AERONAUTICAL ENGINEERING

CASE FILE COPY

A SPECIAL BIBLIOGRAPHY
WITH INDEXES
Supplement 13

JANUARY 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>
</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.
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 December 1971 in

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

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

This supplement to Aeronautical Engineering—A Special Bibliography (NASA SP-7037) lists 283 reports, journal articles, and other documents originally announced in December 1971 in Scientific and Technical Aerospace Reports (STAR) or in International Aerospace Abstracts (IAA). For previous bibliographies in this series, see inside of front cover.

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

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

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

IAA ENTRIES (A71-10000 Series)

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

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

STAR ENTRIES (N71-10000 Series)

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

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

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

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

Avail: NASA Scientific and Technical Information Office. Documents with this availability are usually news releases or informational brochures available without charge in paper 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 up to 72 pages of information reduced to micro images (not to exceed 20:1 reduction)
Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by British Information Services (BIS), New York City. The U.S. price (including a service charge) is given, or a conversion table may be obtained from BIS.

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

Avail: ZLDI. Sold by the Zentralstelle für Luftfahrtelokumentation 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

British Information Service
845 Third Ave.
New York, N.Y. 10022

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 (KS)I
Washington, D.C. 20546

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

National Technical Information Service
Springfield, Virginia 22151

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 Luftfahrdokumentation und Information
8 München 86
Postfach 880
Federal Republic of Germany
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>TABLE OF CONTENTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAA Entries</td>
<td>691</td>
</tr>
<tr>
<td>STAR Entries</td>
<td>707</td>
</tr>
<tr>
<td>Subject Index</td>
<td>A-1</td>
</tr>
<tr>
<td>Personal Author Index</td>
<td>B-1</td>
</tr>
<tr>
<td>Contract Number Index</td>
<td>C-1</td>
</tr>
</tbody>
</table>

## TYPICAL CITATION AND ABSTRACT FROM STAR

**NASA SPONSORED DOCUMENT**

**ACCESSION NUMBER**
N71-12035

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

**AUTHORS**
V. P. Povinelli and A. H. McKibbin

**CONTRACT OR GRANT**
Contract NAS3-7609

**REPORT NUMBER**
Available on Microfiche

**AVAILABLE ON MICROFICHE**

**CORPORATE SOURCE**

**PUBLICATION DATE**
1970

**COSATI CODE**
L

**AVAILABILITY SOURCE**

| TYPICAL CITATION AND ABSTRACT FROM IAA |

**NASA SPONSORED DOCUMENT**

**ACCESSION NUMBER**
A71-10969

**TITLE**
Sphere drag in near-free-molecule hypersonic flow

**AUTHORS**

**PUBLICATION DATE**
1970

**AUTHOR'S AFFILIATION**

O.H.

A rapid résumé of the basic theory of fluidic devices including wall attachment amplifiers, turbulence amplifiers, and vortex amplifiers is presented. The basic fluidic devices are then treated in their application as sensors of temperature and pressure, and there is a review of fluidic indicators and associated relays. Current application of these fluidic devices and fluidic systems for chemical industry inspection, and rejection, fluidic systems for the ammunition industry, and fluidic systems for jet aircraft controls are discussed. The discussion covers the operational benefits of the fluidic systems under actual operating field experience. (Author)


A test program in which several proposed takeoff requirements were evaluated using an F-102A. Particular attention was given to takeoff speeds, expected operational takeoff speed abuses and their effects on safe performance, and minimum speed determination methods. Handling qualities and performance trends were evaluated on a six-degree-of-freedom flight simulator. The aircraft simulated include a reference subsonic design, a generalized SST design, and a specific model of the Concorde prototype. (Author)


The performance of Magnetic Anomaly Detection (MAD) equipment is dependent upon the signal-to-noise ratio achieved. The amount of noise, in turn, is a function of the strength of the aircraft's magnetic field and the degree to which it is affected by aircraft movements relative to the earth's field. Nulling out, or compensating, the aircraft's field reduces the effective aircraft field strength and hence the maneuver noise. However, after compensation the aircraft permanent field strength has been found to change, apparently due to the earth's field inducing magnetism into components of the aircraft structure. These changes in the so-called permanent field degrade MAD equipment performance but tests have shown that they can be predicted, measured and, to some degree, alleviated by selective parking of the aircraft relative to the local earth's field direction. (Author)


The Tu-154 has a cruising speed of about 0.9 Mach at altitudes of 11,000 m. Compressibility effects of the air under those conditions affect the stability and control characteristics of the aircraft. A dependence on manual control is only justified at flight speeds up to 0.85 Mach. The Tu-154 employs, therefore, a nonreversible hydraulic control system, making use of four hydraulic pumps. Details of a suitable design of the control system are discussed, giving attention to the maintenance of aircraft control in case of an emergency due to failure of a component. (G.R.)


Cells often have turreted tops. Contour tracings of the same cell taken from a PPI sequence are presented. The cell growth is shown by the time sequence at several altitudes covering roughly 20 min. At the lower altitudes the cell appears singular and its pattern becomes progressively more recognizable with time as the top of the cell grows to higher levels. At higher elevations the cell appears two-headed. Aspects of cell drift, growth, and distribution are discussed. (G.R.)
A71-43090

The theoretical benefits to be obtained from high lift devices are examined, giving particular attention to Sigma high performance gliders. It is generally accepted that competition gliders will normally operate by climbing in circling flight in thermals and making distance gliders. It is generally accepted that competition gliders will normally operate by climbing in circling flight in thermals and making distance gliders. The merit of various design possibilities for the conflicting climb/cruise requirements are investigated.


Theoretical analysis of factors governing the autorotation mode helicopter landing process. A method is described for delineating domains within which the landing parameters can be varied while ensuring touchdown in a given area at zero sinking speed. A limitation is imposed on the rotor speed due to flow separation on the blades. Numerical examples are given for the Mi-2 helicopter.

T.M.


It has been estimated that an overall saving as great as 30% may be realized if each spare part assembly is subjected to an economic analysis of the desirability of repairing the assembly. A technique is presented for making repair-throwaway decisions which minimize costs over life cycle. The technique indicates those cases where a clear-cut decision cannot be made because of imprecise knowledge of costs and failure rates. It is pointed out that the repair-throwaway analysis should be considered for each part as early as possible in the development stage of an aircraft because potential economic savings are greatest then.

G.R.


An approach to safety problems is discussed together with corporate accident statistics, the determination of the causes of aircraft skidding accidents, Lufthansa pilot training programs, aircraft wake turbulence, the airport certification program, and corporate flight operations in the Japan area. Other subjects considered include ditching and survival, aviation fuels and their safety aspects, the significance of circadian rhythm for pilots, in-flight monitoring and engine reliability, and aircraft modifications.

G.R.


The data presented are based on preliminary data furnished through the courtesy of the National Transportation Safety Board and the Federal Aviation Administration. In an analysis of the data it is found that 70% of the Corporate/Executive fatal accidents occurred on ferry flights. There is a lack of discipline in some corporate flying that becomes acute on flights without passengers. It is pointed out that corporations should be able to improve their safety record with more careful selection, training, and supervision of pilots. This is particularly true of smaller organizations with single pilot operations.

G.R.


Accident investigators have been especially hampered by the lack of reliable means to establish the actual slipperiness of the runway for a given accident situation to aid in their determinations. Slipperiness measurements obtained with a NASA test vehicle are discussed. Computations of aircraft stopping distance using test vehicle stopping distance measurements are compared to FAR wet field length requirements. The investigations of the causes of two aircraft accidents/incidents have shown reasonable agreement between calculated airplane stopping distance on a specific wet runway and the observed aircraft stopping distance.

G.R.


The ditching of a DC-9 jet in the Caribbean in May 1970 is briefly reviewed. Twenty-three passengers lost their lives in the incident. The Coast Guard estimated the swells to be from 8 to 10 feet. Problems were experienced with the life vests both in the aircraft and in the water. The lessons to be learned from the accident are discussed. The importance of passenger-briefing is emphasized, and suggestions for such a briefing are made. It is recommended that each crewmember's jacket be equipped with a small battery-operated VHF transceiver to coordinate rescue operations with aircraft overhead.

G.R.


Hazards caused by the use of the highly volatile and flammable gasoline during the early days of aviation are reviewed. A special gasoline called 'Safety Fuel' was produced prior to World War II. Unfortunately there were certain problems which at the time defied practical solution. The advent of the jet engine, which can use low volatility fuel, represented a major contribution to flight safety. Various currently used fuels are discussed together with properties related to safety aspects of a fuel. In conclusion it is pointed out that there appears to be a well-justified case for prohibiting by regulatory action the use of JP-4 or Jet B type fuel in commercial passenger-carrying aircraft.

G.R.


An original and unique system of turbine engine operational surveillance has been developed. The program is computer-oriented in order to achieve consistency plus rapid response time and particularly to store and correlate pertinent operational data from the time of the manufacturer's green test runup to today's flight. The method permits performance-monitoring starting at any time of the engine's life. It is attempted to determine deterioration from the time of the profile, and not on the basis of a comparison of engine data with a 'theory engine.' To establish the preliminary profile, the operator has to accumulate 25 to 30 recordings of selected readings during established cruise conditions.

G.R.

A71-43234 * # Aircraft wake turbulence progress and plans. William A. McGowan and Mason T. Charak (NASA, Washington, D.C.). In: Annual Corporate Aircraft Safety Seminar, 16th,

In 1970 Congress enacted the Airport and Airway Development Act of 1970 which provides for mandatory minimum safety standards, airport certification, and improved air navigation facilities. The act includes provisions for issuance of airport operating certificates to airports serving air carriers certificated by the Civil Aeronautics Board. As a result of a comprehensive evaluation of all related factors, a two-phase certification program has been developed. The regulations regarding airport operating certificates are presented, and the tasks that lie ahead are analyzed.

Analysis of the characteristics of a finite large aspect ratio wing in a uniform shear flow with velocity variations along the wing span. A singularity approach different from the one used by Kármán and Tsien (1943) is applied to determine the characteristics of various wings of this type in discrete form. Also studied is the different behavior of large aspect wing characteristics in a uniform shear flow and in a uniform potential flow. Analytical expressions are given for a planar wing and for aerodynamic forces providing minimum drag.

Investigation of an important natural source of NO, the reaction O(super 1D) + N2O yields 2NO, and comparison of the natural source with estimates for the source due to a fleet of 500 planes cruising for an average of 7 hr a day. The natural and artificial inputs above 15 km are of comparable magnitude. The natural source corresponds to a net production of NO, averaged over the globe, of about 2 x 10 to the 7th molecules sq cm/sec, and offers a yardstick for judging the possible significance of any artificial input. Additional sources of stratospheric NO, due to downward diffusion from the ionosphere and upward transport from the earth's surface, are discussed but are not quantitatively estimated.


Results of an experimental study of the wakes of two- and three-dimensional bodies in rarefied-gas wind tunnels at various Mach and Reynolds numbers. Some remarks are made concerning the wake configuration of a dihedron in a high-speed rarefied-gas flow. A comparison is made between the wakes of a cone and a dihedron placed at a 12-deg angle of attack in a Mach 4 flow, showing a larger opening in the case of the two-dimensional wake and a lower pressure recorded on the axis of the two-dimensional wake downstream from the base.


Accelerate-stop criteria developed prior to the introduction of the jet transport are reviewed in light of operational experience. Reaction times presently used by the manufacturers in accelerate-stop calculations are examined from the human engineering standpoint. Results of a flight simulator study showing pilot reaction times for transition to the rejected take-off configuration are presented. Each pilot subject in the study was unexpectedly confronted with a simultaneous fire warning bell and light at some specified time increment prior to attaining V sub 1 during a simulated take-off. The resulting times for transition to the full braking configuration and the associated overspeeds above the critical engine failure speed, V sub 1, are compared to the certification performance and show a need for revision to the present criteria.


An aircraft which is producing lift leaves a rotating flow field behind each wing as it flies forward. There is usually one pair of oppositely rotating flow fields, or vortices, extending downstream from each wing tip and moving downward. Each vortex has a core region in which the rotational velocities build up from zero in the center to some maximum velocity at the edge of the core. If another aircraft crosses laterally through the core of each vortex, it will be subjected to an up-flow, a down-flow, and then another up-flow. Hazards connected with these air motions for a light aircraft are discussed.

Operational considerations of angle of attack.
A71-43383


Technology has now provided a new addition to instrumentation used for the evaluation and control of a certain aspect of total aircraft performance. This addition is called Angle of Attack Instrumentation. Various parameters and relations which are involved in the lift performance of an aircraft are examined. The importance of the angle of attack in connection with lift performance is discussed, together with aspects regarding the occurrence of a phugoid oscillation.

G.R.


The development of the altitude instrumentation for the aircraft pilot is discussed. The first instruments, based on the variation of the air pressure with altitude, were improved to allow for barometric adjustments. Weaknesses of the three-pointer Altimeter led to the Servo-Altimeter, a drum-pointer configuration, and to digital readout of the altitude on a digital counter. Other approaches discussed include the radar Altimeter with the 'Altitude Alert' system, and automatic altitude reporting systems.

G.R.


Several years ago, government agency studies concluded that regardless of barometric altimetry system inadequacies, there was nothing better to go to. After the rash of catastrophic air carrier approach and landing accidents during December 1968 and January 1969, the Safety Board released a series of recommendations to the FAA intended to prevent recurrences of such accidents. Among other things it was pointed out that 'the reassessment of altimetry systems with particular regard to their susceptibility to insidious interference by forms of precipitation needs to be the subject of attention by the highest level of aeronautical research facilities and personnel.'

G.R.


The pressure altimeter, sensitive airspeed and vertical velocity instruments are a very important aid during the landing and takeoff phases of flight. There are six key points to be considered which will allow the pilot to obtain proper performance from his instruments. These points include the selection of the right instruments, careful instrument installation, the pilot's ability to recognize the normal from the abnormal conditions of operation, the identification of a problem for the repairman, the selection of a suitable repair shop, and familiarity with a number of altimeter characteristics.

G.R.


In the case of a test program conducted in 1963 involving 152 general aviation aircraft it was found that not a single altimeter was within the tolerance now specified in the rules. A subsequently adopted regulation requires all general aviation aircraft to have an altimeter and static system test before being flown in IFR. Possible problems with altimeters are discussed along with suggestions for remedial action.

G.R.


A number of aspects of pitot-static systems are discussed, giving attention to the various components involved. It is pointed out that a removable drain plug which is easily accessible for inspection shall be located at all low points where water may collect. Problems of line installation are considered, together with the location of the manifolds, and the design of the alternate static system.

G.R.


It is pointed out that in aviation the group with the most stringent training requirements for pilots has percentagewise the smallest number of accidents caused by pilots. Examples of accident causes involving pilot errors are considered. A training program for pilots is suggested, giving attention to a ground and a flight training phase. Flight Check Records are recommended to determine any area that needs specific stress during this training.

G.R.


This paper provides a review of the current airport fire-fighting equipment and requirements. Statistics are offered concerning the inadequacies of such equipment at many airports served by air carriers and suggestions are made for improving the situation. The latest available fire-fighting equipment and fire-fighting agents are detailed as well as that equipment programmed by manufacturers for future use. The author also offers ideas and concepts on fire-fighting tactics that could be employed today, and those to meet future airport needs.

(Author)


It is assumed that multiengine pressurized turbine-powered aircraft are used. Standard vhf communication and navigation in duplicate is essential, and dual ADF is suggested. The use of hf is recommended as the only means to maintain communication in certain areas. Various details regarding flight operations in Latin America are discussed including the amount of fuel to be carried, the paper work, problems of navigation, food, vaccinations, and weather.

G.R.


Upon review of past experimental results and theoretical efforts it is apparent that the mechanism by which combustion noise is generated is not well understood. A theory of combustion noise is developed in this paper which follows rigorously from the principles
of fluid mechanics. Lighthill's approach, used in his studies of aerodynamic noise, is closely followed in the present work. The sound radiated from open, turbulent flames is found to depend strongly upon the structure of such flames; at present their structure is not well known. However, meaningful bounds and scaling rules for the sound power output and spectral content are derived based on the present limited knowledge. A framework is developed which explains past experimental work and the origin of combustion noise.

(Author)


A rectangular thin airfoil in a flow orthogonal to the leading edge is considered, taking into account the case of a small angle of attack. The flow around the airfoil is analyzed by making use of two components, the fundamental flow and the perturbation flow. Assumptions needed for obtaining a singular integral equation for calculating the circulation density are discussed. The singular integral equation is transformed into the form reported by Weissinger (1949).

G.R.


Study of the possibilities of a method of expanding the range of stable operation of axial-flow compressors by regulating the rotating guide vanes on two four-stage model compressors with degrees of reactivity of 0.5 and 1, respectively. It is shown that regulation of rotating guide vanes may be successfully used for compressors with both degrees of reactivity. It is further shown that Titenski and Shirokov's (1967) method of calculating the characteristics of the stages and flow area of an axial-flow compressor during rotation of the guide vanes gives results which are in satisfactory agreement with experimental results.

A.B.K.


The papers deal with developments in the field of photogrammetry, including photo-optical calibration of radio-navigation aids, photogrammetry in traffic merging studies and photogrammetric analysis of an airfoil.

V.P.


The advantages of photogrametric techniques for calibrating and checking airport ILS systems are outlined. In the photogrammetric method, the aircraft is made to circle or to perform radial flights, with lights flashing up at an appropriate pointer position of the cockpit voltmeter, or at a relative minimum or maximum field intensity measured by the board voltmeter. Colored lights may be used to distinguish between flashing signals referring to relative minimum or maximum position. The ground equipment incorporates a phototheodolite or digitized theodolite fitted with a technical camera, and an electronic range meter for determining the Y-base distances.

V.P.


A wind tunnel investigation is described in which the aerodynamics effects produced by a helicopter rotor were recorded photogrammetrically with the aid of smoke visualization techniques. The observed effects are plotted. The equipment and procedure employed are described, and the precision of the technique is assessed.

V.P.


An analysis is presented for compressible fluid flow across shaft face seals and narrow slots. The analysis includes fluid inertia, viscous friction and entrance losses. Subsonic and choked flow conditions can be predicted and analyzed. The model is valid for both laminar and turbulent flows. Results agree with experiment and with solutions which are more limited in applicability. Results show that a parallel film can have a positive film stiffness under choked flow conditions.

(Author)


Experimental investigation of the inlet, engine, and exhaust nozzle of a supersonic propulsion system. Wind-tunnel and flight-test exhaust nozzle results are compared, and the accuracy of flight measurements is assessed. Comparisons are also presented for nozzle performance obtained with a cold jet, a powered turbojet simulator, and a solid jet boundary simulator. The effect of the local boundary layer on nozzle performance is discussed, and the need for good dynamic measurements during inlet-engine testing is illustrated for transients such as inlet unstart and engine stall. Also, the transient nature of inlet distortion and its effect on the engine are described for two different operating conditions.

T.M.


The purpose of this paper is to review NASA-Lewis combustor research aimed at reducing exhaust emissions from jet aircraft engines. Experimental results of tests performed on both conventional and experimental combustors over a range of inlet total pressure, inlet total temperature, reference velocity, and fuel-air ratio are presented to demonstrate the effect of operating variables on pollutant emissions. Combustor design techniques to reduce emissions are discussed. Improving fuel atomization by using an air-assist fuel nozzle has been shown to significantly reduce hydrocarbon and carbon monoxide emissions during idle. A short-length
annular swirl-can combustor has demonstrated a significant reduction in nitric oxide emissions compared to a conventional combustor operating at similar conditions. The use of diffuser wall bleed to provide variable control of combustor airflow distribution may enable the achievement of reduced emissions without compromising combustor performance. 

(Author)

A71-43878


The discussion is concerned primarily with the AN/MRN-13 set, while a brief comparison with the AN/GRN-6 set is conducted to show planning differences. Both sets were deployed to Khe Sanh and Kham Due for tactical air support. The AN/MRN-13 is a mobile, air conditioned beacon which utilizes the NA/URN-5 transmitter. The URN-5 operates from an unattended V-33 van, with power adjustable from 25 watts to 400 watts. The URN-5 can be preset to any frequency within 200 to 800 kHz. Experience with the equipment is discussed, giving attention also to certain operation and maintenance problems.

G.R.

A71-43887


The history and technical characteristics of an all-wood single-seat high-performance aerobatic light-weight aircraft. The aircraft is designed for stresses ranging from +8 g to -8 g and for long periods of inverted flight. The aircraft profile is almost symmetrical, which means that the aerodynamic characteristics hardly differ in normal and inverted flight. The Hartzell constant speed propeller is driven by 220 hp Franklin 6A-350-CI six-cylinder air-cooled engine. The landing gear is not retractable. Extensive tests performed with the aircraft are described in detail.

V.R.

A71-43888


The application of the IBM 9020 multiprocessing computer system to air traffic control is examined. The computer system and its operation are described, and the control sectors for inflight control at air route traffic control centers are discussed. An operational malfunction-analysis program is outlined, and the modes of operation of the polymorphic IBM 9020 computer system are examined.

V.P.

A71-43889


Methods and equipment currently used at airports to determine the runway visibility range (RVR), the plant visibility range (SVR), the lower cloud boundary, and the atmospheric damping coefficient are reviewed. The advantages of using lasers as light sources and using lidars for determining the relationship between reflected light and the state of the atmosphere are outlined.

V.P.

A71-43897


Consideration of certain enumerated principles from the point of view of Boolean algebra and the algebra of events and states in an attempt to formulate these principles relative to their realization with an automatic monitoring system (AMS) designed on the basis of digital technology. An algorithm is derived which establishes the connection between the separate states of the AMS and the operating regimes of the monitored object, and may be used for automatic association of the states of the AMS to the cyclogram for checking the operational capability of different types of aircraft engines and the systems functionally connected with them.

F.R.L.

A71-44071


Formulas are derived, using which the principal geometrical parameters of a two-dimensional supersonic variable-area nozzle can be calculated as a function of the Mach number. The advantages of varying the rigid portion of the nozzle with respect to the Mach number in the case of a wide range of Mach numbers are demonstrated.

G.R.

A71-44077


Optimal control laws and decoupling control laws usually require the complete plant state. However, only a limited number of measurements are usually available in practice. Procedures are developed for obtaining the equations for a minimum order filter which can reconstruct the state from the given measurements when the rank of the augmented control effectiveness matrix is equal to the number of measurements and when a certain matrix constructed from the plant matrices is nonsingular. If m is the number of measurements for an n-th order plant, this filter requires a total of (n-m) integrations and differentiations for realization in general. For the case of practical interest where no differentiations are required, the filter requires (n-m) integrations for realization. An application to a significant multiple control-point problem in aircraft flight control illustrates the use of the theory.

T.M.

A71-44089


The utilization is discussed of available flight test measurements for improved estimates of parameters characterizing new aircraft. The example cited involves estimating the aerodynamic parameters associated with the equations of motion of a large aircraft, such as the DC-10, in the lateral mode when nonperfect measurements of the state and nonperfect measurements of some of the derivatives of the state are available. The total number of states and parameters to be identified is 26. A modified version of the Kopp/Oxford form of the relinearized Kalman filter was developed and used to identify the augmented state vector. Good starting estimates reduced the level of biased errors appreciably. The ability of the filter to estimate the states was very good, with errors in the fraction of one percent.

M.V.E.

A71-44093

A nonvarying-C* control scheme for aircraft. Edward R. Rang (Honeywell, Inc., Hopkins, Minn.; U.S. Naval
A71-44104


A model for the air traffic flow between two airports subject to random constraints on the take-off and landing capacities is set up. A dynamic programming algorithm for computation of optimal landing and take-off rules is established. For a single case the algorithm is used to compute the optimal solutions explicitly. The method used will generalize to problems of optimal control of linear systems subject to random constraints. The specific case discussed illustrates the problems that will be encountered in computing optimal feedback control laws for these types of systems. (Author)

A71-44105


Consideration of the problem of coordinating the traffic flow and holding patterns of N aircraft which desire to land on a single runway. A distance separation is to be enforced over the outer marker. It is shown that this problem can be attacked as a variation of a linear-quadratic optimal control problem. The solution of this optimization problem can be used to indicate which aircraft can accomplish headway corrections by velocity control, and which ones must undergo path stretching or holding maneuvers. The gradual implementation of these strategies in current and evolutionary ATC systems is discussed. (F.R.L.)

A71-44106


Discussion of the synthesis of a flutter mode control system for flight test, with summary of a study to determine the feasibility of an actual flutter control demonstration as part of the Control Configured Vehicles (CCV) Advanced Development Program. The analytical study shows that it is quite practical to artificially destabilize a symmetrical wing flutter mode through adverse mass balancing, and then provide active flutter control of the mode and those modes directly associated with that unstable mode for flight demonstration on the Load Alleviation and Mode Stabilization (LAMS) test vehicle. (F.R.L.)

A71-44107


Consideration of the control of aircraft elastic modes as a result of studies made over the past decade. Flight demonstration of Stability Augmentation Systems on the B-52 and XB-70 aircraft have demonstrated the value of suppressing stable structural modes. These programs and others which provide the basis to proceed with confidence to active control of unstable modes are discussed. Attention is also given to the limited analytical studies accomplished on unstable or flutter modes, with suggestion of future areas of research which can bring this emerging technology to fruition. (F.R.L.)

A71-44108


Discussion of the potential gains which can be achieved by using an active flutter suppression system (FSS) in lieu of conventional means of flutter speed improvement. Analyses show that an FSS, using a dedicated control surface, may impose a smaller weight penalty on an aircraft than mass balancing, an increase in stiffness, or geometry changes. The amount of flutter speed improvement with the FSS is shown to be a function of the location of applied force, the type of sensor or sensors and their locations, and the control system transfer function. Results indicate that adequate margins in gain and phase, as well as the required modal damping, can be achieved. (F.R.L.)

A71-44109


Analytical investigations of active feedback flutter control for fighter type aircraft, specifically with respect to wing/store flutter control, show promise of significant benefits for both contemporary and future aircraft. The F-11 Phantom aircraft with an external store is idealized for a flutter critical configuration. Computer programs, based on both frequency and time domains, are used with conventional control system design techniques to generate feedback compensation for active control of flutter for this configuration. Results of linear analyses indicate the possibility of expanding the permissible flight envelope by 150 knots using the existing alerter control surfaces and establish preliminary requirements for control system hardware. (Author)

A71-44111


Discussion of guaranteed cost control, a method of synthesizing a closed-loop system in which the controlled plant has large parameter uncertainty. The basic theoretical development of guaranteed cost control is given, and it is shown how it can be incorporated into an adaptive system. The uncertainty in parameters is reduced first by either on-line measurement and evaluation, or prior knowledge of the parametric dependence of a certain easily measured situation parameter. Guaranteed cost control is then used to take up the residual uncertainty. It is shown that the
uncertainty in system parameters introduces an additional term in the Riccati equation; a FORTRAN program for computing the guaranteed cost matrix and control law is developed and applied to an airframe control problem with large parameter variations. F.R.L.


This paper presents a suboptimal fixed-point nonlinear data smoothing algorithm for parameter and initial state estimation of nonlinear dynamic systems having a large number of parameters and unknown forcing inputs. Also presented in the paper is a method for estimating the unknown forcing inputs or modeling errors. A start-up procedure for the fixed-point smoothing algorithm and an improved computational algorithm for the variances of the fixed-point smoothed estimates are also proposed. Application of the proposed methods to the identification of V/STOL aircraft parameters is given.

(Author)


Research institutes, design bureaus, and manufacturing plants are administratively autonomous organizations coordinated under the Ministry of Aviation. A prominent feature of the Soviet aircraft industry is the absence of small contractors. Emphasis on the use of handbooks permits the research institutes to control aerodynamic structures and manufacturing techniques. A proposal for a new aircraft is submitted to several independent design bureaus. The building of the prototype is discussed together with the manufacture of the product, and approaches responsible for technological innovations.

G.R.


Brief discussion of the principle of Imai-Lamla's approximation method for subsonic flows in the presence of a steady current to infinity, parallel to the Ox axis, described by Bărsăno-Nagy (1969, 1971). An attempt is made to obtain the complex potential of the flow of the compressible fluid, in second approximation, under the same conditions. This problem is reduced to a Volterra problem with two given singularities, and by applying the Kutta-Joukowski theorem, the resultant of the aerodynamic forces is calculated, with an example.

M.M.


Description of the technical status and future prospects of an airborne weather radar now being used in civilian aviation. A second-generation radar of solid-state design has been completed and is ready for commercial production. The solid-state design has made possible a weight reduction of about 30%, and a reduction in power requirement by half as compared with the vacuum tube design.

F.R.L.


Proposal of variable geometry in the form of high lift flaps as a means of increasing the overall cross-country speed of a sailplane by providing a better compromise between cruise and climb performance. The circling performance of a sailplane with high lift flaps is analyzed, keeping the main design parameters in the range dictated by operational considerations of straight glide performance and the characteristics of thermals encountered. The results show that a substantial increase in both climb performance and effective cross-country speed can be expected.

F.R.L.


