
Handling qualities simulation program for augmenter wing jet STOL research aircraft considering control devices design
A72-11654
STOL aircraft roll moment control possibility for externally-blown jet flap due to engine failure
A72-11803

AIRCRAFT ENGINEERING
Advanced technology air transports propulsion system requirements, considering design, engine performance and reliability, maintenance, airframe problems, noise and pollution control
[SAE PAPER 710761] A72-10258
Concorde engine performance, reviewing control, reheat and exhaust systems
[SAE PAPER 710775] A72-10267

SUBJECT INDEX
B-1 strategic supersonic bomber design, emphasizing variable sweep wing, landing gear, control and instrumentation
A72-11700
Soviet book on in-flight studies of aircraft stability and controllability covering dynamic characteristics, measurements, balancing curves, aerodynamic forces and limiting and special flight regimes
A72-12226
Application of linear mathematical model to represent human operator performance in controlling attacking fighter aircraft
[AD-725069] A72-10042
Analysis and calculation of basic parameters of aircraft automatic control system components
[JPES-54332] A72-11039
AIRCRAFT DESIGN
Aircraft producibility considerations in preliminary design and production planning phases
[SAP PAPER 710746] A72-10245
Aircraft design producibility to reduce production cost and enhance product profitability, using joint engineering and manufacturing teams
[A72-10247
Future aircraft design trends for transcontinental and short haul operation, considering traffic forecasts, current transport aircraft and potential derivatives and technology
[SAP PAPER 710749] A72-10248
TriStar commercial jet transport aircraft design, discussing design and flight tests for operating efficiency, reliability and safety
[SAP PAPER 710755] A72-10252
Augmentor wing jet STOL research aircraft development progress report covering design, engine tests, performance prediction, control simulation and stability augmentation
[SAP PAPER 710757] A72-10254
Propulsion system optimization for commercial transport aircraft design under Advanced Transport Technology study, considering impact on aircraft gross weight
[SAP PAPER 710760] A72-10257
Propulsion system optimization in transonic transport aircraft design, considering nacelle integration, engine choice, noise attenuation and technology utilization
[SAP PAPER 710762] A72-10259
Airline Propulsion Team approach to DC-10 aircraft power plant design for maximum operational effectiveness
[SAP PAPER 710778] A72-10270
Variable speed constant frequency power generation equipment influence weapon system effectiveness, considering weight and cost
A72-11067
Aircraft ride comfort problem in turbulent air, comparing fixed and free wing aircraft responses
A72-11720
B-1 strategic supersonic bomber design, emphasizing variable sweep wing, landing gear, control and instrumentation
A72-12226
Aircraft design interactive computer graphics technique, using human decision input response to computer output information
[DGMC PAPER 71-107] A72-12733
Unsolved aerodynamic problems in sub- and transonic civil and military aircraft design, considering flow problems during transonic flight, takeoff and landing
[DGMC PAPER 71-105] A72-12745
Aircraft design concepts for intraurban transportation system
[NASA CR-114342] A72-10986
Effect of optimum accessibility on improved maintenance and reliability of commercial aircraft
A72-11031
AIRCRAFT EQUIPMENT
Array data analysis system for fixed and rotary wing aircraft flight testing, including airborne and computer controlled ground stations equipment
A72-12408
Basic requirements for airborne infrared forest fire detection system
[AD-726953] A72-10396
Electronic strain-level counter for in-flight aircraft
[NASA-CASE-LAR-10756-1] A72-11803
Doppler system with navigation radar device, computer unit and data transmitter for continuous recording of aircraft position and speed
A72-12749

SUBJECT INDEX
Introduction to airborne infrared forest fire detection system
[AD-726953] A72-10396
Electronic strain-level counter for in-flight aircraft
[NASA-CASE-LAR-10756-1] A72-11803
Doppler system with navigation radar device, computer unit and data transmitter for continuous recording of aircraft position and speed
A72-12749
CF6 high bypass ratio turbofan engine design improvements for fuel consumption, thrust/weight ratio, starting, noise level, smoke emission, maintenance, monitoring and accessory replacement [SAE PAPER 710779] A72-10271
Aircraft hybrid electrical power systems, describing variable frequency generation and high voltage dc distribution A72-11068
Thermal shock fatigue tests on aircraft gas turbine engine inlet nozzles, showing cracks as function of material A72-11373
Thermal radial stresses in axial compressor disk-to-drum transition areas of operating AM-3 aircraft engine A72-11374
Aircraft gas turbine rotating disks thermal and mechanical stresses under variable thermal conditions, describing test assembly A72-11637
PT6 and JT150 gas turbine aircraft engines development and service experience A72-11699
Q/STOL jet aircraft engines design for low noise levels, describing takeoff thrust, bypass ratio and turbine stages A72-12501
Superalloys ductility and workability improvements without sacrificing elevated temperature strength for aircraft engine applications A72-12561
Aircraft activity effects on air pollution in San Francisco bay area with engine emission and climatological data N72-10361
Application of brazing techniques for remanufacturing of jet engine components to reduce cost of commercial aircraft maintenance N72-11024
Assessment of high temperature stability of synthetic lubricants for aircraft gas turbines N72-11695
Analytical methods for early-stage detection of oil deterioration in aircraft engines N72-11698
Thermal stability of trimethyl propane ester based lubricating oil for aircraft engines N72-11699
Feasibility analysis of solid lubricated ball bearings for aircraft propulsion systems application N72-11700
AIRCRAFT EQUIPMENT
Soviet book on civil aircraft high altitude equipment covering air conditioning systems, oxygen equipment and cabin pressurization A72-12295
Application of computers for improved maintenance of avionics equipment, fault isolation, and verification of fault correction N72-11022
Analysis of fire and explosion hazards in aircraft fuel tanks and methods for predicting fuel/air concentrations in tanks [AD-725027] N72-11056
Procedure for measuring performance of aircraft fire extinguishing powders N72-11691
Electronic strain-level counter for in-flight aircraft [NASA CASE-LAR-10756-1] N72-11803
AIRCRAFT FUEL SYSTEMS
Lightweight low pressure hose assemblies in aircraft and missile petroleum base fuel and synthetic lubricating oil systems at 395-710 R and up to 200 psi [SAF-ARP-1180] A72-10388
AIRCRAFT FUELS
Aircraft fuels, lubricants, and fire safety - conferences [AGARD CP-64-71] N72-11668
Small scale combustion chamber rigs for combustion characteristics determination of aviation fuel N72-11674
Dual purpose filter-separators for dirt and water removal from fuel N72-11676
Fuel related problems in aircraft fuel systems, emphasizing hydrogen treated fuel N72-11677
Theoretical analysis of fuel ignition by hot projectile and ignition delay time as function of temperature and width of hot gas region N72-11683
Fire extinguishing system in aircraft, using exhaust gases of solid propellant gas generator to pressurize extinguisher bottle N72-11685
Electrostatic charging in handling of aviation fuels, resulting in incendiary sparking in fuel tank N72-11686
Crash safe turbine fuel program, using gelled fuels N72-11688
Post-crash fire safety of helicopter turbine engine fuels N72-11688
Simulated crash tests to assess fire resistance of aircraft fuels containing polymeric additives N72-11692
Use of fluorocarbon surfactants to extinguish aircraft fuel fires N72-11693
AIRCRAFT GUIDANCE
Carrier system for controlled approach of Naval aircraft to provide pilot window to deck for tactical jet guidance for poor visibility landing A72-12323
AIRCRAFT HAZARDS
Report of aircraft accident involving DC-9 aircraft at Gulfport, Mississippi on February 17, 1971 [N72-10049
Extinguishing flames and fires on aircraft N72-11680
Flammability properties of jet fuels and techniques for fire and explosion suppression under simulated hostile operating- environment conditions N72-11681
Various gelled or emulsified fuels for reducing aircraft crash-fire hazard N72-11689
AIRCRAFT HYDRAULIC SYSTEMS
European A300B airbus flying control hydraulic system and landing gear design for safety and reliability, fatigue life, weight and maintenance A72-10724
AIRCRAFT INDUSTRY
Commercial transport market and technology forecasting, considering all-cargo, STOL, SST and CTOL aircraft [SAE PAPER 710750] A72-10249
AIRCRAFT INSTRUMENTS
Passenger aircraft onboard automated inertial navigation devices, emphasizing accelerometer and gyroscope design and construction A72-10070
Polar navigation with transverse mercator technique for aircraft using secant geared ground position indicators A72-10181
Pressure altimeter system minimum safe performance standards for subsonic aircraft operation, describing test procedures N72-10386
Airfield Vehicle Obstacle Indication Device short range high-definition radar system for aircraft navigation aid A72-12042
Airborne pictorial navigation systems for visual indication of aircraft position in addition to digital readout A72-12106
Soviet book on course-indicating systems and automatic navigation aids for civil aviation aircraft covering design, operation principles, error analysis and reliability A72-12298
AIRCRAFT LANDING
Short haul air transport system need for future short takeoff and landing aircraft, considering airports, airspace, economics and navigation and landing aids A72-11719

Microwave aircraft landing system development, discussing contract definition, feasibility, prototype development, management planning and program costs

A-72-12377

AIRCRAFT ILS, covering history, adverse weather operations and replacement systems

A-72-12645

STOL aircraft integrated landing approach flight control system with elevator and thrust control coupling to angle of attack, altitude and other state variables

[SGLR PAPER 71-063] A-72-12705

Measurement of three track runway and taxiway profiles at two international airports

[SAS-TR-5-056777] A-72-11038

Flight simulator exercise for investigation of pilot performance in low visibility conditions during approach and landing

[SAR-TH-71044] A-72-11042

Flight tests of PAC 221 aircraft crosswind landing and sidestep maneuvers

[ARC-CP-1168] A-72-11045

Elevator lift and cockpit position effects on flight altitude control during aircraft landing approach

[ARC-R/B-3662] A-72-11049

Helicopter lift margin system to aid in determining power requirements for takeoff and landing

[AD-725207] A-72-11053

AIRCRAFT AVIATION

Helicopter elastomeric bearing rotors, discussing downtime and cost reduction, maintenance, endurance and inspection

A-72-10150

Advanced technology air transports propulsion system requirements, considering design, engine performance and reliability, maintenance, airline problems, noise and pollution control

[SARE PAPER 710761] A-72-10258

Aircraft power plant design and installation influence on operational effectiveness, discussing manufacturers and operators cooperation for reliability and maintainability enhancement

[SARE PAPER 710757] A-72-10269

DC-10 nondestructive testing manual, detailing section/subject format, methods, planned area accessibility and aircraft maintenance

A-72-11109

Proceedings of conference on aviation maintenance in 1970 time period conducted at Oklahoma City, Oklahoma, December 8-10, 1970

A-72-11019

Application of computer techniques to improvement of aircraft maintenance operations

A-72-11020

Development of procedures for improving reliability of maintenance manuals and evaluation of reading difficulty level

A-72-11021

Application of computers for improved maintenance of avionics equipment, fault isolation, and verification of fault correction

A-72-11022

Analysis of facilities, equipment, and tools to maintain large commercial aircraft

A-72-11032

Application of brazing techniques for remanufacturing of jet engine components to reduce cost of commercial aircraft maintenance

A-72-11024

Application of nondestructive testing procedures to maintenance of large commercial aircraft

A-72-11025

Application of Apollo Project data and training concepts to maintenance of large commercial aircraft

A-72-11026

Development and characteristics of coordinated, in-flight and on-ground fault isolation system for maintenance of large commercial aircraft

A-72-11027

Development of technique for graphic presentation of fault isolation and problem correction for maintenance of large commercial aircraft

A-72-11028

Development and application of modular design concept to improve jet aircraft engine maintenance

A-72-11030

Effect of optimum accessibility on improved maintenance and reliability of commercial aircraft

A-72-11031

Description of maintenance procedures used on Beechcraft Hawker 125 commercial jet aircraft

A-72-11032

Predictions of aircraft maintenance procedures to be employed during 1970 to 1980 time period

A-72-11033

Improvements in aircraft maintenance procedures based on solid state electrical power management and solid state contactless switching circuits

A-72-11034

Description of aircraft accessory reliability program to provide improved safety of operation for commercial aircraft

A-72-11035

AIRCRAFT MODELS

Local economic region unsteady interference effects on harmonically oscillating wing-tailplane model with variable sweep wing

A-72-12709

Aerelastic models construction for flutter analysis of aircraft design, noting error risk reduction

[SGLR PAPER 71-082] A-72-12722

AIRCRAFT NOISE

STOL aircraft for solving noise reduction and land use problems in future transportation systems, discussing aircraft location and layout for growing air traffic

A-72-11153

Aircraft engine noise effects in airport vicinities, discussing measurement scales, turbofan sources, noise reduction and future air traffic

A-72-12022

Incremental value of noise pollution level as basis for aircraft noise rating


Aircraft noise effects on land use around airports

[PS-201955] A-72-10050

Annotated bibliography on acoustics


Metropolitan aircraft noise abatement policy study, John F. Kennedy International Airport, New York, New York

[PS-200768] A-72-11051

Airport/aircraft system computer listing for Burroughs 5500 and IBM 7094 from study on transportation noise

[PS-201428] A-72-11056

AIRCRAFT PARTS

Integrity control procedures for machining, drilling and grinding of steel and Ti alloy aircraft parts, discussing nondestructive inspection method

[SARE PAPER 771-238] A-72-10969

AIRCRAFT PERFORMANCE

TriStar commercial jet transport aircraft development, discussing design and flight tests for operating efficiency, reliability and safety

[SARE PAPER 710755] A-72-10252

STOL and STOL aircraft performance and efficiency, discussing landing and takeoff distances reduction

A-72-11258

AIRCRAFT PILOTS

Military specification adoption for flight characteristics of piloted V/STOL aircraft

[AD-725746] A-72-10048

AIRCRAFT PRODUCTION

Aircraft producibility considerations in preliminary design and production planning phases

[SARE PAPER 710756] A-72-10245

AIRCRAFT RELIABILITY

Boeing 747B growth model FAA certification, discussing engine thrust, fuel capacity, taxi and flight weights and aircraft noise reduction

[SARE PAPER 710753] A-72-10251

Concorde airworthiness certification, discussing ground and flight test programs for performance, flying qualities and structures fatigue properties evaluation

[SARE PAPER 710756] A-72-10253

Aircraft power plant design and installation influence on operational effectiveness, discussing manufacturers and operators cooperation for reliability and maintainability enhancement

[SARE PAPER 710777] A-72-10269

Development and characteristics of coordinated, in-flight and on-ground fault isolation system for maintenance of large commercial aircraft
AIRCRAFT SAFETY
Air transportation system design for safety and efficiency, discussing navigation facilities and surveillance systems employment for blunder prevention.

Proceedings of conference on aviation maintenance in 1970 time period conducted at Oklahoma City, Oklahoma, December 8-10, 1970.

Development and functions of organization for multinational certification of supersonic aircraft.

Effect of optimum accessibility on improved performance and reliability of commercial aircraft.

AIRCRAFT SPECIFICATIONS
Techniques for forecasting turbulent weather conditions based on 10,000 feet for light aircraft operating in Hawaiian Islands.

Development and operating principles of collision warning system for aircraft accident prevention.

Military specification adoption for flight characteristics of piloted V/STOL aircraft.

AIRCRAFT STABILITY
Aircraft structure and stability requirements for pilot and flight deck environments.

Airplane ride quality and fatigue life in terms of aircraft design.

Aircraft spin characteristics due to superstall, comparing three stall types with respect to recovery, yaw damping and rate of turn.

Aerodynamic modeling for flutter analysis of aircraft design, noting risk error reduction.

Flight vibration testing methods for ascertain flutter stability of high speed aircraft.

Aircraft nose regions for studying conditions of atmospheric boundary layer over oceanic and seafarid region.

AIRCRAFT STRUCTURES
Warpage control of large Al alloy forgings machining of jumbo jet components, using packing and storage methods.

Structural sandwich panel design, establishing simple stress and deflection formulas under transverse loading based on tests evaluating balsa as laminate core.

AIRCRAFT WAKES
Jet aircraft brake parachute loads under engine wake, evaluating velocity and drag coefficient influences.

AIRFOILS
Unsteady flow about two dimensional airfoils, determining surface pressure fluctuations induced by turbulent boundary layers.

Aerodynamic behavior of thin jet-flapped airfoil, investigating integrodifferential equation solution.

AIRPORTS
Skin friction measurement in nonisobaric subsonic flow with pressure gradient over airfoil section by surface impact probes.

Customer utilization and program listing for computer program on two dimensional multicomponent airfoils in viscous flow.

Aerodynamic lift characteristics of oscillating two dimensional airfoil subjected to sinusoidal gust.

Numerical analysis of transonic flow about thin lifting wings and analytic expressions for far field conditions.


Design and development of numerically controlled machine for laying composite tape used in building aircraft engineered systems reinforced resin matrix composite materials.

Compression tests of short skin-stiffener specimens of conventional titanium alloys airframe structure with attached unidirectional brazed boron-aluminum laminate.

AIRPORT PLANNING
STOL transport aircraft technology assessment, analyzing airports growth problems.

Acoustic echo sounder as real time monitor of airport environmental meteorological parameters.

STOL aircraft for solving noise reduction and land use problems in future transportation systems.

Airport operations for solving noise reduction and future air traffic.

Airport efficiency improvement measures, considering boarding gates, parking space, baggage handling, fire protection, monitoring and central control.

Civil aviation air transportation contributing factors to American economy, considering disposable income, airline fares and time-trend variable.

AIRPORTS
Airport apron surface pavement strain measurements under field loading conditions, considering static and dynamic loads with finite element method.

Terminal aerodrome forecasts usefulness and accuracy assessment.

Line, cement, fly ash and sand combination airport pavement design and testing, discussing material structural and chemical properties, compressive strength, costs, etc.

Evaluation of airway operations systems in Indonesia, Laos, Malaysia, and Thailand.

Aircraft noise effects on land use around airports.

Evaluation of airway operations systems in Indonesia, Laos, Malaysia, and Thailand with proposed courses of action, equipment requirements, and economic factors in aeronautical telecommunications.

Short term airport access improvements in Baltimore-Washington area with service brochure implementation.

Aircraft activity effects on air pollution in San Francisco Bay area with engine emission and...
climatological data  $72-10361$

Metropolitan aircraft noise abatement policy study, John F. Kennedy International Airport, New York, New York  [PB-200-164]  $72-11051$

AIRSHIPS

Unpredicted structural vibration in Comet and Electra aircraft, Graf Zeppelin dirigible, missile antennas, etc  $72-12002$

LDAIn 2 AIRCRAFT

LADIn 2 noiseless STOL jet aircraft project, describing exhaust nozzle configuration, design and economics  $72-12503$

ALGORITHMS

Development of structural optimization algorithms for obtaining near optimum distributions of material for structural idealizations  [AD-726-112]  $72-11820$

ALIPHATIC COMPOUNDS

Synthesis and properties of aliphatic ester for turbine lubrication in jet aircraft  $72-11696$

ALL-WEATHER AIR NAVIGATION

Suitability evaluation of fog simulator for weather conditions during flight approach  [PAA-NA-71-44]  $72-10233$

ALTERETERS

Pressure altimeter system minimum safe performance standards for subsonic aircraft operation, describing test procedures  [SAE-AS-942]  $72-10386$

ALUMINUM ALLOYS

Warpage control of large Al alloy forgings machining of jumbo jet components, using packing and storage methods  [SAL PAPER 710801]  $72-10280$

Constant high tensile stress and rapid aerodynamic heating effect on mongering steels and Ti and Al alloys, evaluating test and simulation procedures for design data development  $72-10749$

Residual buckling strength of Al alloy elastic column with fatigue crack  [SAL PAPER 19104]  $72-11511$

ALUMINUM COATINGS

Lightning protective coatings for boron/epoxy composite materials, discussing high current damage mechanisms, simulation facility and test results on aluminum foils, meshes, etc  $72-10783$

ANTENNA DESIGN

Limited scan antenna system for precision approach radar, detailing design for reflector, aperture gain and phased array  $72-12393$

ANTENNA RADIATION PATTERNS

Helicopter antenna placement, using scale models for three dimensional radiation pattern semiautomatic recording under free space conditions  $72-10149$

APPROACH

Suitability evaluation of fog simulator for weather conditions during flight approach  [PAA-NA-71-44]  $72-10233$

APPROACH CONTROL

Stellar attitude reference and navigation associative processor with high computational speed for radar approach control in ATC  $72-12033$

Carrier system for controlled approach of Naval aircraft to provide pilot window to deck for tactical jet guidance for poor visibility landing  $72-12323$

STOL aircraft integrated landing approach flight control system with elevator and thrust control coupling to angle of attack, altitude and other state variables  [DGHL PAPER 71-063]  $72-12705$

Flight simulator exercise for investigation of pilot performance in low visibility conditions during approach and landing  [PAA-TR-71046]  $72-11042$

AROMATIC COMPOUNDS

Jet fuels hydrocarbon composition effect on thermal stability, considering nonaromatic components influence on aromatic hydrocarbons oxidation  $72-12800$

ASSEMBLIES

Lightweight low pressure plastic hose assemblies in aircraft and missile petroleum base fuel and synthetic lubricating oil systems at 395-710 R and up to 200 psi  [SAE-IEP-1180]  $72-10386$

ATMOSPHERIC CIRCULATION

Aerial expedition for studying conditions of atmospheric boundary layer over oasis and semiarid region  [AD-72-7535]  $72-10332$

ATMOSPHERIC PHYSICS

German Research and Test Institute for Aero- and Astronautics 1970 report covering flow mechanics, power conversion, aerospace medicine, atmospheric physics, etc  $72-11151$

Real gas effects in atmosphere to make sonic bang shock wave full dispersion and thickness wide variations  $72-11972$

ATMOSPHERIC PRESSURE

Atmospheric temperature and pressure altitude effects on runway lengths and aircraft takeoff weights  [ASCE PREPRINT 1242]  $72-10193$

ATMOSPHERIC TEMPERATURE

Atmospheric temperature and pressure altitude effects on runway lengths and aircraft takeoff weights  [ASCE PREPRINT 1242]  $72-10193$

ATMOSPHERIC TURBULENCE

Sonic boom pressure signatures during F-104 overflights at Mach 1.3 and 30,000 ft, explaining variations by atmospheric turbulence  $72-11158$

Aerial expedition for studying conditions of atmospheric boundary layer over oasis and semiarid region  [AD-72-7535]  $72-10332$

ATTACK AIRCRAFT

Electronic displays for attack aircraft, discussing subsystems, simulation technique and pilot role  $72-11756$

ATTITUDE CONTROL

Free flight simulation tests for V/STOL aircraft nonlinear attitude control system adaptation to helicopter pitch and roll control  [DGHL PAPER 71-060]  $72-12714$

Analysis and calculation of basic parameters of aircraft automatic control system components  [JFBS-54332]  $72-11039$

AUDIOBIBLIOGRAPHY

Annotated bibliography on acoustics  [NFL-AER-AC-47]  $72-10589$

AUTOMATIC CONTROL

Aircraft high pressure oxygen cylinder system filler valve optimum standards, discussing automatic fill rate and pressure sensitive closing control, design, construction and performance  [SAE-AS-1225]  $72-10385$

ATCAS air traffic control automation system emphasizing Italian situation  $72-12649$

AUTOMATIC FLIGHT CONTROL

Passenger aircraft onboard automated inertial navigation devices, emphasizing accelerometer and gyroscope design and construction  $72-10070$

Inertial navigation role in automatic ATC systems, discussing path control accuracies, environmental conditions, noise and air pollution, etc  $72-11118$

Soviet book on course-indicating systems and automatic navigation aids for civil aviation aircraft covering design, operation principles, error analysis and reliability  $72-12298$

FAA air traffic control automation program, discussing en route stage, computer program, data processing and storage and terminal area navigation and display techniques  $72-12380$

STOL aircraft integrated landing approach flight control system with elevator and thrust control coupling to angle of attack, altitude and other state variables  $72-12380$
BREATHING VIBRATION

Paratroop type parachutes breathing oscillations and
stability characteristics, using high speed
cinematography and kinetheodolites to track during
steady state descent

BRISTOL-SIDDLEY RS 53 ENGINE
Infrared spectrophotometer used for detection of
trace contaminants from Pegagus and Olympus
ingines in aircraft cabin atmospheres

BUFFETING
Prediction of flight penetration of wing buffeting
from wind tunnel model dynamic tests

C-130 AIRCRAFT
Multichannel multispectral scanner system for NASA
[C-130 earth resources aircraft, describing
electronic equipment and calibration sources

CABIN ATMOSPHERES
Infrared spectrophotometer used for detection of
trace contaminants from Pegagus and Olympus
ingines in aircraft cabin atmospheres

CABLES
Aerospace wire and cables testing methods standards
for evaluating mechanical, electrical and chemical
properties, coating thicknesses, continuity flaws,
flammability, geometrical characteristics, etc

CALIBRATION
Flight test procedures for subsonic transport
aircraft pitot static pressure system,
recommending trueding cone calibration method
Calibration of pressure sensors used to measure
aerodynamic noise

CALIFORNIA
Aircraft activity effects on air pollution in San
Francisco Bay area with engine emission and
climatological data

CABON FIBRES
Graphite fiber composite fan blade design for
subsonic turbofan engines, discussing weight and
fatigue sensitivity reductions and performance
test results