Recent experience has shown that a plate-like load suspended beneath a helicopter moving in horizontal forward flight has unstable characteristics at both low and high forward speeds. These findings have prompted a theoretical analysis to determine the longitudinal and lateral dynamic stability characteristics of suspended pallets. Only the longitudinal stability is considered here. Although it is strictly a nonlinear problem, the usual assumptions have been made to obtain linearized equations of motion. The aerodynamic derivative data required for these equations have been obtained, where possible, for the appropriate ranges of Reynolds and Strouhal number by means of static and dynamic wind tunnel testing. The resulting stability equations (with full aerodynamic derivative information) have been set up and solved, on a digital computer, to give direct indication of a stable or unstable system for a combination of physical parameters. These results have indicated a longitudinal unstable mode for all practical forward speeds. Simultaneously the important stability derivatives were found for this instability and modifications were made subsequently in the suspension system to eliminate the instabilities in the longitudinal sense. Throughout this paper, all metric dimensions are given approximately.

(Author)


A blade to blade design tool for analysing the subsonic, transonic and supersonic flows in axial turbine blades is presented using the streamline curvature method. The work includes a numerical convergence analysis which produced convergence of the digital computer programme for all cases attempted. Computed results are compared with experiment and other theory. Comparisons for turbine type cascades up to Mach 1.0 show a satisfactory agreement and techniques introduced give improved leading edge results and allow the Kutta-Joukowski condition to be applied at the trailing edge for the accurate determination of the velocity distribution and the cascade deviation. Predictions for convergent-divergent supersonic wind tunnel type nozzles agree closely with experiment and with other theories. Numerical difficulties are found to be more acute for subsonic/supersonic turbine cascades and experimental agreement, while acceptable, is inferior to that obtained for subsonic cascades.

(Author)


Results of studies conducted for more than five years by the work group formed by the German, British, and French Institutes of
Navigation concerning supersonic transport. Taxiing, takeoff, and landing maneuvers are discussed, as well as operations in terminal areas (climb and descent below Flight Level 250). Subsonic cruise and acceleration to supersonic cruise, the termination of cruise, and deceleration and descent to lower airspace are considered. Aspects of the role of ATC above ocean regions are outlined. F.R.L.


Exposition of the major operational components and techniques of apparatus for visualization and manual control suitable for assembling, and for best presentation of, all useful information in each phase of a commercial or military flight. New concepts of the instrument panel to respond to old and new requirements, and new techniques and developments are described. Attention is given to the interconnections of the integrated system with the other on-board electronic equipment. F.R.L.


The use of liquid hydrogen as a long-term replacement for hydrocarbon fuel for land and air transportation seems technically feasible. It is an ideal fuel from the standpoint of a completely cyclic system, serving as a 'working substance' in a closed chemical and thermodynamic cycle. The energy-per-unit-weight advantage over gasoline or any other hydrocarbon fuel makes liquid hydrogen particularly advantageous for aircraft and long-range land transport. As a pollution-free fuel, it must be seriously considered as the logical replacement for hydrocarbons in the 21st century. G.R.


It is shown that two compromise-control search problems arise for each subsystem of the inner level in a multilevel static hierarchical system. Several types of interactions between the subsystems are possible, depending on the relationships among periods of commands applied to the subsystems. In the case of simultaneous interaction among all the subsystems, the search for compromise control is reduced to a nonlinear programming problem. The results are illustrated by the example of automatic air traffic control of a number of aircraft over a given territory. T.M.


Brief history of automatic flight control system development in the U.K. and the U.S., together with a description of various flight control systems and the current state of these programs. In the American approach, the pilot is retained in the control loop, while some Europeans consider that the pilot should evolve into a systems manager. Progress at the Blind Landing Experimental Unit (BLEU) is discussed. F.R.L.


Review of American developments in automatic flight and their application. The American philosophy on automatic landing has always included a requirement that the pilot must at all times be aware of what is going on and must supervise it. The requirements established by the FAA are outlined, and American interest in visibility enhancement as an aid to the pilot is discussed. F.R.L.


Review of two major European programs to develop automatic flight control systems that would eventually permit the aircraft to which they were fitted to carry out automatic landings in Category IIIA conditions. These were the Smiths Industries SEPS triplex system for the de Havilland (Hawker Siddeley) Trident and the Lear Siegter-Sud Aviation AWLS simplex system for the Sud Aviation (Aérospatiale) Caravelle. The Trident made the first autoflare with fare paying passengers aboard, and the Caravelle made the first automatic landing in scheduled service in Category IIIA conditions. More experience has been gained with these aircraft than with any other type of civil aircraft. F.R.L.


Vortex shedding from the blunt trailing edge of a flat plate spanning a wind tunnel under two kinds of periodic excitation is described. The conditions under which these two forms of excitation, an oscillating flap and an acoustic resonance, cause the vortex shedding to be in phase along the span are compared. Particular attention is paid to cases when the natural shedding frequency and either the flap frequency or the center frequency of the acoustic resonance, respectively, are not quite coincident. (Author)


Description of methods for the direct computation of the blade response variance matrix up to high rotor advance ratios for a series of inertia numbers. Numerical results refer to a rigid blade flapping model with an elastically restrained flapping hinge at the rotor center. Different combinations of the advance ratio, tip-loss factor, flapping restraint parameter and inertia number are included. The white noise excitation is treated without and with input modulation, the latter case including azimuthal blade input variation. The mean square response study of the model shows that up to an advance ratio of the order of 0.3 and at conventional values of the inertia number the perturbation approach is satisfactory. The numerical scheme, in addition to solving directly the response variance equations which are similar in structure to the original blade dynamic equations, uses the fact that the variable part of system parameter functions are independent of the inertia number. M.M.


A model is presented for estimating the acoustic output per unit slice in the adjustment region of a round subsonic jet, and the deduced contributions of the annular, adjustment and fully-developed regions are found to be approximately in the proportions 25:24:1. The method is extended to the case when two similar adjacent parallel round jets interfere, the estimated reduction in total acoustic output being up to 2 dB. An approach to the calculation of the attenuation of suppressor nozzles is also given. (Author)


It is shown that the dissemination of shock waves from a supersonic body can be minimized by employing an aerodynamic shape corresponding to a channel with a converging inlet section and a diverging outlet section. Air compressed at the inlet moves through the channel to fill the outlet region evacuated by the forward motion.
of the body. A specific aircraft design is proposed which employs a rectangular channel containing the propulsion system. The bottom wall of the channel is used to provide some of the required lift. T.M.


Examples of actual corrosive damage of aircraft parts, occasioned by friction forces, intercrystalline attack, and hot gases. A worn universal joint is used to demonstrate the oxidation of a surface exposed to friction loading. Corrosive damage along grain boundaries is described in terms of effects resulting in service, and mechanisms responsible for blade damage in gas turbines are explained.

T.M.


Lift fans have been shown to be effective for providing direct lift for V/STOL aircraft. Recent efforts at Ames Research Center have been directed toward determining the aerodynamic characteristics of podded lift fans located fore and aft of the wing to allow higher wing loading and reduce constraints on wing design. Most existing design studies in which lift fans were used for direct lift show that a fan pressure ratio of about 1.3 is optimum while an augmentation ratio of 2.5 is maintained. For this reason an investigation was made of the aerodynamic characteristics of a 1.3 pressure ratio lift fan. Results show that podded lift-fan configurations can produce induced lift approaching the magnitude of the better fan-in-wing configurations while reducing significantly the variation of pitching moment with forward speed. The 1.3 pressure ratio lift fan performs well in crossflow and research is being conducted to reduce lift-fan noise.

(Author)


Evaluation of the opportunity for STOL aircraft to supplement and complement conventional air transportation in Canada. In Canada air traffic accounts for 30% of passenger traffic in the Quebec-Windsor corridor, and 60% of the common carrier traffic. It is emphasized that a STOL system that will fulfill the various roles that can be seen for it must be capable of landings and takeoffs that are short, steep, and quiet.

(Received for publication March 10, 1971.)

F.R.L.


The STOL system is necessary to increase the productivity of air transport in short axial traffic. It comprises ground installations with short runways, three-dimensional area navigational aids and well-adapted and quiet aircraft. It will deal with the traffic problems of under-developed countries, areas of difficult access, secondary cities and especially interurban travel. The type and capacity of the future aircraft depend on the date of their commercial entry into service. Aérospatiale is developing a new concept of STOL aircraft which will be ready by the end of the 70's.

M.M.


Based on previous research, tests were conducted to determine an optimum method of inflating a keel or leading-edge section of a parawing in hopes of increasing stability. Several small parawings were constructed and tested at low velocities. Increased stability and reliability were noted. The final parawing design had a ram-air inflated keel and leading-edge. An approximation method for determining the inflated wing shape was derived. It was concluded, that the use of semirigid members in a parawing is beneficial to stability characteristics.

(Received for publication March 10, 1971.)

T.M.


A technique has been developed for predicting the aerodynamic forces of powered-lift systems. Theoretically generated powered section data are distributed spanwise along a lifting line to produce three-dimensional characteristics which exhibit good correlation with experimental results employing this technique. Existing aircraft are sized to perform a military STOL mission for field lengths of 1500 to 2500 feet. The lift system concepts include the internally and externally blown jet flaps, BLC, and pure thrust deflection. Direct lift engines are also considered. The sizing process recognizes differences in lift system weight and aerodynamic performance. A comparison of the optimally-sized aircraft produces some interesting conclusions concerning the tradeoff between sophisticated systems and their associated weight penalties.

(Received for publication March 10, 1971.)


The objectives of the flight test measurements discussed were to assess the suitability of the CL-64 and the Harrier as hover rescue vehicles compared to helicopters. The data shows that, near the downwash impingement area, the vertical variation of the outflow velocity is appreciably different for the three vehicles. While the helicopter outflow profile is nearly uniform, the higher disk loading vehicles show higher velocities near the ground and lower velocities at head height. These differences reduce rapidly with radial distance. The measured results were in good agreement with analytically predicted velocity-height profiles.

(Received for publication March 10, 1971.)


A simple method was developed to predict flow angularity around the side of a typical uncambered fuselage forebody at supersonic speeds with zero sideslip. The method falls within the class of slender body solutions in small perturbation theory. The body cross-section at any axial location is analytically described by a truncated cosine series, whose coefficients vary with axial position as the body cross-section changes. A disturbance velocity potential is found, which is made up of axial and crossflow components due to an equivalent body of revolution, plus axial and crossflow com-
ponents which adjust for the body asymmetry. The potential is made to satisfy the approximate boundary conditions of flow tangency on the body. A computer solution provides plots which compare the theoretical crossflow around a fuselage forebody for which experimental data was available. Comparisons were made at Mach 2.5 with angles of attack of -7.5, 7.5, and 12.5 degrees and Mach 2.2 at 8.3 degrees. Agreement of flow angularity is generally good. Surface static pressures were also compared at Mach 2.2 and agreement was unsatisfactory. Recommendations for possible improvements to the method are made.


Discussion of the essential events which occurred in the controls field in the last two decades with the intent of giving the aeronautical engineer some aspects which have attracted great attention. Essential trends of the solution possibilities for optimal control problems are indicated. It is stressed that one aspect of optimal controls has really not gained enough attention. It has been pointed out what enormous role the chosen performance criterion plays. However, it is not always clear what several performance criteria is the most important one for a specific design.

M.M.


Discussion of the necessity for new approaches to evaluation criteria of new system design for future transportation technology. An example of this is cited in the approach taken by the CARD (Civil Aviation Research and Development) Policy Study of the problem of aircraft noise. It is pointed out that mass transit systems such as personal rapid transit, dial-a-ride, dual mode and dynamic traffic control are expected to make a positive contribution. Transportation technology, guided by these new evaluation criteria, is expected to have a dominant effect on our future civilization while minimizing the negative impact to a much more satisfactory degree than has been achieved in the past.

M.M.


Synopsis of broad comments from AIAA members on various aspects of the merits and developments, present and future, of the STOL, VTOL, and V/STOL family of aircraft. The aspects covered include: the current situation, the background and current status of each of these aircraft varieties, the military role, the worth of pursuing the development of a V/STOL aircraft (i.e., a transport that can operate in any mode, including the conventional), the im-


Background material taken from current literature is presented, giving the diverse views that concerned people have on the subject of environmental impact. Some equate environmental degradation directly to the misuse of technology. Others would admit of a less direct relationship but see our survival directly dependent upon the proper use of technology. A shift in values appears to be underway with a corresponding shift in emphasis between first-order effects and side effects. Views on how this shift in emphasis can be achieved in our society are explored, again by quoting from a number of statements in the current literature.


Current trends in the industry of commercial air transportation are reviewed, and the requirements of optimal planning for the future are examined. Key issues discussed include airline economic viability, industry regulation, public service, and environmental compatibility. Options and considerations are presented rather than 'pat' solutions, for optimum solutions to many of the problems are clearly not evident. Only joint industry/government dialogues are likely to start an effective search for sound principles and 'good' objectives.

M.V.E.


The nature and magnitude of the three major problems confronting civil aviation are discussed in the light of the Civil Aviation Research and Development (CARD) Policy Study, along with CARD Study's key recommendations for each problem. The highest priority belongs to the problem of aircraft noise abatement for it affects the solutions to other problems. The most urgent recommendation asks that time-phased research goals be established calling for noise reductions at the generating source of about 10 to 15 dB per decade. Congestion, the next on the priority list, is a complex problem whose solution involves an organized, effort directed at the combination of air traffic control, runway capacity, and airport development. The third major problem of low-density, short-haul service is important to civil aviation's ability to contribute to the goals of the nation, particularly in regard to future regional development. A government-sponsored determination of market sensitivities to changes in service, fare, frequency, and equipment, as well as government-funding of studies for the design and analysis of appropriate vehicles, is recommended.

M.V.E.


A method is described for calculating the over-all properties of flare-induced laminar boundary-layer/shock-wave interactions on axisymmetric bodies at zero incidence in supersonic flow, under adiabatic conditions. The method consists of an extension to axisymmetric flow of the two-dimensional integral method of Lee and Reeves, as recently improved by Klineberg. The relationship between the local slope and Mach number of the external inviscid stream is calculated by a suitable inversion of the second-order shock-expansion method of Syvertson and Dennis. Satisfactory agreement is demonstrated between the theory and measurements on hollow cylinder-flare models at Mach numbers of 2.2 and 4.0.

(Author)
**A71-44613**


It is demonstrated in the steady-state case that the method is capable of achieving 5% accuracy with moderate array sizes, involving 16 points or less, and with wake of less than 5 chord lengths. Further, it is shown that the accuracy improves as these numbers increase. Future work will investigate the applicability of an extended method to the oscillating case with arbitrary streamlines.

G.R.

**A71-44620**


It is pointed out that a problem regarding the periodical recalculation of far field boundary conditions in the method used by Murman and Cole (1971) can be avoided by a new approach. This approach involves the transformation of the infinite domain around the airfoil into a finite domain by coordinate transformation. A typical numerical solution for a nonlifting circular airfoil at a freestream Mach number of 0.8 is presented.

G.R.

**A71-44621**


The investigation discussed is based on the results obtained by Chattopadhyay and Rodkiewicz (1971). A formula for the shear stress on the wall is obtained, and expressions for the different forces acting on the wedge are presented. Effects of parameter changes on the lift/drag ratio of a 2 deg wedge and of a flat plate are determined.

G.R.

**A71-44624**


The equations derived are valid for higher Mach numbers and/or larger cone semiangles than the equations obtained previously by Lighthill (1948) and Whitham (1952). Both the Whitham procedure for calculating a uniformly valid first-order solution, and the simplification afforded by the conical symmetry of the flow are utilized in the derivation. Only the details of the second order characteristics are used in order to obtain a solution. The expressions found for the pressure rise across the shock wave and for the angle that the conical shock wave makes with the linearized Mach cone differ from the results of Lighthill and Whitham by the appearance that the conical shock wave makes with the linearized Mach cone number of 0.8 is presented.

G.R.

**A71-44692**


Development of methods of calculating the mathematical expectations of typical functions encountered in various flight dynamics problems. An effective method of calculating the right members of the correlation system (a system of equations for mathematical expectations and correlation moments of phase coordinates) for various problems of flight vehicle dynamics is developed, and the required tables are compiled. The development of methods which make it possible to take into account nonlinear couplings and the discrete-continuous nature of the control in obtaining the correlation system is also considered.

A.B.K.

**A71-44761**


After appreciating the methodical change of theoretical considerations and experimental investigations, with which Lighthill tried to approach the solution of the problem of the free flight of man, three topics are discussed, to the treatment of which flight dynamics can be useful: the problem of flight noise, the decrease of the influence of gusts on aircraft, and the problem of dynamics stability of parachute-load systems. A reduction of noise annoyance on the ground, particularly after the take-off of V/STOL aircraft, may be obtained by the determination of noise optimal flight profiles. For gust decrease, the method of ‘tuned lift control,’ the lift due to automatic control attacking in the neutral point of the aircraft, proves to be the most advantageous. The analytical treatment of the greatly nonlinear problem of dynamic stability of parachute-load systems succeeds well by employing the theory of describing function, as comparisons with results obtained by numerical integration show.

( Author)

**A71-44763**

Measurements of velocities in a subsonic wind tunnel (0.10 less than V less than 20 m/sec) (Mesures des vitesses en soufflerie subsonique 0.10 less than V less than 20 m/s). J. Moinard and C. Froger (Centre d'Etudes et Recherches des Charbonnages de France, Verneuil-en-Halatte, Oise, France). L'Aéronautique et l'Astronautique, no. 30, 1971, p. 31-37. In French.

Review of low speed wind tunnel studies carried out at the Centre d'Etudes et Recherches des Charbonnages de France (CERCHAR), which show that at very low speeds the sound waves due mainly to the noise of the fan which ensures air circulation in the wind tunnel are propagated in all directions. In this range of velocities the acoustic pressure variations in the testing section have about the same magnitude as the dynamic pressures to be measured. To overcome this difficulty the aerodynamic study was complemented by an acoustic one on a model, and corrections were applied to the full scale tunnel.

F.R.L.

**A71-44765**


General discussion of aircraft and equipment maintenance and reliability problems. Modern methods of satisfactory solutions with best time, cost, and weight compromises are described. Aircraft availability involves systems reliability, redundancy, supervision and preventive maintenance, and flight under specific limitations. The cost of maintenance involves working hours and spare parts, tools, and standardization.

F.R.L.

**A71-44766**


Designed and built jointly by Western Germany, United Kingdom and Italy, the military aircraft Panavia 200 will be a
multiple use, aircraft capable of performing three main tasks: close air support, air superiority and interdiction/strike. The sometimes conflicting requirements resulting from the performance of these three missions could be reconciled owing to a variable geometry concept. The main characteristics of the plane are recalled and some details are given on the engines, the armament and the electronics of this aircraft, the first flight of which is planned for end 1973. (Author)


Development of the folding sidewall tire and its flight demonstration. This tire can be folded in flight for compact storage and expanded again for normal usage upon gear extension. On a retrofit basis it would provide present aircraft with the capability to employ larger tires, thereby improving ground flotation. The tire offers improved performance at high deflection, and run-flat emergency operational capability. An inflation/deflation system, however, reduces the reliability of an aircraft. Results of tests on ten tires exhibited excellent tread wear qualities. F.R.L.


Description of the characteristics of projected SST fleet operations, followed by review of some pertinent aspects of the nature of the atmosphere, the ways that have been suggested that it might be affected by SST operations, and what is still to be learned. The preliminary planning of a program to gain the necessary additional knowledge, and the way it is proposed to carry out the program are discussed. The possible effects of carbon dioxide, water vapor, contrails, particulates, nitrogen oxides, and carbon monoxide are considered. The assessment program will involve study of engine emissions, atmospheric modeling, and photochemistry. F.R.L.


Review of technical improvements in aircraft and navigational and aircraft aids which have eliminated most of the problems of adverse weather which the air transportation industry faced 30 years ago. In spite of the progress made, weather is still capable of setting up hostile environments for aircraft operations. Such elements as thunderstorms, fog, turbulence, snowstorms, heavy winds, and storms can close airports, divert flights, and cause disservice to passengers. Using typical cases, the total effects of weather interruptions are discussed and related to the present-day U.S. fleet of 2400 transport aircraft and to their control. Recent economic studies provide a basis for assessing the cost of several weather factors which interfere with scheduled air transportation. F.R.L.


Description of the results of an analysis of laser terrain profile data obtained with coincident photography from an altitude of 1000 ft over the sea ice fields of the Beaufort Sea in April 1968. Analysis of the data reveals that sea ice surface roughness and the nature of the roughness as well as relative surface reflectivities, which are both manifested in the laser terrain profile, can be used to interpret the categorical stages of ice development. The laser terrain profiler seemed to detect, with acceptable accuracy, all ice features traversed; however, ice pressure ridges, ice hummocks, or ice blocks could not be distinguished from each other on the record because the measurement is only two-dimensional. These features were always detectable even when occurring in rapid succession. Cracks are very discernible on the laser terrain profile record. M.M.


The influence of retardation of crystallization on the energy characteristics of a jet engine is analyzed. Approximate estimates of the influence of crystallization on the flow rate are obtained. The expansion process in the engine is shown to occur at a prescribed area ratio of the nozzle exit section, and it is shown that in the absence of crystallization in the nozzle, the pressure at the nozzle exit section can differ appreciably from the pressure calculated for equilibrium expansion. A more accurate approach, therefore, is to compare the processes with and without crystallization (rather than for a constant outflow pressure). The relative effectiveness of the expansion process in the absence of crystallization is assessed on the basis of special thermodynamic calculations for two compositions with 7 and 15% aluminum and for a BeH2 + H2O2 fuel. Nonequilibrium flows of two-phase combustion products are calculated for studying the influence of the heat transfer rate between the particles and the gas during the crystallization process. V.P.


A method is proposed for determining the optimal temperature field along the radius in front of a gas-turbine stage. The possibility of obtaining a radially nonuniform temperature field with a bypass turbine of special design is studied, and the applicability of this approach to regeneratively cooled turbine engines is demonstrated. V.P.


The possibility of using statistical methods for analyzing the observed spread of the principal characteristics of sheet joints is discussed. Problems involved in the determination of the distribution laws of breaking loads and numerical characteristics are examined. The influence of the spread of the parameters of a joint is evaluated, and the minimum strength of a spot-welded joint is determined. The interrelation between random parameters is studied on the basis of statistics characterizing the relationship between random quantities. All results are obtained for spot-welded and adhesive joints of high-strength aluminum alloy sheet. V.P.


An approximate method is proposed for analyzing the intrinsic dynamic characteristics of an aircraft under unsteady flight conditions. The method consists of integrating approximately the linear
differential equation of perturbed motion of the aircraft over a finite interval of time. A solution over the entire interval under consideration is obtained by consecutively passing from one approximation interval to the next. V.P.


Some aspects of the calculation of a small-aspect-ratio wing with allowance for the fuselage strains are examined. The strong influence of fuselage strains, particularly in the case of antisymmetric loading, on the work of the wing is demonstrated on the basis of extensive calculations performed for a delta wing. V.P.


The permissible deviations of the overall excess air ratio in test-bed engine studies are analyzed with a view toward obtaining excess air ratio values that correspond to technical specifications for various modes of engine operation. A diagram for calculating the constraints placed on the excess air ratio is proposed. V.P.


The problem of integrating the kinematic equations of an astatic gyroscope mounted on an aircraft that moves in an arbitrary fashion near the earth's surface. The rotor axis is close to vertical at the initial moment. Integrals of the kinematic equations are obtained without imposing any restrictions on the rotation of the gimbal or on aircraft motion. Many special cases of gyroscope motion follow from these integrals, T.M.


The expression for the ideal weight of fuselages with the shape of a body of revolution with a straight axis to which can be likened the shapes adopted in modern aircraft, particularly passenger transports. From this expression, which takes into account stressed loads and their distribution as well as cabin pressurization, is derived a general formula to which can be conveniently reduced, by the adoption of suitable coefficients, empirical formulas which give the real weight of fuselages on the basis of data measured statistically. M.M.


Study of the catastrophic deterioration of vanes and blades in the hot section of an aircraft powerplant, caused by operation in an environment containing varying amounts of sea salts. The condition is termed hot corrosion or, more commonly, sulfidation. Current procedures for the repair of nozzle guide vanes exhibiting hot corrosion attack call for the removal of the corrosion by grinding, blending of the surface, and then recoating the grounding area. Several nondestructive methods for rapid detection are discussed. F.R.L.


The concept of altering the flight path of VTOL aircraft to reduce ground noise levels in communities adjacent to the landing site is explored. Two classes of VTOLs are considered: prop-rotor and lift-fan aircraft. Theoretical performance and acoustic models are developed and then mathematically flown to yield representative takeoff and landing flight profiles. Proposed noise abatement profiles are compared with minimum time and fuel trajectories to assess the possible annoyance reduction through flight path control. Significant annoyance reductions are feasible if a nearly vertical takeoff flight path is flown near the landing site. However, the time expended and fuel consumed increase. A procedure is also suggested which assesses the overall community annoyance to VTOL operations. Several noise abatement trajectories of both types of aircraft are evaluated to determine which flight paths are most acceptable to the VTOL port's neighboring community. (Author)


Description of the advanced technology developments in rotor and drive, flight controls, and cargo handling systems areas of the Heavy Lift Helicopter System (HLHS). The system was conceived to expedite the loading and offloading of containerized cargo from ships. The shift to containerization, coupled with the projected availability of a vertical lift system, has provided the opportunity for significant improvement in the logistics support to both military and commercial customers. Commercial applications of the HLHS will also be feasible and profitable in areas such as power line construction, forestry, and bridge building. F.R.L.


The STOL flight control problem is discussed in relationship to its unique operational requirements. A survey is made of the historic growth of control system techniques, and their implementation, in order to put into perspective the STOL position. The danger of regarding STOL control as a simple extension of CTOL technique is exposed, and in contrast, the concept of task orientation and configuration is developed as pertinent to the STOL problem. Reference is made to current control system technology and analytical tools, and thoughts are presented on future trends. The need for a composite approach to control implementation is emphasized. (Author)


A review is presented of typical additives that are being used or recommended for use in aircraft fuels. The following types of additives are considered: antioxidant; metal deactivating; anticorrosive; antiwear; preventing ice crystal formation; preventing accumulation of static electricity; coagulating; thickening; stabilizing; biocide; and antismoke. O.H.

The universal characteristics of a centripetal stage are examined. The influence of the rate of airflow and the pressure ratio on the power is demonstrated, and the velocity triangles of a centripetal stage are examined for two types of compressor and two types of turbine.

V.P.


A simple and time-saving method is proposed for designing a transonic airfoil cascade, and evaluating quantitatively its efficiency from the velocity distribution, without recourse to experimental tests. It is shown how an airfoil lattice with an infinite chord can be reduced to one with a finite chord.

V.P.


Aviation fuels from different sources have shown marked differences in their ability to lubricate load bearing surfaces in aircraft fuel pumps. Over the years there have been changes in the methods used in the refining of aviation fuels. An investigation was conducted to determine what differences existed in the lubricating ability of these fuels. Aviation fuels are produced to conform with comprehensive national specifications but there is no section which relates specifically to lubricating properties. Permitted variations in fuel specification tests, for example, distillation characteristics and viscosity, have failed to relate to service performance. A test has been developed based on the assumption that the resistance to breakdown of the boundary lubricating film depends upon the tenacity of certain fuel constituents adsorbed on the bearing surfaces.

G.R.
The dependence of aircraft buffeting on a combination of two of the overlying layer (a change which characterizes the boundary of the baroclinic layers). On the basis of a graph of the vertical wind vector shear, the Richardson number, and the change in thermal stability from the underlying stratusphere turbulence causing aircraft buffeting and the vertical distribution of meteorological parameters calculated from radiosonde data is determined. In this case the main problem reduces to finding the critical values of these parameters, which optimally characterize the successfulness of a diagnosis of the presence or absence of aircraft buffeting. It is found that the successfulness of such diagnosis is optimally characterized by the vertical wind vector shear, the Richardson number, and the change in thermal stability from the underlying to the overlying layer (a change which characterizes the boundaries of the baroclinic layers). On the basis of a graph of the dependence of aircraft buffeting on a combination of two of these factors, a buffeting parameter is obtained in terms of which a condition governing the presence or absence of buffeting is expressed.