CABIN WINGS
Thin shock layer theory of lifting properties
of reentry caret and flat delta wings and waveriders
at high incidence angles and Mach numbers

CARGO
Computerized design of civil aircraft using freight
criteria in parametric analysis

CASCADE FLOW
One dimensional unsteady flow in turbine engines
rotating and static vane cascades, discussing
vibrations propagation

CASES (CONTAINERS)
Performance of axial flow compressor rotor with
different casing treatment configurations

CASTINGS
Nondestructive radioactive gas penetrant tests for
porosity and fatigue damage in jet engine castings

CATALYTIC ACTIVITY
Possible catalytic reduction of stratospheric ozone
by nitrogen oxides emitted from SST aircraft

CAUCHE PROBLEM
Velocity field of sonic flow about aircraft wing
profile, solving mixed Cauchy problem

CENTRIFUGING STRESS
Aircraft gas turbine rotating disks thermal and
mechanical stressees under variable thermal
conditions, describing test assembly

CERTIFICATION
Boeing 747/A growth model FAA certification,
discussing engine thrust, fuel capacity, taxi and
flight weights and aircraft noise reduction

CHEMICAL COMPOSITION
Jet fuel specifications for military and civil aircraft

CHEMICAL PROPERTIES
Line, cement, fly ash and sand combination airport
pavement design and testing, discussing material
structural and chemical properties, compressive
strength, costs, etc

CIRCULATION
Recirculation mechanism in jet powered V/STOL
aircraft

CIVIL AVIATION
General and commercial aircraft service needs in air
transportation, considering FAA and CAB roles and
policies

Civil aviation air transportation contributing
factors to American economy, considering
disposable income, airline fares and time-trend
variable

Soviet book on civil aircraft high altitude
equipment covering air conditioning systems,
oxygen equipment and cabin pressurization

Soviet book on course-indicating systems and
automatic navigation aids for civil aviation
aircraft covering design, operation principles,
error analysis and reliability

Reports of accidents involving missing aircraft of
US general aviation for 1968

Proceedings of conference on aviation maintenance
in 1970 time period conducted at Oklahoma City,
Oklahoma, December 8-10, 1970

Predictions of aircraft maintenance procedures to be
employed during 1970 to 1980 time period

Computerized design of civil aircraft using freight
criteria in paraenetic analysis

Analysis of economic and feasibility factors
pertaining to commuter oriented, short haul air
transportation system in San Francisco, California
area

CLIMATE
Aircraft activity effects on air pollution in San
Francisco Bay area with engine emission and
climatological data

CLIMBING FLIGHT
Noise reduction for climbing takeoff and V/STOL
aircraft affecting stability

SUBJECT INDEX

A72-10813
A72-11334
A72-11178
A72-11637
A72-11669
A72-12023
A72-10928
A72-11716
A72-11721
A72-12295
A72-12298
A72-11041
A72-11019
A72-11033
A72-11061
A72-11885
A72-10361
A72-11040
SUPPLEMENTARY INDEX

COHERENT ACOUSTIC

COHERENT COLLISION

COHORITICAL AVOIDANCE

COCKPIT

COBETABLE PART

COBROUND PRODUCTS

COLOB PRODUCTS

Elevator lift and cockpit position effects on flight altitude control during aircraft landing approach

[ARC-B-3662] N72-11049

COLLISION AVOIDANCE

Mathematical models for studying incoherent and coherent structures of aerodynamically generated schlieren photography

[ONEPER-TP-983] N72-11036

COHORSBIATION

Small scale combustion chamber rig for combustion characteristics determination of aviation fuel

N72-11674

COMBUSTION CHAMBERS

Jet fuels hydrocarbon composition effect on thermal stability, considering nanoramic components influence on aromatic hydrocarbons oxidation products coagulation

A72-12000

COMBUSTION PRODUCTS

Jet fuels hydrocarbon composition effect on thermal stability, considering nanoramic components influence on aromatic hydrocarbons oxidation products coagulation

A72-12000

COMET 4 AIRCRAFT

Unpredicted structural vibration in Comet and Electra aircraft, Graf Zeppelin dirigible, missile antennas, etc

A72-12002

CONFORT

Aircraft ride comfort problem in turbulent air, comparing free and fixed wing aircraft responses

A72-11720

COMMERCIAL AIRCRAFT

Commercial transport aircraft and BAC 221 aircraft piloted flight simulation near zero rate climb velocity for determining aircraft maneuver controllability at low speed

[ARC-CP-1165] N72-11048

COHORDERY

Predictions of aircraft maintenance procedures to be employed during 1970 to 1980 time period

A72-11033

Computerized design of civil aircraft using freight characteristics determination of aviation fuel

[NASA-CH-11U347] N72-11845

COMPOSITE AIRCRAFT

Jet noise reduction technology, hardware and tests for NASA Quiet Engine Program to develop low noise subsonic civil transport aircraft propulsion system

[SAE PAPER 710765] N72-10425

COMPOSITIVE STRUCTURES

Computerized design of civil aircraft using freight characteristics determination of aviation fuel

[AD-11]

COMPOSITIONAL MATERIALS

Graphite fiber composite fan blade design for subsonic turboprop engines, discussing weight and fatigue sensitivity reductions and performance test results

[SAE PAPER 710771] N72-10265

COHORSIBLE FLOW

Force and pressure distribution measurements on delta wing-body combination in compressible flow, investigating Reynolds number effect

A72-12707

Design programs for swept wings in subcritical, compressible, viscous flow

[HEL-LEBO-NOTE-1100] N72-10018

CONCERSSION TESTS

Compressibility tests of short skin-stiffener specimens of conventional titanium alloys airframe structure with attached unidirectional brazed boron-aluminum composite

[NASA-TH-D-6548] N72-11428

CONCESSIVE STRENGTH

Lime, cement, fly ash and sand combination airport pavement design and testing, discussing material structural and chemical properties, compressive strength, costs, etc

A72-12023

CONCORROR BLADES

Metallographic and fractographic analysis of cracking in T53-113 gas turbine engine compressor disks

A72-10016

Forged Inconel alloy 718 metal powder preforms for dense aircraft engine compressor rotor blades

A72-11441

Tip clearance effect on compressor blade aerodynamic characteristics, applying Bollay analysis to low aspect ratio rectangular wing

A72-12025

CONCROSSOR Rotors

Performance of axial flow compressor rotor with different casing treatment configuration

[NASA-TH-D-6538] N72-10025

COMPRESSOR DESIGN

Starlet attitude reference and navigation associative processor with high computational speed for radar approach control in ATC

A72-12033

COMPRESSOR GRAPHICS

Computer-aided interactive graphic displays for ATC, discussing subsystems, data processing flow and operational capabilities

A72-12420

Aircraft design interactive computer graphic technique, using human decision input response to computer output information

[DCP RAPER 71-107] N72-12733

COMPRESSOR PROGRAMS

FAA air traffic control automation program, discussing on route stage, computer program, data processing and storage and terminal area navigation and display techniques

[AD-7257U4] N72-12380

Technical programmers manual for automated procedure of optimizing practical aerospace structures — Vol. 2

A72-10047

Computer utilization and program listing for computer program on two dimensional multicomponent
Application of computer techniques to improvement of aircraft maintenance operations A72-11020
Application of computers for improved maintenance of avionics equipment, fault isolation, and verification of fault correction A72-11022
Development of computer programs for processing flight test data and standardizing in-flight performance of aircraft [FAD-725761] A72-11054
Airport/aircraft system computer listing for Burroughs 5500 and IBM 7094 from study on transportation noise [PA-19832] A72-11058
COMPUTER STORAGE DEVICES
Digital computer memory system for real time processing and graphics for digital airborne display - discussing logic design, time comparisons and optimum use A72-12647
COMPUTERIZED DESIGN
Aircraft design interactive computer graphics technique, using human decision input response to computer output information [DOLE PAPER 71-107] A72-12733
Computerized design of civil aircraft using freight criteria in parametric analysis [AD-727231] A72-11061
COMPUTERIZED SIMULATION
Handling qualities simulation program for augmentor wing jet STOL research aircraft considering control devices design A72-11654
Mathematical models of rate gyros, servo accelerometers, pressure transducers, and telemetry systems and analog computer simulation programs [NASA-CR-1768] A72-10401
Cost analysis and operational procedures of effective short range, high density computer transportation system for Metropolitan Detroit [NASA-CR-116340] A72-10984
CONCORDE AIRCRAFT
Concorde airworthiness certification, discussing ground and flight test programs for performance, flying qualities and structures fatigue properties evaluation [SAGE PAPER 710756] A72-10253
Concorde engine performance, reviewing control, reheat and exhaust systems [SAGE PAPER 710775] A72-10267
CONFERENCES
Electronics and aerospace systems - IEEE Conference, Washington, D.C., October 1971 A72-12376
Radio aids to maritime and aerial navigation - Conference, Trieste, June 1971 A72-12640
Conference papers on jet and slipstream influence on aerodynamic coefficients using aircraft models [DLR-MATT-70-28] A72-10004
Rotor and propeller wake calculation, recovery rotors, and rotor feedback control [DLR-MATT-71-12] A72-11001
Proceedings of conference on aviation maintenance in 1970 time period conducted at Oklahoma City, Oklahoma, December 8-10, 1970 A72-11019
Aircraft fuels, lubricants, and fire safety - conferences [AGARD-CP-84-71] A72-11668
CONICAL MOUTH
Area rule for change in lift/drag ratio of hypersonic delta wing due to conical body addition on compression side A72-12270
CONTROL SIMULATION
Augmentor wing jet STOL research aircraft development progress report covering design, engine tests, performance prediction, control simulation and stability augmentation [SAGE PAPER 710757] A72-10254
COBTBOL THEOBY
Imposing inclined jet effect on aerodynamic characteristics of control surface in VTOL longitudinal stability A72-10011
CONTROL THEORY
Aircraft pitching and yawing cross couplings compensation at high speed A72-10506
CONTROLLABILITY
Handling qualities simulation program for augmentor wing jet STOL research aircraft considering control devices design A72-11654
Static and dynamic stability and controllability of rigid rotor 80-105 helicopter noting feedback effects A72-11008
Supersonic transport aircraft and BAC 221 aircraft piloted flight simulation near zero rate climb velocity for determining aircraft maneuver controllability at low speed [ABC-CP-1165] A72-11048
COUTDAGE
Axial cords effects on parachute drag and stability characteristics and opening time, discussing wind tunnel and balloon drop tests results A72-10306
Parachute canopy fabrics and rigging lines - considering weight and cost A72-10314
COSBIC BAYS
COSMIC RAYS
In-flight warning meter for solar and cosmic radiation dose equivalent measurements for radiological protection in SST aircraft A72-12078
COST ANALYSIS
Variable speed constant frequency power generation equipment influence weapon system effectiveness, considering weight and cost A72-11067
Cost analysis and operational procedures of effective short range, high density computer transportation system for Metropolitan Detroit [NASA-CR-116340] A72-10984
Graphs and tables of service cost for intrurban transportation system [NASA-CR-114341] A72-10985
Cost analysis and economic models for European aerospace development compared to US experience [AD-725878] A72-10992
COST REDUCTION
Helicopter elastomeric bearing rotors, discussing downtime and cost reduction, maintenance, endurance and inspection A72-10150
Aircraft design productivity to reduce production cost and enhance product profitability, using joint engineering and manufacturing tests [SAGE PAPER 710788] A72-10247
Application of brazing techniques for remanufacturing of jet engine components to reduce cost of commercial aircraft maintenance A72-11024
COUNTERS
Electronic strain-level counter for in-flight aircraft [NASA-CASE-LAB-10756-1] A72-11803
CRACK INITIATION
Metallographic and fractographic analyses of cracking in T53-113 gas turbine engine compressor disks A72-10816
CRACK PROPAGATION
Theoretical and analytical aspects of metal fatigue failure and relationships to fracture mechanics [AD-725028] A72-10957
CRACKING (FRACTURING)
Portable self contained ultrasonic field inspection equipment for nondestructive crack detection in T53 gas turbine compressor disks A72-10816
CRACKS
Residual buckling strength of Al alloy elastic column with fatigue crack

CRASH LANDING
Simulated crash tests to assess fire resistance of aircraft fuels containing polymeric additives

CROSS COUPLING
Aircraft pitching and yawing cross couplings compensation at high speed

CROSS FLOW
Laminar three dimensional boundary layer nonequilibrium effects at hypersonic wing swept leading edge with intensively cooled surface, considering sweep induced crossflow effect

CYLINDRICAL BODIES
Calculation of pressure distribution on cylindrical fuselage with perpendicular lifting jet using singularity method

DATA ACQUISITION
On-line digital computer for wind tunnel, operating wind tunnels measuring equipment and procedures and data acquisition and processing systems, electronics, describing computerized real time data processing system

DATA PROCESSING
Digital computer memory system for real time processing of air and naval traffic data, discussing logic design, time comparisons and optimum use

DATA STORAGE
FAA air traffic control automation program, discussing on route stage, computer program, data processing and storage and terminal area navigation and display techniques

DATA SYSTEMS
Airbus data analysis system for fixed and rotary wing aircraft flight testing, including airborne and computer controlled ground stations equipment

DC 10 AIRCRAFT
Airline Propulsion Team approach to DC-10 aircraft power plant design for maximum operational effectiveness

DECAY RATES
Flutter equation approximate tree damping or rate-of-decay solution by determinant iteration

DECISION MAKING
Avionics contribution to airspace decision making problems, considering navigation, surveillance radar, collision avoidance and ATC techniques

DETERIORATION
Report of aircraft accident involving DC-9 aircraft at Gulfport, Mississippi on February 17, 1971

DETERMINANTS
Flutter equation approximate tree damping or rate-of-decay solution by determinant iteration

DIFFERENTIAL EQUATIONS
Aerodynamic behavior of thin jet-flapped airfoil, investigating integrodifferential equation solution

DIGITAL COMPUTERS
Digital computer memory system for real time processing of air and naval traffic data, discussing logic design, time comparisons and optimum use

DIRECT CURRENT
Aircraft hybrid electrical power systems, describing variable frequency generation and high voltage dc distribution
DIAGNOSTIC CONTROL

A72-11068

Flight simulator used to determine lateral and
directional aerodynamic characteristics of STOL
transport aircraft

A72-11037

DISPLAY DEVICES

Automated radar terminal system /ABTS/ for
monitoring and tracking all aircraft within radar
range, displaying identification, altitude and
ground speed information to air traffic controller

A72-10960

Electronic displays for attack aircraft, discussing
subsystems, simulation technique and pilot role

A72-11756

Airborne pictorial navigation systems for visual
indication of aircraft position in addition to
digital readout

A72-12106

FAA air traffic control automation program,
discussing en route stage, computer program, data
processing and storage and terminal area
navigation and display techniques

A72-12380

Computer-aided interactive graphic displays for ATC,
discussing subsystems, data processing flow and
operational capabilities

A72-12420

Tactical ATC display system for airport
surveillance, precision approach and landing and
operator/aircraft/machine operations by using
terminal area Surveillance Radar

A72-12421

DISTANCE MEASURING EQUIPMENT

VOR, Direct Measuring Equipment and VOR-AID
coordinate radio navigation systems history,
 improvements and future development

A72-12686

DISTRICT OF COLUMBIA

Short term airport access improvements in
Washington-Baltimore area with service brochure

A72-10232

DOCUMENTATION

Documentation of data used in intraurban
transportation analysis appendix

A72-10987

DOPPLER RADAR

Doppler system with navigation radar device,
computer unit and data transmitter for continuous
recording of aircraft position and speed

A72-12749

DOSIMETERS

In-flight warning meter for solar and cosmic
radiation dose equivalent measurements for
radiological protection in SST aircraft

A72-12708

DOWNTIME

Helicopter elastomeric bearing rotors, discussing
downtime and cost reduction, maintenance,
endurance and inspection

A72-10150

DOWNSWASH

European airbus wind tunnel model aerodynamic force
and downwash measurements noting jet interference
reduction

A72-10012

Rotor downwash variation by changing vortice
diameter, flapping, rotor speed, and radius and
placing infinite span wing in flow field

A72-11003

Numerical evaluation of downwash integral for
lifting rectangular wings noting wing loading

A72-11012

DRAG

Area rule for change in lift/drag ratio of
hypersonic delta wing due to conical body addition
on compression side

A72-12270

Jet aircraft brake parachute loads under engine
wake, evaluating velocity and drag coefficient
influences

A72-12504

DRAG CHUTES

Jet aircraft brake parachute loads under engine
wake, evaluating velocity and drag coefficient
influences

A72-12504

DRAG MEASUREMENT

Drag and lift experimental determination for low
aspect ratio rectangular wings with blunt trailing
edge at Mach numbers 0.5-2.2

A72-12712

DROP TESTS

 Ribbon parachutes drop tests at Mach 0.57-1.70,
measuring opening shock loads and functioning time
sequence

A72-10312

DUCTILITY

Superalloys ductility and workability improvements
without sacrificing elevated temperature strength for
aircraft engine applications

A72-12561

DUST

Sand and dust particle filter tests for evaluation of
separation efficiency and aerodynamic
performance

A72-11713

DYNAMIC MODELS

Aerelastic models construction for flutter analysis
of aircraft design, noting error risk reduction

A72-12722

DYNAMIC STABILITY

Static and dynamic stability and controllability of
rigid rotor BO-105 helicopter noting feedback
effects

A72-11008

DYNAMIC TESTS

Prediction of flight penetration of wing buffeting
from wind tunnel model dynamic tests

A72-11044

EARS ATOSPHERE

Air law concept as totality of legal regulations
related to atmosphere use by flying devices,
discussing relation to international environmental
protection

A72-11107

EARS RESOURCES SURVEY AIRCRAFT

Multichannel multispectral scanner system for NASA
C-130 earth resources aircraft, describing
electronic equipment and calibration sources

A72-10946

ECONOMICS

Formaldehyde for components of perturbation velocity in
linearized subsonic theory for symmetrical cranked
wing panels at zero angle of attack

A72-10021

ECONOMIC ANALYSIS

Cost analysis and economic models for European
economic growth compared to US experience

A72-10992

ECONOMIC FACTORS

Evaluation of airway operations systems in
Indonesia, Laos, Malaysia, and Thailand with
telecommunications

A72-10171

ECONOMICS

Civil aviation air transportation contributing
elements to American economy, considering
disposable income, airline fares and time-trend
variable

A72-11721

EDUCATION

Application of Apollo Project data and training
courses to maintenance of large commercial
aircraft

A72-11026

EJECTORS

Vertical takeoff aircraft wind tunnel model with
high pressure ejectors to determine jet
interference on aerodynamic coefficients at Mach numbers

A72-10007

ELASTIC BUCKLING

Residual buckling strength of Al alloy elastic
column with fatigue crack

A72-11511

ELASTIC WAVES

Finite element method for determining transient
response of box-type structure to traveling sonic
pressure wave

A72-10219
Elastomers
Helicopter elastomeric bearing rotors, discussing downtime and cost reduction, maintenance, endurance and inspection A72-10150

Electra Aircraft
Unpredicted structural vibration in Comet and Electra aircraft, Graf Zeppelin dirigible, missile systems, etc A72-12002

Electric Connectors
Solvent removal by immersion of EC-2273 potting compound from P-4 aircraft electrical components (AD-725493) N72-11473

Electric Discharges
Electrodischarge and electrochemical machining applications in continuous repetitive production of aircraft jet engine components A72-11150

Electric Generators
Aircraft hybrid electrical power systems, describing variable frequency generation and high voltage dc distribution A72-11068

Gernan Research and Test Institute for Aero- and Astronautics 1970 report covering flow mechanics, power conversion, aerospace medicine, aerophysics, etc A72-11151

Electric Power
Variable speed constant frequency power generation equipment influence weapon system effectiveness, considering weight and cost A72-11067

Electrochemical Machining
Electrodischarge and electrochemical machining applications in continuous repetitive production of aircraft jet engine components A72-11150

Electromagnetic Radiation
Analysis of target signal requirements for aircraft navigation systems using millimeter wave radiometry from teraiss radiation or ground-based beacons [NASA-TR-2-62086] N72-10539

Electrochemical Devices
Electromechanical nose wheel steering system for general aviation aircraft ground maneuverability improvement, describing design A72-10963

Electronic Equipment
Multichannel multispectral scanner system for NASA C-130 earth resources aircraft, describing electronic equipment and calibration sources A72-10946

Electronic strain-level counter for in-flight aircraft [NASA-CASP-LAB-10756-1] N72-11803

Electronics
Electronics and aerospace systems - IEEE Conference, Washington, D.C., October 1971 A72-12376

Electrostatic Charge
Electrostatic charging in handling of aviation fuels, resulting in incendiary sparking in fuel tank N72-11666

Elevators (Control Surfaces)
Elevator lift and cockpit position effects on flight altitude control during aircraft landing approach [ARC-R-3-3662] N72-11049

Emulsions
Various gelled or emulsified fuels for reducing aircraft crash-fire hazard N72-11689

Endothermic Reactions
Cooling advanced engines by endothermic reactions of hydrocarbon fuels by absorbing sensible and latent heat N72-11672

Engine Control
Concorde engine performance, reviewing control, reheat and exhaust systems [SAE PAPER 710775] A72-10277

Engine Coolants
Cooling advanced engines by endothermic reactions of hydrocarbon fuels by absorbing sensible and latent heat N72-11672

Engine Design
Propulsion system optimization for commercial transport aircraft design under Advanced Transport Technology study, considering impact on aircraft gross weight [SAE PAPER 710760] A72-10257

Advanced technology air transports propulsion system requirements, considering design, engine performance and reliability, maintenance, airline problems, noise and pollution control [SAE PAPER 710761] A72-10258

Graphite fiber composite fan blade design for subsonic turbofan engines, discussing weight and fatigue sensitivity reductions and performance test results [SAE PAPER 710771] A72-10265

Small three spool, reverse and mixed flow turbofan engine for business jets, discussing fuel consumption reduction, therodynamic performance, efficiency and maintainability [SAE PAPER 710776] A72-10268

Aircraft power plant design and installation influence on operational effectiveness, discussing manufacturers and operators cooperation for reliability and maintainability enhancement [SAE PAPER 710777] A72-10269

Airline Propulsion Team approach to DC-10 aircraft power plant design for maximum operational effectiveness [SAE PAPER 710778] A72-10270

CF6 high bypass ratio turbofan engine design improvements for fuel consumption, thrust/weight ratio, starting, noise level, smoke emissions, maintenance, monitoring and accessory replacement [SAE PAPER 710779] A72-10271

PF6 and JT150 gas turbine aircraft engines development and service experience A72-11699

Q/STOL jet aircraft engines design for low noise levels, describing takeoff thrust, bypass ratio and turbine stages A72-11254

Disk shaped lift engine providing additional thrust during takeoff and transition phases of V/STOL aircraft, returning to ground by jet after tank accomplishment A72-12900

Development and application of modular design concept to improve jet aircraft engine maintenance A72-11030

Cascade calculations and tests of blunt trailing edge blades used in advanced axial compressor concepts (AD-725789) N72-11308

Engine Failure
STOL aircraft roll moment control possibility for externally-blown jet fan due to engine failure A72-11700

Engine Inlets
Analysis of interaction of oblique shock with bow shock of blunt leading edge and application to design of hypersonic laser inlets [AD-726111] N72-11312

Engine Noise
Jet aircraft turbofan engine compressor noise reduction by acoustic linings, giving B and D results [NASA PAPER 71-S6] A72-10223

Aircraft engine noise effects in airport vicinities, discussing measurement scales, turbofan sources, noise reduction and future air traffic A72-12022

Noise generation by rotating blades of axial flow fan in infinite annulus [AD-726126] N72-11714

Engine Parts
Electrodischarge and electrochemical machining applications in continuous repetitive production of aircraft jet engine components A72-11150

Jet engine component overhaul procedures for fatigue damage repair, detailing distressed metal removal, replacement and welding techniques A72-12999

Engine Tests
Asbestos wing jet STOL research aircraft development progress report covering design, engine tests, performance prediction, control simulation and stability augmentation A72-12099
ENHANCEMENT POLLUTION

[SARE PAPER 710757] A72-10254
Graphite fiber composite fan blade design for subsonic turbofan engines, discussing weight and fatigue sensitivity reductions and performance test results
[SARE PAPER 710771] A72-10265
Thermal shock fatigue tests on aircraft gas turbine engine inlet nozzles, showing cracks as function of material
A72-11373

ENHANCEMENT SIMULATION
Air law concept as totality of legal regulations related to atmosphere use by flying devices, discussing relation to international environmental protection
A72-11077

ENHANCEMENT SIMULATION
Suitability evaluation of fog simulator for weather conditions during flight approach
[AFA-NA-71-44] N72-10233

ENVIRONMENTAL ENGINEERING
Acoustic echo sounder as real time monitor of airport environmental meteorological parameters
A72-11137

ENVIRONMENTAL TESTS
Evaluation of simulated pilot/system performance in manually controlled IFF formation flight task for UH-1 helicopter under various environmental and operational conditions
[AD-725209] N72-10044

EPoxy RESINS
Lightweight protective coatings for boron/epoxy composite materials, discussing high current damage mechanisms, simulation facility and test results on aluminum foils, mesh, etc
A72-10783