Author

A compilation is presented of the response to a distributed questionnaire on engine-airframe interference in transonic tests among aeronautical laboratories operating transonic wind tunnels, aircraft manufacturers, engine companies, and airplane users in the AGARD countries. The experimental techniques, correction procedures, advantages and limitations of inlet, nozzle/afterbody, complete model testing, and engine thrust determination are discussed in a technical order. Author

The technical information supplied by the Ad Hoc Committee is summarized. After some preliminary remarks on wall interference corrections in transonic tests, the different answers to the AGARD questionnaire are presented together with the main points made by the committee members as representatives of the different countries. A number of general agreements among the committee members are stated which indicate the state-of-the-art of transonic wind tunnel corrections. The discussions and the conclusions of the committee are presented on the problems which appear to be most important for future research. Problems are briefly reviewed and research areas are indicated for which the committee agreed an international program will be most profitable. A list of references is provided which includes the works referenced by all the different groups participating in the committee. Author

An analytical study was conducted to investigate systematically the relative importance of blade flexibility,
unsteady aerodynamics, and variable inflow (with and without wake distortions) in determining predicted helicopter rotor stall characteristics. The theoretical results of this study were compared with a corresponding full scale wind tunnel results for the H-34 rotor system. The classical theory (rigid blades, steady aerodynamics, and constant inflow) produced good correlation at nominally unstalled operating conditions. However, rotor lift is significantly lower than the test values were predicted at high blade angles of attack. The use of unsteady airfoil data provided the most significant improvement in correlation by allowing higher section lift coefficients to be reached due to the stall phenomenon associated with unsteady operating conditions. The primary effect of blade flexibility was due to blade torsional deflections, which, as with blade pitch changes, had a direct effect on performance. Variable inflow, although producing significant changes in the angle of attack distribution over the disc, did not appreciably affect rotor performance.

Author


ANALYTICAL AND NUMERICAL STUDIES OF DOWNWASH OVER RECTANGULAR PLANE FORMS
H. C. Gainer (RAE) and G. F. Miller May 1971 28 p refs
(NPL-MA-99) Avail: NTIS

The distribution of downwash at the surface of rectangular platforms with prescribed subsonic aerodynamic loading is considered. Three separate aspects of the problem are treated analytically, the results of each being tested against those derived from an accurate numerical procedure. Asymptotic expressions for large and small aspect ratio are formulated and shown to apply over a wide range of aspect ratio. Downwash routines from certain existing lifting-surface methods are studied, and their patterns of convergence are illustrated and compared. A logarithmic singularity near the leading tip corner is identified, but it is observed that this can exist without serious detriment to the lifting-surface methods.

Author (ESRO)

N71-36406 National Research Council of Canada, Ottawa (Ontario).

(Contract N00014-69-C-1069) Avail: NTIS CSCL 20/4

An experimental program was conducted to investigate the modifications of a tip vortex which could be obtained by injecting the core of a tip vortex with a stream of air. Wind tunnel tests of an airfoil model were conducted. The results obtained from flow-visualization studies, balance data, and vortex-meter measurements show how the strength of the tip vortex can be reduced significantly by the injection of a linear mass flow of air into the core of the tip vortex. The reduction in drag obtained with injection is important since it allows the recovery of power required to inject the tip vortex core with mass flow.

Author (GRA)


(Contract F40600-72-C-0003) (AD-727006; AEDC-TR-71-105; ARO-PWT-TR-71-68) Avail: NTIS CSCL 14/2

Tests were conducted on two configurations of a 0.0226-scale model of the C-5A aircraft for the purpose of data correlation with other major transonic test facilities. The results reported herein were obtained at Mach numbers from 0.600 to 0.825 and Reynolds numbers from 2.1 million to 4.2 million and represent the AEDC contribution to the correlation study.

Author (GRA)

N71-36411 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A METHOD FOR CALCULATING THE AERODYNAMIC LOADING ON WING-BODY COMBINATIONS AT SMALL ANGLES OF ATTACK IN SUPERSONIC FLOW
Charlie M. Jackson, Jr. and Wallace C. Sawyer Oct. 1971 33 p refs
(Grant AF-AFOSR-1744-69) (AD-728767; TR-1020; AFOSR-71-1956-TR) Avail: NTIS CSCL 20/4

A theoretical method for estimating the aerodynamic loading on a wing-body configuration is described. In order to provide a basis for evaluation of the method, experimental calculations were carried out for closed, partially open and completely open (free-jet) test sections respectively. The model is represented mathematically by a simple horseshoe vortex. Spanwise as well as longitudinal variations of the normal induced velocity at the model are determined. The resulting interference parameters agree with available exact theoretical calculations.

Author

N71-36412 National Aeronautical and Space Administration. Langley Research Center, Langley Station, Va.

AN EXPERIMENTAL PROGRAM TO INVESTIGATE THE FLUID MECHANICS OF THE TURBULENT JET FLOW AND THE EFFECT OF THE JET ON THE AERODYNAMIC LOADING OF A WING-BODY COMBINATION AT SMALL ANGLES OF ATTACK IN SUPERSONIC FLOW
Charlie M. Jackson, Jr. and Wallace C. Sawyer Oct. 1971 33 p refs
(Grant AF-AFOSR-1744-69) (AD-728767; TR-1020; AFOSR-71-1956-TR) Avail: NTIS CSCL 20/4

An experimental program was conducted to investigate the fluid mechanics of the turbulent jet flow and the effect of the jet on the aerodynamic loading of a wing-body combination at small angles of attack in supersonic flow. The tests were conducted on a 0.0226-scale model of a wing-body combination in the AEDC 16-ft transonic wind tunnel. The results obtained from flow-visualization studies, balance data, and vortex-meter measurements show how the strength of the tip vortex can be reduced significantly by the injection of a linear mass flow of air into the core of the tip vortex. The reduction in drag obtained with injection is important since it allows the recovery of power required to inject the tip vortex core with mass flow.

Author (GRA)
measurements of surface pressures, forces, and moments were made on a series of basic wing-body configurations over a Mach number range from 2.5 to 4.5. Comparison of the theoretical estimates with these experimental data generally indicated good agreement for the entire range of configurations and test conditions.


An investigation was made in a unitary plan wind tunnel to determine the static, longitudinal stability and control characteristics of a missile configuration with cruciform delta wings and various horizontal canards. The controls consisted of three different trapezoidal canards and a wing trailing-edge flap located on the horizontal wings only. The tests were made at Mach numbers from 1.50 to 4.63, through an angle-of-attack range from -4 to 30 deg, at an angle of sideslip of 0 deg, and at a Reynolds number of 8,200,000 per meter. The results are summarized in the form of various pertinent aerodynamic parameters as a function of Mach number. Although no detailed analysis of the results was made, the summary of results is useful in demonstrating the importance of certain parameters and should be useful in providing a source of systematic experimental data for correlation with analytical techniques.

Author

N71-36412# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Thrust-minus-drag forces and pressure distributions were obtained on the afterbody and nozzle sections of various fuselage closures at Mach numbers from 0.60 to 2.01. Four interfacing contours were investigated: a circular-arc; an elliptical; and a blunt configuration, all ending at the nozzle attachment station; and one blunt-based type extending between the nozzles. Also, limited data were obtained with tail booms of circular or oval cross section extending from the sides of the afterbody past the nozzles. Propulsive nozzle shapes represented variable geometry iris and convergent-divergent types with circular arc and conical boattailing, respectively. Each was configured for minimum and maximum throat area (dry and augmented power) and operated with compressed air at pressure ratios up to 20, depending on Mach number.

Author

N71-36413# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

An improved near-field method for determining supersonic flow-field properties about a body of revolution is presented and discussed. Comparisons between the improved method, Whitham's theory, and wind-tunnel results are shown for four bodies of revolution - three closed-nose bodies and one blunt body. At Mach numbers of 2.96, 3.83, and 4.63 and ratios of radial distance to body length of 1.0, 2.0 and 5.0, results show that the improved method does reasonably well in predicting flow-field pressure signatures and represents a definite improvement over existing near-field theories. It is also shown that the simple area balancing shock prediction technique works reasonably well for bodies with pointed nose sections provided the improved method is used to locate the body flow-field disturbances more exactly.

Author

N71-36414# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

Turbo engine performance characteristics were obtained for a single stage partial-admission supersonic turbine operating at low Reynolds numbers. The turbine was tested over a range of pressure ratios from 20 to 150 and equivalent speeds from 20 to 100 percent of design.

Author

N71-36415# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LONGITUDINAL AERODYNAMIC CHARACTERISTICS AT MACH 1.50 TO 4.63 OF A MISSILE MODEL EmployING VARIOUS CANARDS AND A TRAILING EDGE FLAP CONTROL

Author
PRELIMINARY TESTS OF THE MIXER NOZZLE CONCEPT

Jack H. Goodykoontz, William A. Olsen, and Robert G. Dorsch

NASA-TM-X-67938; E-6617 Avail: NTIS CSCL01A

The one-dimensional channel flow theory with leakage is described. Using this theory lift and drag laws for low aspect ratio ram-wings with side plates are derived. The one-dimensional channel flow theory is corroborated by wind tunnel tests of two ram-wings of significantly different geometry. Lift/drag ratios far superior to existing surface effect vehicles were measured. A series of successful free flight model tests show that complete vehicles designed from the one-dimensional channel flow theory can be statically and dynamically stable over a ground clearance range from zero to infinity. Author (GRA)

Ernie Bossert

NASA CR-111966; L-7804 Avail: NTIS CSCL01C

An investigation has been conducted at Mach numbers of 0.60 and 0.90 to determine the effects of various combinations of leading-edgeKrueger flaps, inboard plain flaps, and outboard slots on the static aerodynamic characteristics of a twin-jet, swept-wing fighter-airplane model. The angle-of-attack range was varied from -2 deg to 24 deg and the angle-of-sideslip range was varied from about 4 deg to -15 deg. The results of the investigation indicated that the addition of Krueger flaps caused significant improvements in maximum lift coefficient and in drag coefficient at high lift coefficients. Author

Bolt, Baranek, and Newman, Inc., Canoga Park, Calif.

AERODYNAMIC SOUND RADIATION FROM LIFTING SURFACES WITH AND WITHOUT LEADING-EDGE SERRATIONS

Alan S. Hersh and Richard E. Hayden [1971] 101 p refs

NASA CR-144370 Avail: NTIS CSCL01 A

A series of fundamental studies were conducted to understand how lifting surfaces radiate sound in both smooth and turbulent flow. The application of leading edge serrations as a device for reducing the sound radiated from these surfaces was studied for the case of smooth inflow. The directivity pattern radiated by a small airfoil in flow varied less than predicted by Curle's point dipole sound theory, and was found to be sufficient to present a partial check on that aspect of his theory. A theoretical model predicting the sound radiated from a small airfoil in turbulent flow shows good agreement with experiment over a wide speed range. The good agreement between theory and experiment suggests that for small airfoils in turbulent flow, most of the radiated sound is generated by the vorticity associated with the von Karman spectral function are found. It is shown that the wing tip acceleration due to roll for the two-dimensional turbulence case can be greater than the vertical acceleration that is found for the vertical motion reference case. An interesting possible means for evaluation of gust severity is sub w and turbulence scale L from vertical and rolling accelerations only is developed. Author

National Aeronautics and Space Administration.

HELICOPTER AERODYNAMICS


The book contains 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, balance, stability and control of the helicopter and their acting aerodynamic forces. Author (GRA)

Walter P. Kazmierczak

NASA CR-111965; L-7804 Avail: NTIS CSCL01C

A description is given of a device to complement field trials in training pilots in the maneuvering of a remotely controlled steerable parachute-payload system and to study the behavior of such a system when under the control of a pilot. The device consists of roll and glide controls operated by the pilot which are coupled to an analog computer that simulates the flight behavior of the parachute-payload system. A stylized picture of a ground target as seen by a camera on board the payload and generated in the computer is presented on an oscilloscope. This picture is viewed by the pilot who manipulates the controls and attempts to impact the parachute and payload on the target. Author

Army Foreign Science and Technology Center, Charlottesville, Va.

HELICOPTER DEVILOPMENT AND EVALUATION OF AIRCRAFT CLOCKS INSENSITIVE TO HIGH INTENSITY MAGNETIC FIELDS Final Report

National Aeronautics and Space Administration.

ANALOG SIMULATION OF A GUIDED PARACHUTE-PAYLOAD SYSTEM


A description is given of a device to complement field trials in training pilots in the maneuvering of a remotely controlled steerable parachute-payload system and to study the behavior of such a system when under the control of a pilot. The device consists of roll and glide controls operated by the pilot which are coupled to an analog computer that simulates the flight behavior of the parachute-payload system. A stylized picture of a ground target as seen by a camera on board the payload and generated in the computer is presented on an oscilloscope. This picture is viewed by the pilot who manipulates the controls and attempts to impact the parachute and payload on the target. Author

Jack H. Goodykoontz, William A. Olsen, and Robert G. Dorsch

NASA CR-111966; E-6617 Avail: NTIS CSCL01A

A series of fundamental studies were conducted to understand how lifting surfaces radiate sound in both smooth and turbulent flow. The application of leading edge serrations as a device for reducing the sound radiated from these surfaces was studied for the case of smooth inflow. The directivity pattern radiated by a small airfoil in flow varied less than predicted by Curle's point dipole sound theory, and was found to be sufficient to present a partial check on that aspect of his theory. A theoretical model predicting the sound radiated from a small airfoil in turbulent flow shows good agreement with experiment over a wide speed range. The good agreement between theory and experiment suggests that for small airfoils in turbulent flow, most of the radiated sound is generated by the vorticity associated with the von Karman spectral function are found. It is shown that the wing tip acceleration due to roll for the two-dimensional turbulence case can be greater than the vertical acceleration that is found for the vertical motion reference case. An interesting possible means for evaluation of gust severity is sub w and turbulence scale L from vertical and rolling accelerations only is developed. Author

Bolt, Baranek, and Newman, Inc., Canoga Park, Calif.

AERODYNAMIC SOUND RADIATION FROM LIFTING SURFACES WITH AND WITHOUT LEADING-EDGE SERRATIONS

Alan S. Hersh and Richard E. Hayden [1971] 101 p refs

NASA CR-144370 Avail: NTIS CSCL01 A

A series of fundamental studies were conducted to understand how lifting surfaces radiate sound in both smooth and turbulent flow. The application of leading edge serrations as a device for reducing the sound radiated from these surfaces was studied for the case of smooth inflow. The directivity pattern radiated by a small airfoil in flow varied less than predicted by Curle's point dipole sound theory, and was found to be sufficient to present a partial check on that aspect of his theory. A theoretical model predicting the sound radiated from a small airfoil in turbulent flow shows good agreement with experiment over a wide speed range. The good agreement between theory and experiment suggests that for small airfoils in turbulent flow, most of the radiated sound is generated by the vorticity associated with the von Karman spectral function are found. It is shown that the wing tip acceleration due to roll for the two-dimensional turbulence case can be greater than the vertical acceleration that is found for the vertical motion reference case. An interesting possible means for evaluation of gust severity is sub w and turbulence scale L from vertical and rolling accelerations only is developed. Author

The braking performance of a nine-place, light, twin-engine airplane was evaluated on comparative grooved and ungrooved surfaces of a landing research runway. The test airplane was equipped with manual braking on the main wheels of the tricycle landing gear, and its weight varied from (7500 to 8000 lb). The test results indicate that pavement grooving significantly improves aircraft braking and directional control on wet runways. Measurements and observations of runway tire treads made during this test program showed no indication of unusual wear and/or damage attributable to grooved surfaces. Comparative braking data obtained with a jet fighter and a civil and a military jet transport are also presented.

V. Robert Page and Thomas N. Aiken Washington Oct. 1971 29 p Revised (FAA-AC-61-4C) Avail: NTIS; SOD $0.25

The facts, circumstances, and conditions surrounding the fatal crash of the Alaska Airline, Inc., Flight 1866 on September 4, 1971 are presented. No concrete causes were established for the accident.

E.H.W.
A lightweight, high-mobility structural concept for shelters used primarily for general purposes. Hangars used for temporary aircraft storage, and maintenance docks for support of aircraft maintenance crews is presented. Five shelter concepts are described. Several offer modular growth patterns. Four hangar concepts are described. Six maintenance dock concepts are described. The designs are both the aircraft-enclosing type and the access-platform type. One universal panel and beam shelter capable of various spans and shapes is discussed. Models were built of twelve of the concepts for design evaluation. Structural design feasibility analyses were performed and are included as an appendix. Author


N71-36874# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va. RAPID ESTIMATION OF WIND-TUNNEL CORRECTIONS WITH APPLICATION TO WIND-TUNNEL AND MODEL DESIGN

Henry H. Heyson Washington Sep. 1971 370 p refs (NASA-TN-D-6416; L-7793) Avail: NTIS HC $6.00/MF $0.95 CSCL 14B

A chart method is developed for the rapid estimation of wind tunnel interference in closed and closed-on-bottom-only tunnels. In addition, based on varying degrees of correction, are developed. Applications of these results indicate very powerful effects of wing sweep and the degree of correction on the usable testing range of wind tunnels. Author

J. E. Robertson Mar. 1971 98 p refs (Contract NAS8-25700)

(RNA-CR-119847; WR-71-10) Avail: NTIS CSCL 20D

A prediction of in-flight fluctuating pressure environments including protuberance induced flow is presented. Based on test results from many sources, prediction methods for various unsteady flow environments are formulated. In particular, prediction methods are proposed for basic fluctuating pressure phenomena which occur on virtually all aerospace vehicles during some phase of launch and protuberance induced fluctuating pressure phenomena which are typical of three-dimensional protuberances attached to the external surfaces of a vehicle. The prediction methods for the basic fluctuating pressure phenomena were developed for two-dimensional and axisymmetric configurations; however, the conclusions are of fairly general application. The prediction of overall levels, spectra and cross-spectra for both basic and protuberance induced fluctuating pressure phenomena are compared to show characteristics unique to the particular unsteady flow condition. Author

W. Lyle Labs., Inc., Huntsville, Ala. Research Div. PREDICTION OF IN-FLIGHT FLUCTUATING PRESSURE ENVIRONMENTS INCLUDING PROTUBERANCE INDUCED FLOW


TIP VORTICES: VELOCITY DISTRIBUTIONS


Detailed measurements of velocity distributions have been made in vortices generated at the tip of a square-tipped, 18-inch-chord, 48-inch span blade mounted in the NASA-Ames 7-by-10-foot wind tunnel. Time-mean-average velocity components were measured using a triple sensor hot wire probes operated by three separate anemometers. With the blade at an angle of attack of 12 deg., traverses were made through the vortex centers at six axial stations, z/c = -0.76, -0.50, -0.25, 0.0, 2.0, and 4.0, where z/c = 0 is the trailing edge. The dimensions of the vortex increase with distance downstream over the blade surface, and at z/c = 4 the vortex core radius is 1.7% of the span. Maximum circumferential
velocity of 42% of mainstream velocity was measured at x/c = -0.50, over the wing surface, followed by decay to 24.0% of mainstream velocity at x/c = 4. Axial velocity in excess of free stream velocity was measured in the vortex core with maximum axial velocity of 140% of free stream velocity at x/c = -0.25.

Author

N71-36898# Sandie Corp., Albuquerque, N.Mex.

MAGNUS DATA ON THE STANDARD 10 DEG CORE CALIBRATION MODEL

The standard 10 deg cone calibration model was run in a supersonic wind tunnel to obtain Magnus force and moment data at Mach numbers of 1.76, 2.02, and 3.02, at respective Reynolds numbers of 2.74, 2.44, and 1.79 million based on model length. The angle of attack was varied from zero to 12 degrees and the spin helix angle ranged from zero to approximately 0.25 radians. Boundary layer transition occurred on the model at all finite angles of attack. As expected, these results were not in agreement with the theoretical predictions for the all laminar boundary layer condition. Author (NASA)

N71-36895# Imperial Coll. of Science and Technology, London (England), Dept. of Aeronautics.

AN INVESTIGATION OF THE FLOW AROUND RECTANGULAR CYLINDERS

Measurements are presented of the base pressure coefficients, drag coefficient and Strouhal number of rectangular cylinders. The results confirm a finding in Japan that the drag coefficient rises to nearly 3 when the depth of the section is just over half the width. The flow around the sections is found to be strongly influenced by the presence of the trailing edge corners. Author

N71-36994# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

CALCULATION OF NONLINEAR CONICAL FLOWS BY THE METHOD OF LINES

A computational technique, called the method of lines, is developed for computing the flow field about conical configurations at incidence in a supersonic flow. The method, which makes use of the self-similarity property, is developed for the nonlinear flow equations. The method has proved to be an efficient and versatile procedure for constructing the numerical solutions to conical flow problems. It has been successful in computing the flow past circular and elliptic cones at conditions where small regions of supersonic cross flow develop and for the conical delta wings where the region of supersonic cross flow is extensive. The calculations made for circular and elliptic cones as well as for the compression side of various conical delta wings are in good agreement with experimental except in regions where viscous effects become important. Author

N71-36704 National Lending Library for Science and Technology, Boston Spa (England).

THE EFFICIENCY OF SINGLE-ROW IMPULSE STAGES ON THE BASIS OF SOVIET TEST DATA

Test data obtained by determining the internal efficiency of single-row impulse stages are presented. The maximum internal efficiency of a single impulse stage is plotted against the parameters of the nozzle cascade and the leakages in the tip section are examined. It is found that the efficiency values obtained in all the experiments are in good agreement if they are reduced to the same test conditions. Author

N71-38720# Aeronautical Research Associates of Princeton, N.J.

COMPUTING DISPERSAL OF ATMOSPHERIC POLLUTANTS NEAR AIRPORTS

The basic rationale of invariant modeling is demonstrated and verified in specifying the structure of atmospheric turbulence near the ground. A model capable of predicting the dispersal of inert airborne pollutants emanating from arbitrary source configurations and thermal infrared imagery was obtained. This model depends upon the turbulence model for inputs of turbulence and, when the source configuration is specified, predicts the distribution of pollutant concentration downstream. E.M.C.


A REMOTE-SENSING INVESTIGATION OF FOUR MOJAVE PLAYAS. ENVIRONMENTAL RESEARCH PAPERS
Ceriton E. Molineaux, Emmanuel E. Blimpias, and James T. Neal 16 Apr. 1971 73 p refs (AD-727031; AFCLR-71-0235; AFCLR-ERP-352) Avail: NTIS CSCL 08/6

Four dry lakesbeds (playas) in the Mojave Desert are often hard and flat enough to serve as natural landing areas for aircraft. However, the surface physical properties of moisture, strength, and microlrelief can vary with seasonal or local conditions. It is desirable to develop methods for determining and monitoring these properties and their variations. Airborne remote sensing enables collection of data on the reflectance, temperature, and emissivity of these surfaces that can be correlated with soil parameters. Four playas in the Mojave Desert that have a variety of surface properties were investigated. Airborne spectrophotography and thermal infrared imagery were obtained by overflights. Ground photometry and measurements of surface properties were obtained. Moisture-sensitive dyes were applied to one lakesbed surface to evaluate the feasibility of monitoring its dryness through color changes apparent on the aerial photograph. The report describes the results of the remote-sensing investigations and the correlation of photographic and imagery interpretation with actual surface conditions. Author (GRA)


REMOTE SENSING APPLICATIONS IN FORESTRY. THE DEVELOPMENT OF AN EARTH RESOURCES INFORMATION SYSTEM USING AERIAL PHOTOGRAPHS AND DIGITAL COMPUTERS PHOTOGRAPHS AND DIGITAL COMPUTERS Annual Progress Report

Work continued: (1) to develop an operating earth resources information system oriented toward wildland application; (2) to provide techniques for scanning and interpreting aerial photographs automatically to provide inputs to the information system; and (3) to develop sampling designs which optimally utilize the information system and supplementary remote sensor and ground data for resource inventory and analysis. A systems analysis has been completed specifying the equipment and software packages needed to build the wildland information system and programs have been written for data input. Several image matching procedures for automatic mapping of forest
resources using digitized stereopairs of aerial photographs have been tested. A program package for simulating scanned aerial photographs in various orientations has been written. Development of a linear discriminate function (LDF) to automatically classify forest types on panchromatic prints continued. A large scale test of a five-stage forest inventory procedure using Apollo 9 and aerial photographs was conducted on 10 million acres with a sampling error of only 13 percent on an estimate of 2.2 billion cubic feet of timber growing on 5 million acres.

The reliability estimation of an avionic system, which includes gross estimates, rapid estimates, and detailed estimates is discussed. Probability of attainment is then studied by selective reliability allocation among subsystems, followed by feasibility estimates based on experience, complexity, failure rate summations and/or other effective techniques. Constraints including allowable degradation, alternative mode operation, environment, operator effectiveness, and excellence of maintenance will permit improved estimates. Failure mode and effect analyses serves to guide conceptual design decisions so as to eliminate single point failures and identify areas for judicious application of redundancy, requirements for high reliability parts, special environmental control, and beneficial choice of operating profile.


TECHNIQUES OF SYSTEM RELIABILITY ESTIMATION, INCLUDING FAILURE EFFECT ANALYSIS (FAILURE CONSEQUENCE) c15
W. T. Sumerlin In AGARD Reliability of Avionics Systems Jul. 1971 29 p refs
Avail: NTIS

An opinion is given of the probable relative importance of reliability program elements including reliability requirement evaluation and allocation, proof of attainment, parts control, design surveillance, failure analysis and design correction, and reliability progress measurement.
for ice prospecting even in the presence of clouds and fog, but with extremely poor resolution. A complete solution of the problems of ice prospecting can be accomplished only with the use of a combination of devices operating in various parts of the electromagnetic wave spectrum. The use of a combination of various apparatus smooths out the disadvantages of any one system and reinforces their positive values.

Author

N71-36830# National Aeronautics and Space Administration. Lewis Research Center. Cleveland, Ohio. 

EXPERIMENTAL INVESTIGATION OF SELF-ACTING-LIFT-PAD CHARACTERISTICS FOR MAIN-SHAFT SEAL APPLICATIONS


(NASA-TN-D-8384; E-6186) Avail: NTIS CSL 11A

Experimental studies on four acting lift geometries (shrouded step pads) for maintaining positive separation of seal surfaces are compared with theoretical calculations. Load capacities at measured film thicknesses were lower than those predicted by theory for parallel surfaces. Sufficient gas (air) film stiffness was generated so that dynamic tracking of the seal seat face runout was maintained. Seal seat runouts to (0.0035 in.) were accommodated. Tracking, however, is inhibited during startup under light loads when seal seat runouts exceed 0.0025 cm (0.001 in.).

Author

N71-36845# ARO, Inc., Arnold Air Force Station, Tenn. 


W. H. Goethert AEDC Jul. 1971 40 p refs 

(Contract F40600-72-C-0003) 

(AD-727005; AEDC-TR-71-85; ARO-OMD-TR-71-24) Avail: NTIS CSL 14/2

A further clarification of the volume from which data originate in the dual scatter laser Doppler velocimeter is presented. Several factors are noted that specify the primary dimensions of the probe volume which in some cases are totally specified by the collector optics. It was found experimentally that the lens aperture of the light collecting optics has a primary effect on the volume from which data originate. An equation is derived for reducing this data volume for both the on-axis and off-axis cases. Experimental verification is presented and compared to the derived equation.

Author (GRA)

N71-36930# Midwest Research Inst., Kansas City, Mo. 


Ronald D. Butler Wright-Patterson AFB, Ohio AFAPL Jun. 1971 79 p refs 

(Contract F33615-69-C-1265) 

(AD-727060; AFAPL-TR-71-35) Avail: NTIS CSL 11/8

The report describes a technique for the experimental determination of fluid viscosity over the temperature range 100 deg - 700 deg. The method incorporates standard procedures, and meets accepted specifications for data precision and for temperature control and measurement over the entire temperature range. Reliable data of high precision can be obtained for subsequent analysis and prediction of lubricant performance in operating turbine aircraft engines. Complete viscosity data are presented for 30 synthetic lubricants. The following fluid types were included in this study: MIL-L-7808, MIL-L-23699, MIL-L-27502, polyphenyl ether, and silicone formulations. Statistical analysis of the data indicates that a logarithmic relationship accurately describes the variation of kinematic viscosity with temperature over the entire temperature range. Appropriate equation can be used to calculate fluid viscosity at any desired temperature up to 500 F (or 700 F for thermally stable lubricants) with an average error less than 2%. 

Author (GRA)

N71-36985# Environmental Science Services Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.

AN AIRBORNE PYROTECHNIC CLOUD SEEDING SYSTEM AND ITS USE


(ESSA-TM-ERLTM-APLC-5) Avail: SOD $3.75

The development, testing, and use of an airborne pyrotechnic cloud seeding system is described. Pyrotechnic flares producing 50 g of silver iodide smoke each were developed and tested for nucleation effectiveness in a cloud chamber. Night flight tests were made of the delivery rack and firing system reliability, burn time, and flare trajectory. A randomized seeding scheme was used on 19 supercooled cumuli, of which 14 were seeded and 5 were controls. Of the 14 seeded clouds, 13 grew explosively. Seeded clouds grew 10,900 ft higher than the controls, with the difference significant at better than the 1/2 percent level. Rainfall from seeded and control clouds were compared by means of calibrated ground radars. Large increases in rainfall were found from seeded clouds, but not at a satisfactory level.

Author

N71-36990# Society of Motion Picture and Television Engineers, Inc., New York. 

CLOUD PHOTOGRAMMETRY FROM AIRBORNE TIME LAPSE PHOTOGRAPHY c14


The technique used to analyze the aerial cloud photographs, process the Doppler navigational information, and obtain the desired measurements of the clouds is described. The various problems inherent in this method are considered, and results of its application are presented.

Author

N71-37038# National Aviation Facilities Experimental Center, Atlantic City, N.J. 