ERROR ANALYSIS
Terminal aerodrome forecasts usefulness and accuracy assessment
A72-10868
Optical stochastic /Kalman/ filters application to integrated air and submarine navigation systems, discussing measurement errors modeling as bias and colored noise
A72-12050

ESCAPE SYSTEMS
Parachute designs and applications to escape systems, para-trooping, supply dropping, aircraft skiing, weapons systems stabilization, flight testing aids and sport
A72-10302

ESTERS
Synthesis and properties of aliphatic ester for turbine lubrication in jet aircraft
N72-11696
Synthetic high temperature lubricants thickened by complex esters for supercritical steam
N72-11701

EUROPEAN JET FUEL LUBRICITY EVALUATION
European jet fuel lubricity evaluation
N72-11679

EUROPEAN AIRCRAFT
European A300B Airbus flying control hydraulic system and landing gear design for safety and reliability, fatigue life, weight and maintenance
A72-10724
European A300B Airbus flap and slat systems and tailplane actuator for longitudinal pitch trim control
A72-10725
European Airbus wind tunnel model aerodynamic force and downwash measurements noting jet interference reduction
A72-10012

EUROPEAN SPACE PROGRAMS
Cost analysis and economic models for European aerospace development compared to US experience
[AD-725478] N72-10992

EXHAUST FLOW SIMULATION
Jet engine simulation with low speed wind tunnel models for interference drag measurement
A72-10005

EXHAUST GASES
Aircraft activity effects on air pollution in San Francisco Bay area with engine emission and climatological data
A72-10361
Propulsion systems for low emission urban vehicles and analysis of exhaust emissions from fossil-fueled heat engines
N72-10830

EXHAUST NOZZLES
Nozzle shape, temperature, and velocity effects on free hypersonic jet exhaust properties
N72-10013
Design, fabrication, and ground tests of perforated stainless steel exhaust nozzle inserts for Boeing 707 aircraft noise reduction
[NASA-CH-1853] N72-10043

EXHAUST SYSTEMS
Concorde engine performance, reviewing control, rebreat and exhaust systems
[SARE PAPER 710775] A72-10267
Reduction of harmful emissions of turbine engine exhaust system
N72-11675

EXHAUST VELOCITY
Nozzle shape, temperature, and velocity effects on free hypersonic jet exhaust properties
N72-10013

EXPLOSIONS
Analysis of fire and explosion hazard in aircraft fuel tanks and methods for predicting fuel/air concentrations in tanks
[AD-725027] N72-11056
Fire and explosion protection fuel tank ullages, including oxygen reduction, vapor or mist inerting, and plastic foam fillers
N72-11690

F

F-4 AIRCRAFT
Solvant removal by immersion of RC-2273 potting compound from F-4 aircraft electrical components
[AD-725493] N72-11473

FABRICATION
Graphite filament reinforced plastics strength, performance properties, fabrication processes and tooling concepts
[SARE PAPER EM 71-205] A72-10968

FAIL-SAFE SYSTEMS
Fail-operational automatic landing system for Boeing 747 aircraft, noting reduction in allowable minimum weather conditions in U.S. and OK
A72-10661

FAILURE ANALYSIS
Theoretical and analytical aspects of metal fatigue failure and relationships to fracture mechanics
[AD-725028] N72-10957

FATIGUE LIFE
European A300B Airbus flying control hydraulic system and landing gear design for safety and reliability, fatigue life, weight and maintenance
A72-10724

FATIGUE TESTS
Nondestructive radioactive gas penetrant tests for porosity and fatigue damage in jet engine castings
A72-10813
Metal fatigue damage nondestructive detection, discussing inspection methods, equipment, advantages, limitations and test results
A72-12499

FEEDBACK CONTROL
Rotor and propeller wake calculation, recovery rotors, and rotor feedback control
[DLR-MTR-71-12] N72-11001
Static and dynamic stability and controllability of rigid rotor BO-105 helicopter noting feedback effects
N72-11008

FILTERS
Dual purpose filter-separators for dirt and water removal from fuel
N72-11676

FINITE ELEMENT METHOD
Airport apron surface pavement strain measurements under field loading conditions, considering static and dynamic loads with finite element method
A72-10192
Finite element method for determining transient response of box-type structure to traveling sonic pressure wave
A72-10219
Technical programmers manual for automated procedure of optimizing practical aerospace structures - Vol. 2
[AD-725744] N72-10047
FIBBED BODIES

Static and dynamic stability characteristics of finned bodies with cruciform, slotted fin configuration [AD-726016] N72-10003

FLIGHT EXTINGUISHERS

Extending flames and fires on aircraft [AD-726140] N72-11680

Fire extinguishing system in aircraft, using exhaust gases of solid propellant gas generator to pressurize extinguisher bottle [AD-726165] N72-11685


Use of fluorocarbon surfactants to extinguish aircraft fuel fires [AD-726193] N72-11693

FIRE PREVENTION

Basic requirements for airborne infrared forest fire detection system [AD-726093] N72-10396

Simulated crash tests to assess fire resistance of aircraft fuels containing polymeric additives [AD-726953] N72-11692

FIRE

Analysis of fire and explosion hazards in aircraft fuel tanks and methods for predicting fuel/air concentrations in tanks [AD-725027] N72-11056

Aircraft fuels, lubricants, and fire safety - conferences [AGARD-CP-84-71] N72-11668

Flammability properties of jet fuels and techniques for fire and explosion suppression under simulated hostile operating environment conditions [AD-725028] N72-11681

Various gelled or emulsified fuels for reducing aircraft crash-fire hazard [AD-726954] N72-11689

Fire and explosion protection fuel tank bulkheads, including oxygen reduction, vapor or mist inerting, and plastic foam fillers [AD-726955] N72-11690

FIXED WINGS

Wing-fuselage combination aerodynamic coefficients, comparing experimental data with subsonic linear and nonlinear theoretical results [SGLN PAPER 71-115] N72-12723

FLAPPING WINGS

Constant phase shift between flapping and action on center of gravity for spring hinged rotor with variable flapping stiffness [ARC-CP-1176] N72-11048

FLAPS (CONTROL SURFACES)

European A300B airbus flap and slat systems and tailplane actuator for longitudinal pitch trim control [FAA-NA-71-47] N72-10233

Externally blown flaps for STOL characteristics in medium and heavy jet transport aircraft, demonstrating aerodynamic and flight mechanical feasibility [FAA-NA-71-56] N72-10252

Effects of Reynolds number and frequency parameters on buzz characteristics at subsonic speeds using free oscillation method [NPL-ARB-1312] N72-11291

FLIGHT

Radar observation of weather conditions for aircraft flight [NOM-26A-TP-148] N72-11147

Elevator lift and cockpit position effects on flight altitude control during aircraft landing approach [ARC-CP-3662] N72-11049

Elevator lift and cockpit position effectiveness on flight altitude control during aircraft landing approach [ARC-CP-3662] N72-11049

Elevator lift and cockpit position effects on flight altitude control during aircraft landing approach [ARC-CP-3662] N72-11049

FLIGHT ALTITUDE

Elevator lift and cockpit position effects on flight altitude control during aircraft landing approach [ARC-CP-3662] N72-11049

FLIGHT CHARACTERISTICS

Externally blown flaps for STOL characteristics in medium and heavy jet transport aircraft, demonstrating aerodynamic and flight mechanical feasibility [ARC-CP-3662] N72-11049

Soviet book on in-flight studies of aircraft stability and controllability covering dynamic characteristics, measurements, balancing curves, aerodynamic forces and limiting and special flight regimes [ARC-CP-3662] N72-11049

FLIGHT CONTROL

Elevator lift and cockpit position effects on flight altitude control during aircraft landing approach [ARC-CP-3662] N72-11049

Analysis of flight control system requirements for helicopters and design of pilot assisted control system [AD-726550] N72-11057

FLIGHT CRASHES

Effects of environmental stresses on attack helicopter crew task performance in NATO theater [AD-726990] N72-10122

FLIGHT PATHS

Soviet book on course-indicating systems and automatic navigation aids for civil aviation aircraft covering design, operation principles, error analysis and reliability [AD-726956] N72-12298

Suitability evaluation of fog simulator for weather conditions during flight approach [FAA-NA-71-47] N72-10233

FLIGHT RULES

German Federal Republic territorial air traffic regulations covering general, VFR and IFR rules, equipment and personnel examination and certification, safety, takeoff and landing, accidents, etc [FAA-NA-71-47] N72-12621

FLIGHT SIMULATION

Evaluation of simulated pilot/system performance in manually controlled IFB formation flight task for UH-1 helicopter under various environmental and operational conditions [AD-725209] N72-10044

Supersonic transport aircraft and BAC 221 aircraft piloted flight simulation near zero rate climb velocity for determining aircraft maneuver controllability at low speed [ARC-CP-1165] N72-11048

FLIGHT SIMULATORS

Flight simulator used to determine lateral and directional aerodynamic characteristics of STOL transport aircraft [FAA-NA-71-61] N72-11037

Flight simulator exercise for investigation of pilot performance in low visibility conditions during approach and landing [FAA-NA-71-47] N72-11042

FLIGHT TESTS

TriStar commercial jet transport aircraft development, discussing design and flight tests for operating efficiency, reliability and safety [SAE PAPER 710755] N72-10252

Concorde airworthiness certification, discussing ground and flight test programs for performance, flying qualities and structures fatigue properties evaluation [SAA PAPER 710756] N72-10253

Flight test procedures for supersonic transport aircraft pitot static pressure system, recommending trailing cone calibration method [SAA-ARB-921] N72-10389

Army data analysis system for fixed and rotary wing aircraft flight testing, including airborne and computer controlled ground stations equipment [SAA-ARB-921] N72-12408

Flight vibration testing methods for ascertaining flutter stability of high speed aircraft [DGIT PAPER 71-083] N72-12725

Crew compartment noise environment in B-52 aircraft during low altitude, high speed flight [AD-727023] N72-10127

Ground and air tests of flight inspection marker beacon receiving system [FAA-NA-71-47] N72-10173

Flight tests of BAC 221 aircraft crosswind landing and sidestep maneuvers [ARC-CP-1168] N72-11045

Development of computer programs for processing flight test data and standardizing in-flight performance of aircraft [AD-726550] N72-11056

FLIGHT TRAINING

Maneuver acceleration measured for estimating loads during civil aircraft training and test flying [ARC-CP-1176] N72-11043

FLIGHT VEHICLES

Air law concept as totality of legal regulations related to atmosphere use by flying device,
FLOW CHARACTERISTICS

- Discussing relation to international environmental protection

FLOW CHARACTERISTICS
- Parachutes flow characteristics in low speed free descent, discussing glide angle effect on total drag and water channel pattern studies

FLOW DEFLECTION
- Velocity field of sonic flow about aircraft wing profile, solving mixed Cauchy problem

FLOW DISTRIBUTION
- Supersonic and hypersonic flows with attached shock waves over delta wing at angle of attack, deriving unified theory for flow field

FLOW MEASUREMENT
- Gas turbine nozzles aerodynamic throat area flow measurement, describing accuracy, standards, reference nozzles and mounting flanges

FLOW THEORY
- Subsonic linearized theory for symmetrical cranked wings at zero incidence, presenting corrected formulas for streamwise and spanwise perturbation velocity components due to wing thickness

High speed jet noise source physical properties interpretation by theory and scale-model experiments for supersonic transport aircraft noise suppression problem

FLOW VELOCITY
- Velocity field of sonic flow about aircraft wing profile, solving mixed Cauchy problem

FLUID MECHANICS
- German Research and Test Institute for Aero- and Astronautics 1970 report covering flow mechanics, power conversion, aerospace medicine, atmospheric physics, etc

FLUTTER ANALYSIS
- Flutter equation approximate true damping or rate-of-decay solution by determinant iteration

Aerelastic models construction for flutter analysis of aircraft design, noting error risk reduction

Flight vibration testing methods for ascertaining flutter stability of high speed aircraft

FOAMS
- Liquid-base foam sound absorbing properties for jet aircraft noise reduction

FOG
- Suitability evaluation of fog simulator for weather conditions during flight approach

FORCE DISTRIBUTION
- Force and pressure distribution measurements on delta wing-body combination in compressible flow, investigating Reynolds number effect

FORESTS
- Basic requirements for airborne infrared forest fire detection system

FORGED
- Forged Inconel alloy 718 metal powder preforms for dense aircraft engine compressor rotor blades

FORGING
- Forged Inconel alloy 718 metal powder preforms for dense aircraft engine compressor rotor blades

FORMULAS (MATHEMATICS)
- For use in components of perturbation velocity in linearized subsonic theory for symmetrical cranked wing panels at zero angle of attack

FRACTOGRAPHY
- Metallographic and fractographic analyses of cracking in T53-L13 gas turbine engine compressor disks

FRACTURE MECHANICS
- Theoretical and analytical aspects of metal fatigue failure and relationships to fracture mechanics

FREE FLIGHT TEST APPARATUS
- Free flight simulation tests for V/STOL aircraft nonlinear attitude control system adaptation to helicopter pitch and roll control

FREE JETS
- Nozzle shape, temperature, and velocity effects on free hypersonic jet exhaust properties

FREE VIBRATION
- Effects of Reynolds number and frequency parameters on buzz characteristics at subsonic speeds using free oscillation method

FREQUENCIES
- Effects of Reynolds number and frequency parameters on buzz characteristics at subsonic speeds using free oscillation method

FRICTION MEASUREMENT
- Skin friction measurement in nonisobaric subsonic flow with pressure gradient over airfoil section by surface impact probes

FUEL CONSUMPTION
- Small three spool, reverse and mixed flow turbofan engine for business jets, discussing fuel consumption reduction, thermodynamic performance, efficiency and maintainability

FUEL CONTROL
- Variable-office gas turbine system for fuel rate control in aircraft

FUEL SYSTEMS
- Aviation fueling facilities and fueling operation

FUEL TANKS
- Analysis of fire and explosion hazards in aircraft fuel tanks and methods for predicting fuel/air concentrations in tanks

FUEL PROPS
- Viscosity and additive effects on jet engine fuel antiseize properties improvement

FUSELAGES
- Properties evaluation of lubricants and fuels for use in advanced aircraft gas turbine

FUNCTIONAL INTEGRATION
- Aircraft and spacecraft integrated avionics systems design with emphasis on telemetry, discussing space shuttle subsystems integration

FUNCTIONS (MATHEMATICS)
- Linear functional law for alleviating gusts on delta wing aircraft

FUSELAGES
- Acoustic power radiated by jet aircraft fuselage structure exposed to turbulent boundary layer pressure field, evaluating noise reduction treatments

Wing-fuselage combination aerodynamic coefficients, comparing experimental data with subsonic linear and nonlinear theoretical results

Calculation of pressure distribution on cylindrical fuselage with perpendicular lifting jet using singularity method
HELICOPTER DESIGN

- Helicopter pitch and roll control

- Analysis of flight control system requirements for helicopters and design of pilot assisted control system

HELICOPTER DESIGN

- Matrix method calculation for aerodynamic loads, transverse forces, bending moments, and twist of blunted main rotor blades in helicopter during forward flight

- Analysis of military helicopter reliability requirements based on performance and reliability test programs

HELICOPTER PERFORMANCE

- Aerodynamic characteristics of helicopters and principles of helicopter flight

- Helicopter wakes

- Turbulent and laminar jet flow in rotating environments noting application to jet mixing flow in tip drives rotor wakes

- Lifting rotor flow noting wake models

- Variable geometry rotor system for direct control over wake vortex

HELICOPTERS

- Helicopter antennas placement, using scale models for three dimensional radiation pattern semi-automatic recording under free space conditions

- Helicopter elastomeric bearing rotors, discussing downtime and cost reduction, maintenance, endurance and inspection

- Helicopter rotor tip drag relief estimate based on two dimensional drag divergence with Mach number, airfoil parameters and flight conditions

- Aerodynamic characteristics of helicopters and principles of helicopter flight

- Helicopter lift margin system to aid in determining power requirements for takeoff and landing

- Analysis of helicopter tail rotor flow patterns in and out of ground effect

- Post-crash fire safety of helicopter turbine engine fuels

HIGH ALTITUDE

- Soviet book on civil aircraft high altitude equipment covering air conditioning systems, oxygen equipment and cabin pressurization

HIGH ASPECT RATIO

- Theoretical performance of jet flap rotor at advance ratios greater than 1.0

HIGH ENERGY PROPULLENTS

- Possible high energy fuels for supersonic aircraft

HIGH PRESSURE OXYGEN

- Aircraft high pressure oxygen cylinder system filler valve options standards, discussing automatic fill rate and pressure sensitive closing control, design, construction and performance

HIGH TEMPERATURE GASES

- Recirculation mechanism in jet powered V/STOL aircraft

HIGH TEMPERATURE LUBRICANTS

- Assessment of high temperature stability of synthetic lubricants for aircraft gas turbines

- Analysis of lubricant system used in civil supersonic gas turbine engine

- Synthetic high temperature lubricants thickened by complex esters for supersonic aircraft

HORIZONTAL TAIL SURFACES

- European A300B airbus flap and slat systems and tailplane actuator for longitudinal pitch trim control

- Low subsonic region unsteady interference effects on harmonically oscillating wing-tailplane model with variable sweep wing

HUBS

- Lightweight low pressure plastic hose assemblies in aircraft and missile petroleum base fuel and synthetic lubricating oil systems at 395-710 R and up to 200 psi

HUMAN FACTORS ENGINEERING

- Aircraft ride comfort problems in turbulent air, comparing free and fixed wing aircraft responses

- Analysis of flight control system requirements for helicopters and design of pilot assisted control system

HUMAN PERFORMANCE

- Application of linear mathematical model to represent human operator performance in controlling attacking fighter aircraft

- Effects of environmental stresses on attack helicopter crew task performance in NATO theater

HYBRID PROPULSION

- Nach 0.80 quiet intercity STOL transport design comparison for turbofan, prop-fan and turboprop systems

HYDROCARBON FUELS

- Jet fuels hydrocarbon composition effect on thermal stability, considering nonaromatic components influence on aromatic hydrocarbons oxidation products coagulation

- Propulsion systems for low emission urban vehicles and analysis of exhaust emissions from fossil-fueled heat engines

- Possible high energy fuels for supersonic aircraft

- Cooling advanced engines by endothermic reactions of hydrocarbon fuels by absorbing sensible and latent heat

HYPERSONIC AIRCRAFT

- Aerodynamic characteristics of wind tunnel model of hypersonic aircraft

- Kerosene-type fuel for supersonic and hypersonic aircraft

HYPERSONIC FLOW

- Supersonic and hypersonic flows with attached shock waves over delta wing at angle of attack, deriving unified theory for flow field

- Hypersonic boundary layer

- Laminar three dimensional boundary layer nonequilibrium effects at hypersonic wing swept leading edge with intensively cooled surface, considering sweep induced crossflow effect

- Hypersonic boundary layer separation of delta wing in shock tunnel using color and monochromatic schlieren photography

HYPERSONIC VEHICLES

- Area rule for change in lift/drag ratio of hypersonic delta wing due to conical body addition on compression side

IGNITION

- Theoretical analysis of fuel ignition by hot projectile and ignition delay time as function of temperature and width of hot gas region

- Crash safe turbine fuel program, using gelled fuels

IMPACT LOADS

- Parachute opening shock and filling time calculation
based on aerodynamic drag, air mass and effective porosity time functions, using momentan and continuity equations

**IMPACT TESTS**
Crash safe turbine fuel program, using gelled fuels

**IN-FLIGHT MONITORING**
In-flight warning meter for solar and cosmic radiation dose equivalent measurements for radiological protection in SST aircrafts

**Soviets book on in-flight studies of aircraft stability and controllability covering dynamic characteristics, measurements, balancing curves, aerodynamic forces and limiting and special flight regimes**

**INCORAL (TRADEMARK)**
Forged Inconel alloy 718 metal powder preforms for dry sinter engine compressor rotor blades

**INDICATING INSTRUMENTS**
Airfield Vehicle Obstacle Indication Device short range high-definition radar system for aircraft navigation aid

**Soviets book on course-indicating systems and automatic navigation aids for civil aviation aircraft covering design, operation principles, error analysis and reliability**

**INERTIAL NAVIGATION**
Passenger aircraft onboard automated inertial navigation devices, emphasizing accelerometer and gyroscope design and construction

**Passenger aircraft onboard automated inertial navigation devices, discussing path control accuracies, environmental conditions, noise and air pollution, etc**

**INFINITE SPAN WINGS**
Rotor downwash variation by changing vortex diameter, flapping, rotor speed, and radius and placing infinite span wing in flow field

**INFLATION**
Parachute opening shock and filling time calculation based on aerodynamic drag, air mass and effective porosity time functions, using momentan and continuity equations

**Parachute inflation loads and times, presenting calculation method based on unsteady pressure distribution on decelerating inflating parabolic shell of revolution with unsteady starting vortex**

**INFRARED DETECTORS**
Basic requirements for airborne infrared fire detection system

**INFRARED SPECTROPHOTOMETERS**
Infrared spectrophotometer used for detection of trace contaminants from Pegasus and Olympus engines in aircraft cabin atmospheres

**INFRASONIC FREQUENCIES**
Portable detector-recorder for automobile, blast furnace, railroad car, engine room and helicopter infrasonic noise measurements, discussing peak frequencies and subjective effects

**INGESTION (ENGINES)**
Recirculation mechanism in jet powered V/STOL aircraft

**INLET NOZZLES**
Thermal shock fatigue tests on aircraft gas turbine engine inlet nozzles, showing cracks as function of material

**In-flight investigation of installation effects and aerodynamic characteristics of local flow field on auxiliary inlet ejector nozzle on undervening engine macelle**

**INLET/OUTPUT ROUTINES**
Development of structural optimization algorithms for obtaining near optimum distributions of material for structural idealizations

**INTERNATIONAL LAW**

**INSPECTION**
Metal fatigue damage nondestructive detection, discussing inspection methods, equipment, advantages, limitations and test results

Ground and air tests of flight inspection markers beacon receiving system

**Development of technique for graphic presentation of fault isolation and problem correction for maintenance of large commercial aircraft**

**INSTRUMENT ERRORS**
Optimal stochastic Kalman filters application to integrated air and submarine navigation systems, discussing measurement errors modeling as bias and colored noise

Performance tests on aerodynamically compensated pressure heads for BAC 721 aircraft noting pressure sensing errors

**INSTRUMENT LANDING SYSTEMS**
Aircraft ILS, discussing history, adverse weather operations and replacement systems

**INTRAKE SYSTEMS**
In-flight investigation of installation effects and aerodynamic characteristics of local flow field on auxiliary inlet ejector nozzle on undervening engine macelle

**INTEGRAL EQUATIONS**
Aerodynamic behavior of thin jet-flapped airfoil, investigating integro-differential equation solution

**INTERFERENCE DRAG**
Jet engine simulation with low speed wind tunnel models for interference drag measurement

Jet interference effects on raw stability for SAB 37 and 105 wind tunnel models

**Vertical takeoff aircraft wind tunnel model with high pressure ejectors to determine jet interference on aerodynamic coefficients**

Jet interference and lift drag ratio of swept wing aircraft with turbofan above wing

**Influence of jet interference on aerodynamic coefficients of rectangular and swept wings mounted above the engine**

**Impinging inclined jet effect on aerodynamic characteristics of control surface in VTOL longitudinal stability**

European Airbus wind tunnel model aerodynamic force and downwash measurements noting jet interference reduction

Multipropeller slipstream and wing interference, noting lift, drag, pitching moment, normal force distribution, and washes

**INTERFERENCE LIFT**
Low subsonics region unsteady interference effects on harmonically oscillating wing-tailplane model with variable sweep wing

**Multi-Propeller slipstream and wing interference, noting lift, drag, pitching moment, normal force distribution, and wakes**

**Aerodynamic lift characteristics of oscillating two dimensional airfoil subjected to sinusoidal gust**

**INTERNATIONAL COOPERATION**
UHF aeronautical satellite system, presenting ATC trends, international aspects, available flight levels, weather conditions and long haul conflicts

**INTERNATIONAL LAW**
Air law concept as totality of legal regulations related to atmosphere use by flying devices, making sense of international law
JET AIRCRAFT

Augmentor wing jet STOL research aircraft development program report covering design, engine tests, performance prediction, control simulation and stability augmentation [S.A.E. Paper 72-00757] A72-10258

Handling qualities simulation program for augmentor wing jet STOL research aircraft considering control devices design A72-11654

Carrier system for controlled approach of Naval aircraft to provide pilot window to deck for tactical jet guidance for poor visibility landing A72-12323

Externally blown flaps for STOL characteristics in medium and heavy jet transport aircraft, demonstrating aerodynamic and flight mechanical feasibility A72-12502

Jet aircraft brake parachute loads under engine wake, evaluating velocity and drag coefficient influences A72-12504

Full scale wind tunnel tests of small unpowered jet aircraft with T tail [NASA TM-D-6573] N72-10031

Description of maintenance procedures used on Beechcraft Hawker 125 commercial jet aircraft A72-11032

Synthesis and properties of aliphatic ester for turbine lubrication in jet aircraft A72-11696

JET AIRCRAFT NOISE

Liquid-base foam sound absorbing properties for jet aircraft noise reduction A72-10160

Aerodynamic noise radiated by jet aircraft fuselage structure exposed to turbulent boundary layer pressure field, evaluating noise reduction treatments A72-10216

Jet aircraft turbofan engine fan compressor noise reduction by acoustic linings, giving B and D results [S.A.E. Paper 71 S46] A72-10223

Jet noise reduction technology, hardware and tests for NASA Quiet Engine Program to develop low noise subsonic civil transport aircraft propulsion system [S.A.E. Paper 710774] A72-10266

High speed jet noise source physical properties interpretation by theory and scale-model experiments for supersonic transport aircraft noise suppression problem A72-11973

Q/STOL jet aircraft engines design for low noise levels, describing takeoff thrust, bypass ratio and turbine stages A72-12501

Aladin 2 noiseless STOL jet aircraft project, describing exhaust nozzle configuration, design and economics A72-12503

Annotated bibliography on aircraft noise pollution - Vol. 1 [AD-724850] N72-10036

Sound generation and scale model experiments to suppress noise in turbulent jet flow eddies of supersonic transport aircraft [AEC-32723] A72-10254

Noise generation by rotating blades of axial flow fan in infinite annulus [AD-726126] A72-11718

JET ENGINE FUELS

Viscosity and additive effects on jet engine fuel antiflame properties improvement A72-11968

Jet fuels hydrocarbon composition effect on thermal stability, considering nonaromatic components A72-11968

Jet fuel specifications for military and civil aircraft A72-12600

European jet fuel lubricity evaluation W72-11669

Flammability properties of jet fuels and techniques for fire and explosion suppression under simulated hostile operating environment conditions W72-11679


JET ENGINES

Electrodischarge and electrochemical machining applications in continuous repetitive production of aircraft jet engine components A72-11150

Jet engine component overhaul procedures for fatigue damage repair, detailing distress metal removal, replacement and welding techniques A72-12999

Jet engine simulation with low speed wind tunnel models for interference drag measurement A72-10005

Influence of jet interference on aerodynamic coefficients of rectangular and swept wings mounted above the engine A72-10010

European airbus wind tunnel model aerodynamic force and downwash measurements noting jet interference reduction A72-10012

JET EXHAUST

Nozzle shape, temperature, and velocity effects on free hypersonic jet exhaust properties A72-10013

JET FLAPS

STOL aircraft roll moment control possibility for externally-blown jet flap due to engine failure W72-10044

Theoretical performance of jet flap rotor at advance ratios greater than 1.0 A72-10037

JET FLOW

Conference papers on jet and slipstream influence on aerodynamic coefficients using aircraft models [DLR RMIT-70-23] A72-10004

Impinging inclined jet effect on aerodynamic characteristics of control surface in STOL longitudinal stability A72-10011

Flow model for jet pipe sound transmission through nozzle flow [JSEP/69] A72-10252

Sound generation in very low and very high turbulent jet flows from exhaust nozzle A72-10253

JET LIFT

Calculation of pressure distribution on cylindrical fuselage with perpendicular lifting jet using singularity method A72-10014

JOINING

Webbing joints stitching strain, considering nylon and flax yarns stretching properties and various stitching patterns strengths A72-10315

KEROSENE

Kerosene-type fuel for supersonic and hypersonic aircraft W72-11671

L-1011 AIRCRAFT

TriStar commercial jet transport aircraft development, discussing design and flight tests for operating efficiency, reliability and safety [S.A.E. Paper 710755] A72-10252

LAMINAR FLOW

Turbulent and laminar jet flow in rotating environments noting application to jet mixing flow
for aircraft using secant geared ground position indicators

**METAL FATIGUE**

Residual buckling strength of Al alloy elastic columns with fatigue crack

[SAE PAPER 71078] A72-11057

Jet engine component overhaul procedures for fatigue damage repair, detailing distressed metal removal, replacement and welding techniques

A72-12699

**METAL WORKING**

Integrity control procedures for machining, drilling and grinding of steel and Ti alloy aircraft parts, discussing nondestructive inspection method

[SAE PAPER 71079] A72-10969

Superalloys ductility and workability improvements without sacrificing elevated temperature strength for aircraft engine applications

A72-12561

**METALLOGRAPHY**

Metallographic and fractographic analyses of cracking in T53-113 gas turbine engine compressor disks

A72-10816

**METEOROLOGICAL PARAMETERS**

Acoustic echo sounder as real time monitor of airport environmental meteorological parameters

A72-11137

**METEOROLOGICAL RADAR**

Radar observation of weather conditions for aircraft flight

[NMM-264-TP-148] W72-11147

**MICHIGAN**

Cost analysis and operational procedures of effective short range, high density computer transportation system for Metropolitan Detroit

[NASA-CH-114100] W72-10984

**MICROWAVE EQUIPMENT**

Microwave aircraft landing system development, discussing contract definition, feasibility, prototype development, management planning and program costs

A72-12377

**MILITARY AIRCRAFT**

Industry assisted state of art assessment of high lift turbofan configurations for USAR STOL tactical transport technology program

[SAE PAPER 710756] A72-10255

Military specification adoption for flight characteristics of piloted V/STOL aircraft

[AD-72574] A72-10048

**MILITARY HELICOPTERS**

Effects of environmental stresses on attack helicopter crew task performance in NATO theater

[AD-72549] A72-10122

Analysis of military helicopter reliability requirements based on performance and reliability test programs

[AD-725756] A72-11059

**MILITARY TECHNOLOGY**

Parachute designs and applications to escape systems, paratrooping, supply dropping, aircraft braking, weapons systems stabilization, flight testing aids and sport

A72-10302

Paratroop type parachutes breathing oscillations and stability characteristics, using high speed cinematography and kinetodolites to track during steady state descent

A72-10307

**MILLIMETER WAVES**

Analysis of target signal requirements for aircraft navigation systems using millimeter wave radiometry from terrain radiation or ground-based beacons


**MISSILE ANTENNAS**

Unpredicted structural vibration in Conset and Electro aircraft, Graf Zeppelin dirigible, missile antennas, etc

A72-12002

**MISSILE CONTROL**

Three dimensional roll-controlled missile trajectory model for simple time-sharing digital or analog simulation, using wind-to-inertial axis transformation

A72-10964

**MISSILE STRUCTURES**

Lightweight low pressure plastic hose assemblies in aircraft and missile petroleum base fuel and synthetic lubricating oil systems at 395-710 °R and up to 200 psid

[SAE-ARP-1160] A72-10388

**MISSIONS**

Acoustic echo sounder as real time monitor of airport environmental meteorological parameters

A72-11137

**MULTISPECTRAL HARD SCANNERS**

Multichannel multispectral scanner system for NASA C-130 earth resources aircraft, describing electronic equipment and calibration sources

A72-10946

**NACELLES**

Propulsion system optimization in transonic transport aircraft design, discussing sensor integration, engine choice, noise attenuation and technology utilization

[SAE PAPER 710762] A72-10259

**NASA PROGRAMS**

Jet noise reduction technology, hardware and tests for NASA Quiet Engine Program to develop low noise subsonic civil transport aircraft propulsion system

[SAE PAPER 710774] A72-10266

**NAVIGATION AIDS**

Air transportation system design for safety and efficiency, discussing navigation facilities and surveillance systems employment for blunder prevention

A72-11117

Inertial navigation role in automatic A/T systems, discussing path control accuracies, environmental conditions, noise and air pollution, etc

A72-11118

Airfield Vehicle Obstacle Indication Device short range high-definition radar system for aircraft navigation aid

A72-12042

Optimal stochastic Kalman filters application to integrated air and submarine navigation systems, discussing measurement errors modeling as bias and colored noise

A72-12050

Airborne pictorial navigation systems for visual indication of aircraft position in addition to digital readout

A72-12106

Soviet book on course-indicating systems and automatic navigation aids for civil aviation aircraft covering design, operation principles, error analysis and reliability

A72-12998

Radio aids to maritime and aerial navigation - Conference, Trieste, June 1971

A72-12640

L band in satellite system for aerial navigation aid, discussing position accuracy, data transmission and voice communication and modulation methods

A72-12642

Radio aids for air navigation and traffic control in Italy, discussing facilities development

A72-12748

**NAVIGATION SATELLITES**

C/N aeronautical satellite system, presenting A/TC trends, international aspects, available flight levels, weather conditions and long haul conflicts

A72-12833

**NEW YORK**

Metropolitan aircraft noise abatement policy study, John F. Kennedy International Airport, New York, New York

[AD-7200164] W72-11051

**NITROGEN OXIDES**

Possible catalytic reduction of stratospheric ozone by nitrogen oxides emitted from SST aircraft

[UCLL-20568] W72-11334
NOISE (SOUND)

NOISE (SOUND)
Annotated bibliography on acoustics [NPL-AERI-AC-67] #72-10589

NOISE INTENSITY
Aircraft engine noise effects in airport vicinities, discussing measurement scales, turbine sources, noise reduction and future air traffic #72-12022

NOISE POLLUTION
Portable detector-recorder for automobile, blast furnace, railroad car, engine rooms and helicopter infrasonic noise measurements, discussing peak frequencies and subjective effects #72-12015

Aircraft noise effects on land use around airports [PB-201915] #72-10050

NOISE REDUCTION
Liquid-base foam sound absorbing properties for jet aircraft noise reduction #72-10160

Acoustic power radiated by jet aircraft fuselage structure exposed to turbulent boundary layer pressure fields, evaluating noise reduction treatments #72-10126

Jet aircraft turbofan engine fan compressor noise reduction by acoustic linings, given A and B results [NAS PAPER 71-546] #72-10223

Jet noise reduction technology, hardware and tests for NASA Quiet Engine Program to develop low noise subsonic civil transport aircraft propulsion system [SAR PAPER 710776] #72-10266

STOL aircraft for solving noise reduction and land use problems in future transportation systems, discussing airport location and layout for growing air traffic #72-11153

High speed jet noise source physical properties, interpretation by theory and scale-model experiments for supersonic transport aircraft noise suppression problem #72-11973

Aircraft engine noise effects in airport vicinities, discussing measurement scales, turbine sources, noise reduction and future air traffic #72-12022

Design, fabrication, and ground tests of perforated stainless steel exhaust nozzle inserts for Boeing 707 aircraft noise reduction [NASA-CR-18533] #72-10403

Sound generation and scale model experiments to suppress noise in turbulent jet fan flow eddies of supersonic transport aircraft [ARC-32723] #72-10254

Noise reduction for climbing takeoff and V/STOL aircraft affecting stability [NLR-PB-71-10] #72-11040

NOISE TOLERANCE
Incremental value of noise pollution level as basis for aircraft noise rating [NPL-AERO-AC-49] #72-10035

NONDESTRUCTIVE TESTS
Nondestructive radioactive gas penetrant tests for porosity and fatigue damage in jet engine castings #72-10813

Portable self contained ultrasonic field inspection equipment for nondestructive crack detection in T53 gas turbine compressor disks #72-10814

Integrity control procedures for machining, drilling and grinding of steel and Ti alloy aircraft parts, discussing nondestructive inspection method [SMR PAPER 71-2138] #72-10969

Automatic ultrasonic testing equipment for PDT tests of helicopter rotor blades #72-11021

DC-10 nondestructive testing manual, detailing section/subject format, methods, planned area accessibility and aircraft maintenance #72-11109

Metal fatigue damage nondestructive detection, discussing inspection methods, equipment, advantages, limitations and test results #72-12498

Application of nondestructive testing procedures to maintenance of large commercial aircraft #72-11025

NONEQUILIBRIUM FLOW
Laminar three dimensional boundary layer nonequilibrium effects at hypersonic wing swept leading edge with intensively cooled surface, considering swept induced crossflow effect [AIP-71-23] #72-12422

BOWLINEAR SYSTEMS
Free flight simulation tests for V/STOL aircraft nonlinear attitude control system adaptation to helicopter pitch and roll control [DGLR PAPER 71-060] #72-12714

NOSE WHEELS
Electromechanical nose wheel steering system for general aviation aircraft ground maneuverability improvement, describing design and economics #72-10963

NOSE DESIGN
Aladin 2 noseless STOL jet aircraft project, describing exhaust nozzle configuration, design and economics #72-12503

Design of flexible steel liners for adjustable transonic wind tunnel nozzle [NPL-DEH-20-1098] #72-10023

NOSE FLOW
Gas turbine nozzle aerodynamic throat area air flow measurement, describing accuracy, standards, reference nozzles and mounting flanges [SAC-ABP-1195] #72-10390

Flow model for jet pipe sound transmission through nozzle flow [JEPF/69] #72-10252

Sound generation in very low and very high turbulent jet flows from exhaust nozzle #72-10253

NOSE GEOMETRY
Gas turbine nozzle aerodynamic throat area air flow measurement, describing accuracy, standards, reference nozzles and mounting flanges [SAC-ABP-1195] #72-10390

NUMERICAL ANALYSIS
Mathematical analysis of separation standards and aircraft navigational collision risk for parallel tracks in radar monitored systems #72-10178

NUMERICAL INTEGRATION
Aircraft stability coefficient determination by numerical integration fitting to differential equations of motion #72-11136

Numerical evaluation of downwash integral for lifting rectangular wings noting wing loading [NPL-DEH-20-1095] #72-11012

Nylon (Trademark)
Parachute canopy fabrics and rigging linesording properties requirements, considering nylon, polypropylene, silk, cotton and nonwoven scrim-reinforced fabrics #72-10314

Webbing joints stitching strata, considering nylon and flax yarns stretching properties and various stitching patterns strengths #72-10315

O

OF-LINE PROGRAMMING
On-line digital computer for wind tunnel, operating systems, and real time operation [NPL-AERO-10-1326] #72-10184

ONE DIMENSIONAL FLOW
One dimensional unsteady flow in turbine engines rotating and static vane cascades, discussing vibrations propagation #72-11584

OPERATING SYSTEMS (COMPUTERS)
On-line digital computer for wind tunnel, operating systems, and real time operation [NPL-AERO-10-1326] #72-10184

OPERATIONS RESEARCH
Role of time and money cost in demand for air travel [AR-725800] #72-11850

A-26
OPTIMIZATION
Airline Propulsion Team approach to DC-10 aircraft power plant design for maximum operational effectiveness
[S AE PAPER 710778] A72-10270
Technical programmers manual for automated procedure of optimizing practical aerospace structures - Vol. 2
[AD-72574a] W72-10947
Development of structural optimization algorithms for obtaining near optimum distributions of material for structural idealizations
[AD-726112] W72-11820

OSIMICS
Variable-orifice gas turbine system for fuel rate control in aircraft

OXYGEN SUPPLY EQUIPMENT
Soviet book on civil aircraft high altitude equipment covering air conditioning systems, oxygen equipment and cabin pressurization
W72-12295

PITODN
Possible catalytic reduction of stratospheric ozone by nitrogen oxides emitted from SST aircraft
[OCRL-20568] W72-11334

PARACHUTE DESCENT
Paratroop type parachutes breathing oscillations and stability characteristics, using high speed cinematography and kinetodendrites to track during steady state descent
W72-10307
Parachute flow characteristics in low speed free descent, discussing glide angle effect on total drag and water channel flow pattern studies
W72-10309
Parachute opening shock and filling time calculation based on aerodynamic drag, air mass and effective porosity time functions, using moenutus and continuity equations
W72-10310
Parachute inflation loads and times, presenting calculation method based on unsteady pressure distribution on decelerating inflating parabolic shell of revolution with unsteady starting vortex
W72-10311

PARACHUTE FABRICS
Parachute canopy fabrics and rigging lines cordage properties requirements, considering nylon, polyethylene, silk, cotton and nonwoven scrim-reinforced fabrics
W72-10314

PARACHUTES
Parachutes and related technologies - Conference, London, September 1971
W72-10301
Parachute designs and applications to escape systems, para trooping, supply dropping, aircraft braking, weapons systems stabilization, flight testing aids and sport
W72-10302
Nonporous rigid parachute models three component measurements, using low speed wind tunnel for testing skirt length effects on aerodynamic characteristics
W72-10303
Industrial parachutes R and D in UK, discussing management, technical staff requirements and government/industry liaison
W72-10304
Axial cords effects on parachute drag and stability characteristics and opening time, discussing wind tunnel and balloon drop tests results
W72-10306

PASSENGER AIRCRAFT
Passenger aircraft onboard automated inertial navigation devices, emphasizing accelerometer and gyroscope design and construction
W72-10070

PAVEMENTS
Airport apron surface pavement strain measurements under field loading conditions, considering static and dynamic loads with finite element method
W72-10192
Life, cement, fly ash and sand combination airport pavement design and testing, discussing material structural and chemical properties, compressive strength, costs, etc
W72-12023

PENETRANTS
Nondestructive radioactive gas penetrant tests for porosity and fatigue damage in jet engine castings
W72-10813

PENETRATION
Protection of flight penetration of wing buffetting from wind tunnel model dynamic tests
[ARC-CP-1171] W72-11044

PERFORATED PLATES
Design, fabrication, and ground tests of perforated stainless steel exhaust nozzle inserts for Boeing 707 aircraft noise reduction

PERFORMANCE
Evaluation of simulated pilot/system performance in manually controlled IFF formation flight task for UH-1 helicopter under various environmental and operational conditions
W72-10044

PERFORMANCE PREDICTION
Procedure for measuring performance of aircraft fire extinguishing powders
W72-11691

PERFORMANCE TESTS
Supersonic ribbon parachute testing by transonic wind tunnel, rocket sled and water channel simulator
W72-10305
Performance of axial flow compressor rotor with different casing treatment configuration
[NASA-TP-6-6530] W72-10025
Basic requirements for airborne infrared forest fire detection system
[AD-726951] W72-10396
Performance tests on aerodynamically compensated pressure heads for BAC 221 aircraft noting pressure sensing errors
[ARC-CP-1167] W72-11046
Analysis of military helicopter reliability requirements based on performance and reliability test programs
[AD-725959] W72-11059
Calibration and performance of cosmic radiation detector for Concorde supersonic transport
[FAA-AM-71-26] W72-11370
Sand and dust particle filter tests for evaluation of separation efficiency and aerodynamic performance
[AD-725953] W72-11713

PHASED ARRAY
Constant phase shift between flapping and action on center of gravity for spring hinged rotor with variable flapping stiffness
W72-11007

PHASED ARRAYS
Phased scanning array for ATC radar beacon systems, airport or air route surveillance radars and ground landing systems
W72-10962

PHYSICAL PROPERTIES
High speed jet noise source physical properties interpretation by theory and scale-model experiments for supersonic transport aircraft noise suppression problem
W72-11973

PILOT PERFORMANCE
Evaluation of simulated pilot/system performance in manually controlled IFF formation flight task for UH-1 helicopter under various environmental and operational conditions
[AD-725209] W72-10004
Flight simulator exercise for investigation of pilot performance in low visibility conditions during approach and landing
[FAA-TH-71049] W72-11042

PILOTS (PERSONNEL)
Crew compartment vibration environment in B-52 aircraft during low altitude, high speed flight
[AD-727023] W72-10127

PIPE FLOW
Pipe flow blockage corrections in uniform and nonuniform pipe flow determined by wind tunnel measurements
[ARC-CP-1172] W72-11295

PITCH (INCLINATION)
Aircraft pitching and yawing cross couplings
compensation at high speed

**PITCHING MOMENTS**

Multipropeller slipstream and wing interference, noting lift, drag, pitching moment, normal force distribution, and wake

**PITOT TUBES**

Flight test procedures for subsonic transport aircraft pitot static pressure systems, recommending trailing cone calibration method

**PLASTIC AIRCRAFT STRUCTURES**

Lightweight low pressure plastic hose assemblies in aircraft and missile petroleum base fuel and synthetic lubricating oil systems at 395-710°F and up to 200 psi

**PLASTIC COATINGS**

Development of sprayable urethane sealant for protection of heated areas on aircraft structures

**PNEUMATIC EQUIPMENT**

Airframe high pressure oxygen cylinder system filler valve optimum standards, discussing automatic fill rate and pressure sensitive closing control, design, construction and performance

**POLAR COORDINATES**

VOF, Direct Measuring Equipment and TACAN polar coordinate radio navigation systems history, improvements and future development

**POLAR NAVIGATION**

Polar navigation with transverse mercator technique for aircraft using secant geared ground position indicators

**POLYPROPYLENE**

Parachute canopy fabrics and rigging lines cordage properties requirements, considering nylon, polypropylene, silk, cotton and nonwoven scrim-reinforced fabrics

**PORTABLE EQUIPMENT**

Portable detector-recorder for automobile, blast furnace, railroad car, engine room and helicopter infrasonic noise measurements, discussing peak frequencies and subjective effects

**POSITION ERRORS**

ATC separation minima and navigational errors on airways in general and long range oceanic environments

**POSITION INDICATORS**

Polar navigation with transverse accelerometer technique for aircraft using secant geared ground position indicators

**POWDER METALLURGY**

Forced Inconel alloy 718 metal powder preforms for dense aircraft engine compressor rotor blades

**POWER**

Helicopter lift margin system to aid in determining power requirements for takeoff and landing

**POWER SUPPLIES**

Aircraft hybrid electrical power systems, describing variable frequency generation and high voltage dc distribution

**PRESSURE DISTRIBUTION**

Parachute inflation loads and times, presenting calculation method based on unsteady pressure distribution on decelerating inflatable parametric shell of revolution with unsteady starting vortex

**PRESSURE GRADIENTS**

Skin friction measurement in nonisobaric subsonic flow with pressure gradient over airfoil section by surface impact probes

**PRESSURE HEADS**

Performance tests on aerodynamically compensated pressure heads for BAC 221 aircraft noting pressure sensing errors

**PRESSURE MEASUREMENTS**

Unsteady flow about two dimensional airfoils, determining surface pressure fluctuations induced by turbulent boundary layers

**PRESSURE SENSORS**

Airframe high pressure oxygen cylinder system filler valve optimum standards, discussing automatic fill rate and pressure sensitive closing control, design, construction and performance

**PRIMARY COSMIC RAYS**

Thin-down intensities for heavy primaries at SST flight levels, using plastic stacks measurements

**PRODUCT DEVELOPMENT**

Aircraft producibility considerations in preliminary design and production planning phases

**PRODUCTION ENGINEERING**

Aircraft producibility considerations in preliminary design and production planning phases

**SUBJECT INDEX**

AD-72-10506

Aircraft high pressure oxygen cylinder system filler valve optimum standards, discussing automatic fill rate and pressure sensitive closing control, design, construction and performance

[SAE-ARP-921] 472-10369

Portable detector-recorder for automobile, blast furnace, railroad car, engine room and helicopter infrasonic noise measurements, discussing peak frequencies and subjective effects

[SAE PAPER 710746] 472-10245

Aircraft producibility considerations in preliminary design and production planning phases

[SAE-ARP-1180] 472-10388

Polar navigation with transverse mercator technique for aircraft using secant geared ground position indicators

[SAE-AS-942] 472-10386

Calibration of pressure sensors used to measure pressure sensing errors

[SAE-4S-1225] 472-10385

Airframe high pressure oxygen cylinder system filler valve optimum standards, discussing automatic fill rate and pressure sensitive closing control, design, construction and performance

[SAE-ARP-942] 472-10386

Pilot stem blockage corrections in uniform and nonuniform flow with pressure gradient over airfoil section noting surface impact probes

[SAE-72-11053] 472-10311

Aircraft hybrid electrical power systems, describing variable frequency generation and high voltage dc distribution

[SAE PAPER 710746] 472-10245

Aircraft producibility considerations in preliminary design and production planning phases

[SAE-72-11053] 472-10311

Polar navigation with transverse mercator technique for aircraft using secant geared ground position indicators

[SAE-72-11053] 472-10311

Aircraft hybrid electrical power systems, describing variable frequency generation and high voltage dc distribution

[SAE PAPER 710746] 472-10245

Aircraft producibility considerations in preliminary design and production planning phases
PROJECT PLANNING
Transportation planning for national and local levels
[N72-11150]

PROPELLER DRIVE
Slipstream vortex street geometry influence on velocity and load distribution of VTOL propellers
[N72-11004]

PROPELLER SLIPSTREAMS
Conference papers on jet and slipstream influence on aerodynamic coefficients using aircraft models
[DLR-MITT-70-28] [N72-10004]
Multipropeller slipstream and wing interference, noting lift, drag, pitching moment, normal force distribution, and waves
[N72-10015]
Rotor and propeller wake calculation, recovery, rotors, and rotor feedback control
[DLR-MITT-71-17] [N72-11001]
Slipstream vortex street geometry influence on velocity and load distribution of VTOL propellers
[N72-11004]

PROPSULSION
Propulsion systems for low emission urban vehicles and analysis of exhaust emissions from fossil-fueled heat engines
[PB-200744] [N72-10830]

PROPSULSION SYSTEM CONFIGURATIONS
Propulsion system optimization for commercial transport aircraft design under Advanced Transport Technology study, considering impact on aircraft gross weight
[SAE PAPER 710760] [N72-10257]
Propulsion system optimization in transonic transport aircraft design, considering propeller integration, engine choice, noise attenuation and technology utilization
[SAE PAPER 710762] [N72-10259]

PROPSULSION SYSTEM PERFORMANCE
Advanced technology air transports propulsion system requirements, considering design, engine performance and reliability, maintenance, and pollution control
[SAE PAPER 710761] [N72-10258]
Jet noise reduction technology, hardware and tests for NASA Quiet Engine Program to develop low noise subsonic civil transport aircraft propulsion systems
[SAE PAPER 710774] [N72-10266]
Airline Propulsion Team approach to DC-10 aircraft power plant design for maximum operational effectiveness
[SAE PAPER 710779] [N72-10270]
Fuel related problems in aircraft fuel systems, emphasizing hydrogen treated fuel
[N72-11677]
Feasibility analysis of solid lubricated ball bearings for aircraft propulsion systems application
[N72-11700]