Clifford Shapiro Sep. 1971 27 p refs 

(FAA-NA-71-16) Avail: NTIS 

Prior to the conduct of tests pertinent to radar separation standards, a review of previous efforts was accomplished to ascertain the application of existing data towards the establishment of separation criteria within the en route Air Traffic Control National Airspace System. Model 1 complex at Jacksonville, Florida. Data analyses and presentation were directed towards the range and azimuth resolution characteristics and aircraft separation measurement capability of the secondary radar/digitizer subsystem.

Author

N71-37041# Civil Aeromedical Inst., Oklahoma City, Okla. 

ATTITUDES AND MOTIVATIONAL FACTORS IN TERMINAL AREA AIR TRAFFIC CONTROL WORK 

Roger C. Smith, Bart B. Cobb, and William E. Collins Jul. 1971 30 p refs 

(FAA-AM-71-30) Avail: NTIS 

A sample of 614 journeymen terminal ATCSs at 17 high-density IFR airports, and 514 ATC trainees were administered a questionnaire which asked them to list what they liked best and what they liked least about ATC work in general; in addition, ATCSs made similar lists for work at their assigned facilities. Responses were surveyed for clusters, and nine response categories were established. The frequency of responses within each category was tabulated. With minor variations the pattern of responses from ATCSs was highly similar from one facility to another. The categories of job
The design and development of 28-inch diameter rotating seals for air breathing propulsion systems is discussed. The results of testing the compressor seals, an analysis of two improved self-acting compressor seal designs, and the performance tests of stator pivot seals are presented. Numerical analyses and graphs are used to further substantiate the test results.

Author

N71-37378# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PEAK AXIAL VELOCITY DECAY WITH MIXER-TYPE EXHAUST NOZZLES


Preliminary results of an experimental study on the peak axial-velocity decay obtained with circular and non-circular nozzles and several mixer-type nozzles is summarized. Prime applications of nozzles having a rapid axial velocity decay are for: (1) reduction of jet exhaust-deflected flap interaction noise associated with STOL aircraft using an externally blown flap lift augmentation system; (2) VTOL downwash suppression resulting from vertically oriented exhaust nozzles; and (3) conventional exhaust noise suppressors with and without ejectors. With a mixer element nozzle, the velocity of the individual jets decays rapidly by mixing with the surrounding air. At some distance downstream of the nozzle exit plane, the individual jets coalesce sufficiently to form a large diameter coalescing core and a very slow peak-velocity degradation occurs. Once the coalesced core has fully formed, rapid mixing again occurs with an associated rapid velocity degradation.

Author

N71-37381# Pratt and Whitney Aircraft, West Palm Beach, Fl. Research and Development Center.


The report describes the design, fabrication and test of a radial turbine designed to produce 219.6 Btu/lb stage work at 87.5% efficiency, with a 5:1 stage pressure ratio. Turbine inlet gas conditions at design point were 257.5 psia and 2300 F. The resulting turbine configuration consisted of an air-cooled, 12-bladed rotor designed for 67,000 rpm, and a 20-vaned air-cooled nozzle section of a reflex-type (supersonic) design. Both parts were designed as IN100 (PWA 858) investment castings. As part of the preliminary design effort, a fabrication study was conducted to evaluate feasible methods of casting the turbine nozzle and rotor. Results showed that the nozzle section could be cast as an integral assembly, but fabrication of the rotor as an integral casting was much more difficult. Bicasting was evaluated as an alternate method of fabricating the rotor, and results showed substantial advantages for the bicasting technique. However, neither method could produce designed rotor properties, and testing was conducted with structurally limited rotors. A test rig was designed and fabricated by the contractor. The test rig consisted of a supercharged gas generator, which had the capability of controlling the turbine load by varying the compressor flow rate. Burner testing preceded turbine testing.

Author (GRA)
The investigation was conducted at the Langley 18-foot transonic tunnel at Mach numbers up to 1.30. The purpose of the investigation was to establish changes in thrust-minus-drag performance as well as longitudinal and directional stability and control characteristics attributable to an in-flight thrust reverser. The performance results and the effects of the thrust reverser on local surface temperatures and pressures are presented in this report. Test conditions simulated landing approach conditions as well as high-speed maneuvering such as may be required for combat or steep descent from altitude. The results indicate that the developed thrust control unit will produce reverse thrust up to 52 percent of forward thrust at static conditions and that reverse-thrust effectiveness increased with an increase in Mach number over the speed range investigated. Secondary cooling during reverse thrust and local tail temperatures may require further design considerations.

Author

N71-37543 Stanford Univ., Calif. IMPACT ON PLATES ON ELASTIC FOUNDATIONS Arthur Gates Ware, III (Ph.D. Thesis) 1970 104 p Avail: Univ. Microfilms Order No. 70-18501 The equations of motion for a plate-foundation system under a dynamic load are presented. By assuming that the load can be broken into the product of a space-dependent function and a time-dependent function two approaches are followed to separate the basic partial differential equations for the infinite plate. The final solutions are applied to the landing of an aircraft and numerical examples are carried out to illustrate the effect of the various parameters. The results show that the responses of plates on elastic foundations are almost identical whenever the bending rigidity of the plate is greater than that of the model. However, for plates possessing less bending rigidity than the foundation, the continuity of the foundation begins to assert itself. The concluding part of the work describes the cases of dual and multiple wheel assemblies and possible extensions of the investigation are outlined. Dissert. Abstr.

N71-37563*## National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. PROCEDURE FOR SCALING OF EXPERIMENTAL TURBINE VANE AIRFOIL TEMPERATURES FROM LOW TO HIGH GAS TEMPERATURES Herbert J. Gladden and John N. B. Livingood Washington Sep. 1971 28 p refs (NASA-TN-D-6510; E-6250) Avail: NTIS CSCL 20 M A procedure was developed based on conditions of similarity whereby cooled turbine vane airfoil temperatures measured at low levels of gas temperature can be used to accurately represent both the local and average airfoil temperatures that would be expected at a much higher level of gas temperature. The feasibility of this scaling procedure was verified experimentally in a four-vane cascade capable of operation at gas temperatures and pressures up to 1645 K (2500 F) and 103.4 newtons per square centimeter (150 psi), respectively. A comparison of these scaled airfoil temperatures with experimentally measured airfoil temperatures for the same high temperature conditions is presented. Author


carry out tests on large models over a wide range of Reynolds numbers. The study of helicopter blade elements with chords identical to those of rotor blades tested in a similar wind tunnel makes comparisons possible. The systematic study of wall interactions was carried out in the second wind tunnel, which is well adapted for basic research at high Reynolds numbers. Preliminary results indicate corrections which are applicable to test conditions in the latter wind tunnel. Author

TRIM, CONTROL, AND STABILITY OF A GYRO-STABILIZED HINGELESS ROTOR (AT: HIGH ADVANCE RATIO AND LOW ROTOR SPEED

Methods are developed for predicting the behavior of hingeless rotors with stiff blades, at high advance ratios and low rotor speeds. The methods are simple and expository in nature, and are developed for the purposes of: (1) providing insight into the influences of various rotor and control parameters on rotor system behavior, (2) examining the suitability of existing methods which contain more comprehensive analytic descriptions for predicting behavior of hingeless rotors at high advance ratios at low rotor speeds, and (3) providing analysis techniques which are flexible enough to be useful in preliminary design studies.

AERODYNAMIC TESTS ON A CENTRIFUGAL FAN IMPELLER MODEL WITH SWEEP-BACK BLADES
H. S. Fowler May 1971 64 p refs
(NRC-12020; ME-237) Avail: NTIS

A low speed centrifugal compressor rig was used to test a 58 1/2 inch diameter model of a fan impeller with highly sweep-back vanes. The impeller was run over a range of speeds and throttle settings to explore the whole operating field. The flow was measured at inlet and impeller exit by hot-wire anemometer traverses, and motion pictures of the flow were made using smoke visualisation. The flow through the impeller is described in detail, and is compared with that in other impellers investigated on the same test rig. A comparison is also made with the flow in a geometrically similar impeller tested in a water tunnel. The correspondence between the flows seen in these two experiments is shown to be very close. Author

(Contract N00019-70-C-0100) (AD-727628; MDC-J0971-01) Avail: NTIS CSCL 01/3

The report describes work accomplished during the second phase of a projected three-phase effort to develop a computer program to calculate potential flow about arbitrary three-dimensional lifting bodies. The main task of this phase was programming and checking-out logic that had been developed previously. Evaluation of the method by numerical experimentation has just begun, and the few results obtained so far comprise the body of this report. Simple wings of rectangular planform are considered. Preliminary results indicate that surface pressures are insensitive to wake shape but sensitive to the means of applying the Kutta condition. For some situations there is an anomaly in the surface dipole distribution, which fortunately does not affect the surface pressures.

EXPERIMENTAL STUDY OF ROTOR UNSTEADY AIRLOADS DUE TO BLADE-VORTEX INTERACTION
Pennsylvania State Univ. University Park


Measurements of unsteady, rotor-blade airloads and their time derivatives are presented for a rotor blade intersecting a completely rolled-up vortex. These results, taken at the blade spanwise stations of 0.8R, 0.85R, and 0.75R, complement measurements previously reported for the 0.95R station in CR-1573. Incremental values in the section lift coefficient as high as 1.17 were obtained at the 0.75R station. Generally, these values decreased with increasing radius. Author

DEPENDENCE OF AIRCRAFT BUFFETING IN THE STRATOSPHERE ON HORIZONTAL TEMPERATURE AND WIND DISTRIBUTION
S. A. S. Devi May 1971 15 p refs
(NASA-TT-F-13978) Avail: NTIS CSCL 01C

The relationship between buffeting of aircraft in the stratosphere and horizontal temperature and wind distributions is analyzed on the basis of data collected in previous studies and results of instrument measurements of stratospheric turbulence, done in a special aircraft laboratory at altitudes of 10 to 18-19 km. The task was to determine the critical values of the horizontal parameters that would cause the most successful diagnosis of buffeting. Of all examined parameters considering the horizontal temperature and wind distributions, horizontal wind shears along and across the stream are best for diagnosing stratospheric buffeting. Author
additional kinematic couplings, along with general and variational methods of solving problems in flight dynamics. Methods of calculating elements of trajectories, and takeoff and landing characteristics of aircraft, including ballistic rockets, orbital aircraft, artificial satellites, and spacecraft are given. Methods of calculating the trajectory of ballistic rockets over powered and passive phases is given, along with methods of calculating the trajectory of motion of artificial satellites when injected into orbit. Methods of optical control of spacecraft are examined briefly. Author (GRA)

N71-37603# · National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EXPLORATORY WIND-TUNNEL INVESTIGATION OF DEPLOYABLE FLEXIBLE VENTRAL FINS FOR USE AS AN EMERGENCY SPIN-RECOVERY DEVICE
Sanger M. Burk, Jr. Washington Oct. 1971 33 p refs Film Supplement Number L-1103 to this report is available on loan from NASA. Langley Research Center (NASA-TN-D-6509; L-7877) Avail: NTIS CSCL 01A

Spin-tunnel tests have been conducted on dynamic models of two fighter airplanes to explore the feasibility of using deployable flexible ventral fins as an emergency spin-recovery device. Various fin configurations, deflections, and locations were tested. The results indicated that the fins provided satisfactory spin recoveries for the models tested. Author


THE 1989 CRC AVIATION EMISSION-TREATMENT TECHNIQUE EVALUATION
Mar. 1970 58 p refs (Rept-430) Avail: NTIS

Methods for sampling, handling, and measuring emissions from aircraft gas turbine engines were evaluated. Agreement among three particulate methods in measuring carbonaceous materials was fairly good. Flame ionization detectors were quite satisfactory for measuring hydrocarbon concentrations in the range of 200 to 300 ppm by volume. The Fisher partitioner and the nondispersive infrared absorption (NDIR) analyzer were well suited for measuring carbon monoxide and carbon dioxide. The phenol disulphonic acid method for measuring nitrogen oxides and the NDIR analyzer for measuring nitric oxide performed well. The 3-methyl 2-benzothiazolinone hydrazone hydrochloride method gave fair results when the engine was operated at low rpm and concentrations of oxygenated materials were in the range of 10 ppm. Traverses of the tail pipe plane showed significant variations in emissions among sampling points. The length of sample hydrocarbon sample line was unimportant, but the use of Teflon rather than stainless steel as line material, high line temperature, and high sample flow rate were all judged desirable. Author

N71-37605# · Federal Aviation Administration, Washington, D.C. STOL: THE AGONY AND THE ECSTASY

The nature of intetcity travel is discussed, and the historical growth of air transportation is reviewed. Some of the significant factors concerning the air transportation penetration into the intetcity travel market are presented and discussed. As a result of this penetration, air transportation now accounts for the majority of commercial passenger miles traveled. Commercial air transportation is short-haul oriented with half of all scheduled flights covering distances of 500 miles or less. Commercial air transportation is also oriented toward areas of high population density, with 11 communities accounting for half of all passenger enplaneements. The growth in air transportation has resulted in many acute problem areas such as noise, pollution, and traffic congestion. The population increase and the resulting increase in travel demand over the next 10 years will cause a corresponding increase in the severity of these problems. Author

N71-37606# · Royal Aircraft Establishment, Farnborough, England.

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

The design, execution and preliminary results of a flight simulator experiment to investigate the problems of aircraft operating in Category 2 conditions are described. Both military and airline pilots participated and over 500 approaches were performed. The effects of decision height, contact time, lateral offset, visual sequence and visual segment on the approach success (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 which appear to have certain deficiencies. A full analysis of the flight path performance and pilot comments was omitted. Author

N71-37607# · Tippett-Abbett-McCarthy-Stratton, Washington, D.C.

AIRCRAFT GROUND OPERATIONS SIMULATION

A description is given of an aircraft ground operations simulation program coded in GPSS/360. The physical elements of the airfield are described in terms of GPSS entities and inputted through GPSS matrix savevalues. The aircraft transactions are generated into the model through deterministic flight schedules projected for the simulated target years. The program logic is related to GPSS block actions. Indirect addressing is used extensively to give the program a flexible structure. Supplementary output to standard utilization statistics includes a computer produced movie film. Author

N71-37608# · McDonnell Aircraft Corp., St. Louis, Mo.


The Survivable Flight Control System (SFCS) Program is an advanced development program of which the principal objective is the development and flight test demonstration of an SFCS utilizing Fly-By-Wire and Integrated Actuator Package techniques. The studies and analyses conducted to date have sufficiently defined the system requirements to provide a definition of an approach to the implementation of the SFCS. The results of these studies and the definition of the approach are presented in the basic report. The details of the Control Criteria and Control Law Development studies are presented in report supplements 1 and 2, respectively. The details of the Hydraulic Power and Actuation studies are reported in this supplement 3. Author

N71-37609# · Mississippi State Univ., State College. Dept. of Aerophysics and Aerospace Engineering.

FEASIBILITY STUDY OF A COMBINED LAMINAR AND TURBULENT BOUNDARY LAYER CONTROL SYSTEM
AURAL GLIDE SLOPE CUES: THEIR EFFECT ON PILOT PERFORMANCE DURING IN-FLIGHT SIMULATED ILS APPROACHES

E. H. W.

AUERAL GLIDE SLOPE CUES: THEIR EFFECT ON PILOT PERFORMANCE DURING IN-FLIGHT SIMULATED ILS INSTRUMENT APPROACHES

A. Howard Hasbrook and Paul G. Rasmussen May 1971 27 p refs

(AAA-AM-71-24) Avail: NTIS

Forty instrument rated commercial and ATR pilots with 250 to 12,271 flight hours each flew ten simulated ILS approaches in a single engine, general aviation aircraft. Divided into five groups, each group used a different glide slope cue display in combination with a modified T instrument panel configuration. Two types of glide slope cue displays were utilized: (1) voice and (2) Morse code signals. No significant differences were found among the five groups relative to accuracy in glide slope tracking. There was no apparent improvement with practice. The presence of aural glide slope cues resulted in the aircraft being flown slightly higher across the middle maker than when only the conventional visual display was utilized. Localizer performance showed a slight but significant initial decrease in the presence of aural glide slope cues with respect to only one performance measure. Transition from the conventional visual cross-pointer display to the aural (voice) glide slope cues was achieved with a minimum of familiarization and with no apparent difficulty.

Author

A VERSATILE C BAND RADAR TRANSMITTER


(AD-727086: NRL-MR-2278) Avail: NTIS CSCL 17/B

The C band transmitter is one of the four radar transmitters which are included in the Four-Frequency Radar System. The Four-Frequency Radar in its entirety is an airborne system capable of measuring target characteristics and terrain backscatter, and has been used in the synthetic aperture mode to map sea ice, waterborne oil pollution, and land and sea surfaces. The four radar transmitters operate at P/UHF (428 MHz), L band (1228 MHz), C band (4455 MHz), and X band (8910 MHz). Previous attempts to produce the required power and versatility at C band netted only partial success, and in due course, it was decided to replace and update the C band transmitter. A new transmitter has been produced by NRL and installed as a part of the airborne Four-Frequency Radar System. The new transmitter uses an electrostatic focused Klystron and meets its design goals while having approximately one-half the weight and cubic displacement of the older transmitter. The Four-Frequency Radar is a valuable research tool and the addition of a stable dependable transmitter in the C band region gives it the balance and continuity envisioned in its inception.

Author (GRA)

ALTERNATIVE ATC CO-CHANNEL SEPARATION CRITERIA BASED ON PROBABILITY-OF-INTERFERENCE CONSIDERATIONS


(IST-101) Avail: NTIS

Current air traffic control standards for separation between locations using the same frequency are discussed. Two aspects are considered: relative signal strength differential between interfering signals, and conditions under which this differential is applied to determine acceptable ground transmitter separations. The general geometrical relationships among controlled aircraft and their respective ground transmitters are considered in order to permit analysis of the probability of interference occurring which exceeds the differential specified. High altitude enroute control is used as a vehicle for developing specific analysis procedures and resulting quantitative results. It appears that use of probability-of-interference criteria, instead of worst case, would permit reductions in co-channel RCAG separations sufficient for a minimum increase of 50 percent in use of any given frequency; if lesser signal strength differentials were accepted and normal sector traffic were considered, improvement by a factor of six might be possible for high altitude enroute service. Extension of the method to other classes of ATC service should be straightforward. Substitution of probability-of-interference criteria for separation standards represents a desirable approach to improvement because safety is not compromised.

Author


James W. Glenn, Ronald N. Gordon, and Gabriel Moschetti 30 Apr. 1971 112 p refs

(Contract N00019-70-C-0426)

(AD-727574) Avail: NTIS CSCL 17/2

The objectives of the contract were to investigate the effects of the pilot's acoustic environment, optimize system...
parameters for operation in the cockpit environment, provide system performance statistics, and investigate the availability of on-board computing systems which may be utilized. Voice data were recorded in aircraft cockpits and in an altitude test chamber. These data were analyzed to determine the effects of the environment and of physiological stresses experienced by the speakers. The results of the analyses determined modifications to be made to a simulated voice control system. The recorded data were then processed by the simulated system to obtain performance statistics. Lack of positive control over environmental variables and the inability to provide an immediate indication of system response to the speaker resulted in a database inadequately to support statistically significant results. However it was noted that the main sources of interference to reliable speech recognition in the cockpit environment are sounds made by the pilot's oxygen supply equipment and his own breathing sounds. Methods for accommodating such sources are suggested.

Author (GRA)

N71-37742# Information Processing Association of Israel, Jerusalem.

PROCEEDINGS OF THE NATIONAL CONFERENCE ON DATA PROCESSING
Asa Kasher, ed. (Bar-Ilan Univ.) 1970 478 p refs Partly in ENGLISH; partly in HEBREW Conf. held in Tel-Aviv, 12 Oct. 1970 Avail: NTIS HC $6.00/MF $0.95

CONTENTS:
1. TECHNOLOGICAL FORECAST 1970 I. L. Auerbach (Auerbach Corp.) p E1-E18
2. MADAP: A COMPUTERIZED AIR TRAFFIC CONTROL SYSTEM L. Borocin (Eurosystems) p E19-E33
5. APL: BASIC CHARACTERISTICS AND APPLICATIONS TO MATHEMATICAL PROGRAMMING AND TO DATA PROCESSING E. Sharon (Hebrew Univ.) p E61-E90 refs
6. A "COMPUTER-SYSTEM LANGUAGE" (CSL): A LANGUAGE FOR JOB CONTROL N. Minsky and I. Rotbard (Hebrew Univ.) p E91-E99 refs
7. MANAGEMENT INFORMATION SYSTEMS N. S. Priyes (Penna. Univ.) p E101-E109 refs
8. AUTOMATIC READING OF HANDWRITTEN HEBREW A. J. van der Toorn (Neth. Postal and Telecommunications Service) p E111-E126 refs

N71-37744# Eurosystem, Paris (France).

MADAP: A COMPUTERIZED AIR TRAFFIC CONTROL SYSTEM

Avail: NTIS HC $6.00/MF $0.95

MADAP - Maastricht Automatic Data Processing and Display System in a real time system intended to facilitate the air traffic control in the upper airspace of a region covering Belgium, Luxemburg, the Netherlands and the Federal Republic of Germany. The goal as the system is to help the human controller in memorizing all the elements of the situation, to present synthetic information for quick decision making, and to initiate a warning when a decision has to be made. The system uses for input flight plans, radar data, meteorological data, and radio links with aircrafts. Its subfunctions are divided in such a way that each corresponds to a programming module of three to four thousand instructions. An extension of the system is projected by replacing older computers with newer hardware having strong storage facilities.

G.G.

N71-37765# Naval Air Systems Command, Washington, D.C.

ADVANCED AVIONIC DIGITAL COMPUTER DEVELOPMENT PROGRAM Progress Report
Ronald S. Entner 1 Jul. 1971 108 p refs (AD-727607; PR-8) Avail: NTIS CSCL 09/2

The report contains the following: Preliminary statement of work for an analytical study to establish the feasibility of a tactical interactive programming facility; Summary sheets of AADC program review; Papers entitled, the programmer as a computer designer; AADC status report; Storage technology and advanced computer architecture; Agenda of the advanced digital technology conference.

GRA

N71-37766# Naval Air Systems Command, Washington, D.C.

ADVANCED AVIONIC DIGITAL COMPUTER DEVELOPMENT PROGRAM Progress Report
Ronald S. Entner 4 Feb. 1971 52 p refs (AD-727605; PR-7) Avail: NTIS CSCL 09/2

Contents: AADC bibliography; Preliminary statement of work for a high level programming language development; On software modularity.

GRA


The report discusses the transformation of certain computational algorithms to a form convenient for computer adaptation. It is shown that, by reducing an algorithm to a form that makes it possible to obtain the values of a function from its increments, the length of the digital network of the computer can be shortened with a very small accuracy penalty. This is of particular importance in the case of aircraft computers, as it simplifies their structure and reduces the speed requirements.

Author (GRA)

N71-37774# Royal Aircraft Establishment, Farnborough (England).

TUT-3: A COMPUTER PROGRAM FOR SIMULATING THE ATTACK OF LOW FLYING AIRCRAFT BY ANTI-AIRCRAFT MISSILES [MASKIPN PROGRAM FØR SIMULERING AV LV-ROBOT MOT LAGT FYNGADE FYLPAN]

Intervisibility distances are distances along the aircraft's flight course where there exists alternately a line of sight and no line of sight. The means by which these distances are obtained are described in a separate report. The computer program to be described in this paper uses these intervisibility distances, obtaining them either from magnetic tape, or alternately generating them from a built in Monte Carlo type subroutine. TUT-3 computer program simulates an anti-aircraft defence with the aircraft flying along a course divided into intervisibility distance. Results are given in the form of average number of engagements per shot. In the simulation, the aircraft is assumed to be flying at constant speed along a straight-line course. The missile is assumed to fly on an intercept path, i.e. towards a point ahead of the aircraft. The missile acceleration can if necessary be varied.
in the time of flight. The time for a relaunch after an interception, or after a line of sight interruption may be fed in as a constant or as a probability with some time distribution. 

Author

N71-37792# Westinghouse Research Labs., Pittsburgh, Pa. 
Astronautics Lab. 
R. B. Campbell, H. S. Berman, W. D. Loftus, and C. E. Hardies 
July 1971 80 p refs 
(Contract F33615-70-C-1053) 

The fabrication of a silicon carbide (SiC) junction field effect transistor (J-FET) was shown practicable. Several amplifier designs were broadbanded with silicon devices to study the required parameters. A simplified building block amplifier was constructed and tested. 

Author (GRA)

N71-37820# Federal Aviation Administration, Washington, D.C. 
MEASUREMENT OF RUNWAY FRICTION Minutes of Meeting 
(FS-150-65-68-2) Avail: NTIS 

Four basic problems associated with wet, icy, and slush or snow covered runways were identified as aircraft stopping distance, aircraft directional control in a crosswind, engine ingestion effects, and slush drag effects. The first two of these problems were treated in detail. Nine influences on aircraft stopping distance and seven influences on directional control were listed and the effects of each were discussed. Statistics were presented on year-off and overrun accidents for the 1967 to 1969 period. Traction test data were presented to illustrate the effect of rubber deposits on slipperiness of normal, grooved, and sealed runways. The proceedings are summarized and the minutes of the discussion session are included. 

J.G.M.

N71-37821# Naval Ordnance Lab., White Oak, Md. 
NOL HYPERVELOCITY WIND TUNNEL REPORT NO. 2: NOZZLE DESIGN 
Walter J. Glowacki 30 Apr. 1971 129 p refs 
(AD-727831; NOLTR-71-6; Rept-2) Avail: NTIS CSCL 14/2 

The NOL hypervelocity wind tunnel will provide a high Reynolds number turbulent flow simulation in the Mach number range 10 to 20. This facility, much needed for large-scale testing of hypersonic vehicles, will be operational late in 1972. This report presents the detailed procedure used to design three nozzles for the facility. Pressure and temperature effects on the thermodynamic properties of nitrogen are taken into account in both the inviscid core and the boundary layer calculations. The supersonic portion of the inviscid core is calculated by the method of characteristics and the subsonic portion is approximated as a one-dimensional flow. The boundary layer calculation procedure is based on an integral moment of momentum equation and is valid for thick as well as thin boundary layers. 

GRA

N71-37823# National Aeronautics and Space Administration. 
Flight Research Center, Edwards, Calif. 
VALIDATION OF A GENERAL PURPOSE AIRBORNE SIMULATOR FOR SIMULATION OF LARGE TRANSPORT AIRCRAFT HANDLING QUALITIES 
(NASA-TN-D-6431; H-591) Avail: NTIS CSCL 148 

A flight simulation program was conducted to validate the general purpose airborne simulator (GPAS) for handling-quality studies of large transport aircraft in cruise. Pilots compared flying qualities of the XB-70-1 with those simulated on the GPAS during consecutive flights of the two vehicles. In addition, various handling-qualities parameters and time histories for the XB-70 and the airborne simulator were compared to assess simulator fidelity. The GPAS was shown to be capable of accurate and realistic simulation of the XB-70 at two flight conditions (Mach 1.2 at 12,200 meters (40,000 feet) altitude and Mach 2.35 at 16,800 meters (55,000 feet) altitude). In-flight changes to the programmed model were required to obtain a satisfactory simulation from the pilot's point of view. In most instances, these changes were necessary to improve model representation of the XB-70 rather than to correct for possible simulator-introduced distortions. 

Author

N71-37824# Federal Aviation Administration, Washington, D.C. 
Apr. 1971 121 p 
(OMB-04-571002) Avail: NTIS 

General instructions relating this manual to the 1972 National Transportation Needs study are presented as well as instructions for the preparation of information related to airports and other intercity terminals. Needs estimates for 1970 to 1990 and capital improvement programs for fiscal years 1974 to 1978 and 1979 to 1990 are discussed. The development of airport needs estimates, capital improvement programs, and reporting requirements are included. Terminal issues and the development of needs estimates and capital improvement programs for other intercity terminals are also covered. 

Author

N71-37825# National Aviation Facilities Experimental Center, Atlantic City, N.J. 
J. Roy Bradley, Jr. Nov. 1971 19 p 
(FAA-NA-71-37; FAA-RD-71-77) Avail: NTIS 

The design concept and operational feasibility of an undecagon (11-sided) control tower cab for the new Dallas-Fort Worth Regional Airport are discussed. A report was made on position and equipment arrangements, tower console design, and operational factors resulting from the study. A full-scale plywood mockup of the tower cab and consoles was constructed. After installation of equipments and displays, a 30-day evaluation was conducted. Results indicate that the design concept of the 11-sided tower cab for the Dallas-Fort Worth Regional Airport is valid and that it is highly feasible from an operational aspect. Position arrangements and the console design are considered excellent. An improved equipment arrangement was developed and recommended. 

Author

DESIGN AND OPERATION OF THE BSRL WATER TUNNEL 
John N. Olsen Sep. 1971 28 p refs 
(D180-14130-1) Avail: NTIS 

The design, construction, and performance of a water tunnel for two-dimensional testing of pitching airfoils is described. The test section is 4.5 inches x 12 inches x 36 inches long. The tunnel can run at 40 feet/second, but cavitation may even occur at lower speeds depending on the pressure coefficients on the model. A practical limit for say an NACA 0012 airfoil is 20 feet/second if cavitation is to be avoided. The velocity profile is uniform within at least 1% and the turbulence level is below .15%. 