PROPSULSIVE EFFICIENCY
Small three spool, reverse and mixed flow turbofan engine for business jets, discussing fuel consumption reduction, thermodynamic performance, efficiency and maintainability
[SAE PAPER 710776] [N72-10268]

PROTECIVE COATINGS
Lightweight protective coatings for boron/epoxy composite materials, discussing high current damage mechanisms, simulation facility and test results on aluminum foils, meshes, etc
[A72-10783]

QUALITY CONTROL
Integrity control procedures for machining, drilling and grinding of steel and Ti alloy aircraft parts, discussing nondestructive inspection method
[A72-10784]
REAL TIME OPERATION

Acoustic echo sounder as real time monitor of wind environment meteorological parameters A72-11137

Digital computer memory system for real time processing of air and naval traffic data, discussing logic design, time comparisons and optimum use A72-12647

Wind tunnels measuring equipment and procedures and data acquisition and processing systems electronics, describing computerized real time data processing system A72-12898

On-line digital computer for wind tunnel, operating systems, and real time operation [NPL-AEBO-1326] A72-10184

RECEIVERS

Ground and air tests of flight inspection marker beacon receiving system [FAA-NA-71-29] A72-10173

RECORDING INSTRUMENTS

Doppler system with navigation radar device, computer unit and data transmitter for continuous recording of aircraft position and speed A72-12769

RECTANGULAR WINGS

Drag and lift experimental determination for low aspect ratio rectangular wings with blunt trailing edges at Mach numbers 0.5-2.2 [DGLR PAPER 71-114] A72-12712

Influence of jet interference on aerodynamic coefficients of rectangular and swept wings mounted above the engine A72-10010

Numerical evaluation of downwash integral for lifting rectangular wings noting wing loading [NPL-AERO-NOT2-1095] A72-11012

REFUELING

Aviation fueling facilities and fueling operation A72-11678

REGULATIONS

German Federal Republic territorial air traffic regulations covering general, VFR and IFR rules, equipment and personnel examination and certification, safety, takeoff and landing, accidents, etc A72-12621

REINFORCED PLASTICS

Lightning protective coatings for boron/epoxy composite materials, discussing high current damage mechanisms, simulation facility and test results on aluminum foils, meshes, etc A72-10783

Graphite filament reinforced plastics strength, performance properties, fabrication processes and tooling concepts [SERA PAPER EM 71-205] A72-10968

DESIGN AND DEVELOPMENT

Design and development of numerically controlled machine for laying composite tape used in building aircraft structured from filament reinforced resin matrix composite materials A72-10425

REINFORCEMENT (STRUCTURES)

Compression tests of short skin-stiffener specimens of conventional titanium alloys airframe structure with attached unidirectional braided boron-aluminum composite [NAA-TR-D-6548] A72-11428

RELIABILITY ENGINEERING

Air transportation system design for safety and efficiency, discussing navigation facilities and surveillance systems employment for blower prevention A72-11117

Description of aircraft accessory reliability program to provide improved safety of operation for commercial aircraft A72-11035

Analysis of military helicopter reliability requirements based on performance and reliability test programs [AD-725595] A72-11059

RESEARCH AIRCRAFT

Augmentor wing jet STOL research aircraft development progress report covering design, engine tests, performance prediction, control simulation and stability augmentation [SERA PAPER 710757] A72-10250

Handling qualities simulation program for augmentor wing jet STOL research aircraft considering control devices design A72-11654

RESEARCH AND DEVELOPMENT

Industrial parachute B and D in UK, discussing management, technical staff requirements and government/industry liaison A72-10304

German Research and Test Institute for Aero- and Astronautics 1970 report covering flow mechanics, power conversion, aerospace medicine, atmospheric physics, etc A72-11151

Cost analysis and economic models for European aerospace development compared to US experience [AD-725478] A72-10992

RESEARCH MANAGEMENT

Industrial parachute B and D in UK, discussing management, technical staff requirements and government/industry liaison A72-10304

RESIDUAL STRESS

Residual buckling strength of Al alloy elastic column with fatigue crack [SERA PAPER 1914A] A72-11511

RETRACTABLE EQUIPMENT

European A300B Airbus flying control hydraulic system and landing gear design for safety and reliability, fatigue life, weight and maintenance A72-10724

REYNOLDS NUMBERS

Force and pressure distribution measurements on delta wing-body combination in compressible flow, investigating Reynolds number effect [DGLR PAPER 71-118] A72-12707

Effects of Reynolds number and frequency parameters on buzz characteristics at subsonic speeds using free oscillation method [NPL-AERO-1312] A72-11291

RIBBON PARACHUTES

Supersonic ribbon parachute testing by transonic wind tunnel, rocket sled and water channel simulator A72-10305

Ribbon parachutes drop tests at Mach 0.5-1.70, measuring opening shock loads and functioning time sequence A72-10312

RIGGING

Parachute canopy fabrics and rigging lines cordage properties requirements, considering nylon, polypropylene, silk, cotton and nonwoven scrim-reinforced fabrics A72-10314

RIGID ROTORS

Static and dynamic stability and controllability of rigid rotor 80-105 helicopter noting feedback A72-10314
### Subject Index

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effects</strong></td>
<td></td>
<td>N72-11008</td>
</tr>
<tr>
<td><strong>Rigid Structures</strong></td>
<td>Nonporous rigid parachute models: three component measurements, using low speed wind tunnel for testing skirt length effects on aerodynamic characteristics</td>
<td>A72-10303</td>
</tr>
<tr>
<td><strong>Rocket Propelled Sleds</strong></td>
<td>Wind tunnel and rocket sled results with ribbon parachutes for supersonic release, discussing aerodynamic, structural flutter and inflation time characteristics.</td>
<td>A72-10308</td>
</tr>
<tr>
<td><strong>Rolling</strong></td>
<td>Rolling vertical takeoff and landing procedure for VTOL aircraft, using thrust augmentation by afterburning.</td>
<td>N72-10034</td>
</tr>
<tr>
<td><strong>Rolling Moments</strong></td>
<td>STOL aircraft roll moment control possibility for externally-blown jet flap due to engine failure.</td>
<td>N72-11700</td>
</tr>
<tr>
<td><strong>Rotary Wings</strong></td>
<td>Automatic ultrasonic testing equipment for RDT tests of helicopter rotor blades</td>
<td>A72-11021</td>
</tr>
<tr>
<td><strong>Rotating Disks</strong></td>
<td>Theoretical performance of jet flap rotor at advance ratios greater than 1.0</td>
<td>N72-10037</td>
</tr>
<tr>
<td><strong>Rotating Environments</strong></td>
<td>Analysis of helicopter tail rotor flow patterns in and out of ground effect</td>
<td>N72-11060</td>
</tr>
<tr>
<td><strong>Rolling</strong></td>
<td>Aircraft gas turbine rotating disks thermal and mechanical stresses under variable thermal conditions, describing test assembly.</td>
<td>A72-11374</td>
</tr>
<tr>
<td><strong>Rotating Environments</strong></td>
<td>Turbulent and laminar jet flow in rotating environments noting application to jet mixing flow in tip driven rotor wakes.</td>
<td>A72-10008</td>
</tr>
<tr>
<td><strong>Rotary Dynamics</strong></td>
<td>Rotor and propeller wake calculation, recovery rotors, and rotor feedback control.</td>
<td>N72-11001</td>
</tr>
<tr>
<td><strong>Rotary Blades</strong></td>
<td>Linear aerodynamic rotor theories showing effect of applied vortex model on exactitude of numerical analysis.</td>
<td>N72-11005</td>
</tr>
<tr>
<td><strong>Rotary Blades</strong></td>
<td>Automatic ultrasonic testing equipment for RDT tests of helicopter rotor blades.</td>
<td>A72-11021</td>
</tr>
<tr>
<td><strong>Rotary Blades (Turbochamber)</strong></td>
<td>Sound radiation from axial flow fans running in turbulent flow, evaluating fluctuating lift on rotor blades due to incident gusts</td>
<td>N72-10220</td>
</tr>
<tr>
<td><strong>Rotary Speed</strong></td>
<td>Forged Inconel alloy 718 metal powder preforms for dense aircraft engine compressor rotor blades.</td>
<td>N72-11441</td>
</tr>
</tbody>
</table>

### SUN TIME (COMPUTERS)

- Stellar attitude reference and navigation with high computational speed for radar approach control in ATC. | A72-12033 |

### Runways

- Airport apron surface pavement strain measurements under field loading conditions, considering static and dynamic loads with finite element method. | A72-10192 |

### Safety Factors

- Atmospheric temperature and pressure altitude effects on runway lengths and aircraft takeoff weights. | N72-10193 |

### Sand

- Sand and dust particle filter tests for evaluation of separation efficiency and aerodynamic performance. | N72-11713 |

### Sandwich Structures

- Structural sandwich panel design, establishing simple stress and deflection formulas under transverse loading based on tests evaluating balsa laminate core. | A72-10723 |

### Satellite Transmission

- L band in satellite system for serial navigation aid, discussing position accuracy, data transmission and voice communication and modulation methods. | A72-12642 |

### Scale Models

- High speed jet noise source physical properties interpretation by theory and scale-model experiments for supersonic transport aircraft noise suppression problem. | A72-11973 |

### Schlieren Photography

- Hypersonic boundary layer separation of delta wing in shock tunnel using color and monochrome schlieren photography. | N72-10022 |

### Self Induced Vibration

- One dimensional unsteady flow in turbine engines rotating and static wake cascades, discussing vibrations propagation. | A72-11584 |

### Separation

- Sand and dust particle filter tests for evaluation of separation efficiency and aerodynamic performance. | A72-11713 |

### Separators

- Dual purpose filter-separators for dirt and water removal from fuel. | N72-11676 |

### Servomechanisms

- Analysis of flight control system requirements for helicopters and design of pilot assisted control systems. | A72-10587 |

---

**A-31**
SHOCK LOADS
Thin shock layer theory of lifting properties of recrrent flat and flat delta wings and waveriders at high incidence angles and Mach number

SHOCK LOADS
Ribon parachutes drop tests at Mach 0.57-1.70, measuring opening shock loads and functioning time sequence

SHOCK TUNNELS
Hypersonic boundary layer separation of delta wing in shock tunnel using color and monochrome schlieren photography [SP-782-809-191] W72-10012

SHOCK WAVES
Real gas effects in atmosphere to make sonic bang shock wave full dispersion and thickness wide variations

Supersonic and hypersonic flows with attached shock waves over delta wing at angle of attack, deriving unified theory for flow field

Analysis of interaction of oblique shock with bow shock of blunt leading edge and application to design of hypersonic ramjet inlets [AB-726113] W72-11312

SHORT HAUL AIRCRAFT
Future aircraft design trends for transcontinental and short haul operation, considering traffic forecasts, current transport aircraft and potential derivatives and technology [SAF PAPER 710759] W72-10248

Short haul air transport system need for future short takeoff and landing aircraft, considering airports, airways, economics and navigation and landing side

SHORT TAKEOFF AIRCRAFT
STOL transport aircraft technology assessment, analyzing airports growth problems [SAF PAPER 710759] A72-10250

Augmentor wing jet STOL research aircraft development progress report covering design, engine tests, performance prediction, control simulation and stability augmentation [SAF PAPER 710757] A72-10254

Industry assisted state of art assessment of high lift turbofan configurations for USAF STOL tactical transport technology program [SAF PAPER 710758] A72-10255

Mach 0.80 quiet intercity STOL transport design, comparison for turbofan, prop-fan and turboprop systems [SAF PAPER 710759] A72-10256

STOL aircraft for solving noise reduction and land use problems in future transportation systems, discussing airport location and layout for growing air traffic

STOL and VTOL aircraft performance and efficiency, discussing landing and takeoff distances reduction W72-11258

Handling qualities simulation program for augmentor wing jet STOL research aircraft considering control devices design

STOL aircraft roll moment control possibility for externally-blown jet flap due to engine failure W72-11700

Short haul air transport system need for future short takeoff and landing aircraft, considering airports, airways, economics and navigation and landing side

Q/STOL jet aircraft engines design for low noise levels, describing takeoff thrust, bypass ratio and turbine stages

Externally blown flaps for STOL characteristics in medium and heavy jet transport aircraft, demonstrating aerodynamic and flight mechanical feasibility

A-32

SUBJECT INDEX

Aladin 2 noiseless STOL jet aircraft project, describing exhaust nozzle configuration, design and economics A72-12502

STOL aircraft integrated landing approach flight control system with elevator and thrust control coupling to angle of attack, altitude and other state variables [DGLR PAPER 71-063] A72-12705

Turbofoils under wings to provide lift and thrust for STOL aircraft [NASA-CASK-LEW-11224-1] W72-10033

Cost analysis and operational procedures of effective short range, high density computer transportation system for Metropolitan Detroit [NASA-CR-11430] A72-10984

Flight simulator used to determine lateral and directional aerodynamic characteristics of STOL transport aircraft W72-11037

SIGNATURE ANALYSIS
Sonic boom pressure signatures during F-104 overflights at Mach 1.3 and 30,000 ft, explaining variations by atmospheric turbulence

SIMULATION
Simulated crash tests to assess fire resistance of aircraft fuels containing polymeric additives

SINGULARITY (MATHEMATICS)
Calculation of pressure distribution on cylindrical fuselage with perpendicular lifting jet using singularity method

SKIN FRICTION
Increasing lift and Reynolds number effects on displacement and skin friction of three dimensional turbulent boundary layer on infinite swept wing

Skin friction measurement in nonisobaric subsonic flow with pressure gradient over airfoil section by surface impact probes

SLOW PERTURBATION FLOW
Subsonic linearized theory for symmetrical cracked wings at zero incidence, presenting corrected formulas for streamwise and spanwise perturbation velocity components due to wing thickness

SOLAR COSMIC RAYS

SOLID LUBRICANTS
Feasibility analysis of solid lubricated ball bearings for aircraft propulsion systems application

SOLID STAFF DEVICES
Improvements in aircraft maintenance procedures based on solid state electrical power management and solid state contactless switching circuits

SOLVENT EXTRACTION
Solvent removal by immersion of EC-2273 potting compound from F-4 aircraft electrical components [AD-725849] W72-11473

SONIC BOOMS
Finite element method for determining transient response of box-type structure to traveling sonic pressure wave

SONIC BOOMS
Sonic boom pressure signatures during F-104 overflights at Mach 1.3 and 30,000 ft, explaining variations by atmospheric turbulence

Sonic boom waveforms measured during exercise summer sky in southern Great Britain [ARC-8-R-369] W72-11015

SOUND GENERATORS
Sound generation in very low and very high turbulent jet flows from exhaust nozzle
SUBJECT INDEX

Noise generation by rotating blades of axial flow fan in infinite annulus [AD-726126] W72-11714

SOUND TRANSMISSION
Flow model for jet pipe sound transmission through nozzle flow [JFPW/69] W72-10252

SOUND WAVES
Acoustic power radiated by jet aircraft fuselage structure exposed to turbulent boundary layer pressure field, evaluating noise reduction treatments A72-10216
Sound radiation from axial flow fans running in turbulent flow, evaluating fluctuating lift on rotor blades due to incident gusts A72-10220

SOUTHEAST ASIA
Evaluation of airway operations systems in Indonesia, Malaysia, and Thailand with proposed courses of action, equipment requirements, and economic factors in aeronautical telecommunications W72-10171

SPACE SHUTTLES
Aircraft and spacecraft integrated avionics systems design with emphasis on telemetry, discussing space shuttle sub-systems integration A72-12403

SPACECRAFT RECOVERY
Rower and propeller wake calculation, recovery rotors, and rotor feedback control [DLR-BT-P-71-12] W72-11001

SPECTRUM ANALYSIS
Spectral analysis of transient data applied to auto-pilot parameter studies of coupled transfer function [AD-725068] W72-10501

SPEED INDICATORS
Doppler system with navigation radar device, computer unit and data transmitter for continuous recording of aircraft position and speed A72-12799

SPIN DYNAMICS
Aircraft spin characteristics due to superstall, comparing three stall types with respect to recovery, yaw damping and rate of rotation [DGLR-PAPER 71-097] A72-12718

STABILITY TESTS
Static and dynamic stability characteristics of finned bodies with cruciform, slotted fin configuration [AD-726016] W72-10003

STABILIZERS (FLUID DYNAMICS)
Parachute designs and applications to escape systems, paratrooping, supply dropping, aircraft braking, weapon system stabilization, flight testing aids and sport A72-10302

STAINLESS STEELS

STANDARDIZATION
Aircraft high pressure oxygen cylinder system filler valve optimum standards, discussing automatic fill rate and pressure sensitive closing control, design, construction and performance [SAE-AS-1225] A72-10385

STANDARDS
Airspace wire and cables testing methods standards for evaluating mechanical, electrical and chemical properties, coating thicknesses, continuity flaws, flammability, geometrical characteristics, etc [SAE-AS-1198] A72-10384
Pressure altimeter system minimum safe performance standards for subsonic aircraft operation, describing test procedures [SAE-AS-942] A72-10386

STATIC PRESSURE
Flight test procedures for subsonic transport aircraft pitot static pressure system, recommending trailing edge calibration method [SAF-ARP-924] A72-10389
Pitot stem blockage corrections in uniform and nonuniform pipe flow determined by wind tunnel measurements [ASCE-PREP-1175] W72-11295

STATICAL STABILITY
Jet interference effects on yaw stability for SAAB 37 and 105 wind tunnel models W72-10006

STATISTICAL ANALYSIS
Statistical analysis of track keeping Strumble VOB data for lateral navigation separation standards and collision risk in continental environment A72-10179
Statistical analysis of home built aircraft accidents [PB-201438] W72-10038
Statistical analysis of weather effects in aircraft accidents [PB-201437] W72-10039

STEERING
Electromechanical nose wheel steering system for general aviation aircraft ground maneuverability improvement, describing design A72-10963

STIFFNESS
Constant phase shift between flapping and action on center of gravity for spring hinged rotor with variable flapping stiffness W72-11007

STRAIN GAGE BALANCES
Three component shock tunnel strain gage balance for measuring aerodynamic forces on thin delta wings [ABC-R-M-3664] A72-11375

STRAIN GAUGES

STRATOSPHERE
Possible catalytic reduction of stratospheric ozone by nitrogen oxides emitted from SST aircraft W72-11334

STREAMS
Axial and tangential velocity distributions within trailing line vortex to large distance downstreams of generating wing extended from available data A72-11335

STRESS (PHYSIOLOGIST)
Effects of environmental stresses on attack helicopter crew task performance in NATO theater [AD-726949] W72-10122
Crew compartment vibration environment in B-52 aircraft during low altitude, high speed flight [AD-727023] A72-10127

STRESS ANALYSIS
Structural sandwich panel design, establishing simple stress and deflection formulas under transverse loading based on tests evaluating balsa as laminate core A72-10723

STRESS MEASUREMENT
Airport apron surface pavement strain measurements under field loading conditions, considering static and dynamic loads with finite element method A72-10723

STRUCTURAL ANALYSIS
Development of structural optimization algorithms for obtaining near optimum distributions of material for structural idealizations [AD-726112] W72-11820

STRUCTURAL DESIGN
Aircraft design interactive computer graphics technique, using human decision input response to computer output information [DGLR-PAPER 71-107] A72-12733

STRUCTURAL VIBRATION
Finite element method for determining transient response of box-type structure to traveling sonic pressure wave A72-10219
Unpredicted structural vibration in Comet and Electra aircraft, Graf Zeppelin dirigible, missile antennas, etc A72-12002

STRUCTURAL WEIGHT
Atmospheric temperature and pressure altitude effects on runway lengths and aircraft takeoff weights [ASCE-PREP-1242] A72-10193

SUBCRITICAL FLOW
Design programs for swept wings in subcritical, A1-33

SUBCRITICAL FLOW
Structural interference effects on yaw stability for SAAB 37 and 105 wind tunnel models W72-10006
SUBHEADS

compressible, viscous flow
[NPL-ASBO-NOTE-1100] N72-10018

SUBHEADS

Optimal stochastic /Kalman/ filters application to integrated air and submarine navigation systems, discussing measurement errors modeling on bias and colored noise
A72-12050

SUBSONIC AIRCRAFT

Flight test procedures for subsonic transport aircraft pilot static pressure system, recommending trailing cone calibration method
[SAT-REF-927] A72-10389

Unsolved aerodynamic problems in sub- and transonic civil and military aircraft design, considering flow problems during transonic flight, takeoff and landing
[DGLR PAPER 71-105] A72-12745

SUBSONIC FLOW

Subsonic linearized theory for symmetrical cranked wings at zero incidence, presenting corrected formulas for streamlined and spanwise perturbation velocity components due to wing thickness
A72-1115a

Skin friction measurement in nonscotic subsonic flow with pressure gradient over airfoil section by surface impact probes
A72-12275

Low subsonic region unsteady interference effects on harmonically oscillating wing-tailplane model with variable sweep wing
[DGLR PAPER 71-081] A72-12709

Formulas for components of perturbation velocity in linearized subsonic theory for symmetrical cranked wing panels at zero angle of attack
[NPL-ASBO-NOTE-1050] W72-10021

SUBSONIC SPEED

Full scale wind tunnel tests of small unsupersonic jet aircraft with T tail
[NASA-TR-D-6573] N72-10031

Effects of Reynolds number and frequency parameters on buzz characteristics at subsonic speeds using free oscillation method
[NPL-ASBO-1312] W72-11291

SUITABILITY

Suitability evaluation of fog simulator for weather conditions during flight approach
[PAE-WA-71-04] A72-10233

SULPHUR

Effect of sulfur in JP-5 fuel on hot corrosion of turbine blade materials operating in marine environment
[AD-725619] N72-11706

SUNDER

Sonic boom waveforms measured during exercise summer sky in southern Great Britain
[ARC-R-73-3659] N72-11015

SUPersonic AIRCRAFT

B-1 strategic supersonic bomber design, emphasizing variable sweep wing, landing gear, control and instrumentation
A72-12226

Unsolved aerodynamic problems in sub- and transonic civil and military aircraft design, considering flow problems during transonic flight, takeoff and landing
[DGLR PAPER 71-105] A72-12745

Development and functions of organization for multinational certification of supersonic aircraft
W72-11029

Possible high energy fuels for supersonic aircraft
W72-11670

Kerosene-type fuel for supersonic and hypersonic aircraft
W72-11671

Synthetic high temperature lubricants thickened by complex esters for supersonic aircraft
W72-11701

SUPersonic FLOW

Supersonic and hypersonic flows with attached shock waves over delta wing at angle of attack, deriving unified theory for flow field
A72-12030

SUPersonic JET FLOW

High speed jet noise source physical properties interpretation by theory and scale-model experiments for supersonic transport aircraft noise suppression problems
A72-11973

SUPersonic speeds

Supersonic ribbon parachute testing by transonic wind tunnel, rocket sled and water channel simulator
A72-10305

SUPersonic TRANSPORTS

Thin-down intensities for heavy primaries at SST flight levels, using plastic stacks measurements
[NASA-TH-D-6573] H72-11047

In-flight warning meter for solar and cosmic radiation dose equivalent measurements for radiological protection in SST aircraft
A72-12078

Sound generation and scale model experiments to suppress noise in turbulent jet flow eddies of supersonic transport aircraft
[ARC-32723] W72-10254

Possible catalytic reduction of stratospheric ozone by nitrogen oxides emitted from SST aircraft
[OCBL-20568] W72-11334

SUPersonic Turbines

Analysis of lubrication system used in civil supersonic gas turbine engine
W72-11697

SURFACE PROPERTIES

Unsteady flow about two dimensional airfoils, determining fluctuations induced by turbulent boundary layers
A72-10217

SURFACES

Numerical analysis of transonic flow about thin lifting wings and analytic expressions for far field conditions
[NASA-TR-D-6530] H72-11289

SURFACTANTS

Use of fluorocarbon surfactants to extinguish aircraft fuel fires
W72-11693

SURVEILLANCE

Air transportation system design for safety and efficiency, discussing navigation facilities and surveillance systems employment for blunder prevention
A72-11117

SURVEILLANCE RADAR

Avionics contribution to airspace decision making, considering navigation, surveillance radar, collision avoidance and ATC techniques
A72-10180

Tactical ATC display systems for airport surveillance, precision approach and landing and operator/aircraft/machine operations by using terminal area Surveillance Radar
A72-12421

Sweep EFFECT

Laminar three dimensional boundary layer nonequilibrium effects at hypersonic wing swept leading edge with intensively cooled surface, considering swept induced crossflow effect
[VP-F-71-23] A72-12422

SWEPT WINGS

Subsonic linearized theory for symmetrical cranked wings at zero incidence, presenting corrected formulas for streamwise and spanwise perturbation velocity components due to wing thickness
A72-1115a

Increasing lift and Reynolds number effects on displacement and skin friction of three dimensional turbulent boundary layer on infinite swept wing
A72-11395

Laminar three dimensional boundary layer nonequilibrium effects at hypersonic wing swept leading edge with intensively cooled surface, considering swept induced crossflow effect
[VP-F-71-23] A72-12422