Author

N71-37835# Hamilton Standard, Windsor Locks, Conn. 
DEVELOPMENT OF ATMOSPHERIC GUST CRITERIA FOR SUPERSONIC INLET DESIGN Final Report 
Frank W. Barry Dec. 1958 205 p refs 
(Contract NAS2-4515) 
(NASA-CR-114372; HSER-5195) Avail: NTIS CSCL 20D 

A method was developed for relating transient tolerances in inlet throat Mach number and shock position to the frequency of unstarts of a supersonic inlet due to atmospheric disturbances. 

723
Data on high-altitude atmospheric turbulence was collected and evaluated. A general linear analytical model was developed to compute changes in inlet throat Mach number and shock position. The relation of inlet transient tolerances to propulsion system performance is presented. A stepwise procedure for relating frequency of inlet unstarts to transient tolerances is given and applied to a representative example. Author

N71-37836

TUNNEL INTERFERENCE IN THE ARA 8 FOOT BY 9 FOOT SOME MEASUREMENTS OF POROUS TUNNEL WALL (England).

METHOD TO CALIBRATE A SIMPLE ONE corrections at subsonic Mach numbers. Corrections were applied to results in the porous section obtained on a very different type of model - a large canard configuration with low drag-rise Mach numbers. These corrected results were compared with tests on the model in the tunnel with closed walls. Agreement in lift and drag is generally very good. Author

N71-37862

Michigan Univ., Ann Arbor. Infrared and Optics Lab.


Two remote sensing techniques which measure water depth were investigated. One technique involves photographic observation of wave refraction phenomena and of wave length changes measured in Fourier transforms. The transforms were obtained by optical processing. Test sites near Puerto Rico and Barbados were used to study wave changes which occur near nonuniform bottom profiles of shallow reefs. The second technique makes use of multispectral scanner to measure radiation reflected from the ocean floor. Measurement occurs in several spectral intervals in the visible region. The depth is calculated when the ratio of signals in pairs of spectral bands is taken. The technique was tested for sandy beach gradients, as well as for coral reef areas which contained a variety of materials of different reflectances. Examples of computer-generated depth maps are included. Author

N71-37896

Deutsche Lufthansa Aktiengesellschaft, Hamburg (West Germany).

PROBLEMS OF AIR NAVIGATION c21


Avail: NTIS HC $6.00/MF $0.95

Problems in air navigation from the airline operations point of view are presented. Aids to final approach and landing, short distance aids, and long distance aids are also discussed. ESRO

N71-37922

Nova Univ., Dania, Fla. Physical Oceanographic Lab.

DEVELOPMENT OF AN OPERATIONAL SYSTEM FOR MEASURING OCEAN SURFACE CURRENT FROM AIRCRAFT Final Report William S. Richardson May 1971 17 p (Contract DOT-CG-10737-A) (AD-726668) Avail: NTIS CSCL 08/3

The report contains the development of an operational system which permits surface current measurements (and, incidentally, volume transport measurements per unit width) to be made in the ocean from aircraft. It is assumed that this method will have applications to the Coast Guard's efforts in search and rescue, in pollution monitoring. An inexpensive expendable probe is launched from the airplane and, on contacting the sea surface, a dye package separates and floats on the surface. The remainder of the probe is carried to the bottom by its weight and from its fixed location on the bottom releases two floats at separate, predetermined times. The floats return to the surface under their own buoyancy. At the surface the three parts (surface marker and two floats) emit fluorescent dye which can be photographed or otherwise relatively positioned. Author

N71-37924


TIDEWATER SHORELINES IN BROWARD AND PALM
In South Florida, pressures to extend and modify tidewater shorelines are very strong. These modifications include canal excavations, dredging and filling, bulkheading, erection of sea walls, and dock construction. Access to tidewater is much coveted and competition for such access is keen. Using color infrared aerial photography flown at 5000 ft., eight types of tidal shorelines are distinguished in a portion of NASA Test Site 184. Comparisons are made with other imagery, including high-altitude (80,000 ft.) photography and that from the Reconfax and Bendix Thermal Infrared sensor systems; and the degree to which these shoreline types are observable is noted. Some changes over time are also indicated, in particular the extent of additional modifications during a period of approximately one year.

Author (GRA)

BEACH COUNTIES, FLORIDA: AN ANALYSIS OF CHARACTERISTICS AND CHANGES INTERPRETED FROM COLOR, COLOR INFRARED AND THERMAL AERIAL IMAGERY


In South Florida, pressures to extend and modify tidewater shorelines are very strong. These modifications include canal excavations, dredging and filling, bulkheading, erection of sea walls, and dock construction. Access to tidewater is much coveted and competition for such access is keen. Using color infrared aerial photography flown at 5000 ft., eight types of tidal shorelines are distinguished in a portion of NASA Test Site 184. Comparisons are made with other imagery, including high-altitude (80,000 ft.) photography and that from the Reconfax and Bendix Thermal Infrared sensor systems; and the degree to which these shoreline types are observable is noted. Some changes over time are also indicated, in particular the extent of additional modifications during a period of approximately one year.

Author (GRA)

N71-37928# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SOME CONSIDERATIONS IN THE SELECTION OF AIRCRAFT FOR EARTH RESOURCE OBSERVATIONS


The logistics problems and cost aspects of earth resource surveys using various types of aircraft are discussed. Eight categories of aircraft (from piston engine to large jet) as well as commercial air carriers are examined on the basis of quantity needed, coverage afforded, and annual program cost. Independent parameters in the analysis include (1) the requirements of a typical group of resource features, (2) number and location of bases, (3) cloud cover uncertainty, and (4) aircraft cost and the parametric influence of payload associated costs. The results obtained in this analysis show an advantage in cost and rate of coverage for a special fleet of twin engine turboprops over all other aircraft options. Special fleets of turboprop, large turbojet, piston engine planes and commercial air carriers were found to be inferior, principally because of the greater number of aircraft required to achieve comparable coverage. To illustrate, to cover 45 to 95 percent of the resources considered about every two weeks, the special fleet of twin-engine jets requires 6 to 30 aircraft, while the commercial air carrier numbers range from 36 to 180 for coverage ranging from 40 to 80 percent. Annual program operating costs would appear to run between $2 and $10 million plus the costs associated with payload and data handling. Total costs might average between $10 and $100 million annually.

Author

N71-38013# South Dakota School of Mines and Technology. Rapid City. Inst. of Atmospheric Sciences.

COMPARISON OF INFORMATION CONTENT OF SPACE PHOTOGRAPHY AND LOW ALTITUDE AERIAL PHOTOGRAPHY


Three problems are discussed. First it is shown, through the use of information theory, that the capability of space photography to transmit information compares favorably to that of conventional aerial photography. Secondly, results indicate that there is a significant overlap between the size of the smallest features which can be identified on the space photography and the larger features which can be identified on low altitude photography at scales of less than 1:15,000. Last is the determination of the geologic information content of space and conventional aerial photography.

Author

N71-38022# Pratt and Whitney Aircraft. East Hartford, Conn.

DEVELOPMENT OF MAINSHAFT SEALS FOR ADVANCED AIR BREATHING PROPULSION SYSTEMS. PHASE 3 Final Report


Five self-acting gas-turbine face seals for advanced gas-turbine engines were analyzed and four were tested. All five seal designs incorporated shrouded Rayleigh step lift pads at the primary seal surfaces to provide the gas-turbine lubrication. The wide pad and revised narrow pad seal were successfully operated at seal sliding speeds up to 500 ft/sec (17,300 rpm), pressure differential up to 300 psi, and gas temperatures up to 1200 F. The air leakages for both seals were in good agreement with calculated values and were about 1/10 of leakages expected from labyrinth seals at comparable conditions. The operating range of the narrow pad seal was limited due to insufficient film thickness. The ceramic seal suffered damage due to chipping during testing.

Author


DESIGN OF COMPRESSORS: AERODYNAMIC CALCULATIONS


The book sets forth the foundations of the theory and design of axial compressors. Particular attention is devoted to compressors of stationary installations. The book is intended for engineers who design axial compressors. In addition, the book can be used by students in higher technical training institutions.

G. R.

N71-38132# Dow Chemical Co., Midland, Mich.


The report consists, essentially, of two parts: a state-of-the-art review and laboratory testing of the effects of adding two Dow polymeric latexes to Fast-Fix C-1. The state-of-the-art review covers several basic studies in which many materials, both organic and inorganic, were investigated. The study was then focused on the study of fast-setting inorganic cements and methods to obtain high strength concrete, silicate concrete, and cementitious ceramic materials, are also covered. The state-of-the-art review also has a section indicating areas in which fast-setting cements can serve and the requirements placed on this service. Topics covered are runway design, pavement requirements, pavement evaluation, surface repair and cold weather construction. In the lab study, two polymeric latexes, Dow Latex 460 and Dow Latex 464, were incorporated at selected concentrations in Fast-Fix C-1 mortars. Tests were conducted to determine freeze-thaw durability, tensile strength, compressive strength, flexural strength, and shear bond. All latex concentrations improved bond strength and freeze-thaw durability and decreased 24-hour water absorption. All concentrations tended to retard set and early strength gain. Low concentrations (4%) of Latex 464 produced a modest improvement in compressive and flexural strengths, but no change in the elastic modulus.

Author (GRA)

N71-38133# Southern Research Inst., Birmingham, Ala.

A polymer prepared as a prospective rain-erosion-resistant coating from hexafluoroacetone, propylene, and bis(dimethylamino)-dimethylsilane had a glass-transition temperature of -50°C, and it had good resistance to heat and aliphatic or aromatic hydrocarbons. However, it was not successfully cured to an elastomer. A polymer prepared from 1,4-bis(dimethylhydroxysilyl)benzene and bis(dimethylamino)dimethylsilane had a glass-transition temperature of -62°C, excellent thermal stability, but less resistance to hydrocarbons than the fluoropolymer. It was cured to a tough elastomer at room temperature. The coating obtained when this elastomer was sprayed onto airfoil test specimens was found to have much greater resistance to simulated rain erosion at ordinary temperatures than a silicone coating and slightly less than neoprene. It suffered no degradation on being heated 4 hours at 250°C, as indicated by sand-erosion tests.

Author (GRA)

N71-38149# National Aviation Facilities Experimental Center, Atlantic City, N.J.


A 2 sq ft stainless steel panel was constructed with the same dimensions between the fuselage skin and cabin wall as those of a titanium fuselage previously exposed to an external fuel fire. The panel was subjected to a 2 gal/hr kerosene burner which simulates the heat flux and temperature from a large JP-4 fuel fire. Testing of the panel utilizing the same materials found in the titanium fuselage caused phenomena and temperature distribution very similar to those observed during the full-scale test, thus giving credence to the test method as being representative of what would occur to a titanium or stainless-steel aircraft during a post-crash fire. Two commercially available high-temperature insulations tested without any sealant maintained survivable conditions for at least 15 minutes. Viton, a hydrofluorocarbon elastomer, was found not to flame or cause a flash-fire under conditions which silicone did. The propensity of the formation of a flash-fire was strongly influenced by the compactness of the insulation and the presence of any voids or passageways between the fuselage skin and cabin wall interface.

Author

N71-38210# Royal Aircraft Establishment, Farnborough (England).


Details are given of the aircraft traffic over the North Atlantic for the years 1966 to 1969. An estimation of the minimum time routes to North America is made together with a comparative study of flights at various Mach numbers and below level 310. Penalties are given for deviations of 2 deg in latitude from these minimum time routes. In a mathematical study, the numbers of tracks necessary for the period 1970 to 1980 are worked out, leading to work on track compensation and the establishment of the NAT structure for each characteristic meteorological situation, with particular emphasis on an equitable distribution of penalties between users from various geographical regions.

Author


Continuing research of visual landing aids is reported and includes the results of studies on: (1) visibility meters and their application, and (2) airfield lighting and marking. The operational performance of two models of backscatter visibility meters is described, and modifications made to enhance their performance are discussed. Another research effort involved an analysis of sky luminance measurements as a consideration of factors affecting the visual range of runway lights. An investigation was made to determine the performance characteristics of selected organic coatings for use on panels of control tower consoles. The coatings systems were tested for abrasion resistance, adhesion, and stain resistance. Tables are presented of the results obtained. In another study, the performance of a narrow-beam deck floodlight using a 400-watt high pressure sodium lamp was evaluated. The characteristics of the lamp as compared to those of incandescent fixtures is discussed.

D.L.G.

N71-38213# Federal Aviation Administration, Washington, D.C. Office of Aviation Research

FAA PROGRAM EFFECTIVENESS AND FACILITY CRITERIA. AN ANALYSIS OF THE COSTS AND EFFECTIVENESS OF AIR TRAFFIC CONTROL TOWERS James Ganse Apr. 1971 92 p Avail: NTIS

Analytical data was developed on the effectiveness of VFR control towers. The results of a research effort which was conducted as a special issue study are presented. The analytical substance is included, as well as summaries of two interim reports prepared earlier and a summary of a draft report by the National Bureau of Standards. The major finding, based on statistical analysis, is that for airports with low and medium amounts of annual traffic, those airports with VFR control towers have a significantly lesser rate of aircraft accidents than airports without towers. Another finding indicates that VFR towers can help to reduce aircraft time in approach and landing at airports.

Author

N71-38214# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service


The material is presented in separate sections for each of the SRDS technical development divisions: Air Traffic Control, Communications, Navigation, Frequency Management, Systems Analysis, and Aircraft. Subprograms are listed in sequential numerical order along with key descriptive words on each effort.

Author

N71-38215 Air Traffic Control Evaluation Unit, Bournemouth (England).


The results are presented of performance evaluation tests conducted on the strip cutter and loader machine to determine its acceptability for use at air traffic control centers. The function of the machine is to cut and load flight progress strips in page form, and it was designed to load into special plastic strip holders which were modified to work with the machine. The evaluation tests consisted of an analysis of the percentage of misloaded strips and strips not loaded in comparison with the total number of loads. In addition, cutter wear and the noise level of the machine were assessed. Based on the results, the machine was judged to be acceptable for operational use.

D.L.G.

N71-38277# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LARGE NUCLEAR-POWERED SUBSONIC AIRCRAFT FOR TRANSOCEANIC COMMERCE

Frank E. Rom and Charles C. Masser Washington Nov. 1971 47 p refs
Large subsonic aircraft, greater than 905 metric tons (1000 tons) gross weight, have the potential for hauling transoceanic cargo at rates in the range of $0.006 to $0.036 per metric ton-kilometer ($0.01 to $0.06/tom-n mi) at speeds of 740 to 926 kilometers per hour (400 to 500 knots). It theoretically would take a fleet of 500 such aircraft to handle 1 percent of the forecast world ocean trade in 1980. For gross weights of 3820 metric tons (4000 tons) the cargo rate would be reduced to less than $0.012 per metric ton-kilometer ($0.02/tom-n mi). It theoretically would take a fleet of over 1000 such aircraft to carry 8 percent of the world transoceanic trade projected for 1980 or 4 percent of the projected trade in 1995. Aircraft with a gross weight of 3620 metric tons (4000 tons) using compact lightweight nuclear reactors show better performance than chemical aircraft for ranges greater than 5565 kilometers (3000 n mi). Nuclear aircraft performance is less sensitive than that of chemical aircraft to the operating and cost assumptions used. Relatively large variations in any of the important assumptions have a relatively small effect on nuclear aircraft performance.

Author


The results of a test conducted to determine the noise characteristics of a STOL wing with externally blown flaps in the vicinity of an aircraft propulsor are summarized. The STOL wing used for these tests was a 0.43 scale model with 60 deg and 0 deg flap configurations; however, this wing system was not an optimum configuration, nor was it representative of all STOL wing/flap systems. The propulsor used was a low tip speed, high bypass ratio, low pressure ratio variable pitch prop-fan model. Far field noise data and directional character were determined for a 60 deg and 0 deg flap configuration. In addition, the noise character of the 21 inch diameter prop-fan model without the STOL wing was evaluated.

Author

N71-38539# Air Force Systems Command, Wright-Patterson AFB, Ohio. GAS TURBINE ENGINES FOR HELICOPTERS Engines. Sep. 1971 p 1-8 (AD-727188; FTD-HC-23-519-70) Avail: NTIS HC $6.00/MF $0.95 CSCL 21/5

The textbook presents an analysis of the designs of modern gas turbine engines. It discusses forces acting on the essential units, and their dependence on the operating regimes of the engine and the flight conditions. The construction and the operation of the engine components and parts are described. Methods of calculating safety factors for the most heavily loaded parts are given. Problems of vibration and methods of computing the vibrational load factors for engines are discussed. The operation and construction of the lubrication, fuel supply, start-up, and automatic engine control systems are examined. Brief data are given on the servicing of the engines when in operation.

Author (GRA)


The first part, basically, elucidates questions connected with the use of gas turbine engines with a free power turbine for helicopters: the characteristics of thermal calculation and the
calculation of characteristics, conditions of synchronizing the operation of the engine and the rotor, the means of adjustment, and the design. Briefly, mainly for purposes of comparison with engines with a free turbine, single shaft engines are also considered. The operating conditions of gas turbine engines on helicopters in service are elucidated. In the second part, questions are considered regarding the use of a jet drive of the rotor of a helicopter both by means of turbojet engines mounted on the blade tips and also by means of turbojet engines mounted on the blade tips and also by means of supplying compressed gas to jet nozzles on the blade tips. This book is intended for technical engineering workers who are engaged in designing and operation of helicopters and helicopter engines. It may also be useful for teachers and students of the respective specialties in aviation technical schools. Author (GRA)


COMBUSTION CHAMBERS OF GAS TURBINE ENGINES
(AD-727980; FTD-MT-24-306-70) Avail: NTIS CSCL 21/2

The report is a textbook for students studying power-engineering and machine building and it may also be useful to technical and engineering personnel and to advanced aeronautical engineering students. The book deals with gas-turbine fuels, fuel production, processing properties, and characteristics, combustion, combustion theory and products, combustion-chamber design, construction, and operation. GRA

N71-38552# California Univ., Berkeley. Lawrence Radiation Lab.

AN Experimental measurement of galactic cosmic radiation dose in conventional aircraft between San Francisco and London compared to theoretical values for conventional and supersonic aircraft
(Contract W-7405-eng-48) (UCRL-20209; Conf.-710304-11) Avail: NTIS

By utilizing beta-gamma and NTA photographic emulsions and thermoluminescent dosimeters, measurements of radiation dose were made in conventional jet aircraft. These direct measurements were in fair agreement with computations made using a program that takes into consideration both basic cosmic ray atmospheric physics and the focusing effect of the earth's magnetic field. These measurements also agreed with those made at supersonic jet aircraft altitudes in RB-57 aircraft. It was concluded that both experiments and theory show that the doses received at conventional jet aircraft altitudes are slightly higher than those encountered in supersonic flights at much higher altitudes, when the long time of exposure at the lower altitudes is taken into consideration. Author (NSA)


QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT, 1 APRIL - 30 JUNE 1971
Jun. 1971 113 p refs (DME/NAE-1971(2)) Avail: NTIS

CONTENTS:
2. EXPERIMENTS WITH AN ON-LINE PICTURE LANGUAGE T. Kaevand p 21-56 refs
3. THE UNBOUNDED TURBULENT JET AS A TRANSDUCER

N71-38627# National Aeronautical Establishment, Ottawa (Ontario). Low Speed Aerodynamics Lab.


The exercise was performed mainly out of curiosity, partly as to the nature of the method itself, and partly as to the results it can produce. The numerical results of the relevance marking system used appear to be sensitive to individual judgment, and may merely indicate which bandwagon the scorer prefers. On the other hand, the relevance tree provides a simple graphic display of the possible connections between specific research areas, and broad national goals. Author


SPACE SHUTTLE: AERODYNAMIC HEATING TO THE GRUMMAN SPACE SHUTTLE ORBITERS (ROS-N81 AND ROS-W81) AT MACH NUMBER 8.0

The results are presented for a heat transfer wind tunnel test conducted on 0.0087 scale models utilizing the phase-change paint technique. Two delta wing orbiter configurations were investigated. One configuration was tested with a ventral fin on selected runs. Date were obtained for an angle of attack range from 0 to 50 degrees. Author (NASA-CR-119984; DMS-DR-1154) Avail: NTIS CSCL 22B

The exercise was performed mainly out of curiosity, partly as to the nature of the method itself, and partly as to the results it can produce. The numerical results of the relevance marking system used appear to be sensitive to individual judgment, and may merely indicate which bandwagon the scorer prefers. On the other hand, the relevance tree provides a simple graphic display of the possible connections between specific research areas, and broad national goals. Author

N71-38734# AirResearch Mfg. Co., Los Angeles, Calif.

LOW-CYCLE FATIGUE EVALUATION FOR REGENERATIVELY COOLED PANELS

The results of low cycle fatigue evaluations at room and elevated temperatures of Inconel 825 and Hastelloy X, brazed, plate-fin sandwiches suitable for regeneratively cooled structural panel applications are presented and compared with available theory. Also presented are results of supplemental parent metal tensile and fatigue tests. Author

N71-38758# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AERODYNAMIC HEATING AT MACH 8 OF ATTACHED INFLATABLE DECELERATOR CONFIGURATIONS

Heat transfer coefficients on four attached inflatable decelerator (AID) configurations were obtained in a Mach 8 variable-density tunnel at angles of attack of 0. 5, and 10 deg for a Reynolds number range of 220,000 to 1,230,000 in air. A fusible-temperature-indicator technique which employs a temperature-sensitive material that changes from an opaque solid to a clear liquid at a known temperature was used to obtain these coefficients. The results of this investigation indicate
that the heat transfer coefficients on the ram-air inlets and the burble fence are up to five times larger than the coefficients at identical locations on a smooth AID body. Moving the ram-air inlets rearward reduces the heating rates immediately behind the aft row of inlets. This placement of the inlets also increases the heating rate on the burble fence. Increasing Reynolds number resulted in an increase in heat transfer coefficient primarily on the burble fence.

Author

The report covers additional testing of the stratified charge RC-90 engine to explore its exhaust emission characteristics plus a brief evaluation of the Texaco ignition system. Author (GRA)

Author

N71-38767# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. PERFORMANCE OF A MODULAR COMBUSTOR DESIGNED FOR A VTOL TIP-TURBINE LIFT ENGINE Nicholas R. Marchionna Washington Nov. 1971 18 p refs (NASA-TN-D-6542; E-6441) Avail: NTIS CSCL 20M
An array of 16 swirl-can modules was tested with liquid ASTM A-1 fuel in a 10.75-in. diameter circular duct at conditions simulating the design operating point of a combustor for a 10,000-lbf thrust VTOL lift engine with an inlet air temperature of 800 F, an inlet total pressure of 111 psia, and a reference velocity of 165 ft/sec. Performance of flat plate and conical flame holders were compared for combustion efficiency, total pressure loss, and pattern factor. At the design operating point requiring an exhaust gas temperature of 1440 F, combustion efficiency was close to 100 percent for all models tested. The flat plate flame holders gave better exhaust gas temperature profile characteristics than the conical flame holders. With a burning length of 18 in., the pattern factor was 0.38 and the total-pressure loss was 5.1 percent. Author

Author

Contents: Vortex interactions in modern aerodynamics: Methods of eliminating phased array blind spots; Signal processing with elastic surface waves: Rare earth cobalt magnets; A new vacuum microbalance; Vulliémeir cycle cryogenic coolers demonstrate a new era in aircraft reliability; Laser research: Irradiation defects and the electrical quality of ion implanted silicon; High resolution chemical ionization mass spectroscopy: Design and synthesis of materials for lasers; Geodetic application of long base interferometry: A model for evaluating the utility of forecasting natural environmental phenomena; Research advances: Research needs. GRA

Author

In most long range aviation system planning, a singleness of purpose is missing. The proposed Goals Approach method of aviation system planning gives clear direction for system development. Aviation system goals should relate to broad societal needs as well as internal system requirements. Levels of research and development strongly affect rate of goal achievement. Industry and government program information indicates FAA research expenditures are appropriate at an annual expenditure rate of $100-200 million. Author

Author
SUBJECT INDEX

AERONAUTICAL ENGINEERING / A Special Bibliography (Suppl. 13) JANUARY 1972

Typical Subject Index Listing

ACCELERATION (PHYSICS)
ADAPTIVE CONTROL
ACOUSTIC PROPAGATION
ACROBATICS
ADHESION TESTS
ADJABATIC CONDITIONS
AERIAL PHOTOGRAPHY

ACCIDENT PREVENTION

Typical Subject Index Listing

ACCIDENT PREVENTION

NOTATION
OF CONTENT
REPORT
NUMBER
NASA
ACCESSION
NUMBER

The subject heading is a key to the subject content of the document. The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The accession number is located beneath and to the right of the Notation of Content, e.g., N71-11466. Under any one subject heading, the accession numbers are arranged in sequence with the NASA accession numbers appearing first.