Jet interference and lift drag ratio of swept wing aircraft with turbonn above wing

Influence of jet interference on aerodynamic coefficients of rectangular and swept wings mounted above the engine
W72-10010

Design programs for swept wings in subcritical, compressible, viscous flow
[NPL-ASBO-1326] N72-11011

Vortex drag factor of untapered swept wing with part-span flap, noting spanwise loading
[NPL-ASBO-1326] N72-11011
SYNTHESIS
Synthesis and properties of alphabetic ester for turbine lubrication in jet aircraft
A72-11696

SYSTEMS ANALYSIS
Evaluation of airway operations systems in Indonesia, Laos, Malaysia, and Thailand with proposed courses of action, equipment requirements, and economic factors in aeronautical telecommunications
A72-10711

SYSTEMS ENGINEERING
Airline Propulsion Team approach to DC-10 aircraft power plant design for maximum operational effectiveness
[SAE PAPER 710778] A72-10270
Air transportation system design for safety and efficiency, discussing navigation facilities and surveillance systems employment for blinder prevention
A72-11117
Inertial navigation role in automatic ATC systems, discussing path control accuracies, environmental conditions, noise and air pollution, etc
A72-11118
ATC system decision making problem and future technological and administrative improvements
A72-11718
Microwave aircraft landing system development, discussing contract definition, feasibility, prototype development, management planning and program costs
A72-12377
Discrete address ATC radar beacon system operation and design
A72-12378
Aircraft and spacecraft integrated avionics systems design with emphasis on telemetry, discussing space shuttle subsystems integration
A72-12403
Computer-aided interactive graphic displays for ATC, discussing subsystems, data processing flow and operational capabilities
A72-12420
Analytical methods for early-stage detection of oil deterioration in aircraft engines
A72-11698

T TAIL SURFACES
Full scale wind tunnel tests of small unpowehe jet aircraft with T tail
[NASA-FN-0-6573] A72-10031
T-53 ENGINE
Portable self contained ultrasonic field inspection equipment for nondestructive crack detection in T53 gas turbine compressor disks
A72-10814
Metallographic and fractographic analyses of cracking in T53-L13 gas turbine engine compressor disks
A72-10816

TABLES (DATA)
Graphs and tables of service cost for intraurban transportation system
Documentation of data used in intraurban transportation analysis appendix

TACAN
Tactical ATC display system for airport surveillance, precision approach and landing and operator/aircraft/machine operations by using tactical area surveillance radar
A72-12421

VOR, DIRECT MEASURING EQUIPMENT AND TACAN POLAR COORDINATE RADIO NAVIGATION SYSTEMS HISTORICAL IMPROVEMENTS AND FUTURE DEVELOPMENT
A72-12646

TAKEOFF
Noise reduction for climbing takeoff and V/STOL aircraft affecting stability
[DLR-PB-71-10] A72-11040
Helicopter lift margin system to aid in determining power requirements for takeoff and landing
[AP-725207] A72-11053

TAKEOFF RUNS
Atmospheric temperature and pressure altitude
A72-11373

TECHNOLOGY ASSESSMENT
STOL transport aircraft technology assessment, analyzing airports growth problems
[SAE PAPER 710750] A72-10249

TELECOMMUNICATION
Evaluation of airway operations systems in Indonesia, Laos, Malaysia, and Thailand with proposed courses of action, equipment requirements, and economic factors in aeronautical telecommunications
A72-10711

TELEMETRY
Aircraft and spacecraft integrated avionics systems design with emphasis on telemetry, discussing space shuttle subsystems integration
A72-12403
Mathematical models of rate gyro, servo accelerometers, pressure transducers, and telemetry systems and analog computer simulation programs

TEMPERATURE MEASUREMENT
Nozzle shape, temperature, and velocity effects on free hypersonic jet exhaust properties
A72-10013

TENSILE TESTS
Constant high tensile stress and rapid aerodynamic heating effect on maring steels and Ti and Al alloys, evaluating test and simulation procedures for design data development
A72-10749

TERMINAL BALLISTICS
Theoretical analysis of fuel ignition by hot projectile and ignition delay time as function of temperature and width of hot gas region
A72-11683

TERMINAL FACILITIES
Airport efficiency improvement measures, considering boarding gates, parking space, baggage handling, fire protection, monitoring and central control
A72-11717

TERMINAL GUIDANCE
Terrain clearance during descent and approach of aircraft under radar control, discussing optimum profile, ATC, navaids and rules
A72-10183

TERREN
Terrain clearance during descent and approach of aircraft under radar control, discussing optimum profile, ATC, navaids and rules
A72-10183

TEST EQUIPMENT
Metal fatigue damage nondestructive detection, discussing inspection methods, equipment, advantages, limitations and test results
A72-12498
Analysis of facilities, equipment, and tools to maintain large commercial aircraft
A72-11023

THERMAL FATIGUE
Thermal shock fatigue tests on aircraft gas turbine engine inlet nozzles, showing cracks as function of material
A72-11373

THERMAL INSULATION
Development of sprayable urethane sealant for protection of heated areas on aircraft structures
[AD-725292] A72-10489

THERMAL SHOCK
Thermal shock fatigue tests on aircraft gas turbine engine inlet nozzles, showing cracks as function of material
A72-11373

A-35
THERMAL STABILITY
Jet fuels hydrocarbon composition effect on thermal stability, considering homoromatic components influence on aromatic hydrocarbons oximation products coagulation \textbf{[A72-12800]}
Assessment of high temperature stability of synthetic lubricants for aircraft gas turbines \textbf{[N72-11695]}
Thermal stability of triethyl propane water based lubricating oil for aircraft engines \textbf{[N72-11699]}

THERMAL STRESSES
Thermal radial stresses in axial compressor disk-to-drum transition areas of operating \textbf{[ARC-85-3664]} aircraft engine \textbf{[A72-11378]}
Aircraft gas turbine rotating disks thermal and mechanical stresses under variable thermal conditions, describing test assembly \textbf{[A72-11637]}

THIN WINGS
Three component shock tunnel strain gage balance for measuring aerodynamic forces on thin delta wings \textbf{[ARC-85-3664]} \textbf{[N72-11375]}

THREE DIMENSIONAL BOUNDARY LAYER
Increasing lift and Reynolds number effects on displacement and skin friction of three dimensional turbulent boundary layer on infinite swept wing \textbf{[A72-11395]}
Laminar three dimensional boundary layer nonequilibrium effects at hypersonic wing swept leading edge with intensively cooled surface, considering sweep induced crossflow effect \textbf{[VPI-E-71-23]} \textbf{[A72-12422]}

THREE DIMENSIONAL MOTION
Three dimensional roll-controlled missile trajectory model for simple time-sharing digital or analog simulation, using wind-to-inertial axis transformation \textbf{[A72-10964]}

THRUST
Turbofans under wings to provide lift and thrust for STOL aircraft \textbf{[NASA-CASE-LF-11224-1]} \textbf{[N72-10033]}

THRUST AUGMENTATION
Rolling vertical takeoff and landing procedure for STOL aircraft using thrust augmentation by afterburning \textbf{[BMYG-PEWT-71-13]} \textbf{[N72-10034]}

THRUST CONTROL
STOL aircraft integrated landing approach flight control system with elevator and thrust control coupling to angle of attack, altitude and other state variables \textbf{[DGLR PAPER 71-063]} \textbf{[A72-12705]}

TIME FUNCTIONS
Parachute opening shock and filling time calculation based on aerodynamic drag, air mass and effective porosity time functions, using momentum and continuity equations \textbf{[A72-10310]}

TIME RESPONSE
Parachute inflation loads and times, presenting calculation method based on unsteady pressure distribution on decelerating inflating parabolic shell of revolution with unsteady starting vortex \textbf{[A72-10311]}
Ribbon parachutes drop test at Mach 0.57-1.70, measuring opening shock loads and functioning time sequence \textbf{[A72-10312]}

TIP DRIVER ROTORS
Turbulent and laminar jet flow in rotating environments noting application to jet mixing flow in tip driven rotor wakes \textbf{[N72-10008]}

TITANIUM ALLOYS
Constant high tensile stress and rapid aerodynamic heating effect on maraging steels and Ti and Al alloys, evaluating test and simulation procedures for design data development \textbf{[A72-10749]}
Compression tests of short skin-stiffener specimens of conventional titanium alloys airframe structure with attached unidirectional braed boron-aluminum composite \textbf{[NASA-TM-D-5548]} \textbf{[N72-11402]}

TOOLING
Graphite filament reinforced plastics strength, performance properties, fabrication processes and tooling concepts \textbf{[SPE PAPER EN 71-205]} \textbf{[A72-10968]}
Tools Analysis of facilities, equipment, and tools to maintain large commercial aircraft \textbf{[N72-11023]}

TOWED BODIES
Equilibrium configuration of cable towed in circular path, presenting multivalued boundary value problem mathematical analysis \textbf{[A72-11132]}

TRADE CONTAINMENTS
Infrared spectrophotometer used for detection of trace contaminants from Pegasus and Olympus engines in aircraft cabin atmospheres \textbf{[NAS-G-M-74]} \textbf{[A72-10040]}

TRAILING EDGES
Axial and tangential velocity distributions within trailing line vortex to large distance downstreams of generating wing extended from available data \textbf{[A72-11135]}
Drag and lift experimental determination for low aspect ratio rectangular wings with blunt trailing edges at Mach numbers 0.5-2.2 \textbf{[A72-12712]}

TRAINING DEVICES
Application of Apollo Project data and training concepts to maintenance of large commercial aircraft \textbf{[N72-11026]}

TRAJECTORY ANALYSIS
Three dimensional roll-controlled missile trajectory model for simple time-sharing digital or analog simulation, using wind-to-inertial axis transformation \textbf{[A72-10964]}

TRANSFER FUNCTIONS
Spectral analysis of transient data applied to auto-pilot parameter studies of coupler transfer function \textbf{[AP-725068]} \textbf{[N72-10501]}

TRANSIENT RESPONSE
Finite element method for determining transient response of box-type structure to traveling sonic pressure wave \textbf{[A72-10219]}

TRANSONIC FLYING
Unsolved aerodynamic problems in sub- and transonic civil and military aircraft design, considering flow problems during transonic flight, takeoff and landing \textbf{[DGLR PAPER 71-105]} \textbf{[A72-12745]}

TRANSONIC FLOW
Velocity field of sonic flow about aircraft wing profile, solving mixed Cauchy problem \textbf{[A72-11170]}

TRANSONIC SPEED
Numerical analysis of transonic flow about thick lifting wings and analytic expressions for far field conditions \textbf{[NASA-TN-D-5530]} \textbf{[N72-11289]}

TRANSONIC WIND TUNNELS
Design of flexible steel liners for adjustable transonic wind tunnel nozzle \textbf{[NPL-AERO-MOF-1098]} \textbf{[N72-10023]}

TRANSPORT AIRCRAFT
Future aircraft design trends for transcontinental and short haul operation, considering traffic forecasts, current transport aircraft and potential derivatives and technology \textbf{[SAP PAPER 710749]} \textbf{[A72-10248]}
Commercial transport market and technology forecasting, considering all-cargo, STOL SST and CTOL aircraft \textbf{[SAP PAPER 710750]} \textbf{[A72-10249]}
STOL transport aircraft technology assessment, analyzing airports growth problems \textbf{[SAP PAPER 710751]} \textbf{[A72-10250]}
Industries assisted state of art assessment of high lift turbofan configurations for U.S. STOL tactical transport technology program \textbf{[SAP PAPER 710758]} \textbf{[A72-10255]}
Mach 0.80 quiet intercity STOL transport design comparison for turbofan, prop-fan and turboprop systems \textbf{[SAP PAPER 710759]} \textbf{[A72-10256]}

SUBJECT INDEX
Transportation planning for national and local levels

[SAE PAPER 710760] A72-10257

Advanced technology air transports propulsion system requirements, considering design, engine performance and reliability, maintenance, airline problems, noise and pollution control

[SAE PAPER 710761] A72-10258

Propulsion system optimization in transonic transport aircraft design, considering nacelle integration, engine choice, noise attenuation and technology utilization

[SAE PAPER 710762] A72-10259

Flight test procedures for subsonic transport aircraft, pitot static pressure system, recommending trailing cone calibration method

[SAE PAPER 710763] A72-10389

Externally blown flaps for STOL characteristics in medium and heavy jet transport aircraft, demonstrating aerodynamic and flight mechanical feasibility

A72-12502

Full scale wind tunnel tests of small unpunred jet aircraft with T tail

[NASA-TN-D-6571] N72-10031

Description of maintenance procedures used on Beechcraft Hawker 125 commercial jet aircraft

N72-11032

Predictions of aircraft maintenance procedures to be employed during 1970 to 1980 time period

N72-11033

Flight simulator used to determine lateral and directional aerodynamic characteristics of STOL transport aircraft

[FAA-HD-71-01] N72-10373

Transportation

Transportation planning for national and local levels

[PB-200076] N72-11849

Traveling Waves

Finite element method for determining transient response of one-dimensional structure to traveling sonic wave pressure

A72-10219

Turbine Blades

Graphite fiber composite fan blade design for subsonic turbofan engines, discussing weight and fatigue sensitivity reductions and performance test results

[SAE PAPER 710771] A72-10265

One-dimensional unsteady flow in turbine engines, rotating and static vane cascades, discussing vibrations propagation

N72-11584

Effect of sulfur in JP-5 fuel on hot corrosion of turbine blade materials operating in marine environment

[AD-725619] N72-11706

Turbine Engines

Reduction of harmful emissions of turbine engine exhaust system

N72-11675

Post-crash fire safety of helicopter turbine engine fuels

N72-11688

Turbine Exhaust Nozzles

Aladin 2 noiseless STOL jet aircraft project, describing exhaust nozzle configuration, design and economics

A72-12503

Turbines

Synthesis and properties of aliphatic ester for turbine lubrication in jet aircraft

N72-11696

Turbocompressors

Jet aircraft turbofan engine fan compressor noise reduction by acoustic linings, giving R and D results

[NAS PAPER 71 S96] A72-10223

Thermal radial stresses in axial compressor disk-to-drum transition areas of operating A-3 aircraft engine

A72-11374

Performance of axial flow compressor rotor with different casing treatment configuration

[BSA-TW-D-6538] A72-10025

Cascade calculations and tests of blunt trailing edge blades used in advanced axial compressor concepts

[FAA-RD-725789] N72-11308

Turbopfan Aircraft

Industry assisted state of art assessment of high lift turbofan configurations for short takeoff and landing (STOL) tactical transport technology program

[SAE PAPER 710758] A72-10255

Mach 0.80 quiet intercity STOL transport design comparison for turbofan, prop-fan and turboprop systems

[SAE PAPER 710759] A72-10256

Turbopfan Engines

Jet aircraft turbofan engine fan compressor noise reduction by acoustic linings, giving R and D results

A72-10223

Gravite composite fan blade design for subsonic turbofan engines, discussing weight and fatigue sensitivity reductions and performance test results

[SAE PAPER 710771] A72-10268

Small three spool, reverse and mixed flow turbofan engine for business jets, discussing fuel consumption reduction, thermodynamic performance, efficiency and maintainability

A72-10265

CP6 high bypass ratio turbofan engine design improvements for fuel consumption, thrust/weight ratio, starting, noise level, smoke emission, maintenance, monitoring and accessory replacement

[SAE PAPER 710779] A72-10271

Jet interference and lift drag ratio of swept wing aircraft with turbofan above wing

[FAA-M-AMRO-1271] N72-10009

Turbopfans

Turbopfans under wings to provide lift and thrust for STOL aircraft

[NASA-CAS-LSM-11224-1] N72-10033

Turboshaft Engines

Development and application of modular design concept to improve jet aircraft engine maintenance

A72-11030

Turboshoop Aircraft

Mach 0.80 quiet intercity STOL transport design comparison for turbofan, prop-fan and turboshoop systems

[SAE PAPER 710759] A72-10256

Turbulence Effects

Sonic boom pressure signatures during F-10A overflights at Mach 1.3 and 30,000 ft, explaining variations by atmospheric turbulence

A72-11158

Aircraft ride comfort problem in turbulent air, comparing free and fixed wing aircraft responses

A72-11720

Turbulent Boundary Layer

Acoustic power radiated by jet aircraft fuselage structure exposed to turbulent boundary layer pressure field, evaluating noise reduction treatments

A72-10216

Unsteady flow about two dimensional airfoils, determining surface pressure fluctuations induced by turbulent boundary layers

A72-10217

Increasing lift and Reynolds number effects on displacement and skin friction of three dimensional turbulent boundary layer on infinite swept wing

A72-11395

Turbulent Diffusion

Sound generation and scale model experiments to suppress noise in turbulent jet flow eddies of supersonic transport aircraft

[ARC-24723] N72-10254

Turbulent Flow

Sound radiation from axial flow fans running in turbulent flow, evaluating fluctuating lift on rotor blades due to incident gusts

A72-10220

Development mechanisms of turbulent jet flows

[VR-C-56-36] N72-10245

Techniques for forecasting turbulent weather conditions below 10,000 feet for light aircraft operating in Hawaiian Islands

[AD-726107] N72-11525
TURBULENT JETS

Turbulent and laminar jet flow is rotating environments noting application to jet mixing flow in tip driven rotor wakes N72-10008

Development mechanisms of turbulent jet flows (VTR-LS-36) N72-10245

Flow model for jet pipe sound transmission through nozzle flow (JPR/69) N72-10252

Sound generation in very low and very high turbulent jet flows from exhaust nozzle N72-10253

Sound generation and scale model experiments to suppress noise in turbulent jet flow eddies of supersonic transport aircraft (ARC-32723) N72-10254

TURBULENT WAKES

Full scale measurement of flow in turbulent wake of hangars [ARC-CP-1166] N72-11047

TWISTING

Matrix method calculation for aerodynamic loads, transverse forces, bending moments, torques and twist of hinged main rotor blades in helicopter during forward flight A72-12440

TWO DIMENSIONAL FLOW

Customer utilization and program listing for computer program on two dimensional multicomponent airfoils in viscous flow [NASA-CR-1843] N72-11010

UH-1 HELICOPTER

Evaluation of simulated pilot/system performance in manually controlled IFB formation flight task for UH-1 helicopter under various environmental and operational conditions (AD-725209) N72-10048

ULTRASHORT FREQUENCIES

UHF aeronautical satellite system, presenting ATC trends, international aspects, available flight levels, weather conditions and long haul conflicts A72-12383

L band in satellite system for aerial navigation aid, discussing position accuracy, data transmission and voice communication and modulation methods A72-12642

ULTRASONIC TESTS

Portable self contained ultrasonic field inspection equipment for nondestructive crack detection in T53 gas turbine compressor disks A72-10814

Automatic ultrasonic testing equipment for NDT tests of helicopter rotor blades A72-11021

Application of nondestructive testing procedures to maintenance of large commercial aircraft N72-11025

UNITED STATES OF AMERICA

Cost analysis and economic models for European aerospace development compared to US experience (AD-725478) N72-10992

UNSTEADY FLOW

Unsteady flow about two dimensional airfoils, determining surface pressure fluctuations induced by turbulent boundary layers A72-10217

One dimensional unsteady flow in turbine engines rotating and static vane cascades, discussing vibrations propagation A72-11584

URBAN TRANSPORTATION

Max 0.80 quiet intercity STOL transport design comparison for turbofan, prop-fan and turboprop systems [SAE PAPER 710759] A72-10256

Propulsion systems for low emission urban vehicles and analysis of exhaust emissions from fossil-fueled heat engines [PB-200146] N72-10830

Graphs and tables of service cost for intracity transportation system [NASA-CR-116341] A72-10985

Aircraft design concepts for intracity transportation system N72-10985

SUBJECT INDEX

[NASA-CR-119382] N72-10986

Documentation of data used in intracity transportation analysis appendix [NASA-CR-119393] N72-10987

V

V/STOL AIRCRAFT

Free flight simulation tests for V/STOL aircraft nonlinear attitude control system adaptation to helicopter pitch and roll control [DGLR PAPER 71-060] A72-12714

Disk shaped vortex in providing additional thrust during takeoff and transition phases of V/STOL aircraft, returning to ground by jet after task accomplishment A72-12900

Military specification adoption for flight characteristics of piloted V/STOL aircraft (AD-725766) N72-10048

Recirculation mechanism in jet powered V/STOL aircraft [DNGO-PWNT-71-12] N72-10828

Noise reduction for climbing takeoff and V/STOL aircraft affecting stability [DLR-PB-71-10] N72-11040

Full scale measurement of flow in turbulent wake of hangars [ARC-CP-1166] N72-11047

VARIABLE SWEEP WINGS

B-1 strategic supersonic bomber design, emphasizing variable sweep wing, landing gear, control and instrumentation A72-12226

Low subsonic region unsteady interference effects on harmonically oscillating wing-tailplane model with variable sweep wing [DGLR PAPER 71-081] A72-12709

VELOCITY DISTRIBUTION

Axial and tangential velocity distributions within trailing line vortex to large distance downstreams of generating wing extended from available data N72-11135

Subsonic linearized theory for symmetrical cracked wings at zero incidence, presenting corrected formulas for streamwise and spanwise perturbation velocity components due to wing thickness A72-11154

Velocity field of sonic flow about aircraft wing profile, solving mixed Cauchy problem A72-11178

VERTICAL LANDING

Rolling vertical takeoff and landing procedure for VTOL aircraft using thrust augmentation by afterburning [DNGO-PWNT-71-13] N72-10034

VERTICAL TAKEOFF AIRCRAFT

STOL and VTOL aircraft performance and efficiency, discussing landing and takeoff distances reduction A72-11258

Vertical takeoff aircraft wind tunnel model with high pressure ejectors to determine jet interference on aerodynamic coefficients A72-10007

Rolling vertical takeoff and landing procedure for VTOL aircraft using thrust augmentation by afterburning [DNGO-PWNT-71-13] N72-10034

Slipstream vortex street geometry influence on velocity and load distribution of VTOL propellers N72-11004

VHF OMBIBRANCE NAVIGATION

Statistical analysis of track keeping Struble VOR data for lateral navigation separation standards and collision risk in continental environment A72-10179

VOR, Direct Measuring Equipment and TACAN polar coordinate radio navigation systems history, improvements and future development A72-12646

VIBRATION DAMPING

Flutter equation approximate true damping or rate-of-decay solution by determinant iteration A72-11133

VIBRATION MEASUREMENT

Crew compartment vibration environment in B-52 aircraft during low altitude, high speed flight (AD-727023) N72-10127
SUBJECT INDEX

VIBRATION MODE
Uncorrected structural vibration in Comet and Electra aircraft, Graf Zeppelin dirigible, missile antennas, etc
A72-12002

VIBRATION TESTS
Flight vibration testing methods for ascertaining flutter stability of high speed aircraft
[DGLR PAPER 71-083]
A72-12725

VISCOSITY
Viscosity and additive effects on jet engine fuel antwear properties improvement
A72-11968

VISCOS FLOW
Design programs for swept wings in subcritical, compressible, viscous flow
[NPL-AERO-BOTE-1100]
N72-10018

VISIBILITY
Suitability evaluation of fog simulator for weather conditions during flight approach
[FAA-NA-71-44]
N72-10233

VORTEX STREETS
Slipstream vortex street geometry influence on velocity and load distribution of WTOL propellers
A72-11004

VORTEXES
Axial and tangential velocity distributions within trailing line vortex to large distance downstream of generating wing extended from available data
A72-11135

Rotor downwash variation by changing vortice diameter, flapping, rotor speed, and radius and placing infinite span wing in flow field
A72-11003

Linear aerodynamic rotor theories showing effect of applied vortex model on exactitude of numerical analysis
A72-11005

Vortex drag factor of untapered swept wing with part-span flap, noting spanwise loading
[NPL-AERO-1329]
N72-11011

WARNING SYSTEMS
Pilot collision warning indicator performance in terminal area traffic, using computer fast-time simulation for traffic model
A72-11134

FAA activity in collision avoidance system and pilot warning instrument areas
A72-12379

Development and operating principles of collision warning system for aircraft accident prevention
[NASA-CASE-MHR-10703]
N72-11527

WARPAGE
Warpage control of large Al alloy forgings machining of jumbo jet components, using packing and storage methods
[SAE PAPER 710801]
A72-10280

WAVE DISPERSION
Real gas effects in atmosphere to make sonic bang shock wave full dispersion and thickness wide variations
A72-11972

WAVEFORMS
Sonic boom waveforms measured during exercise summer sky in southern Great Britain
[ARC-EN-A-3659]
N72-11015

WEAPON SYSTEMS
Variable speed constant frequency power generation equipment influence weapon system effectiveness, considering weight and cost
A72-11067

WEAP TESTS
Viscosity and additive effects on jet engine fuel antwear properties improvement
A72-11968

WEATHER
Statistical analysis of weather effects in aircraft accidents
[PB-201437]
N72-10039

Suitability evaluation of fog simulator for weather conditions during flight approach
[FAA-NA-71-44]
N72-10233

WEATHER FORECASTING
Terminal aerodrome forecasts usefulness and accuracy assessment
A72-10864

Techniques for forecasting turbulent weather conditions below 10,000 feet for light aircraft operating in Hawaiian Islands
[AD-726107]
N72-11525