A

ABOUT TRAJECTORIES
Mathematical modeling of F-8 aircraft wave off trajectories for aircraft carrier approaches (AD-727121) N71-36439

ACCELERATION (PHYSICS)

Aircraft accelerations-stop factors and regulations, pilot reaction times and accidents during takeoff (AD-727380)

ACIDENT PREVENTION

Aircraft wake turbulence and trailing vortices, investigating physical characteristics, hazard potential and avoidance techniques (AD-727329)

ACCURACY

Technique for improving calibration accuracy standards from boundary layer calculations (IC/71/23) N71-37851

ACOUSTIC NOISE OUTPUT FROM ROUND INTERFERING VORTEX SHEDDING FROM BLUNT TRAILING EDGE OF FLAT PLATE SPANNING WIND TUNNEL UNDER OSCILLATING FLAP AND ACOUSTIC RESONANCE EXCITATIONS (AD-727556)

ACOUSTIC MEASUREMENTS

Acoustic noise output from round interfering subsonic jets, considering suppressor nozzle attenuation (AD-727556)

ACOUSTIC PROPAGATION

Low speed wind tunnel measurements correction for acoustic effects due to fan noise propagation (AD-727673)

ACROBATICS

Acrostar II all wood single seat acrobatic light weight aircraft designed for plus/minus 8g and inverted flight (AD-727887)

ACTUATORS

Hydraulic power and actuation requirements of survivable flight control system utilizing fly by wire control for F-4 aircraft (AD-727761) N71-37608

ADAPTIVE CONTROL

Longitudinal adaptive aircraft control through use of normal acceleration and pitch rate (AD-727608)

Adaptive guaranteed cost control for systems with parametric variation, demonstrating system stability and airframe pitch control (AD-727608)

ADDITIONS

Jet aircraft fuel additives covering functions and applications (AD-727608)
AERODYNAMIC COEFFICIENTS

Magnar force and moment data for standard 10 degree cone calibration model as determined in supersonic wind tunnel

[SC-DC-71-3821] N71-36688

Development of methods for measuring and predicting behavior of rigid rotors with stiff blades at high advance ratios and low rotor speeds

[NASA-CR-114362] N71-37594

Turbulent aerodynamic characteristics during takeoff, climb, horizontal flight, landing stability and maneuverability, and strength under various loads

[AD-722710] N71-37615

Aerodynamic characteristics of variable sweep wings under a variety of operating conditions

[AD-727191] N71-37618

Aerodynamic calculations in designing axial compressors with emphasis on compressors of stationary installations - handbook

[AD-727191] N71-38032

AERODYNAMIC COEFFICIENTS

Methods for prediction and evaluation of propulsion-augmented lift systems for STOL aircraft, considering weight, thrust and wing loading

[AIAA PAPER 71-990] A71-44585

AGARD report on engine-airplane interference and wall correction in transonic wind tunnel tests

[AGARD-R-36-71] N71-36400

Conclusions and recommendations concerning wind tunnel tests of interaction between engine flow and wall corrections in transonic wind tunnels

[NASA-TN-D-6441] H71-36401

Wall corrections for airplanes with interference lift in transonic wind tunnel tests

[NASA-TN-D-6441] N71-36403

Drag coefficient measurements in flow around rectangular cylinders

[IC-AERO-71-15] N71-36695

AERODYNAMIC CONFIGURATIONS

Leading edge suction of this aerofoil theory

[ARL/SN-NE72-360] N71-36399

Minimum drag airfoil shape solutions with supersonic flow and turbulent boundary layers for given chord length and heat transfer rate

[AD-725677] N71-36409

Theoretical method for calculating aerodynamic loading on wing-body combinations

[NASA-TN-D-6441] N71-36411

Methods for prediction of centerline shock layer thickness and pressure distribution on delta wing body configurations

[NASA-TN-D-6550] N71-36418

Prediction formulations for transonic fluctuating pressure environments including protuberance induced turbulent boundary layer flows

[NASA-CR-119967] N71-36677

Aerodynamic characteristics of variable sweep wings under a variety of operating conditions

[AD-727121] N71-37615

AERODYNAMIC FORCES

Resultant aerodynamic forces on circular arc profile with normal jet in subsonic steady compressible flow, using Imai-Lasla approximation method

[AIAA PAPER 71-994] A71-44271

Subsonic force effect calculations on rectangular wings, using downwash velocity potential method

[NASA-TN-D-6441] N71-44613

AERODYNAMIC HEAT TRANSFER

Minimum drag airfoil shape solutions with supersonic flow and turbulent boundary layers for given chord length and heat transfer rate

[AD-725677] N71-36409

AERODYNAMIC HEATING

Mach 0 variable-density tunnel used for determination of aerodynamic heating of attached inelastic deaccelerator configurations

[NASA-TN-D-2355] N71-38756

AERODYNAMIC LOADS

Theoretical method for calculating aerodynamic loading on wing-body combinations

[NASA-TN-D-6441] N71-36411

Measurements of unsteady, rotary wing air loads and time derivatives for rotor blade intersecting completely rolled up vortex

[NASA-CR-1909] N71-37598

AERODYNAMIC NOISE

Aerodynamic combustion noise generation from premixed or diffusion open turbulent flames, using fluid mechanics and Lighthill method

[NASA-CR-1769] N71-38624

AERODYNAMIC STABILITY

Principles of helicopter flight including flight stability

[AD-728641] N71-36429

AERODYNAMIC STALLING

Analytical investigation of effects of blade flexibility, unsteady aerodynamics, and variable inflow on helicopter rotor stall characteristics

[NASA-CR-1769] N71-38640

AERODYNAMICS

V/stol aircraft lift fan aerodynamics, discussing optimum fan pressure ratios, augmentation ratio, noise constraints, wing loading and fan configurations

[AIAA PAPER 71-981] A71-45577

Canadian National Science Council research in low speed aerodynamics, machine learning, and turbulent jet transducer

[NASA-CR-1769] N71-38626

Summaries of air force research activities

[AD-727318] N71-38799

AEROSPACE INDUSTRY

Commercial air transportation industry trends and optimal planning requirements, discussing airline economic viability, industry regulation, public service and environmental compatibility

[AIAA PAPER 71-1022] A71-44600

APTEBOBIES

Thrust-minus-drag forces and pressure distributions of closely spaced twin-jet afterbodies with different inboard-outboard fairing and nozzle shapes

[NASA-TN-D-2329] N71-36412

AER CARGO

Technology developments in rotor, drive, flight controls and cargo handling systems of heavy lift helicopter system, noting military and commercial applications

[AIAA PAPER 71-994] A71-45296

Freight, express, and mail tonnage forecasts for domestic airline operations

[NASA-CR-72887] N71-37373

Rate of growth of US air cargo markets - tables

[NASA-CR-72887] N71-38793

AER FLOW

Visualization flow patterns of airflow in centrifugal rotors with thin plate blading and with thick airfoil blades

[NASA-72-238] N71-36410

AER MAIL

Freight, express, and mail tonnage forecasts for domestic airline operations

[NASA-CR-72887] N71-38793

AER NAVIGATION

Corporate aircraft operations in Latin America, discussing communication and navigation, fuel, paper work, food, vaccinations and weather

[AIAA PAPER 71-994] A71-62596

Mobile LP air navigation AN/ARN-13 equipment, operation and maintenance

[AIAA PAPER 71-994] A71-43978

AERIAL VIEW of air navigation problems

[NASA-CR-72887] N71-38796

AERI PIRACY

Convention for suppression of unlawful aircraft seizure and article by article analysis

[NASA-CR-72887] N71-37590

AER POLLUTION

Operating variables effect on pollutant exhaust from
jet aircraft turbine engines, discussing combus-
tor design techniques for emissions reduction
A71-43600
SST operation climatic impact assessment program,
considering carbon dioxide, water vapor,
and contrails, particulates, nitrogen oxides and
carbon monoxide
A71-44982
AIR TRAFFIC
Canadian STOL program, discussing Quebec- Windsor
coridor passenger traffic
[AAIA PAPER 71-982] A71-44578
STOL aircraft systems, discussing ground
installations, runways, three dimensional area
navigational aids, noise reduction, air traffic
and short haul productivity
[AAIA PAPER 71-983] A71-44579
Graphs and tables of aircraft traffic over North
America - 1966 through 1969
[RARL-LID-PANS-1560] N71-38210
AIR TRAFFIC CONTROL
IBM 9020 multiprocessor computer application to
ATC, discussing control sectors for inflight
control at air route traffic control centers in U.S.
A71-43888
Stochastic optimal control theory application to
airplane rescheduling model, obtaining dynamic
programming algorithms for optimal landing and
takeoff rules
A71-44104
Computer-aided decision algorithms for ATC problem in
near terminal area, emphasizing scheduling and
holding strategies
A71-44105
Supersonic transports and ATC, discussing taxiing,
takeoff, landing and terminal area operations
A71-44352
Civil aviation research and development policy
review covering aircraft noise, congestion, ATC,
runway capacity and airport development problems
[AAIA PAPER 71-1024] A71-44602
Range and azimuth resolution characteristics and
aircraft separation measurement capability of radar
beacon-digitizer subsystem
[PAAR-AM-71-1640] N71-37038
Attitudes and motivational factors in job
performance of terminal area air traffic control personnel
[PAAR-AM-71-30] N71-37041
Airborne traffic situation display system for use
with radar control terminal system
[AD-727769] N71-37042
Alternate air traffic control co-channel separation
criteria based on probability-of-interference
considerations
[IST-101] N71-37712
Automatic data processing systems for air traffic
control, health services, operations research,
management planning, information systems, and
reading machines
N71-37742
Computerized real time data processing and display
system for air traffic control in airspace over
Belgium, Luxembourg, the Netherlands, and Germany
N71-37746
Evaluation of design concept and operational
feasibility of 11-sided control tower cab
[PAAR-AM-71-37] N71-37026
Effectiveness of control towers in reducing aircraft
accidents and approach time
N71-38213
Air traffic control, communications, navigation,
frequency management, systems analysis, and
aircraft SBDS program developments
N71-38214
Performance evaluation of automatic flight progress
strip cutter and loader used in air traffic
control facility
[AFTCSP-130] N71-38215
AIR TRANSPORTATION
Future transportation technology impact, considering
system design evaluation criteria and civil
aviation and urban mass transit systems
contributions
[AAIA PAPER 71-1010] A71-44594
Commercial air transportation industry trends and
optimal planning requirements, discussing airline
economic viability, industry regulation, public
service and environmental compatibility
[AAIA PAPER 71-1022] A71-44600
Weather interruption effects on air transportation
operations and economics, considering fog, snow,
freezing rain, thunderstorms, winds, CAT and
runway conditions
A71-44983
Design, development, and performance requirements
for large rigid airships for freight and cargo
transportation
[DEPT-5] N71-36425
Guidelines for national aviation system planning and
R and D policy
[AAAR-71-2] A71-38798
AIRBORNE EQUIPMENT
Solid state airborne weather radar for civil
aviation, discussing design, weight and power
requirement reduction
A71-44273
Cost ownership analysis of avionic equipment
N71-36780
Characteristics of sensors for aerial observation of
ice formations and comparison of effectiveness of
various methods
[JPBS-54162] N71-36801
Airborne traffic situation display system for use
with radar control terminal system
[AD-727769] N71-37042
C band radar transmitter for airborne radar system
[AD-727086] N71-37707
AIRBORNE/SPACEBORNE COMPUTERS
Advanced avionic digital computer development
program
[AD-727607] N71-37765
AIRCRAFT
Cost effectiveness of built in test provisions in
aircraft operations
N71-36780
Flight dynamics and calculation of flight
trajectory of various aircraft and spacecraft
[AD-72764] N71-37602
Development of rain erosion resistant plastic
coatings as high speed aircraft surface finish
[AD-727750] N71-38133
Air traffic control, communications, navigation,
frequency management, systems analysis, and
aircraft SBDS program developments
N71-38214
Impact of air activity on environment and federal
interest in environmental studies
N71-38792
AIRCRAFT ACCIDENT INVESTIGATION
Corporate aircraft 1970 accident statistics analysis
stressing pilot selection, training and
supervision
A71-43227
Aircraft skidding accidents investigation, comparing
airplane stopping distance computations and
calculations
A71-43228
Aircraft accident briefs for 1969 including date,
location, aircraft data, injuries, flight purpose,
and pilot data
[NTSB-BA-71-2] N71-36433
Aircraft accident investigation of Alaska Airlines
Flight 1866 on Sept. 4, 1971
[S8-71-97] N71-36436
AIRCRAFT ACCIDENTS
Aircraft ditching and flying personnel survival,
stressing passenger briefing and crew jacket
equipment with FFR transmitter for rescue
operations coordination
A71-43229
Aircraft accelerate-stop factors and regulations,
pilot reaction times and accidents during takeoff
A71-43230
Barometric altimetry system inadequacies and
approach/landing accidents, noting pilot static
components blocking hazards
A71-43238
Corporate aircraft pilot ground and flight phase
training, errors and accidents
A71-43288
Airport crash fire fighting equipment requirements
and rescue operations
A71-43289
Statistical, cause/factor and injury tables,
accident rates, and briefs of accidents involving
US carriers in 1969
AIRCRAFT BRAKES

[ NTSB-ARC-7L-1 ]

AIRCRAFT hazards and accidents due to brakes
[ AD-727881 ]

Effectiveness of control towers in reducing aircraft
accidents and approach time
[ N71-36437 ]

[ N71-36437 ]

AIRCRAFT CARRIERS

Mathematical modeling of F-8 aircraft wave off
trajectories for aircraft carrier approaches
[ N71-36439 ]

AIRCRAFT COMUNICATION

Corporate aircraft operations in Latin America,
discussion for taxation and navigation, fuel,
paper work, food, vaccinations and weather
[ A71-43391 ]

Alternate air traffic control co-channel separation
criteria on probability-of-interference
considerations
[ JST-101 ]

AIRCRAFT CONFIGURATIONS

Supersonic aircraft shape for shock waves
minimization based on channel configuration with
converging inlet and diverging outver section
Panavia 200 multipurpose military aircraft,
describing variable geometry design concept,
performance characteristics, engines, armament and
electronics
[ A71-44766 ]

AIRCRAFT CONTROL

Fluid amplifiers theory and use as temperature and
pressure sensors, discussing applications in
chemical and propulsion industries and jet
aircraft control
[ IEEE PAPER 70-TP-120-IGA ]

SST handling qualities, takeoff speeds and
performance evaluation on six degree of freedom
flight simulator
Panavia 200 projective military aircraft,
describing variable velocity design concept,
performance characteristics, engines, armament and
electronics
[ A71-44766 ]

AIRCRAFT DESIGN

High lift device application to high performance
competition gliders, considering merit of design
for conflicting climb/cruise requirements
AIRCRAFT ENGINES

In-flight monitoring of aircraft turbine engine
reliability
Operating variables effect on pollutant exhaust from
jet aircraft turbine engines, discussing combustor
design techniques for emissions reduction
Digital algorithms for automatic aircraft engine
monitoring system, using Boolean algebra and
events/states theory
Nondestructive detection of hot corrosion-
sulfidation in U.S. Navy aircraft turbine engines
Conclusions and recommendations concerning wind
tunnel tests of interaction between engine flow
and wall corrections in transonic wind tunnels
Combustion characteristics of gas turbine aircraft
engines
Nondestructive detection of hot corrosion-
sulfidation in U.S. Navy aircraft turbine engines
Analysis of gas turbine design and application to
aircraft operation with description of components,
safety factors, and vibration problems
[ A71-37387 ]

AIRCRAFT EQUIPMENT

Aircraft permanent magnetic field strength
variation, observing magnetic anomaly detection
equipment performance degradation
Aircraft takeoff, navigation, and landing aids,
aerodynamics characteristics, and crew rescue
equipment
AIRCRAFT FUELS

Jet engine advent impact on aviation fuels safety,
discussing gasoline hazards in prejet aircraft
Jet fuel performance at higher test conditions
Sun's effect on aviation fuels and engines
Jet fuel additive covering functions and
applications
Aviation fuels lubricating characteristics,
discussing refining methods, viscosity, service
performance and load testing
Jet fuel performance at higher test conditions
Jet fuel determined for maximum performance in
high altitude flight
AIRCRAFT HAZARDS

Aircraft wind tunnel testing and trailing vortices,
investigating physical characteristics, hazard
potential and avoidance techniques
Aircraft generated vortex wakes and core air motions
hazards for encountering light airplane
AIRCRAFT TAKEOFF, NAVIGATION, AND LANDING AIDS

Aircraft takeoff, navigation, and landing aids,
aircraft operation and description of components,
safety factors, and vibration problems
AIRCRAFT MERITS AND DEVELOPMENTS

Aircraft takeoff, navigation, and landing aids,
aircraft operation and description of components,
safety factors, and vibration problems
AIRCRAFT TAKEOFF, NAVIGATION, AND LANDING AIDS

Aircraft takeoff, navigation, and landing aids,
aircraft operation and description of components,
safety factors, and vibration problems
AIRCRAFT TAKEOFF, NAVIGATION, AND LANDING AIDS

Aircraft takeoff, navigation, and landing aids,
aircraft operation and description of components,
safety factors, and vibration problems
AIRCRAFT TAKEOFF, NAVIGATION, AND LANDING AIDS

Aircraft takeoff, navigation, and landing aids,
aircraft operation and description of components,
safety factors, and vibration problems
AIRCRAFT TAKEOFF, NAVIGATION, AND LANDING AIDS

Aircraft takeoff, navigation, and landing aids,
aircraft operation and description of components,
safety factors, and vibration problems
<table>
<thead>
<tr>
<th>SUBJECT INDEX</th>
<th>AIRCRAFT STABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft hazards and accidents due to birds</td>
<td>universal joint and blade grain boundary damage</td>
</tr>
<tr>
<td>[AD-727881]</td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT HYDRAULIC SYSTEMS</td>
<td></td>
</tr>
<tr>
<td>Nonreversible hydraulic control design and emergency maintenance for Tu 154 aircraft subsonic cruising at 11 km altitude</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT INDUSTRY</td>
<td></td>
</tr>
<tr>
<td>Soviet aircraft industry R and D organizations and management</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT INSTRUMENTS</td>
<td></td>
</tr>
<tr>
<td>Angle of attack instrumentation for evaluating aircraft lift performance and phugoid oscillations</td>
<td></td>
</tr>
<tr>
<td>Altitude instrumentation for aircraft pilot, discussing three pointer, servo and drone pointer altimeters, digital readout, radar alert and automatic reporting systems</td>
<td></td>
</tr>
<tr>
<td>Aircraft pitot static systems design with removable drain plug, noting line installation problems</td>
<td></td>
</tr>
<tr>
<td>Astatic gyroscope mounted on aircraft moving arbitrarily near earth surface, obtaining integrals of kinematic equations</td>
<td></td>
</tr>
<tr>
<td>Aircraft mechanical and battery operated clocks resistant to high intensity magnetic fields</td>
<td></td>
</tr>
<tr>
<td>Pilot performance in recognizing electronic display systems under varying dazzle and color conditions in cockpits</td>
<td></td>
</tr>
<tr>
<td>[BAE-LIB-TRANS-1585]</td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT LANDING</td>
<td></td>
</tr>
<tr>
<td>Mathematical modeling of F-8 aircraft wave off trajectories for aircraft carrier approaches</td>
<td></td>
</tr>
<tr>
<td>Airborne remote sensing of Mojave Desert playas for use as natural landing areas</td>
<td></td>
</tr>
<tr>
<td>Equations of motion for elastic plate foundation system under dynamic load applied to aircraft landing</td>
<td></td>
</tr>
<tr>
<td>Tu-134 aerodynamic characteristics during takeoff, climb, horizontal flight, landing stability and maneuverability, and strength under various loads</td>
<td></td>
</tr>
<tr>
<td>Effect of wet, icy, and snow covered runways on aircraft stopping distance and directional control in crosswinds, effect of surface texture and contamination on runway slipperiness</td>
<td></td>
</tr>
<tr>
<td>[PS-160-65-66-24]</td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT MAINTENANCE</td>
<td></td>
</tr>
<tr>
<td>Nonreversible hydraulic control design and emergency maintenance for Tu 154 aircraft subsonic cruising at 11 km altitude</td>
<td></td>
</tr>
<tr>
<td>Aircraft part repair-throwaway decisions for minimizing costs over life cycle by economic graphic screening techniques</td>
<td></td>
</tr>
<tr>
<td>Civil transport aircraft and equipment maintenance and reliability problems solutions with best time, cost and weight compromises</td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT NOISE</td>
<td></td>
</tr>
<tr>
<td>Civil aviation research and development policy review covering aircraft noise, congestion, ATC, runway capacity and airport development problems</td>
<td></td>
</tr>
<tr>
<td>[AIAA PAPER 71-1024]</td>
<td></td>
</tr>
<tr>
<td>Flight dynamics of noise optical flight profiles for VTOL aircraft, minimization of gust effects on aircraft and nonlinear dynamic stability of parachute-load systems</td>
<td></td>
</tr>
<tr>
<td>Prop rotor and lift fans VTOL aircraft ground noise level reduction, using flight trajectory management</td>
<td></td>
</tr>
<tr>
<td>[AIAA PAPER 71-997]</td>
<td></td>
</tr>
<tr>
<td>Noise characteristics of model STOL wing with externally blown flaps in vicinity of aircraft propulsor</td>
<td></td>
</tr>
<tr>
<td>[NASA-CR-111956]</td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT PARTS</td>
<td></td>
</tr>
<tr>
<td>Aircraft parts damage by corrosive friction forces, hot gases and intercrystalline attack, noting worn universal joint and blade grain boundary damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT PERFORMANCE</td>
<td></td>
</tr>
<tr>
<td>SST handling qualities, takeoff speeds and performance evaluation on six degree of freedom flight simulator</td>
<td></td>
</tr>
<tr>
<td>High lift device application to high performance competition gliders, considering merit of design for conflicting climb/cruise requirements</td>
<td></td>
</tr>
<tr>
<td>Angle of attack instrumentation for evaluating aircraft lift performance and phugoid oscillations</td>
<td></td>
</tr>
<tr>
<td>Sailplane circling cross-country speed increase by variable geometry in high lift flap fold for better compromise between cruise and climb performance</td>
<td></td>
</tr>
<tr>
<td>Performance prediction and evaluation of propulsion-augmented high lift systems for STOL aircraft, considering weight, thrust and wing loading</td>
<td></td>
</tr>
<tr>
<td>Transient dynamic characteristics of aircraft under unsteady flight, using Laplace-Carson integral transforms</td>
<td></td>
</tr>
<tr>
<td>Aircraft fuselage antisymmetric loading strain effects on small aspect delta wing performance</td>
<td></td>
</tr>
<tr>
<td>Compilation of responses to questionnaire on engine-airframe interference in transonic tests</td>
<td></td>
</tr>
<tr>
<td>Wall corrections for airplanes with interference lift in transonic wind tunnel tests</td>
<td></td>
</tr>
<tr>
<td>Wind tunnel performance characteristics of single-engine fighter model fitted with in-flight thrust reversers</td>
<td></td>
</tr>
<tr>
<td>Computer program for analyzing and simulating attack of low flying aircraft by antiaircraft missiles and probability of aircraft survival</td>
<td></td>
</tr>
<tr>
<td>Performance and costs of nuclear aircraft used in transoceanic commerce</td>
<td></td>
</tr>
<tr>
<td>Aircraft accident briefs for 1969 including date, location, aircraft data, injuries, flight purpose, and pilot data</td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT RELIABILITY</td>
<td></td>
</tr>
<tr>
<td>Civil transport aircraft and equipment maintenance and reliability problems solutions with best time, cost and weight compromises</td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT SAFETY</td>
<td></td>
</tr>
<tr>
<td>Corporate aircraft safety - Conference, Washington, D.C. April 1971</td>
<td></td>
</tr>
<tr>
<td>Jet engine advent impact on aviation fuels safety, discussing gasoline hazards in prejet aircraft</td>
<td></td>
</tr>
<tr>
<td>Corporate aircraft safety - Conference, San Antonio, May 1970</td>
<td></td>
</tr>
<tr>
<td>Determination of physical and chemical properties of fuels gelled with carbohydrate resins to evaluate effectiveness in reducing aircraft fire hazards</td>
<td></td>
</tr>
<tr>
<td>AIRCRAFT STABILITY</td>
<td></td>
</tr>
<tr>
<td>Stability augmentation system for aircraft elastic modes control, discussing active flutter suppression technology</td>
<td></td>
</tr>
<tr>
<td>Flexible ram air inflated keel and leading edge paraving design optimization for increased stability and reliability, introducing semirigid member concept</td>
<td></td>
</tr>
<tr>
<td>SST aircraft flight control, problems, discussing Mach trim, artificial feel, stability/feedback system responses and lateral/directional laws</td>
<td></td>
</tr>
<tr>
<td>Relation between turbulence in stratosphere causing aircraft buffeting, and vertical distribution of meteorological parameters calculated from</td>
<td></td>
</tr>
</tbody>
</table>
AIRCRAFT STRUCTURES

Radionuclide data [NASA-TR-R-13981] N71-36398
Horizontal temperature and wind distribution effects on aircraft buffeting in stratosphere [NASA-TR-R-13978] N71-37600
Spin tunnel tests to determine effectiveness of deployable, flexible ventral fin for spin recovery device on fighter aircraft [NASA-TR-R-6509] N71-37603

AIRCRAFT STRUCTURES

Statistical analysis of spot welded and adhesive joints of high strength Al alloy sheet in aircraft structures A71-45012
Variability of aluminum alloy aircraft structure fatigue life under symmetric and asymmetric loads [AIAA-136-R-329] N71-37542
Reduction of resonant vibrations in integrally stiffened skin-stringer panels using viscoelastic materials [AD-727773] N71-37540
Structural analysis of corrugated aircraft wing skin panels to determine effects of corrosion damage [AD-728009] N71-37519

AIRCRAFT TAKES

Folding sidewall aircraft tires design, construction and flight tests, noting advantages and disadvantages A71-46975
Aircraft wake turbulence and trailing vortices, investigating physical characteristics, hazard potential and avoidance techniques A71-43234
Aircraft generated vortex wakes and core air motions hazards for encountering light airplane A71-43381

AIRFOIL PROFILES

Resultant aerodynamic forces on circular arc profile with normal jet in subsonic steady compressible flow, using Imai-Lamla approximation method A71-48271
Transonic airfoil cascade analytical design, determining efficiency from velocity distribution A71-45381

AIRCRAFT WAKES

Transonic flows about two dimensional airfoils, calculating far field boundary conditions with coordinate transformation A71-44620
Leading edge suction of this aerofoil theory [AIAA-60-R-360] N71-36399
Wind tunnel study of tip vortex modification by mass flow injection [AD-726736] N71-36406
Visualized flow patterns of airflow in centrifugal rotors with thin plate blading and with thick airfoil blades [RE-238] N71-36410
Development of procedure for scaling of experimental turbine vane airflow temperatures from low to high gas temperatures [NASA-TR-R-6503] N71-37563
Two dimensional flow tests of transonic airfoils [NASA-TR-R-13980] N71-37593
Design, construction, and performance of water tunnel for two dimensional testing of pitching airfoils D180-14130-1] N71-37827

AIRCRAFT AIRFRAMES

Technical aviation handbook covering aircraft maintenance, navigation aids, airframes, lubricants, pistons and gas engine turbines, and checkout procedures [AD-727195] N71-37613

AIRCRAFT OPERATIONS

Corporate aircraft operations in Latin America, discussing communication and navigation, fuel, paper work, food, vaccinations and weather A71-43391
Commercial air transportation industry trends and optimal planning requirements, discussing airline economic viability, industry regulation, public service and environmental compatibility [AIAA PAPER 71-1022] A71-46400
Weather interruption effects on air transportation operations and economics, considering fog, snow, freezing rain, thunderstorms, winds, CFIT and runway conditions A71-47772

SUBJECT INDEX

Cost effectiveness of built-in test provisions in aircraft operations A71-49983
Simulation of aircraft ground operations for Dallas-Fort worth Regional Airport A71-36700
Aircraft view of air navigation problems A71-37896
Firefight, express, and mail tonnage forecasts for domestic airline operations A71-38793

AIRPORT PLANNING

Airport crash fire fighting equipment requirements and rescue operations A71-43389
Civil aviation research and development policy review covering aircraft noise, congestion, ATC, runway capacity and airport development problems [AIAA PAPER 71-1024] A71-44602

AIRPORT TOWERS

Evaluation of design concept and operational feasibility of 11-sided control tower cab [PAA-HA-71-37] N71-37826
Effectiveness of control towers in reducing aircraft accidents and approach time N71-38213

AIRPORTS

Airport certification and safety inspection program mandated by Airport and Airway Development Act of 1971 A71-43235
Composting dispersal of atmospheric pollutants near airports by use of mean wind and temperature profiles [NASA-CE-111962] N71-36720
Manual for development of needs estimates and capital improvement programs for airports and other interior terminals for 1970 to 1990 [OMB-04-571002] N71-37824

AIRSHIP

Design, development, and performance requirements for large rigid airships for freight and cargo transportation [REPT-5] N71-36425

AIRSPED

Pressure altimeter, airspeed and vertical velocity instruments, discussing selection, installation, pilot verification, error identification, repair and use A71-43385
Sailplane circling cross-country speed increase by variable geometry in high lift flap form for better compromise between cruise and climb performance A71-44342

ALASKA


ALGORITHMS

Digital algorithm for automatic aircraft engine monitoring system, using Boolean algebra and events/states theory A71-43897
Stochastic optimal control theory application to airplane rescheduling model, obtaining dynamic programming algorithms for optimal landing and takeoff rules A71-44104
Computer-aided decision algorithms for ATC problem in near terminal area, emphasizing scheduling and holding strategies A71-44105
Suboptimal fixed point data smoothing algorithms for parameter and initial state estimation of nonlinear dynamic systems A71-44113
Algorithms for dual coordinate control problems arising from each subsystem of inner level in multilevel static hierarchical system A71-44393
Conversion of computational algorithms for decreasing length of word format of control computers for aircraft [AD-727917] A71-38793

ALTIMETERS

Altitude instrumentation for aircraft pilot, discussing three pointer, servo and drum pointer A71-38772
ALUMINUM ALLOYS
Statistical analysis of spot welded and adhesive joints of high strength Al alloy sheet in aircraft structures
[ASL/SN-REPORT-329] N71-37524

ANGLE OF ATTACK
Angle of attack instrumentation for evaluating aircraft lift performance and phugoid oscillations
[IEEE PAPERS 70-TP-120-IGA] A71-13187

APPROACH
Mathematical modeling of F-8 aircraft wing off trajectories for aircraft carrier approaches
[AD-727769] N71-37611

AVIONICS
Cost effectiveness, failure analysis, and design techniques for measuring reliability of avionics systems
[AGARD-LS-87-71] N71-36779

AXIAL FLOW
Axial flow compressors stable operation, using rotating guide vanes regulation
A71-43554

AXIAL FLOW TURBINES
Streamline curvature analysis of compressible subsonic, transonic and supersonic cascade flows in axial turbine blades
A71-40834

AXI-SYMMETRIC BODIES
Flare induced laminar boundary layer/shock wave interactions on axisymmetric bodies at zero incidence in supersonic flow under adiabatic conditions
A71-44604

AUTOMATIC CONTROL
Effectiveness of reliability programs for avionic equipment
[FAA-HA-71-16] N71-37038

AUTOMATIC PILOTS
Automatic pilots for control of rotary and fixed wing aircraft
[AD-727769] N71-37611

AUTOMATIC TEST EQUIPMENT
Digital algorithms for automatic aircraft engine monitoring system, using Boolean algebra and events/statem theory
A71-43897

AUTOMATION
Helicopter optimal autorotation landing parameters for touchdown at zero speed, including rotor rpm drop due to flow separation on blades
[FAA-HA-71-16] N71-37038

BAROMETRIC ALTIMETRY
Studies on the effect of control towers in reducing aircraft accidents and approach time
N71-36213

BEAR SECTORS
Barometric altimetry system inadequacies and approach/landing accidents, noting FAA requirements, pilot involvement and visibility enhancement
A71-44455

BEAR SECTORS
Barometric altimetry system inadequacies and approach/landing accidents, noting FAA requirements, pilot involvement and visibility enhancement
A71-44455

BERNARD CHS
Radar observation of convective processes in clear air, presenting turretted top cell contour tracings from PPI sequence
[FAA-HA-71-16] N71-37038
BIBLIOGRAPHIES

Digital computer bibliography, programming techniques and applications, and software standardization and reliability
[AD-727605]  
BIBLIOGRAPHIES

Aircraft hazards and accidents due to birds
[AD-727881]  
BODIES OF REVOLUTION

Development of near-field method for determining supersonic flow properties about bodies of revolution
[NASA-TM-D-6500]  
Pressure distributions and drag coefficients of 18 constant length and volume slender bodies of revolution at zero incidence for Mach numbers 2.0 to 12.0 - graphs
[NASA-TW-D-6526]  
BOEING AIRCRAFT

Aircraft accident investigation of Alaska Airlines Flight 866 on Sept. 4, 1971
[SB-71-87]  
BOUNDARY LAYER CONTROL

Feasibility study of combined laminar and turbulent boundary layer control system using distributed suction with application to low-speed research aircraft of glass reinforced plastic
[AD-727767]  
BOUNDSARY LAYER FLOW

Design, construction, and performance of a water tunnel for two dimensional testing of pitching airfoils
[B10-14130-1]  
Performance tests and efficiency measurement of hub-lift-suction stator in single stage compressor
[NASA-CR-120802]  
BOUNDARY LAYERS

Technique for improving calibration accuracy standards from boundary layer calculations
[IC/71/23]  
BOUNDARY VALUE PROBLEMS

Transonic flows about two dimensional airfoils; calculating far field boundary conditions with coordinate transformation
[IC/71/23]  
BRAKING

Evaluation of braking performance of light, twin engine airplane on grooved and ungrooved runway surfaces
[NASA-TM-D-6444]  
BUFFETING

Relation between turbulence in stratosphere causing aircraft buffeting, and vertical distribution of meteorological parameters calculated from radiosonde data
[NASA-TR F-13961]  
Horizontal temperature and wind distribution effects on aircraft buffeting in stratosphere
[NASA-TR F-13978]  
C

C-band radar transmitter for airborne radar systems
[AD-727085]  
C-5 AIRCRAFT

Tests on scale model configurations of C-5 aircraft to obtain data correlation on three transonic wind tunnels
[AD-727006]  
CALIBRATING

Aeronaustical radio navigation aids photo-optical calibration, describing photogrammetric procedure and ground equipment for checking out airport ILS systems
[IC/71/23]  
Technique for improving calibration accuracy standards from boundary layer calculations
[IC/71/23]  
CALIFORNIA

Airborne remote sensing of Mojave Desert plays for use as natural landing areas
[AD-727031]  
CANADA

Canadian National Science Council research in low speed aerodynamics, machine learning, and turbulent jet transducer
[DBE/NAE-1971(2)]  
National Science Council goals in low speed aerodynamics - Canada
[AD-727881]  
CANNON CONFIGURATIONS

Wind tunnel static vertical stability and control characteristics of cruciform delta winged missile with various horizontal canards and trailing-edge flap control between 1.50 and 4.63
[NASA-TN-I-2367]  
CARNOTIC FREEBYES

Determination of physical and chemical properties of fuels gelled with carbohydrate resins to evaluate effectiveness in reducing aircraft fire hazards
[FAA-AC-61-4C]  
CASCADE FLOW

Streamline curvature analysis of compressible subsonic, transonic and supersonic cascade flows in axial turbine blades
[AD-727347]  
Noise reduction studies involving variable geometry inlet guide vanes for choking using two-sector cascade apparatus with three inlet configurations
[NASA-TN-I-2392]  
CASCADES

Transonic airfoil cascade analytical design, determining efficiency from velocity distribution
[AD-727381]  
CAVITATION FLOW

Design, construction, and performance of water tunnel for two dimensional testing of pitching airfoils
[B10-14130-1]  
CHEMICAL COHPOSILTIONS

Control and chemical composition of aircraft fuels, lubricants, piston and gas turbine engines, and special liquids
[AD-727199]  
CENTRIFUGAL COMPRESSORS

Compressors and turbines centrifugal stages operational characteristics, investigating airflow rate and pressure ratio effects on power
[AD-727380]  
Visualization flow patterns of airflow in centrifugal rotors with thin plate blading and with thick airfoil blades
[NR-238]  
Swept-back vane impeller tested on low speed centrifugal compressor rig
[NRC-12020]  
CERTIFICATION

Airport certification and safety inspection program mandated by airport and Airway Development Act of 1971
[FAA-AC-61-4C]  
Guide to private and commercial multiengine aircraft pilot certification
[FAA-AC-61-4C]  
CHANNEL FLOW

Supersonic aircraft shape for shock waves minimization based on channel configuration with converging inlet and diverging outlet section
[IC/71/23]  
CHECKPOINT

Technical aviation handbook covering aircraft maintenance, navigation aids, airframes, lubricants, piston and gas turbine engines, and checkout procedures
[AD-727195]  
CHEMICAL COMPOSITION

Control and chemical composition of aircraft fuels, lubricants, and special liquids
[AD-727199]  
CHROMOPHOTOGRAPHY

Techniques for aerial time-lapse cloud photographic analysis, Doppler navigation data analysis, and photogrammetric data acquisition
[NASA-TH-X-2367]  
CIRCULAR SHELLS

Ideal weight of axisymmetric fuselage shells, taking
[AD-727031]
SUBJECT INDEX

CIVIL AVIATION
Solid state airborne weather radar for civil aviation, discussing design, weight and power requirement reduction
*AD-727960* [A71-43600]

Future transportation technology impact, considering design evaluation criteria and civil aviation and urban mass transit systems contributions
[AIAA PAPER 71-1010] *AD-727917* [A71-43592]

Civil aviation research and development policy review covering aircraft noise, congestion, ATC, runway capacity and airport development problems
[AIAA PAPER 71-1024] *AD-727574* [A71-43391]

Aircraft accident briefs for 1969 including date, location, aircraft data, injuries, flight purpose, and pilot data
[*NTSB-BA-71-2*] N71-36433

Statistical, cause/factor and injury tables, accident rates, and briefs of accidents involving US carriers in 1969
[*NTSB-ABC-7L-1*] N71-36437

Planning short-haul intercity commercial air transportation with STOL aircraft
[WACK-2] N71-37605

Survey of domestic air passenger trip length, including number of passengers and aircraft types
N71-38795

CLEAR AIR TURBULENCE
Radar observation of convective process in clear air, presenting tarred top cell contour tracings from PPI sequence
A71-43088

CLIMATOLOGY
SST operation climatic impact assessment program, considering carbon dioxide, water vapor, contrails, particulates, nitrogen oxides and carbon monoxide
A71-44982

CLIMBING FLIGHT
Tu-134 aerodynamic characteristics during takeoff, climb, horizontal flight, landing stability and maneuverability, and strength under various loads
[AD-727196] N71-37612

CLOCKS
Aircraft mechanical and battery operated clocks resistant to high intensity magnetic fields
[AD-726700] N71-36430

CLOUD PHOTOGRAPHY
Techniques for aerial time-lapse cloud photograpic analysis, Doppler navigation data analysis, and photogrammetric data acquisition
N71-36990

CLOUD SEEDING
Development, testing, and utilization of silver iodide pyrotechnic cloud seeding system
[EASA-TB-BLTH-APCL-5] N71-36985

CLOUDS (METEOROLOGY)
Laser technique for runway and stability visibility range, lower cloud boundary and atmospheric damping coefficient
A71-43889

COASTS
Interpretation of color infrared photography of Florida tidewater coastline
[AD-727630] N71-37924

COCKPIT
Pilot performance in recognizing electronic display systems under varying dazle and color conditions in cockpits
[BAS-LIB-TRANS-1545] N71-37621

Environmental and performance tests of voice initiated cockpit control and interrogation system
[AD-727578] N71-37723

COLLISION AVOIDANCE
Analysis of problems and requirements for nonvisual flight of helicopters
[AD-727635] N71-37610

COBUSTION
Supersonic combustion chemistry and mixing of high energy density fuels related to advanced air-breathing engine design, using boron particles
[AD-727782] N71-38530

Combustion chambers operating variables effect on pollutant exhaust from jet aircraft turbine engines, discussing combustor design techniques for emissions reduction
*AD-727960* [A71-43600]

Textbook on combustion chambers of gas turbine engines
[AD-727960] N71-38542

Combustion efficiency and performance of swirl can modules under conditions simulating operation of 10,000 pound thrust lift engine for vertical takeoff
[NASA-TM-D-6542] N71-38767

Combustion efficiency and performance of swirl can modules under conditions simulating operation of 10,000 pound thrust lift engine for vertical takeoff
[NASA-TM-D-6542] N71-38767

Combustion products
Condensate particle crystallization retardation effect on energy characteristics of jet engine, calculating nonequilibrium flows of two phase combustion products in nozzle
A71-45004

CORRECTION VIBRATION
Aerodynamic combustion noise generation from premixed or diffusion open turbulent flames, using fluid mechanics and light path methods
A71-43448

COSTS
Growth rate of US air cargo markets - tables
N71-38794

CIVIL AIRCRAFT
Corporate aircraft operations in Latin America, discussing communication and navigation, fuel, paper work, food, vaccinations and weather
A71-43391

Survey of domestic air passenger trip length, including number of passengers and aircraft types
N71-38795

COPRESSES GAS
Some aspects of propulsion for augmentor wind concept
[NASA-TP-F-10005] N71-38535

COMPRESSIBLE FLOW
Compressible flow across shaft face seals and narrow slots, examining fluid inertia, viscous friction and entrance losses
A71-43592

Streamline curvature analysis of compressible subsonic, transonic and supersonic cascade flows in axial turbine blades
A71-44347

COMPRESSOR ROTORS
Visualization flow patterns of airflow in centrifugal rotors with thin plate blade and with thick airfoil blades
[AR-238] N71-36410

Performance tests and efficiency measurement of hub-slit suction stator in single stage compressor
[NASA-CH-120802] N71-37836

COMPUTER PROGRAMMING
Computer program development for potential flow calculation about lifting bodies
[AD-727628] N71-37597

Automatic data processing systems for air traffic control, health services, operations research, management planning, information systems, and reading machines
N71-37792

Advanced avionic digital computer development program
[AD-726707] N71-37765

Digital computer bibliography, programming techniques and applications, and software standardization and reliability
[AD-726705] N71-37766

Conversion of computational algorithms for decreasing length of word format of control computers for aircraft
[AD-727917] N71-37772

Computer program for analyzing and simulating attack of low flying aircraft by antiaircraft missiles and probability of aircraft survival
[BAS-LIB-TRANS-1578] N71-37774

COMPUTER PROGRAMS
Computer program for numerical integration of downwash subsonic flow about rectangular platforms, for different aspect ratios
[HPL-MA-99] N71-36805
**COMPUTER TECHNIQUES**

Digital computer bibliography, programming techniques and applications, and software standardization and reliability

(AD-727605) N71-37766

**COMPUTER TECHNIQUES**

For 9020 multiprocessing computer application to ATC, discussing control sectors for inflight control at air route traffic control centers in U.S.

A71-43888

Automatic data processing systems for air traffic control, health services, operations research, management planning, information systems, and reading machines

N71-37742

Computerized real-time data processing and display system for air traffic control in airspace over Belgium, Luxemburg, the Netherlands, and Germany

N71-37744

**COMPUTERIZED SIMULATION**

Computer program for calculating lift interference factors of wind tunnel test sections by vortex lattice method

[TAE-124] N71-3607

Simulation of aircraft ground operations for Dallas-Fort Worth Regional Airport

N71-3607

**CONDENSATES**

Condensate particle crystallization retardation effect on energy characteristics of jet engine, calculating nonequilibrium flows of two phase combustion products in nozzle

A71-45004

**CONFERENCES**

Corporate aircraft safety - Conference, Washington, D.C. April 1971

A71-43226

Corporate aircraft safety - Conference, San Antonio, May 1970

A71-43379

Photography of moving objects - Conference, Saint-Mande, France, September 1970

A71-43586

Automatic data processing systems for air traffic control, health services, operations research, management planning, information systems, and reading machines

N71-37742

**CONGRESS**

Convention for suppression of unlawful aircraft seizure and article by article analysis

N71-37590

**CONICAL BODIES**

Necessity for and moment data for standard 10 degree cone calibration model as determined in supersonic wind tunnel

[SC-DC-71-3021] N71-36688

**CONICAL FLOW**

Approximate solution for position and strength of shock waves about cones in steady supersonic flow

A71-44624

Method of lines technique for computing flow field about conical configurations at incidence in supersonic flow

[AGABD-LS-17-71] N71-36776

**COMPARISONS**

Comparing dispersal of atmospheric pollutants near airports by use of mean wind and temperature profiles

[NASA-TR-R-374] N71-36697

**CONTROL EQUIPMENT**

Analysis of criteria for survivable flight control system using fly-by-wire and integrated actuator package techniques

[AD-727762] N71-36720

**CONTROL STABILITY**

Active flutter mode control system synthesis for flight test, showing mass balancing as possible artificial symmetrical wing destabilization

A71-44106

**CONTROL SURFACES**

Control surfaces and direct jet force flutter suppression system shown to increase flutter speed of wing

A71-44108

**CONTROL THEORY**

Algorithm for dual compromise control problems arising from each subsystem of inner level in multilevel static hierarchical system

A71-44393

Trends in automatic control field in last two decades, emphasizing optimal control and performance criteria selection

[IAA PAPER 71-1001] A71-44591

**CONTROLLABILITY**

SST handling qualities, takeoff speeds and performance evaluation on six degree of freedom flight simulator

A71-42922

**CONVECTIVE FLOW**

Radar observation of convective process in clear air, presenting target cell contour tracings from PPI sequence

A71-34008

**COORDINATE TRANSMISSIONS**

Transonic flows about two dimensional airfoils, calculating far field boundary conditions with coordinate transformation

A71-46620

**CORRELATION**

Correlation system of equations for mathematical expectations and phase coordinate correlation moments for accuracy analysis in flight vehicle dynamics problems

A71-44111

Cost ownership analysis of avionic equipment

N71-36784

Performance and costs of nuclear aircraft used in transoceanic commerce


**COST EFFECTIVENESS**

Civil transport aircraft equipment maintenance and reliability problems solutions with best time, cost and weight compromises

A71-44765

Cost effectiveness, failure analysis, and design techniques for measuring reliability of avionics systems

[AGARD-LS-47-71] N71-36776

Cost effectiveness of built in test provisions in aircraft operations

N71-36780

**COST ESTIMATES**

Comparison of logistics problem and cost aspects in selection of aircraft for earth resources surveys


**COST REDUCTION**

Aircraft part repair-throwaway decisions for minimizing costs over life cycle by economic graphic screening techniques

A71-43197

**CRASH LANDING**

Airport crash fire fighting equipment requirements and rescue operations

A71-43309

**CROSS SECTIONS**

Computer program for calculating lift interference factors of wind tunnel test sections by vortex lattice method

[TAE-124] N71-36407

**CRYSTALLIZATION**

Condensate particle crystallization retardation effect on energy characteristics of jet engine, calculating nonequilibrium flows of two phase combustion products in nozzle

A71-45004
CYLINDRICAL BODIES
Drag coefficient measurements in flow around rectangular cylinders [IC-AER-71-15] W71-36695

DATA SYSTEMS
Performance evaluation of automatic flight progress strip cutter and loader used in air traffic control facility [ACTM-336] W71-38215

DECISION MAKING
Aircraft part repair-throwaway decisions for minimizing costs over life cycle by economic graphic screening techniques W71-43197

DEGREES OF FREEDOM
Single degree of freedom roll response due to vertical canard two dimensional vertical gust [NASA-CR-111966] W71-36421

DELTA WINGS
Slender two dimensional wedge wings aerodynamic characteristics in hypersonic strong interaction flow, determining wall shear stress and lift drag ratio effects W71-44621

WIND TUNNEL
Wind tunnel static longitudinal stability and control characteristics of cruciform delta winged missile with various horizontal canards and trailing-edge flap control between Mach 1.50 and 4.63 [NASA-TM-2367] W71-36415

METHODS
Methods for prediction of centerline shock layer thickness and pressure distribution on delta wing body configurations [NASA-TM-6550] W71-36418

HYPERSONIC WIND TUNNEL

DEEPER MEASUREMENT
Shallow ocean depth measurements by aerial photographs of water refraction and wavelength changes and by multispectral scanning of wave reflection [NASA-CR-123194] W71-37862

DESERTS
Airborne remote sensing of Mojave Desert playas for use as natural landing areas [AD-727031] W71-36748

DB 121 AIRCRAFT
European automatic flight control systems for landing in category IIIA conditions, discussing trilayer system in Trident and simpler in Caravelle W71-44456

DIFFUSION FLAMES
Aerodynamic combustion noise generation from premixed or diffusion open turbulent flames, using fluid mechanics and Lighthill method W71-83448

DIGITAL COMPUTERS
Digital computer bibliography, programming techniques and applications, and software standardization and reliability [AD-727605] W71-37766

DIGITAL NAVIGATION
Range and azimuth resolution characteristics and aircraft separation measurement capability of radar beacon-digitizer subsystem [FAA-71-17-16] W71-37038

Advanced avionic digital computer development program [AD-727607] W71-37765

DIGITAL SIMULATION

DIGITAL TECHNIQUES
Digital algorithms for automatic aircraft engine monitoring system, using Boolean algebra and events/states theory W71-43897

DISPLAY DEVICES
Integrated system for aircraft control and operation with visualization and manual regulation techniques, emphasizing interconnections with onboard electronic equipment W71-44353

Airborne traffic situation display system for use with radar control terminal system [AD-727609] W71-37042

Pilot performance in recognizing electronic display systems under varying dazzle and color conditions in cockpits [BAR-LIB-TRANS-1545] W71-37621

Pilot transition from conventional visual cross pointer display to optical slide slope cues [PAA-M-71-24] W71-37682

DISTANCE
Survey of domestic air passenger trip length including number of passengers and aircraft types W71-38795

DISTRESSING (LANDING)
Aircraft ditching and flying personnel survival, stressing passenger briefing and crew jacket equipment with VHF transceiver for rescue operations coordination W71-43229

DOPPLER NAVIGATION
Techniques for aerial time-lapse cloud photographic analysis, Doppler navigation data analysis, and photogrammetric data acquisition W71-36990

DOPPLES RADAR

DOWNSH
Subsonic force effect calculations on rectangular wings, using downwash velocity potential method W71-48613

Computer program for numerical integration of downwash subsonic flow about rectangular planform, for different aspect ratios W71-36405

DRAG MEASUREMENT
Pressure distributions and drag coefficients of 18 constant length and volume slender bodies of revolution at zero incidence for Mach numbers 2.0 to 12.0 - graphs [NASA-TM-6556] W71-36416

DOPPEL RADAR

Comparison of blockage corrections in porous tunnel wall to closed wall tunnel at subsonic Mach numbers [ABA-19] W71-37853

DUCTED FANS
Low speed wind tunnel measurements correction for acoustic effects due to fan noise propagation W71-44763

DYES
Development of operational system for measuring ocean surface current from aircraft using floats and fluorescent dyes [AD-726568] W71-37922

DYNAMIC CHARACTERISTICS
Suboptimal fixed point data smoothing algorithms for parameter and initial state estimation of nonlinear dynamic systems W71-49113

Transient dynamic characteristics of aircraft under unsteady flight, using Laplace-Carson integral transforms W71-45016

DYNAMIC LOADS
Longitudinal stability of plate-like load towed beneath helicopter in horizontal forward flight
DYNAMIC PROGRAMMING

Equations of motion for elastic plate foundation system under dynamic load applied to aircraft landing

A71-44346

DYNAMIC PROGRAMMING

Stochastic optimal control theory application to airplane rescheduling model, obtaining dynamic programming algorithms for optimal landing and takeoff rules

A71-37543

DYNAMIC RESPONSE

Lifting rotors aerodynamic damping in forward flight, describing methods for blade response variance matrix computation

A71-44104

EARTH RESOURCES PROGRAM

Remote aerial sensing and automatic mapping for forest resources information system

A71-36770

EARTH RESOURCES SURVEY AIRCRAFT

Comparison of logistics problems and cost aspects in selection of aircraft for earth resources surveys


ECONOMIC ANALYSIS

Aircraft part repair-throwaway decisions for minimizing costs over life cycle by economic graphic screening techniques

A71-43197

ECONOMIC FACTORS

Weather disruption effects on air transportation operations and economics, considering fog, snow, freezing rain, thunderstorms, winds, CAT and runway conditions

A71-44983

EFFECTIVENESS

Effectiveness of reliability programs for avionic equipment

A71-36779

ELASTIC PROPERTIES

Equations of motion for elastic plate foundation system under dynamic load applied to aircraft landing

A71-37543

ELECTRONIC EQUIPMENT

Integrated system for aircraft control and operation with visualization and manual regulation techniques, emphasizing interconnections with onboard electronic equipment

A71-44353

EMISSION

Stratified charge engine tests to determine exhaust emission characteristics

[AD-727765] A71-38760

ENGINE DESIGN

Supersonic combustion chemistry and mixing of high energy density fuels related to advanced air-breathing engine design, using boron particles

[AD-727782] A71-38530

Analysis of gas turbine design and application to aircraft operation with description of components, safety factors, and vibration problem

[AD-727788] A71-38538

ENGINE FAILURES

In-flight monitoring of aircraft turbine engine reliability

A71-43233

ENGINE MONITORING INSTRUMENTS

Digital algorithms for automatic aircraft engine monitoring system, using Boolean algebra and events/states theory

A71-43897

ENGINE PARTS

Supersonic propulsion system inlet, engine and exhaust nozzle in wind tunnel and flight tests, discussing boundary layer effects on performance

A71-43599

ENGINE TESTS

Condensate particle crystallization retardation effect on energy characteristics of jet engine, calculating nonequilibrium flows of two phase combustion products in nozzle

A71-43599

Test bed engine studies of overall excess air ratio permissible deviation, obtaining diagram for constraints calculation

A71-45004

ENVIRONMENT POLLUTION

Environmental degradation relation to technology, discussing priorities

[AD-727782] A71-45022

Impact of air activity on environment and federal interest in environmental studies

A71-45097

ENVIRONMENTAL CONTROL

Environmental degradation relation to technology, discussing priorities

[AD-727782] A71-45097

SST operation: climatic impact assessment program, considering carbon dioxide, water vapor, contrails, particulates, nitrogen oxides and carbon monoxide

A71-45092

ENVIRONMENTAL ENGINEERING

Computing dispersion of atmospheric pollutants near airports by use of mean wind and temperature profiles


ENVIRONMENTAL TESTS

Development, testing, and utilization of silver iodide pyrotechnic cloud seeding system


Environmental and performance tests of voice initiated cockpit control and interrogation system

A71-37723

ENVIRONMENTS

Impact of air activity on environment and federal interest in environmental studies

A71-37543

EQUATIONS OF MOTION

Equations of motion for elastic plate foundation system under dynamic load applied to aircraft landing

A71-37543

ERROR ANALYSIS

Correlation system of equations for mathematical expectations and phase coordinate correlation moments for accuracy analysis in flight vehicle dynamics problems

A71-44692

ESTIMATES

Reliability estimation, including failure effect analysis of avionic systems

A71-36777

Manual for development of needs estimates and capital improvement programs for airports and other intercity terminals for 1970 to 1990

[CHM-04-S71002] A71-37824

ESTIMATING

Wind tunnel interference estimation for model design applications using chart method

[ESA-C-JS-51456] A71-36675

EXHAUST GASES

Operating variables effect on pollutant exhaust from jet aircraft turbine engines, discussing combustor design techniques for emissions reduction

A71-43600

Sampling, handling, and measuring emissions from aircraft gas turbine engines

[REPT-430] A71-37604

Stratified charge engine tests to determine exhaust emission characteristics

[AD-727745] A71-38760

EXHAUST NOISES

Supersonic propulsion system inlet, engine and exhaust nozzle in wind tunnel and flight tests, discussing boundary layer effects on performance

A71-43599

Exhaust jet mixing flow nozzles with peak axial velocity degradation for noise suppression

[ESA-C-TR-57934] A71-37378

EXTERNAL STORES

Active feedback wing/store flutter control for fighter aircraft, using computer programs based on frequency and time domains for linear analysis

A71-44109

F-4 AIRCRAFT

Hydraulic power and actuation requirements of survivable flight control system utilizing fly by wire control for F-4 aircraft

[AD-727763] A71-37608
<table>
<thead>
<tr>
<th>SUBJECT INDEX</th>
<th>FLIGHT SIMULATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-8 AIRCRAFT Mathematical modeling of F-8 aircraft wave off trajectories for aircraft carrier approaches [AD-727121] N71-36439</td>
<td>FLAT PLATES Vortex shedding from blunt trailing edge of flat plate spanning wind tunnel under oscillating flap and acoustic resonance excitations A71-44558</td>
</tr>
<tr>
<td>FAILURE ANALYSIS Cost effectiveness, failure analysis, and design techniques for measuring reliability of avionics systems [AGARD-LS-07-71] N71-36776</td>
<td>FLEXIBILITY Analytical investigation of effects of blade flexibility, unsteady aerodynamics, and variable inflow on helicopter rotor stall characteristics [NASA-CH-1769] N71-36604</td>
</tr>
<tr>
<td>FEEDBACK CONTROL Reliability estimation, including failure effect analysis of avionics systems N71-36777</td>
<td>FLEXIBLE WINGS Flexible wing air inflated keel and leading edge parawing design optimization for increased stability and reliability, introducing semirigid member concept [AIAA PAPER 71-986] A71-44582</td>
</tr>
<tr>
<td>FAR FIELDS Transonic flows about two dimensional airfoils, calculating far field boundary conditions with coordinate transformation A71-44620</td>
<td>FLIGHT CHARACTERISTICS Flight dynamics and calculation of flight trajectories of various aircraft and spacecraft [AD-727474] N71-37602</td>
</tr>
<tr>
<td>FATIGUE LIFE Variability of aluminum alloy aircraft structure fatigue life under symmetric and asymmetric loads [ARL/SM-REPORT-329] N71-37524</td>
<td>FLIGHT CONTROL Minimum order state vector reconstruction linear filters for constant plants optimal control, applying to aircraft flight multiple control-point problem A71-44077</td>
</tr>
<tr>
<td>FEEDBACK CONTROL Design data for regeneratively cooled panels from low cycle fatigue evaluation of Hastelloy X and Inconel 625 sheet and sandwich panel specimens [NASA-CH-1884] N71-38734</td>
<td>Stability augmentation system for aircraft elastic modes control, discussing active flutter suppression technology A71-44107</td>
</tr>
<tr>
<td>FEEDBACK CONTROL Stability augmentation system for aircraft elastic modes control, discussing active flutter suppression technology A71-44107</td>
<td>Technology developments in rotor, drive, flight controls and cargo handling systems of heavy lift helicopter system, noting military and commercial applications [AIAA PAPER 71-994] A71-45296</td>
</tr>
<tr>
<td>FEEDBACK CONTROL Active feedback wing/store flutter control for fighter aircraft, using computer programs based on frequency and time domains for linear analysis A71-44109</td>
<td>STOL aircraft flight control problems, discussing Mach trim, artificial feel, stability, feedback system response and lateral/directional laws [AIAA PAPER 71-993] A71-45297</td>
</tr>
<tr>
<td>FEEDBACK CONTROL Adaptive guaranteed cost control for systems with parametric variation, demonstrating system stability and airframe pitch control A71-44111</td>
<td>Hydraulic power and actuation requirements of survivable flight control system utilizing fly by wire control for F-4 aircraft [AD-727763] N71-37608</td>
</tr>
<tr>
<td>FEEDBACK CONTROL Automatic flight control systems, discussing pilot as systems manager or retained in control loop A71-44650</td>
<td>Analysis of criteria for survivable flight control system using fly-by-wire and integrated actuator package techniques [AD-727762] N71-37616</td>
</tr>
<tr>
<td>FIELD EFFECT TRANSISTORS Breadboard models of silicon carbide junction field effect transistor amplifiers [AD-727761] N71-37792</td>
<td>FLIGHT INSTRUMENTS Pressure altimeter, airspeed and vertical velocity instruments, discussing selection, installation, pilot verification, error identification, repair and use A71-43385</td>
</tr>
<tr>
<td>FIELD EFFECT TRANSISTORS Active feedback wing/store flutter control for fighter aircraft, using computer programs based on frequency and time domains for linear analysis A71-44109</td>
<td>FLIGHT MECHANICS Correlation system of equations for mathematical expectations and phase coordinate correlation moments for accuracy analysis in flight vehicle dynamics problems A71-44692</td>
</tr>
<tr>
<td>FIELD EFFECT TRANSISTORS Wind tunnel performance characteristics of single-engine fighter model fitted with in-flight thrust reverser [NASA-TH-D-6460] N71-37304</td>
<td>Flight dynamics of noise optimal flight profiles for V/STOL aircraft, minimization of gust effects on aircraft and nonlinear dynamic stability of parachute-load systems A71-44761</td>
</tr>
<tr>
<td>FIGHTER AIRCRAFT Active feedback wing/store flutter control for fighter aircraft, using computer programs based on frequency and time domains for linear analysis A71-44109</td>
<td>FLIGHT PATHS Propeller and lift fan VTOL aircraft ground noise level reduction, using flight trajectory management [AIAA PAPER 71-991] A71-45295</td>
</tr>
<tr>
<td>FIGHTER AIRCRAFT Wind tunnel performance characteristics of single-engine fighter model fitted with in-flight thrust reverser [NASA-TH-D-6460] N71-37304</td>
<td>FLIGHT RECORDERS Performance evaluation of automatic flight progress strip cutter and loader used in air traffic control facility [ACTEC-330] N71-38215</td>
</tr>
<tr>
<td>FIGHTER AIRCRAFT Leading edge suction of thin aerofoil theory [ARL/SH-REPORT-360] N71-36399</td>
<td>FLIGHT SAFETY Aircraft ditching and flying personnel survival, stressing passenger briefing and crew jacket equipment with VHF transceiver for rescue operations coordination A71-43229</td>
</tr>
<tr>
<td>FIGHTER AIRCRAFT Automatic flight control systems, discussing pilot as systems manager or retained in control loop A71-44650</td>
<td>FLIGHT SIMULATORS Motion cue and simulation fidelity aspects of validation of general purpose airborne simulator [NASA-TH-D-6432] N71-36672</td>
</tr>
<tr>
<td>FIGHTER AIRCRAFT Aircraft ditching and flying personnel survival, stressing passenger briefing and crew jacket equipment with VHF transceiver for rescue operations coordination A71-43229</td>
<td>Flight simulator for studying problems of aircraft during approaches and landings at night under category 2 visual conditions [NBA-TH-NAVIONICS-59(829)] N71-37606</td>
</tr>
</tbody>
</table>
FLIGHT STABILITY TESTS