WEBS
Webbing joints stitching strain, considering nylon and flax yarns stretching properties and various stitching patterns strengths
A72-10315

WEIGHT ANALYSIS
Variable speed constant frequency power generation equipment influence weapon system effectiveness, considering weight and cost
A72-11067

WELDING
Jet engine component overhaul procedures for fatigue damage repair, detailing distressed metal removal, replacement and welding techniques
A72-12499

WIND PRESSURE
Analysis and comparison of gust load models based on either discrete gust concept or continuous gust concept
[WEA-TR-710250]
N72-10998

WIND TUNNEL APPARATUS
Wind tunnels measuring equipment and procedures and data acquisition and processing systems electronics, describing computerized real time data processing system
A72-12898

WIND TUNNEL MODELS
Nonporous rigid parachute models three component measurements, using low speed wind tunnel for testing skirt length effects on aerodynamic characteristics
A72-10303

Wind tunnel and rocket sled results with ribbon parachutes for supersonic release, discussing aerodynamic, structural flutter and inflation time characteristics.
A72-10308

Wing-fuselage combination aerodynamic coefficients, comparing experimental data with subsonic linear and nonlinear theoretical results
[DGLR PAPER 71-115]
A72-12723

Conference papers on jet and slipstream influence on aerodynamic coefficients using aircraft models
[DLR-KT-T-70-28]
N72-10004

Jet engine simulation with low speed wind tunnel models for interference drag measurement
N72-10005

Vertical takeoff aircraft wind tunnel model with high pressure ejectors to determine jet interference on aerodynamic coefficients
A72-10007

Aerodynamic characteristics of wind tunnel model of hypersonic aircraft
[NASA-TR-D-5577]
N72-10085

Prediction of flight penetration of wing buffet flow from wind tunnel model dynamic tests
[ARC-CP-1711]
N72-11004

WIND TUNNEL NOZZLES
Design of flexible steel liners for adjustable transonic wind tunnel nozzle
N72-10023

WIND TUNNEL STABILITY TESTS
Full scale wind tunnel tests of small unpowered jet aircraft with V tail
[NASA-TR-D-5673]
N72-10031

WIND TUNNELS
On-line digital computer for wind tunnel, operating systems, and real time operation
[SPL-AERO-1326]
N72-10184

Pilot stem blockage corrections in uniform and nonuniform pipe flow determined by wind tunnel measurements
[ARC-CP-1715]
N72-11295
WING FLOW METHOD TESTS

Aerodynamic forces and pressure distribution measurement on wing-body combination model, investigating boundary layer on wing upper surface
A72-12228

WING LOADING
Increasing lift and Reynolds number effects on displacement and skin friction of three dimensional turbulent boundary layer on infinite swept wing
A72-11395

This shock layer theory of lifting properties of reentry caret and flat delta wings and waveriders at high incidence angles and Mach number
A72-12345

Analysis and comparison of gust load models based on either discrete gust concept or continuous gust concept
ELR-TR-710259

Vortex drag factor of untapered swept wing with part-span flap, noting spanwise loading
NPL-AERO-1324

Numerical evaluation of downwash integral for lifting rectangular wings noting wing loading
NPL-AERO-NOTE-1095

WING OSCILLATIONS
Aerodynamic lift characteristics of oscillating two dimensional airfoil subjected to sinusoidal gust
AD-726132

WING PANELS
Formulae for components of perturbation velocity in linearized subsonic theory for symmetrical cranked wing panels at zero angle of attack
NPL-AERO-NOTE-1090

WING PROFILES
Velocity field of sonic flow about aircraft wing profile, solving mixed Cauchy problem
A72-11178

WING SPAN
Vortex drag factor of untapered swept wing with part-span flap, noting spanwise loading
NPL-AERO-1324

WING TIPS
Tip clearance effect on compressor blade aerodynamic characteristics, applying Bollay analysis to low aspect ratio rectangular wing
A72-12825

WINGS
Multipropeller slipstream and wing interference, noting lift, drag, pitching moment, normal force distribution, and wakes
A72-10015

WIRE
Aerospace wire and cables testing methods standards for evaluating mechanical, electrical and chemical properties, coating thicknesses, continuity flaws, flammability, geometrical characteristics, etc
SAR-AS-1198

X

X-RAY INSPECTION
Application of nondestructive testing procedures to maintenance of large commerical aircraft
N72-11025

Y

YARNS
Weaving joints stitching strain, considering nylon and flax yarns stretching properties and various stitching patterns strengths
A72-10315

YAW
Aircraft pitching and yawing cross couplings compensation at high speed
A72-10506

Jet interference effects on yaw stability for SAAB 37 and 105 wind tunnel models
N72-10006

A-80
### PERSONAL AUTHOR INDEX

**AERONAUTICAL ENGINEERING / A Special Bibliography (Suppl. 15) FEBRUARY 1972**

**Typical Personal Author Index Listing**

<table>
<thead>
<tr>
<th>PERSONAL AUTHOR</th>
<th>TITLE</th>
<th>REPORT NUMBER</th>
<th>NASA ACCESSION NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABDEBSOB, P.</td>
<td>Investigation of display requirements for helicopter IFB manual formation flight under various operational and environmental conditions</td>
<td>[AD-725209]</td>
<td>N72-10044</td>
</tr>
</tbody>
</table>

Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief 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 title, e.g., N72-11004. Under any one author's name the accession numbers are arranged in sequence with the IAA accession numbers appearing first.

---

**A**

ACKEBBAB, G. H.
Cooling of advanced engines by endothermic reactions of hydrocarbon fuels

ADAMS, R. W.
Maintenance fault isolation in the seventies

ADAROB, G. P.
Modular design concept improves jet engine maintainability

AKEN, T. N.
Full-scale wind-tunnel tests of a small unpowered jet aircraft with a T-tail

ALLOB, O. C.
Preliminary results of measurements of heavy primaries in the region of supersonic transport using plastic stacks.

ANDERSON, P. A.
Investigation of display requirements for helicopter IFB manual formation flight under various operational and environmental conditions

ANDERSON, P. A.
Investigation of display requirements for helicopter IFB manual formation flight under various operational and environmental conditions

ARGIES, J. B.
Application of interactive computer graphics in wing unit designs

AROB, I.
Problems of the use of inertial navigation systems in aviation

ARZT, P.
Integrity control procedures for machining steel and titanium aircraft components.

AUDL, J. H.
Solvent removal of EC-2273 potting compound from F-4 aircraft electrical components

AUGHLAN, F.
Basic investigations of recirculation with configurations consisting of 1 to 6 jets

B

BAEBD, B.
Study and calibration of pressure sensors in particular environments

BARBER, G. A.
Some experiments on an engine installation above the wing of a swept-winged aircraft

BARNETT, C. S.
Flight and wind-tunnel tests on an aerodynamically compensated pilot-static head for the BAC 221 aircraft

BARTON, J. E.
Fire hazard evaluation of thickened aircraft fuels

BARTON, J. E.
Fatigue damage detection.

BAYL, S. M.
Determination of aircraft stability coefficients from dynamic motions.

BAYRE, H.
Influence of a jet on the aerodynamic properties of wings positioned above the jet nozzle

BEAE, H.
Maintenance fault isolation in the seventies

BEAB, D. I.
Helicopter aerodynamics

BEAD, J. P.
The development of small gas turbine engines at GAIC /Lecture/. (DGLR Paper 71-081)

BECKR, J.
Investigation of unsteady interference effects on a harmonically oscillating wing-tailplane model with a variable sweep wing in the low subsonic region

BECKETT, B. G.
Fuel-related problems in aircraft fuel systems

BECKW, W. B.
Utilization of meteorological radar for aeronautics

BEDAGOB, P.
Synthesis and properties of esters of tetramethyl-2,2,7,7 octane diol-1,8

BEHSET, C. L.
Control of warpage during machining.

BENNETT, C. L.
Control of warpage during machining.

BENNING, G.
Interference effects from jets on aircraft static stability. Wind tunnel methods used in Sweden

BEHAT, D. W.
Acoustics - A new approach for monitoring the environment near airports.

BERG, R. A.
A flight simulator study of STOL transport directional control characteristics
<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHOE, Y.</td>
<td>The configuration of a cable towed in a circular path.</td>
<td>A72-11132</td>
</tr>
<tr>
<td>CLARENCE, T. A.</td>
<td>Effect of lip slots on the static and dynamic stability characteristics of finned bodies</td>
<td>[AD-728016] A72-10003</td>
</tr>
<tr>
<td>CLEVELAND, W. E.</td>
<td>The handling qualities simulation program for the augmentor wing jet STOL research aircraft.</td>
<td>A72-11654</td>
</tr>
<tr>
<td>CLIFFORD, D. W.</td>
<td>Experimental evaluation of lightning protective coatings for boron/epoxy composites.</td>
<td>A72-10783</td>
</tr>
<tr>
<td>COLEMAN, R. J.</td>
<td>Some full-scale measurements of the flow in the wake of a hangar</td>
<td>[ABC-CP-1168] A72-10347</td>
</tr>
<tr>
<td>COOK, R. F.</td>
<td>Harnessing the digital computer for aircraft maintenance</td>
<td>A72-11022</td>
</tr>
<tr>
<td>CORBETT, J. E.</td>
<td>The infra-red analysis of aircraft cabin-gas atmospheres</td>
<td>[AD-724571] A72-10040</td>
</tr>
<tr>
<td>CORBOSS, J. J.</td>
<td>Advanced technology for STOL transports.</td>
<td>[SAD PAPER 710751] A72-10250</td>
</tr>
<tr>
<td>CORBETT, G.</td>
<td>Some results on gust alleviation</td>
<td>[ONERA-TP-925] A72-10999</td>
</tr>
<tr>
<td>CRAIG, R.</td>
<td>Air transportation in the American economy.</td>
<td>A72-11721</td>
</tr>
<tr>
<td>CRAIG, S. J.</td>
<td>Experimental study of shock impingement on a blunt leading edge with application to hypersonic inlet design</td>
<td>[AD-726111] A72-11312</td>
</tr>
<tr>
<td>CRAIG, S. J.</td>
<td>A flight simulator study of STOL transport directional control characteristics</td>
<td>[FAA-RP-71-81] A72-11037</td>
</tr>
<tr>
<td>CURRY, B. N.</td>
<td>Display research collision warning system</td>
<td>[NASA-CAS-824-10703] A72-11527</td>
</tr>
<tr>
<td>[EBERTO, B. K.]</td>
<td>[WLE-TR-710250] A72-10998</td>
<td></td>
</tr>
<tr>
<td>[ERHART, J. P.]</td>
<td>Vibration - A review of interesting cases.</td>
<td>A72-12002</td>
</tr>
<tr>
<td>[DESAVO, J. S.]</td>
<td>Proceedings of a conference on regional transportation planning</td>
<td>[PB-200076] A72-11649</td>
</tr>
<tr>
<td>[DI RRO, J. P.]</td>
<td>Computer application strategy for control of airline maintenance in the seventies</td>
<td>A72-11020</td>
</tr>
<tr>
<td>[DUNEE, K.]</td>
<td>Three component measurements for rigid parachute models.</td>
<td>A72-10303</td>
</tr>
<tr>
<td>[DUNBBE, F. W.]</td>
<td>Lubricant experience and duties in a civil supersonic gas turbine engine</td>
<td>A72-11697</td>
</tr>
<tr>
<td>[DONB, H.]</td>
<td>Synthetic lubricants for supersonic aircraft</td>
<td>A72-11701</td>
</tr>
<tr>
<td>[DOTLE, H.]</td>
<td>Facilities, equipment and tools to support wind bodied airplane maintenance in the seventies</td>
<td>A72-11623</td>
</tr>
<tr>
<td>[DUNN, H.]</td>
<td>Development of composite tape laying process for advanced fibrous reinforced composite structures</td>
<td>[AD-725765] A72-10425</td>
</tr>
<tr>
<td>[DUNPL, L. W.]</td>
<td>Theory of the measurement and standardization of in-flight performance of aircraft</td>
<td>[AD-725741] A72-11054</td>
</tr>
<tr>
<td>[DUNN, R. G.]</td>
<td>Ductility improvements in superalloys.</td>
<td>A72-12561</td>
</tr>
<tr>
<td>[DVMORSE, L. A.]</td>
<td>Investigation of airborne marker beacon</td>
<td>[PAA-RP-71-29] A72-10173</td>
</tr>
<tr>
<td>[DVMER, W. J.]</td>
<td>An automated procedure for the optimization of practical aerospace structures. Volume 1: Theoretical development and user’s information</td>
<td>[AD-726112] A72-11820</td>
</tr>
<tr>
<td>[DYMB, G. C.]</td>
<td>Polar navigation - A new Transverse Mercator technique.</td>
<td>A72-10181</td>
</tr>
<tr>
<td>[EATON, H. L.]</td>
<td>Development of composite tape laying process for advanced fibrous reinforced composite structures</td>
<td>[AD-725765] A72-10425</td>
</tr>
<tr>
<td>[EDDY, W. C., JR.]</td>
<td>Radioactive gas penetrant system - A report on initial product application.</td>
<td>A72-10813</td>
</tr>
<tr>
<td>[EDER, W.]</td>
<td>Basic investigations of recirculation with configurations consisting of 1 to 6 jets</td>
<td>[BBMG-FBVT-71-12] A72-10828</td>
</tr>
<tr>
<td>[EDGERTON, R. W.]</td>
<td>Helicopter lift-margin system, volume 2</td>
<td>[AD-725207] A72-11053</td>
</tr>
<tr>
<td>[EDWARDS, J. W.]</td>
<td>The microwave landing system development program.</td>
<td>A72-12377</td>
</tr>
<tr>
<td>[ELLIS, D. H.]</td>
<td>Telemetry and the integrated avionics approach.</td>
<td>A72-12403</td>
</tr>
</tbody>
</table>
Technical programmer's manual
[AD-725784] W72-10047
An automated procedure for the optimization of practical aerospace structures. Volume 1:
Theoretical development and user's information [AD-726112] W72-11820
ENCE, W.
Preliminary results of measurements of heavy primaries in the region of supersonic transport using plastic stacks.
A72-12077
ERDEMAN, V. J.
Field practices in the repair of fatigue damaged jet engine components.
A72-12499
Erickson, J. D.
Automated air traffic control.
A72-10960
Erickson, P. W.
Solvent removal of EC-2273 potting compound from F-4 aircraft electrical components
[AD-725493] W72-11473
EDWARDS, D.
Numerical calculation of a sonic flow about an aircraft wing profile, by an inverse method
A72-11170
EDROV, N. B.
Systems of aircraft automatic control [JFBS-54332] W72-11039

F
Pagan, C. H.
Elastomeric bearings for rotor system applications.
A72-10150
FAITH, L. E.
Cooling of advanced engines by electrothermal reactions of hydrocarbon fuels
W72-11672
FECHEK, F. J.
Manufacturing experiences with graphite filament reinforced composites. [Ss PAPER EM 71-205] A72-10960
FEDER, A.
Two examples of application of Kalman filters to integrated navigation systems
A72-12050
Pooncswilliams, J. E.
On the noise sources of the unsuppressed high-speed jet.
A72-11973
Transmission of low frequency jet pipe sound through a nozzle flow [JEPW/69] W72-10252
Jet noise at very low and very high speed.
W72-10253
On the noise sources of the unsuppressed high-speed jet [ARC-32723] W72-10254
FIALA, B.
Contribution to the selection of fire extinguishing systems and agents for aircraft fires
W72-11685
Investigation of fire extinguishing powders by means of a new measuring procedure
W72-11691
FLEMMING, C. M.
Integrity control procedures for machining 300 M steel and titanium aircraft components. [Ss PAPER IQ 71-238] A72-10969
FORDER, S. L.
Fuel related problems in aircraft fuel systems
W72-11677
FORCEY, R. I.
Experimental investigation of the strength of rotating disks in aircraft gas turbines operating under variable thermal conditions
A72-11637
FRAZER, W. E.
A survey of propulsion systems for low emission urban vehicles [PB-200144] W72-10830
FUCHS, J. S.
Influence of electric power quality on avionic design and weapon system effectiveness.
A72-11067
FIELDEBERG, V.
Calibration of the Concorde radiation detection instrument and measurements at SST altitude
[FAA-AM-71-26] W72-11370
FRISTON, B. M.
Fume inhibition chemistry
W72-11680
FROST, W. O.
Telemetry and the integrated avionics approach.
A72-12043
FRETER, W.
Measuring, data-acquisition, and data-processing systems for the large wind tunnels of the Aerodynamische Versuchsanstalt Goettingen
A72-12898
FURB, J. W.
Influence of different parameters (like jet contraction, vortex core diameter) upon rotor downwash calculation. Application to the case of an auxiliary wing
W72-11003
FULLER, E. W.
Radiological protection in SST aircraft.
A72-12078
FULLER, K. L.
GORD - A short-range high-definition radar.
A72-12042
FURNO, A. L.
Fire hazard evaluation of thickened aircraft fuels
W72-11689
GARDNER, L.
Jet fuel specifications
W72-11659
GARBER, M. C.
The vortex drag of a swept wing with partly-span flaps [NPL-ABRO-1124] W72-11071
Convergence of current routines for evaluating downwash at a lifting surface [NPL-ABRO-BOTE-1695] W72-11012
GEHR, K.
Linear aerodynamic rotor theory
W72-11005
GISSELLE, W.
Force and downwash measurements with jet simulation on models of the European Airbus in a low speed wind tunnel
W72-10012
GOSPERLEIN, H.
The possibilities of actually testing the combustion characteristics of aviation fuels with appropriate equipment
W72-11674
GOETZ, A.
Analysis of aircraft fuel tank fire and explosion hazards
[AD-725027] W72-11056
GLADSTONE, D.
Parachute R & D in industry.
A72-10304
GLASS, J.
Doppler - A modern aid for air navigation
A72-12749
GLOVER, J.
Ultrasonic inspection of helicopter rotor blades.
A72-10211
GOLD, C.
GOLOD, A.
Buckling of an elastic column containing a fatigue crack. [Ss PAPER 19144] A72-11011
GOODBAW, L. T.
Installation and integration of transonic transport propulsion systems. [Ss PAPER 7753762] A72-10259
GODLAND, R. H.
GOULD, R. W.
Pitch-stem blockage corrections in uniform and non-uniform flow [ARC-CR-1175] W72-11295
GRABBEY, K.
Air traffic regulations
A72-12621
Air traffic law

GBASSO, G.

Aircraft radio navigation system by means of polar coordinates and their development

A72-12645

A72-12646

GBiZIABI, D.

GRADL, S.

HABTHANB, K.

GRABEN, S. J.

GBISHANOV, H. J.

GBIGOfi'EV, P. F.

GBIEGBB, I.

HABRE, D.

HAISE, B. J.

HAAS, J.

HAEEL, P.

HAHEL, P.

HAGEMANS, D. J.

HAASE, B. J.

HAAS, J.

HALL, O. J., Jr.

HAINL, G.

HAIDER, M. J.

HAZELWOOD, J. H.

HALL, H. W.

HAVERDILL, R. F.

HABPUB, H.

HABHS, L.

HABBPUB, H.

HABKBS, J. E.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.

HOFBAHB, B.
HOLLINGSWORTH, S. R.

Air traffic law

HOLLINGSWORTH, S. R.
Investigation of display requirements for helicopter IFR manual formation flight under various operational and environmental conditions

HOOD, E. A.
Field measurement of infrasonic noise.

HOUBOLT, J. C.
On the aerodynamic forces of oscillating two dimensional lifting surfaces

HUBBET, W.
The stability- and control behavior of the hingeless Boelkow rotor system

HUBERT, J.
Numerical calculation of a sonic flow about an aircraft wing profile, by an inverse method

HUX, W.
Supersonic and hypersonic flow with attached shock waves over delta wings.

HUBB, R. G.
Observations on breathing and related phenomena in some parachute type parachutes when freely descending.

HUMPHREY, G. L.
Automated air traffic control.

HUNT, F. L.
Sonic boom measurements during exercise summer sky

HURBAS, J. W.
The role of inertial navigation in future air traffic control systems.

INGERS, G. E.
Nonequilibrium boundary layer flow on highly-swept hypersonic wings.

INGRAM, C. W.
Determining aircraft stability coefficients from dynamic motions.

IBRAHIM, K. K.
Experimental manufacture of Inconel Alloy 718 compressor rotor blades from metal powder preforms.

J.

JABLOKSEI, W.
Improving the readability of maintenance manuals

JAMES, K.
The influence of axial cords on parachute performance.

JANOUR, Z.
Boundary-layer development on a wing-body combination.

JANZEN, E.
Early stage detection of oil changes in aircraft engines

JOHANNESON, B. B.
Real-gas effects in very weak shock waves in the atmosphere and the structure of sonic bangs.

JOHNSON, D.
Supersonic and transonic deployment of ribbon parachutes at low altitudes.

JOHNTON, H.
Catalytic reduction of stratospheric ozone by nitrogas oxides

JULBERD, A.
Study and calibration of pressure sensors in particular environments
KRAEB, J. J.
The NASA Quiet Engine.
[SAE Paper 710774]
A72-10266

KUCHTA, J. M.
Fire hazard evaluation of thickened aircraft fuels
N72-11689

KURH, P.
Externally blown flaps, aerodynamic feasibility
study of a STOL-transporter.
A72-12502

KUGLER, W.
Theoretical considerations of a spring, hinged rotor
of variable flapping stiffness and constant phase shift
N72-11007

KURSEVA, I. I.
Determination of radial stresses in ring-to-drum
transition areas of disks
A72-11374

KUSENBERGER, F. W.
Fatigue damage detection.
A72-12498

KUSMAN, A.
Survey of different models for computing the flow of
a lifting rotor
N72-11002

L.

LA ROBERE, P.
Automation of air traffic - The ATCAS system
A72-12649

LALIBERTE, W. G.
Automated air traffic control.
A72-10960

LAMBHOUGH, J.
Studying the coherent and incoherent structures of
aerodynamically generated noise
[ONERA-TP-983]
N72-11036

LAMO, W. R.
Analysis of pilot warning indicator performance in
terminal area traffic.
A72-11134

LANGLET, M.
Strength and stiffness of sandwich panels under
transverse loading.
A72-10723

LAV, R. K.
A survey of propulsion systems for low emission
urban vehicles
[PR-200144]
N72-10839

LEE, C. H.
A hybrid electrical power system for aircraft
application.
A72-11068

LEHAW, A. F.
Model studies of helicopter tail rotor flow patterns
in and out of ground effect
[AD-725591]
N72-11069

LEHIAN, D. R.
Convergence of current routines for evaluating
downwash at a lifting surface
[NPL-AERO-NOTE-1095]
N72-11012

LEMOAL, G. A.
Slight pavement stresses under aircraft loading.
A72-10192

LEONARD, B. E.
Development of ultrasonic field inspection equipment
for T53 gas turbine compressor discs.
A72-10814

LESCHENKOFF, T. M.
Experimental investigation of the strength of
rotating disks in aircraft gas turbines operating
under variable thermal conditions
A72-11637

LEYDENHALL, H. G.
Field measurement of infrasonic noise.
A72-10157

LEVINE, G. B.
Tactical displays.
A72-12421

LEWIS, A.
Fuel for supersonic and hypersonic aircraft
N72-11671

Electrostatic charging in the handling of aviation fuels
N72-11686

LIEBRECHT, L. L.
Study and development of acoustic treatment for jet
engine tailpipes
[NASA CR-1853]
N72-10043

LLOYD, D. E.
Mathematical studies on separation standards.
A72-10178

LOCK, B. C.
A note on subsonic linearised theory for symmetrical
crested wings at zero incidence.
A72-11154

Locke, B. C.
A note on subsonic linearised theory for symmetrical
crested wings at zero incidence.
N72-10021

LOBERT, G.
Aerodynamic calculations for the interference of several
propeller-jets with an aerotof
N72-10015

LOGAN, A. H.
Vortex velocity distributions at large downstream
distances.
A72-11135

Loomis, J. P.
Air transportation in our changing society.
A72-11716

LONDI, J. A.
A study of noise generation by a rotating blade row
in an infinite annulus
[AD-726126]
N72-11714

LORSCH, J. B.
Airborne infrared forest fire detection system
[AD-726953]
N72-10396

LOWRY, R. B.
Air Force STOL tactical transport technology
program.
[SAE Paper 710758]
A72-10255

LUCIFERD, F.
Two examples of application of Kalman filters to
integrated navigation systems
A72-12050

LUIDENS, R. W.
Multiple fan integrated propulsion wing system
[NASA-CASE-LEX-11224-1]
N72-10033

LUNDEQST, G. E.
FSA plans for AEROSAT.
A72-12383

M.

MABET, D. G.
An hypothesis for the prediction of flight
penetration of wing buffet from dynamic tests
on wind tunnel models
[ARC-CP-1171]
N72-11044

MACDONALD, J. A.
Fire and explosion protection of fuel tank ullage
N72-11690

MACKINNON, D.
The role of inertial navigation in future air
traffic control systems.
A72-11118

MADE, P. H.
Airborne infrared forest fire detection system
[AD-726953]
N72-10396

MAGI, C.
Investigation of an associative memory for use in
digital computers employed as aids to air and
naval traffic
A72-12647

MALKUTIS, R.
A new area rule for hypersonic wing-bodies.
A72-12270

MANGAROTTI, R. A.
The reduction of aircraft engine fan-compressor
noise using acoustic linings.
[SAE Paper 71 SA6]
A72-10223

MANN, A. R.
Skin-friction measurement in low with pressure
gradient.
A72-12275

MANSO, L.
Jet-noise reduction through liquid-base foam
injection.
A72-10160

MARCUS, R. E.
The mechanical design of an adjustable nozzle for
the NPL 25 in by 20 in (635 mm by 508 mm)
transonic wind tunnel
[NPL-AERO-NOTE-1096]
N72-10023

MARSHALL, R. E.
STOL aircraft in future transport systems.
MATTESON, D. E.

A72-11553

MATTESON, D. E.

Study of aircraft in intraurban transportation

systems, volume 3 [NASA-NC-114342] N72-10986

MATTESON, N. C.

Study of aircraft in intraurban transportation

systems, volume 1 [NASA-NC-114340] N72-10984

Study of aircraft in intraurban transportation

systems, volume 2 [NASA-NC-114341] N72-10985

Study of aircraft in intraurban transportation


MAYDEW, R. C.

Supersonic and transonic deployment of ribbon

parachutes at low altitudes. A72-10312

MAYES, A.

Target contrast considerations in millimeter wave

radiometry for airborne navigation [NASA-TR-78-1-62082] N72-10539

MAYES, R. C.

Nondestructive inspection: An aircraft maintenance
tool of the seventies N72-11025

MCANALLY, W. J., III

Investigation of feasibility of integral gas turbine

equipment solid particle inlet separators, Phase 2: Feasibility demonstration [AD-725593] N72-11173

MCPARLAND, S. B.

Development of ultrasonic field inspection equipment

for T33 gas turbine compressor discs. A72-10814

MCPhAUL, R. J.

Development of the DC-10 Nondestructive Testing

Manual. A72-11109

MCINTOSH, S.

Cost growth and productivity in European aerospace
development programs [AD-725078] N72-10992

MCWITHE, A. J.

Optimization studies of aircraft control variables

[AD-725065] N72-10042

Spectral analysis of transient data with application
to auto-pilot parameter studies [AD-725068] N72-10501

MEHAFNY, V. S.

Compensation of cross-couplings in aircraft motion

A72-10506

MENKUSL, D.

Measuring, data-acquisition, and data-processing

systems for the large wind tunnels of the

Aerodynamische Versuchsanstalt Goettingen A72-12098

MELANCON, L.

A limited scan antenna. A72-12393

MELZER, E.

Possibilities for jet simulation in the 3m wind

tunnel of the DFVLR-AVA Goettingen N72-10005

MESSCHERLAKSEN, H.

Thermal strength testing methods for aircraft gas
turbine engine nozzle apparatuses A72-11373

MIAJAF, L. A.

Systems of aircraft electronic control

[JPRS-54332] N72-11039

MILLER, B. E.

Simulated crash tests as a means of rating aircraft

safety fuels N72-11692

MILLER, T. S.

Projected maintainability advantages of solid state
electrical power management and solid state

contactless switching systems N72-11034

MITHRALL, R. B.

The performance of parachutes at low speeds. A72-10309

The strain of stitched joins. A72-10315

MITROPOULOS, V. T.

One-dimensional unsteady flow in a rotating vane

cascade

PERSONAL AUTHOR INDEX

A72-11584

MIYAI, Y.

A note of the configuration of jet sheet on a thin,

jet-flapped airfoil. A72-11669

MOORE, E. D.

Effect of casing treatment on overall and blade


MUGGERIDGE, B. D.

Turbulent boundary layers and surface pressure

fluctuations on two-dimensional aerofoils. A72-10217

MURPHY, D. G.

The crystal ball focuses on the next generation of

transport aircraft. [SAR PAPER 710756] A72-10249

MURPHY, J. W.

Fire hazard evaluation of thickened aircraft fuels

N72-11689

N

NAKAMURA, Y.

Effects of Reynolds number and frequency parameter

on control-surface buzz at high subsonic speeds

[AD-725711] N72-10013

NANNOIUS, R.

Study and calibration of pressure sensors in

particular environments [ONERA-TF-982] N72-11168

NABDI, G.

Low emission fuels and devices for aviation engines

N72-11675

NAKH, T. C., JR.

A progress report on the development of an augmentor

wing jet STOL research aircraft. [SAR PAPER 710757] A72-10254

NASI, J. P.

The three-dimensional turbulent boundary layer on an

infinite yawed wing. A72-11395

NELS, W. P., JR.

Aerodynamic characteristics of an all-body

hypersonic aircraft configuration at Mach numbers

from 6.5 to 10.6 [NASA-TN-D-6577] N72-10045

NELSON, J. C.

Automated air traffic control. A72-10960

NELSON, J. M.

Calibration of the Concorde radiation detection

instrument and measurements at SST altitude

[PA-AM-71-26] N72-11370

NELSON, R. D.

Study and development of acoustic treatment for jet

engine tailpipes [NASA-NC-1053] N72-10043

NERFERT, H.

Spin control by means of the usuperstall

characteristic [DGLR PAPER 71-057] A72-12718

NICHOLAS, G. P.

Brief flight tests of crosswind landings and

sidestep manoeuvres on the BAC 221 aircraft

[ARC-CP-1164] N72-11045

Flight and wind-tunnel tests on an aerodynamically

compensated pitot-static head for the BAC 221

aircraft [ARC-CP-1167] N72-11046

NORTH, D.

High speed parachute research in the U.K. A72-10308

O

O'KEEFE, J. V.

A progress report on the development of an augmentor

wing jet STOL research aircraft. [SAR PAPER 710757] A72-10254

OATES, G. S., JR.

Air Force STOL tactical transport technology

program. [SAR PAPER 710756] A72-10255

OJALO, J. S.

An automated procedure for the optimization of

practical aerospace structures. Volume 2:

Technical programmer's manual [AD-725744] N72-10047

B-8
An automated procedure for the optimization of practical aerospace structures. Volume 1: Theoretical development and user’s information [AD-726112] A72-11820
OKTOBYB, B. N.
Systems of aircraft automatic control [JPBS-54332] A72-11039
GLASON, H. L.
Future trends in aircraft design. [SNAME PAPER 710749] A72-10248
OLQON, B.
Design comparison of quiet N = 0.80 STOL transports. [SNAME PAPER 710759] A72-10256
OPTONSS, T.
A three component gas tunnel balance designed for testing thin delta wings [Airplane]. A72-11375
ORDREK, F. J.
Experimental study of shock impingement on a blunt leading edge with application to hypersonic inlet design [AD-726111] A72-11312
OSAND, B. B.
Utilization of meteorological radar for aeronautics [ONR-264-TP-148] A72-11147
PALLAT, R. J.
Sonar bang measurements during exercise summer sky [ARC-9/R-3659] A72-11015
PARKER, G. R.
Automatrd fuelling operations and quality control A72-11678
PAVILIA, I. G.
Systems of aircraft automatic control [JPBS-56332] A72-11039
PIABBB, B. E.
Remanufacturing of jet engine components employing brazing techniques A72-11024
PETEB, A.
Current situation of radio aids for aerial navigation in Italy and prospects for the near future A72-12748
PENBLL, R.
Studying the coherent and incoherent structures of aerodynamically generated noise [ONERA-TP-908] A72-11036
PETROB, C. G.
Productivity in design. A72-10247
PETROB, V. V.
The KFA (Department of the Atmospheric Physics) aerial expeditions 1 and 2 for study of the peculiarities of conditions of the boundary layer of the atmosphere over an oasis and a semiarid region [AD-727535] A72-10332
PFAHMA, E.
PIBMA, H.
Cost growth and productivity in European aerospace development programs [AD-725478] A72-10992
PIBIA, A. D.
Time dependence of variances of sonic boom waveforms. A72-11158
PICKER, W. J. G.
A theoretical study of heat control in flight close to the ground as affected by elevator lift and cockpit position [ARC-8/R-3662] A72-11049
PITTS, F. L.
Electronic strain level counter [NASA-CASE-LAB-10756-1] A72-11803
POBB, R. J.
Automated landing system. A72-10961
POBB, H.
Field practices in the repair of fatigue damaged jet engine components. A72-12499
POPLEE, N.
The vibration of a box-type structure. II - Response to a travelling pressure wave. A72-10219
POTEB, B. B.
Theory of the measurement and standardization of on-flight performance of aircraft [AD-725761] A72-11054
POTEB, B. P.
For a better, short-haul flight. A72-11719
POLL, B. J.
A program of research into viscous aspects of flow on swept wings [NFL-AEROTE-1100] A72-10018
POBBIK, R. T.
A discrete address ATC beacon system. A72-12378
POBBIK, J. B.
Terrain clearance during descent and approach. A72-10183
POBBIK, H.
The Eustrum. A72-12882
POBD, G.
Doppler - A modern aid for air navigation A72-12749
QAGLIO, G.
Problems and technical aspects connected with the use of the L band in an aerial navigation aid system via satellite A72-12642
QUIGG, H. T.
Effect of very low sulfur in JP-5 fuel on hot corrosion [AD-725619] A72-11706
QUIGLEK, B. C.
A progress report on the development of an augmentor wing jet STOL research aircraft. [SNAME PAPER 710757] A72-10254
RABB, J. W.
The FAA air traffic control automation program. A72-12380
RATCLIFFE, S.
The potential of existing avionics technology. A72-10180
REED, J. A. I.
The testing of parachutes at supersonic speeds. A72-10305
REYMAK, F.
Thermal stability of a tri-methyl-propane ester based lubricating oil A72-11699
REYNOLDS, L. J.
Smother travel in rough air. A72-11720
RICHARD, O.
Preliminary tests and performance of rolling vertical takeoff and landing of the VJ 101 C-X2 with ignited afterburners [BMVG-PWMT-71-13] A72-10034
RIGGLES, F. W.
Measuring, data-acquisition, and data-processing systems for the large wind tunnels of the Aerodynamische Versuchsanstalt Goettingen A72-12898
RIGIY, P.
Numerical calculation of a sonic flow about an aircraft wing profile, by an inverse method A72-11178
RIST, D.
Concept and flight behavior of a jet-powered recoverable lift engine A72-12900
RITB, H.
Test and evaluation of a daytime cockpit fog simulator [FAA-WA-71-44] A72-10233
ROBBITS, B.
Research on advanced axial compressor concepts [AD-72589] A72-11308
ROBBITS, B. W.
The aerodynamic inflation of shell type structures with particular reference to parachutes. A72-10311
The load on the brake parachute of a jet aeroplane

Computer application strategy for control of airline

Angle of attack and thrust control for steeply

Emulsified fuels and aircraft safety

Bays of improving the antiwear properties of fuels

Rigid pavement stresses under aircraft loading.

Preliminary results of measurements of heavy

primaries in the region of supersonic transport

using plastic stacks.

Automated air traffic control.

5-1 design keyed to future growth.

Crew compartment vibration environment in the B-52

aircraft during low-altitude, high-speed flight

Brief flight tests of crosswind landings and

sidestep manoeuvres on the BAC 221 aircraft

Rigid pavement stresses under aircraft loading.

From the propeller to the jet engine

Research on advanced axial compressor concepts

Methods of flight vibration testing of modern

high-performance aircraft

Analysis of pilot warning indicator performance in
terminal area traffic.

Helicopter development reliability test

requirements. Volume 1

Crash safe turbine fuel development by the Federal

Aviation Administration, 1964 - 1970

S

Computer application strategy for control of airline

maintenance in the seventies

Research on advanced axial compressor concepts

The load on the brake parachute of a jet aeroplane

under the influence of the engine wake.

Rigid pavement stresses under aircraft loading.

Ways of improving the antinew properties of fuels for

jet engines

Automated air traffic control.

Plane inhibition chemistry

Emulsified fuels and aircraft safety

Angle of attack and thrust control for steeply

approaching aircraft
STEVENS, G. W. H.
A review of parachute applications and some associated current research problems.
A72-10302

Observations on breathing and related phenomena in some paratroop type parachutes when freely descending.
A72-10307

STEVENS, W. A.
Mathematical model for two-dimensional multi-component airfoils in viscous flow
[NASA-CR-1843]

STOOP, G. C.
Study of aircraft in intraurban transportation systems, volume 1
[NASA-CR-114340]

STOUT, E. G.
Air transportation in the American economy.
A72-11721

SIBLEY, B.
A flight simulator study of STOL transport directional control characteristics
[FAA-RD-71-81]

SIBLEY, S. A.
Synthesis and properties of stems of tetramethyl-2,2,7,7 octane diol-1,8
A72-11656

SIMAFER, A. A.
Determination of radial stresses in ring-to-drum transition areas of disks
A72-11374

SIBAK07, A. A.
In-flight studies of aircraft stability and controllability
A72-12542

SIBAK07, T. B., Ill
A programme of research into viscous aspects of flow on swept wings
[ABC-32723]

SIBAK07, T. B.
The configuration of a cable towed in a circular path.
A72-11132

SIBAK07, B.
Study of aircraft in intraurban transportation
[FAA-RD-71-81]

SIMAFER, B.
Microphone testing of fuselage and landing gear noise of a certain aircraft configuration at Mach numbers from 0.65 to 10.6
A72-10045

SKOPEL, B. A.
In-flight studies of aircraft stability and controllability
A72-11342

SKEPIER, W. A.
Determination of the flow around a cylinder with a jet
A72-10308

SKOPEL, R. A.
The configuration of a cable towed in a circular path.
A72-11132

SMITH, T. B., III
Display research collision warning system
[NASA-CASE-MEM-10703]

SMITH, W.
On the noise sources of the unsuppressed high-speed jet.
A72-11973

SMITH, B.
On the noise sources of the unsuppressed high-speed jet
[ABC-32723]

SHINGHARO, W. A.
Ignition of fuels by a hot projectile
A72-11683

SHERRER, I. I.
In-flight studies of aircraft stability and controllability
A72-11342

SNYDER, D.
Pacific Airframe Corporation accessory reliability program (PACAR)
A72-11035

SODERER, P. T.
Full-scale wind-tunnel tests of a small unpowered jet aircraft with a T-tail
[NASA-TN-D-6573]

SPEKMAN, J. D.
Crew compartment vibration environment in the B-52 aircraft during low-altitude, high-speed flight
[AD-720723]

SPERG, R.
Spectral analysis of transient data with application to auto-pilot parameter studies
[AD-725608]

SPENCER, J. L.
Electronic strain level counter
[NASA-CASE-LAR-10756-1]

SPEREH, N. L.
Ductility improvements in superalloys.
A72-12561

SQUIRE, L. C.
A comparison of the lift of flat delta wings and waveriders at high angles of incidence and high Mach number.
A72-12345

STAAL, W.
Force and pressure distribution measurements on a wing-body combination with wing of low aspect ratio in compressible flow
[DGLR PAPER 71-118]

STANLEY, A.
Development of a stress crack resistant urethane sealant for heated areas of aircraft surfaces
[AD-727532]

STANLEY, J. J.
Electronic scanning array for ATC.
A72-10962

STEIN, J. A.
The crystal ball focuses on the next generation of transport aircraft
[SAE PAPER 710750]

STEIN, J. A.
A review of parachute applications and some associated current research problems.
A72-10302

STEIN, J. A.
Observations on breathing and related phenomena in some paratroop type parachutes when freely descending.
A72-10307

STEIN, J. A.
Mathematical model for two-dimensional multi-component airfoils in viscous flow
[NASA-CR-1843]

STEIN, J. A.
Study of aircraft in intraurban transportation systems, volume 1
[NASA-CR-114340]

STEIN, J. A.
Study of aircraft in intraurban transportation systems, volume 2
[NASA-CR-114341]

STEIN, J. A.
Study of aircraft in intraurban transportation systems, volume 3
[NASA-CR-114342]

STEIN, J. A.
Study of aircraft in intraurban transportation systems, volume 4: Appendix
A72-10987

STEINERSON, B.
Fuels for supersonic and hypersonic aircraft
A72-11671

SUIMARK, O. O.
Development of composite tape laying process for advanced fibrous reinforced composite structures
[AD-725765]

SUGITA, T.
On the characteristics of wing with tip clearance. III - The force acting on a rectangular wing of low aspect ratio.
A72-12825

SUNAPP, W. O.
Development of composite tape laying process for advanced fibrous reinforced composite structures
[AD-725765]

TAHNEE, E.
Experimental investigation of the drag and lift of wings with a blunt trailing edge in compressible flow
[DGLR PAPER 71-118]

TAYLER, B.
High speed parachute research in the U.K.
A72-10308

TEPPER, G. L.
A flight simulator study of STOL transport directional control characteristics
[FAA-RD-71-81]

THOMAS, C. L.
Aerodynamic characteristics of an all-body hypersonic aircraft configuration at Mach numbers from 0.65 to 10.6
[NASA-TN-D-6577]

THOMPSON, B. C.
A review of parachute applications and some associated current research problems.
A72-10962

THOMSON, J. R.
A flight simulator study of STOL transport directional control characteristics
[FAA-RD-71-81]

THOMSON, J. R.
A flight simulator study of STOL transport directional control characteristics
[FAA-RD-71-81]

THOMSON, R. E.
Improving the efficiency of airports.
A72-11717

THORP, J. M.
Development of ultrasonic field inspection equipment for T53 gas turbine compressor discs.
A72-10814

TOHRS, R. J.
Electronic scanning array for ATC.
A72-10962

TOYAKAMI, M. L.
Investigation of display requirements for helicopter IFI manual flight under various operational and environmental conditions
[AD-72509]

TOURNER, J. G.
Productivity considerations in production planning for new aircraft.
[SAE PAPER 710746]

TOURNERINE, G.
Numerical calculation of a sonic flow about an
aircraft wing profile, by an inverse method

BACHS SAH, B.

VOLOSBIH, G. I.

VESDITTI, A.

BAGGOSER, J. T.

VITA1I, E.

VEBE, B. A.

VEEDIE, G.

VAUGBH, L. A.

Stew data and training concept

Operating logic - New data and training concept

Conflict detection at Knoxville.

VAGGOHER, J. T.
WILLIAMS, R. N.
Theoretical performance of a pure jet flap rotor at high advance ratios [AD-726706] N72-10037

WILLIAMS, S. B.
Helicopter lift-margin system, volume 2 [AD-725207] N72-11053

WILSON, E. A.
Airborne infrared forest fire detection system [AD-726953] N72-10396

WINTERFELD, G.
Investigation of fire extinguishing powders by means of a new measuring procedure N72-11691

WRIGHT, J. W., Jr.
Tensile behavior of high-strength alloys during rapid heating. A72-10749

WRIGHT, L. A.
Team approach to power plant design for maximum operational effectiveness. [SPEE PAPER 710770] A72-10270

WRIGHT, P. B.
An assessment scheme for aerodrome forecasts. A72-10864

WULF, R.
Possibilities for jet simulation in the 3m-wind tunnel of the DVL-AVA Goettingen N72-10055

WYETH, E. W. G.
Fire and explosion protection of fuel tank ullage N72-11690

YANG, K. C.
New paving concept for New York airports. A72-12023

YATES, J. E.
On the aerodynamic forces of oscillating two-dimensional lifting surfaces [AD-726132] N72-11017

YOUNG, L. R.
Display research collision warning system [NASA-CASE-BLN-10703] N72-11527

YOUNG, R. J.
Possible developments of a wind tunnel computer system [NPL-AERO-1326] N72-10184

YOUNG, G. W.
Selecting the basic parameters of civil aircraft for specified ranges and operational load [AD-727231] N72-11061

ZAITZEPF, E. M.
MSDS - An experimental 24-channel multispectral scanner system. A72-10946

ZEILE, Y.
Preliminary tests and performance of rolling vertical takeoff and landing of the VJ 101 C-X2 with ignited afterburners [BrVIG-FWT-71-13] N72-10034

IZELE, L.
Basic investigations of recirculation with configurations consisting of 1 to 6 jets [BrVIG-FWT-71-12] N72-10828

ZEREN, L.
Matrix method of calculating the strength of hinged main-rotor blades for a helicopter in steady forward flight A72-12440

ZILDE, R. A.
Recording antenna radiation patterns by semi-automation. A72-10189

ZIMMERMAN, G.
Future aircraft noise in the vicinity of airports. A72-12022

ZONG, L. B.
Analysis of aircraft fuel tank fire and explosion hazards [AD-725027] N72-11056
## Typical Contract Number Index Listing

Listings in this index are arranged alphanumerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order with the IAA accession numbers appearing first. The accession number denotes the number by which the citation is identified in either the IAA or STAR section.

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF PROJ. 689L</td>
<td>N72-10543</td>
</tr>
<tr>
<td>AF PROJ. 682 (B)</td>
<td>N72-10332</td>
</tr>
<tr>
<td>AF PROJ. 698DC</td>
<td>N72-10048</td>
</tr>
<tr>
<td>AF PROJ. 872-7</td>
<td>N72-10425</td>
</tr>
<tr>
<td>AF PROJ. 3012</td>
<td>N72-11312</td>
</tr>
<tr>
<td>AF PROJ. 3048</td>
<td>N72-11056</td>
</tr>
<tr>
<td>AF PROJ. 5710</td>
<td>N72-11820</td>
</tr>
<tr>
<td>AF PROJ. 7065</td>
<td>N72-11308</td>
</tr>
<tr>
<td>AF PROJ. 7231</td>
<td>N72-10127</td>
</tr>
<tr>
<td>AF PROJ. 7351</td>
<td>N72-10957</td>
</tr>
<tr>
<td>AF PROJ. 7921</td>
<td>N72-10042</td>
</tr>
<tr>
<td>AF PROJ. 9781</td>
<td>N72-11714</td>
</tr>
<tr>
<td>AF PROJ. 9782-01</td>
<td>N72-11047</td>
</tr>
<tr>
<td>AP 33(615)-3736</td>
<td>N72-10048</td>
</tr>
<tr>
<td>AP 69(639)-1680</td>
<td>N72-11107</td>
</tr>
</tbody>
</table>

**APRA, ODEB, 636**

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA PROJ. 1-P-1-62204-A-14231</td>
<td>N72-11060</td>
</tr>
<tr>
<td>DA PROJ. 1-G-162207-A-1-71</td>
<td>N72-11713</td>
</tr>
<tr>
<td>DA PROJ. 1-F1-62204-A-139</td>
<td>N72-11050</td>
</tr>
<tr>
<td>DA PROJ. 1-F1-62204-A-19232</td>
<td>N72-11060</td>
</tr>
<tr>
<td>DA-31-124-ARO(D)-149</td>
<td>N72-11135</td>
</tr>
</tbody>
</table>

**DA/DOJ/OS-5-70-C-0250**

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>N72-11688</td>
<td>N72-10814</td>
</tr>
<tr>
<td>N72-11050</td>
<td>N72-11135</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11055</td>
</tr>
<tr>
<td>N72-11688</td>
<td>N72-11050</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11688</td>
</tr>
<tr>
<td>N72-11713</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11050</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11688</td>
<td>N72-11057</td>
</tr>
</tbody>
</table>

**DA/DOJ/OS-5-70-C-0030**

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>N72-10814</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11050</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11050</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11688</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11057</td>
</tr>
</tbody>
</table>

**DA/DOJ/OS-5-70-C-0013**

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>N72-11688</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11688</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11057</td>
</tr>
</tbody>
</table>

**DA/DOJ/OS-5-70-C-0013**

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>N72-11688</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11688</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11057</td>
</tr>
</tbody>
</table>

**DAB/DOJ/OS-5-70-C-0013**

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>N72-11688</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11688</td>
<td>N72-11057</td>
</tr>
<tr>
<td>N72-11060</td>
<td>N72-11057</td>
</tr>
</tbody>
</table>

**DOT-PB-70-MA-1393**

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>N72-11037</td>
<td>N72-11049</td>
</tr>
</tbody>
</table>

**DOT-OS-00047**

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>N72-11045</td>
<td>N72-11045</td>
</tr>
</tbody>
</table>

NASA-Langley, 1972
This special bibliography lists 363 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1972. 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.
PUBLISHED 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.

CALIFORNIA
University of California, Berkeley

COLORADO
University of Colorado, Boulder

DISTRICT OF COLUMBIA
Library of Congress

GEORGIA
Georgia Institute of Technology, Atlanta

ILLINOIS
The John Crerar Library, Chicago

MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge

MISSOURI
Linda Hall Library, Kansas City

NEW YORK
Columbia University, New York

PENNSYLVANIA
Carnegie Library of Pittsburgh

TEXAS
Southern Methodist University, Dallas

WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library

COLORADO
Denver Public Library

CONNECTICUT
Hartford Public Library

DELAWARE
Wilmington Institute Free Library, Wilmington

MARYLAND
Enoch Pratt Free Library, Baltimore

MASSACHUSETTS
Boston Public Library

MICHIGAN
Detroit Public Library

MINNESOTA
Minneapolis Public Library
James Jerome Hill Reference Library, St. Paul

MISSOURI
Kansas City Public Library
St. Louis Public Library

NEW JERSEY
Trenton Public Library

NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library

OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library

OKLAHOMA
Oklahoma County Libraries, Oklahoma City

TENNESSEE
Cossitt-Goodwin Libraries, Memphis

TEXAS
Dallas Public Library
Fort Worth Public Library

WASHINGTON
Seattle Public Library

WISCONSIN
Milwaukee Public Library

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