Analysis and validation of characteristics of general purpose airborne simulator for simulation of aerodynamic characteristics of large transport aircraft
[ (NASA-TM-D-6431) ]

FLIGHT STABILITY TESTS

Transient dynamic characteristics of aircraft under unsteady flight, using Laplace-Carson integral transforms

FLIGHT TESTS

Flight test measurements for improved estimates of aircraft states and aerodynamic parameters, using relinearized Kalman filter

Active flutter mode control system synthesis for flight test, showing mass balancing as possible artificial symmetrical wing destabilization

Folding sidewall aircraft tires design, construction and flight tests, noting advantages and disadvantages

Guide to private and comersial multieplane aircraft pilot certification
[ (FAA-AC-61-4C) ]

FLIGHT TRAINING

Corporate aircraft pilot ground and flight phase training, errors and accidents

FLIGHT VEHICLES

Correlation system of equations for mathematical expectations and phase coordinate correlation moments for accuracy analysis in flight vehicle dynamics problems

FLOATS

Development of operational system for measuring ocean surface current from aircraft using floats and fluorescent dyes
[ (AD-726568) ]

FLORIDA

Interpretation of color infrared photography of Florida tidal wave coastline
[ (AD-727650) ]

FLOW CHARACTERISTICS

Compressors and turbines centrifugal stages operational characteristics, investigating airflow rate and pressure ratio effects on power

Computer program development for potential flow calculation about lifting bodies
[ (AD-727628) ]

FLOW DISTRIBUTION

Drag coefficient measurements in flow around rectangular cylinders
[ (IC-Aero-71-15) ]

Factors effecting volume from which data originate in laser Doppler velocimeter dual scatter probe
[ (AD-727005) ]

FLOW GEOMETRY

Flow angularity prediction near supersonic fuselage forebody with arbitrary cross section and zero sideslip, using small perturbation theory
[ (AIAA PAPER 71-996) ]

FLOW MEASUREMENT

Helicopter, tilt wing and jet lift hovering aircraft outflow measurements to determine suitability as rescue vehicles
[ (AIAA PAPER 71-992) ]

FLOW STABILITY

Aerodynamic sound radiation from lifting surfaces in smooth and turbulent flow
[ (NASA-CR-114370) ]

FLOW VISUALIZATION

Photogrammetric recording of helicopter rotor induced aerodynamic effects using wind tunnel test smoke visualization technique

FLOWRATES

Factors effecting volume from which data originate in laser Doppler velocimeter dual scatter probe
[ (AD-727005) ]

FUEL AMPLIFIERS

Fluid amplifiers theory and use as temperature and pressure sensors, discussing applications in chemical and ammunition industries and jet aircraft control
[ (IEEE PAPER 70-TP-120-10A) ]

FLUORESCENCE

Development of operational system for measuring ocean surface current from aircraft using floats and fluorescent dyes
[ (AD-726568) ]

FLUTTER ANALYSIS

Active flutter mode control system synthesis for flight test, showing mass balancing as possible artificial symmetrical wing destabilization

Stability augmentation system for aircraft elastic modes control, discussing active flutter suppression technology

Control surfaces and direct jet force flutter suppression system shown to increase flutter speed of wing

Active feedback wing/store flutter control for fighter aircraft, using computer programs based on frequency and time domains for linear analysis

FLY-BY-WIRE CONTROL

Hydraulic power and actuation requirements of survivable flight control system utilizing fly-by-wire control for F-4 aircraft
[ (AD-727763) ]

Analysis of criteria for survivable flight control system using fly-by-wire and integrated actuator package techniques
[ (AD-727762) ]

FOLDING STRUCTURES

Folding sidewall aircraft tires design, construction and flight tests, noting advantages and disadvantages

FORCE DISTRIBUTION

Control surfaces and direct jet force flutter suppression system shown to increase flutter speed of wing

FOREBODIES

Flow angularity prediction near supersonic fuselage forebody with arbitrary cross section and zero sideslip, using small perturbation theory
[ (AIAA PAPER 71-996) ]

FORECASTING

Freight, express, and mail tonnage forecasts for domestic airlines operations
[ (NASA-CR-122922) ]

FORESTS

Remote aerial sensing and automatic mapping for forest resources information system
[ (NASA-CR-122922) ]

FRACTIONATION

Aviation fuels lubricating characteristics, discussing refining methods, viscosity, service performance and load testing

FRICTION FACTOR

Aircraft parts damage by corrosive friction forces, hot gases and intercrystalline attack, noting worn universal joint and blade grain boundary damage

FUEL COMBUSTION

Combustion characteristics of gas turbine aircraft engines
[ (AD-727175) ]

FUEL-AIR RATIO

Test bed engine studies of overall excess air ratio permissible deviation, obtaining diagram for constraints calculation

FUSELAGES

Flow angularity prediction near supersonic fuselage forebody with arbitrary cross section and zero sideslip, using small perturbation theory
[ (AIAA PAPER 71-996) ]

Airframe fuselage antisymmetric loading strain effects on small aspect delta wing performance

Ideal weight of axisymmetric fuselage shells, taking into account load distribution and cabin pressurization
GALACTIC RADIATION
Jet aircraft measurements of galactic cosmic radiation dose and comparison with theoretical values for supersonic flights [N971-38552]

GAS DISSOCIATION
Nitrous oxide dissociation as natural source of stratospheric nitric oxide, noting estimates as an yardstick for artificial source [A71-43347]

GAS FLOW
Analysis of maximum internal efficiency of single impulse stage of turbine engine [ALL-CR-2885-5631-(9022.09)] [N71-36704]

GAS LUBRICANTS
Analysis and tests of self-acting mainshaft seals to provide gas film lubrication for advanced gas turbine engines [NASA-CR-72967] [N71-38022]

GAS TURBINE ENGINES
Temperature field profiling along radius in front of gas turbine stage, applying to regeneratively cooled turbine engine [A71-45011]

Combustion characteristics of gas turbine aircraft engines [AD-727175] [N71-37387]

Sampling, handling, and measuring emissions from aircraft gas turbine engines [REPRT-430] [N71-37604]

Technical aviation handbook covering aircraft maintenance, navigation aids, airframes, lubricants, pistons and gas turbine engines, and checkout procedures [AD-727195] [N71-37613]

Analysis and tests of self-acting mainshaft seals to provide gas film lubrication for advanced gas turbine engines [NASA-CR-72967] [N71-38022]

Design and performance characteristics of gas turbine engines for helicopters [AD-727959] [N71-38541]

Textbook on combustion chambers of gas turbine engines [N71-38542]

GAS TURBINES
Heavy load transportation Mi 12 helicopter design and performance, noting gas turbine rigid shaft connection [A71-42926]

Design and tests of high temperature, air cooled radial turbine configurations [AD-726466] [N71-37381]

GELLED PROPPELLANTS
Determination of physical and chemical properties of fuels gelled with carbohydrate resins to evaluate effectiveness in reducing aircraft fire hazards [PAA-MA-71-18] [N71-37369]

GENERAL AVIATION AIRCRAFT
Corporate aircraft 1970 accident statistics analysis stressing pilot selection, training and supervision [A71-43227]

Corporate aircraft safety - Conference, San Antonio, May 1970 [A71-43379]

General aviation aircraft altimeter errors, tolerances and static system tests [A71-43386]

Corporate aircraft pilot ground and flight phase training, errors and accidents [A71-43388]

Aircraft accident briefs for 1969 including date, location, aircraft data, injuries, flight purpose, and pilot data [WTSB-RA-71-2] [N71-36433]

GEOLOGY
Quantity and quality of geodetic information transmitted by space photography compared with low altitude aerial photography [J8-050C-229] [N71-38013]

GLIDES
High lift device application to high performance competition gliders, considering merit of design for conflicting climb/cruise requirements [A71-43089]

GOALS
National Science Council goals in low speed aerodynamics - Canada [N71-38627]

GOVERNMENTS
Impact of air activity on environment and federal interest in environmental studies [A71-4574]

GRAIN BOUNDARIES
Aircraft parts damage by corrosive friction forces, hot gases and intercrystalline attack, noting worn universal joint and blade grain boundary damage [A71-4574]

GRAPHS (CHARTS)
Pressure distributions and drag coefficients of 18 constant length and volume slender bodies of revolution at zero incidence for Mach numbers 2.0 to 12.0 - graphs [NASA-TN-D-6536] [N71-36416]

Wind tunnel interference estimation for model design applications using chart method [NASA-TN-D-6416] [N71-36675]

Graphs and tables of aircraft traffic over North America - 1966 through 1969 [NAS-AIR-TRANS-1500] [N71-36210]

GROUND EFFECT MACHINES
One dimensional channel flow theory for designing ram wing surface effect vehicle [AD-727774] [N71-36419]

GROUND STATIONS
Development and characteristics of lightweight, mobile structures for aircraft storage and maintenance [AD-727056] [N71-36674]

GROUND SUPPORT EQUIPMENT
Mobile LF air navigation A6/MRH-13 equipment, operation and maintenance [A71-43878]

Simulation of aircraft ground operations for Dallas-Fort worth Regional Airport [N71-37607]

GUIDE VANES
Axial flow compressors stable operation, using rotating guide vanes regulation [A71-43554]

Noise reduction studies involving variable geometry inlet guide vanes for cheating two-sector cascade apparatus with three inlet configurations [NASA-TR-2-2392] [N71-37601]

GUST LOADS
Flight dynamics of noise optimal flight profiles for V/STOL aircraft, minimization of gust effects on aircraft and nonlinear dynamic stability of parachute-load systems [A71-44761]

Single degree of freedom roll response due to vertical random two dimensional vertical gusts [NASA-CR-111966] [N71-36421]

GYROSCOPES
Astatic gyroscope mounted on aircraft moving arbitrarily near earth surface, obtaining integrals of kinematic equations [A71-45160]

HANDBOOKS
Guide to private and commercial multiengine aircraft pilot certification [FAA-AC-61-4C] [N71-36438]

Aerodynamic calculations in designing axial compressors with emphasis on compressors of stationary installations - handbook [AD-727191] [N71-38032]

Design and performance characteristics of gas turbine engines for helicopters [AD-727959] [N71-38541]

HANGARS
Development and characteristics of lightweight, mobile structures for aircraft storage and maintenance [AD-727056] [N71-36674]

HASTELLOY (TRADEMARK)
Design data for regeneratively cooled panels from
HELICOPTER CONTROL


HELICOPTER CONTROL

Helicopter optimal autorotation landing parameters for touchdown at zero speed, including rotor rpm drop due to flow separation on blades [AD-727635] \#71-43090

Analysis of problems and requirements for nonvisual formation flight of helicopters [AD-727635] \#71-37610

HELICOPTER DESIGN

Heavy load transportation Mi 12 helicopter design and performance, noting gas turbine rigid shaft connection [AD-729599] \#71-38541

Technology developments in rotor, drive, flight controls and cargo handling systems of heavy lift helicopter system, noting military and commercial applications [AIAA PAPER 71-999] \#71-45296

HELICOPTER ENGINES

Design and performance characteristics of gas turbine engines for helicopters [AD-729599] \#71-38541

HELICOPTER PERFORMANCE

Heavy load transportation Mi 12 helicopter design and performance, noting gas turbine rigid shaft connection [AD-729599] \#71-42926

HELICOPTERS

Longitudinal stability of plate-like load towed beneath helicopter in horizontal forward flight [AIAA PAPER 71-992] \#71-44586

Helicopter, tilt wing and jet lift hovering aircraft outflow measurements to determine suitability as rescue vehicles [AIAA PAPER 71-992] \#71-44586

Principles of helicopter flight including flight stability [AD-726841] \#71-36429

Analysis of problems and requirements for nonvisual formation flight of helicopters [AD-727635] \#71-37610

HIERARCHIES

Algorithm for dual compromise control problems arising from each subsystem of inner level in multilevel static hierarchical system [AIAA PAPER 71-992] \#71-44393

HIGH TEMPERATURE GASES

Aircraft parts damage by corrosive friction forces, hot gases and intercrystalline attack, noting worn universal joint and blade grain boundary damage [AIAA PAPER 71-992] \#71-44393

HIGH TEMPERATURE TESTS


HORIZONTAL FLIGHT

Longitudinal stability of plate-like load towed beneath helicopter in horizontal forward flight [AD-727196] \#71-43357

Tu-134 aerodynamic characteristics during takeoff, climb, horizontal flight, landing stability and maneuverability, and strength under various loads [AD-727196] \#71-37612

HOT-WIRE ANEMOMETERS

Hot-wire anemometer measurements of streamwise magnitudes and normal velocity components of wing tip vortex [NASA-TB-1-62087] \#71-36679

HOVERING

Helicopter, tilt wing and jet lift hovering aircraft outflow measurements to determine suitability as rescue vehicles [AIAA PAPER 71-992] \#71-44586

HYDRAULIC EQUIPMENT

Hydraulic power and actuation requirements of survivable flight control system utilizing fly by wire control for F-4 aircraft [AD-727763] \#71-37608

HYDRAULIC TEST TUNNELS

Design, construction, and performance of water tunnel for two dimensional testing of pitching airfoils [D185-1-1130-1] \#71-37827

HYDROCARBON FUELS

Liquid hydrocarbons as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion [AIAA PAPER 71-992] \#71-44365

HYDROGEN FUELS

Liquid hydrogen as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion [AIAA PAPER 71-992] \#71-44365

HYPERSONIC FLOW

Slender two dimensional wedge wings aerodynamic characteristics in hypersonic strong interaction flow, determining wall shear stress and lift drag ratio effects [AIAA PAPER 71-992] \#71-44365

HYPERSONIC WAKES

Two dimensional and three dimensional wakes in supersonic and hypersonic rarefied gas wind tunnels, comparing cone and disk/hedron configurations [NASA-CR-119884] \#71-38668

INCOMPRESSIBLE FLOW

Lifting rectangular thin airfoil in symmetrical incompressible steady uniform orthogonal flow at small angle of attack, deriving Weissenberg integral equation [AIAA PAPER 71-992] \#71-43233

INCONEL (TRADEMARK)

Design data for regeneratively cooled panels from small angle of attack, deriving Reissinger and entrance losses [AIAA PAPER 71-992] \#71-43233

ICE FORMATION

Arctic ocean pack ice terrain profiling by airborne laser altimeter and coincident photography, analyzing data for ice development stages interpretation [AIAA PAPER 71-992] \#71-43888

ICE RESEARCH

Characterization of sensors for aerial observation of ice formations and comparison of effectiveness of various methods [NASA-PB-54162] \#71-36081

IMPULSES

Swept back vane impeller tested on low speed centrifugal compressor rig [WRC-12020] \#71-37596

IN-FLIGHT MONITORING

In-flight monitoring of aircraft turbine engine reliability [AIAA PAPER 71-992] \#71-43888

INERTIA

Compressible flow across shaft face seals and narrow slots, examining fluid inertia, viscous friction and entrainment losses [AIAA PAPER 71-992] \#71-37349

SUBJECT INDEX

Liquid hydrogen as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion [AIAA PAPER 71-992] \#71-44365

HYPERSONIC FLOW

Slender two dimensional wedge wings aerodynamic characteristics in hypersonic strong interaction flow, determining wall shear stress and lift drag ratio effects [AIAA PAPER 71-992] \#71-44365

HYPERSONIC WAKES

Two dimensional and three dimensional wakes in supersonic and hypersonic rarefied gas wind tunnels, comparing cone and disk/hedron configurations [NASA-CR-119884] \#71-38668

INCOMPRESSIBLE FLOW

Lifting rectangular thin airfoil in symmetrical incompressible steady uniform orthogonal flow at small angle of attack, deriving Weissenberg integral equation [AIAA PAPER 71-992] \#71-43233

INCONEL (TRADEMARK)

Design data for regeneratively cooled panels from small angle of attack, deriving Reissinger and entrance losses [AIAA PAPER 71-992] \#71-43233

ICE FORMATION

Arctic ocean pack ice terrain profiling by airborne laser altimeter and coincident photography, analyzing data for ice development stages interpretation [AIAA PAPER 71-992] \#71-43888

ICE RESEARCH

Characterization of sensors for aerial observation of ice formations and comparison of effectiveness of various methods [NASA-PB-54162] \#71-36081

IMPULSES

Swept back vane impeller tested on low speed centrifugal compressor rig [WRC-12020] \#71-37596

IN-FLIGHT MONITORING

In-flight monitoring of aircraft turbine engine reliability [AIAA PAPER 71-992] \#71-43888

INERTIA

Compressible flow across shaft face seals and narrow slots, examining fluid inertia, viscous friction and entrainment losses [AIAA PAPER 71-992] \#71-37349

A-16
SUBJECT INDEX

INFLATABLE STRUCTURES
Flexible ram air inflated keel and leading edge paravane design optimization for increased stability and reliability, introducing semirigid member concept
[AIAA PAPER 71-986] A71-44582
Design, development, and performance requirements for large rigid airships for freight and cargo transportation
[REPRT-5] N71-36425

INJURIES
Statistical, cause/factor and injury tables, accident rates, and briefs of accidents involving US carriers in 1969
[TS89-ARC-7L-1] N71-36437

INLET NOZZLES
Supersonic propulsion system inlet, engine and exhaust nozzle in wind tunnel and flight tests, discussing boundary layer effects on performance
A71-43599

INSTRUMENT ERRORS
Pressure altimeter, airspeed and vertical velocity instruments, discussing selection, installation, pilot verification, error identification, repair and use
A71-43385
General aviation aircraft altimeter errors, tolerances and static system tests
A71-43386

INSTRUMENT LANDING SYSTEMS
Aeronautical radio navigation aids photo-optical calibration, describing photogrammetric procedure and ground equipment for checking out airport ILS systems
A71-43587

INTEGRAL EQUATIONS
Lifting rectangular thin airfoil in symmetrical incompressible steady uniform flow at small angle of attack, deriving Weisinger integral equation
A71-43487

INTERFERENCE DRAG
Conclusions and recommendations concerning wind tunnel tests of interaction between engine flow and wall corrections in transonic wind tunnels
N71-36401
Compilation of responses to questionnaire on engine-airframe interference in transonic tests
N71-36402
Wall corrections for airplanes with interference lift in transonic wind tunnel tests
N71-36403
Thrust-minus-drag forces and pressure distributions of closely spaced twin-jet afterbodies with different inboard-outboard faired and nozzle shapes

INTERFERENCE LIFT
Computer program for calculating lift interference factors of wind tunnel test sections by vortex lattice method
[TAE-124] N71-36407

INVISCID FLOW
Nozzle design procedure and calculations for hypervelocity wind tunnel including thermodynamic properties of nitrogen and inviscid core and boundary layer calculations
[AD-727591] N71-37821

ITERATIVE SOLUTION
Technique for improving calibration accuracy standards from boundary layer calculations
[IC/77/23] N71-37851

JET AIRCRAFT
Fluid amplifiers theory and use as temperature and pressure sensors, discussing applications in chemical and combustion industries and jet aircraft control
[IEEE PAPER 70-TP-120-10A] A71-62921
Jet aircraft fuel additives covering functions and applications
A71-65325

JET AIRCRAFT NOISE
Acoustic noise output from round interfering subsonic jets, considering suppressor nozzle attenuation
A71-44560

JET ENGINE FUELS
Jet aircraft fuel additives covering functions and applications
A71-65325

JET ENGINES
Condensate particle crystallization retardation effect on energy characteristics of jet engine, calculating nonequilibrium flows of two phase combustion products in nozzle
A71-85004
Stratified charge engine tests to determine exhaust emission characteristics
N71-38760
Combustion efficiency and performance of swirl can modules under conditions simulating operation of 10,000 pound thrust lift engine for vertical takeoff
[NASA-TN-D-6542] N71-38767

JET FLOW
Resultant aerodynamic forces on circular arc profile with normal jet in subsonic steady compressible flow, using Ismail-Lamia approximation method
A71-44271

JET LIFT
Helicopter, tilt wing and jet lift hovering aircraft outflow measurements to determine suitability as rescue vehicles
[AIAA PAPER 71-992] A71-44586

JET MIXING FLOW
Exhaust jet mixing flow nozzles with peak axial velocity degradation for noise suppression

KINEMATIC EQUATIONS
Astatic gyroscope mounted on aircraft moving arbitrarily near earth surface, obtaining integrals of kinematic equations
A71-85160

LAMINAR BOUNDARY LAYERS
Plate induced laminar boundary layer/shock wave interactions on axisymmetric bodies at zero incidence in supersonic flow under adiabatic conditions
A71-44604
Feasibility study of combined laminar and turbulent boundary layer control system using distributed suction with application to low-speed research aircraft of glass reinforced plastic
[AD-727767] N71-37609

LANDING AIDS
Flight simulator for studying problems of aircraft during approaches and landings at night under category 2 visual conditions
[RAE-TH-AVIONICS-59(BLED)] N71-37606
Aircraft takeoff, navigation, and landing aids, aerodynamics characteristics, and crew rescue equipment
[AD-727860] N71-37618
Evaluation of visual landing aids involving visibilityeters and airfield lighting and marking
[HBS-10604] N71-38211

LANDING LOADS
Analysis of seaplane impact on planing deadrise in smooth and rough water
[AD-727753] N71-37814

LASER ALTIMETERS
Arctic ocean pack ice terrain profiling by airborne laser altimeter and coincident photography, analyzing data for ice development stages interpretation
A71-84986

LASER OUTPUTS
Laser technique for runway and slant visibility range, lower cloud boundary and atmospheric damping coefficient
A71-43889

LASERS
Factors affecting volumes from which data originate in laser Doppler velocimeter dual scatter probe
[AD-727005] N71-36825

LATEX
Laboratory tests of polymeric latex modified fast-fix C-7 cement for repair of damaged runway
LIHEAB PBEDICTIOH
LIIB1B FILTBBS
LIGBT AIBCBAPT
Lit (JOBISPBODBBCB)
LIFTIIG BOTOBS
LIFTIIG BODIES
LIFT DEVICES
LIFT
LBABBIBG HACHISBS
LBADIHG EDGES
LIFT FIBS
Aircraft generated vortex wakes and core air motions
Flight test measurements for improved estimates of
Acrostar flk.II all wood single seat acrobatic light
Computer program development for potential flow
Aerodynamic sound radiation from lifting surfaces in
Bigh lift device application to high performance
Sailplane circling cross-country speed increase by
Variable geometry in high lift flap form for
for conflicting clinb/cruise requirements
Sone aspects of propulsion for angmentor wind
Performance prediction and evaluation of
propulsion-augmented high lift systems for STOL
aircraft, considering weight, thrust and wing
loading
[IAIA PAPER 71-990]
[AD-726700] H71-36430
Comparison of blockage corrections in porous tunnel
Bagnus force and moment data for standard 10 degree
Aircraft mechanical and battery operated clocks
Two dimensional supersonic variable area nozzle
Control and chemical compositon of aircraft fuels,
National Science Council goals in low speed
Hobile LF air navigation AH/BBH-13 equipment,
Longitudinal adaptive aircraft control through sum
of normal acceleration and pitch rate
Adaptive guaranteed cost control for systems with
parametric variation, demonstrating system
stability and airframe pitch control
Longitudinal stability of plate-like load towed beneath helicopter in horizontal forward flight
Aircraft fuselage antisymmetric loading strain effects on small aspect delta wing performance
Mobile LF air navigation AH/BBH-13 equipment,
operation and maintenance
National Science Council goals in low speed aerodynamics - Canada
Technical aviation handbook covering aircraft
maintenance, navigation aids, airframes,
lubricants, piston and gas turbine engines, and
checkout procedures
[AD-727199] H71-37613
[AD-727195] H71-38531
Technique for experimental determination of fluid
viscosity of synthetic turbine engine lubricants
Lubricating oils
Aviation fuels lubricating characteristics,
discussing refining methods, viscosity, service
performance and load testing
Two dimensional supersonic variable area nozzle
geometry calculation as function of Mach number
Comparison of blockage corrections in porous tunnel
wall to closed wall tunnel at subsonic Mach numbers
[ABA-19]
Aircraft permanent magnetic fields strength
Varibility of aluminum alloy aircraft structure
fatigue life under symmetric and asymmetric loads
Comparison of logistics problems and cost aspects in
selection of aircraft for earth resources surveys
Stability and airframe pitch control
Selection of aircraft for earth resources surveys
Lubricants
Unit weight and pollution-free combustion
Longitudinal stability of airplane
Lubricating oils
Liquid hydrogen as future replacement for
hydrocarbon fuels in surface and air
transportation, noting advantages in energy per
unit weight and pollution-free combustion
Load distribution (forces)
Aircraft fuselage antisymmetric loading strain effects on small aspect delta wing performance
Loads (forces)
Variability of aluminum alloy aircraft structure
Longitudinal control
Low aspect ratio wings
Liquid hydrogens
Aircraft fuselage antisymmetric loading strain
Low frequencies
Low speed
MACH NUMBER
Two dimensional supersonic variable area nozzle
genometry calculation as function of Mach number
Comparison of blockage corrections in porous tunnel
wall to closed wall tunnel at subsonic Mach numbers
Magnetic anomalies
Aircraft permanent magnetic fields strength
Magnetic fields
Aircraft mechanical and battery operated clocks
resistant to high intensity magnetic fields
Magnetic flux
Aircraft permanent magnetic fields strength
Magnetic effect
Magnus force and moment data for standard 10 degree
A static gyroscope mounted on aircraft moving arbitrarily near earth surface, obtaining

integrals of kinematic equations

MEASURING INSTRUMENTS
Canadian National Science Council research in low speed aerodynamics, machine learning, and turbulent jet transducer

MEDICAL SERVICES
Automatic data processing systems for air traffic control, health services, operations research, management planning, information systems, and reading machines

METAL JOINTS
Statistical analysis of spot welded and adhesive joints of high strength Al alloy sheet in aircraft structures

METEOROLOGICAL PARAMETERS
Weather interruption effects on air transportation operations and economics, considering fog, snow, freezing rain, thunderstorms, winds, CAT and runway conditions

Relation between turbulence in stratosphere causing aircraft buffeting, and vertical distribution of meteorological parameters calculated from radiosonde data

METEOROLOGICAL RADAR
Solid state airborne weather radar for civil aviation, discussing design, weight and power requirement reduction

MINITARY AIR FACILITIES
Development and characteristics of lightweight, mobile structures for aircraft storage and maintenance

MINITARY AIRCRAFT
Basic engineering technology for automatic Inspection Diagnostic And Prognostic Systems (ADIPS) for Army aircraft

MINITARY AIRCRAFT
Development and characteristics of lightweight, mobile structures for aircraft storage and maintenance

MISSILE CONTROL
Wind tunnel static longitudinal stability and control characteristics of cruciform delta winged missile with various horizontal canards and trailing-edge flap control between Mach 1.50 and 4.63

MOTION
Attitudes and motivational factors in job performance of terminal area air traffic control personnel

MULTIENGINE VEHICLES
Guide to private and commercial multiengine aircraft pilot certification

MULTIENGINE SCANNERS
Shallow ocean depth measurements by aerial photographs of wave refraction and wavelength changes and by multispectral scanning of wave reflection

NATIONAL AVIATION SYSTEM
IBM 9020 multiprocessing computer application to ATC, discussing control sectors for inflight control at air route traffic control centers in U.S.
NAVIGATION
Aircraft takeoff, navigation, and landing aids, aerodynamics characteristics, and crew rescue equipment [AD-727860] N71-37618
Air traffic control, communications, navigation, frequency management, systems analysis, and aircraft SDRS program developments N71-38214

NAVIGATION AIDS
Aeronautical radio navigation aids photo-optical calibration, describing photogrammetric procedure and ground equipment for checking out airport ILS systems N71-63587
STOL aircraft system, discussing ground installations, runways, three dimensional area navigational aids, noise reduction, air traffic and short haul productivity [AIAA PAPER 71-963] N71-64579

NITRIC OXIDE
Nitrous oxide dissociation as natural source of stratospheric nitric oxide, noting estimates use as yardstick for artificial source N71-63347

NITROGEN
Nozzle design procedure and calculations for hypervelocity wind tunnel including thermodynamic properties of nitrogen and inviscid core and boundary layer calculations [AD-727591] N71-37821

NITROUS OXIDES
Nitrous oxide dissociation as natural source of stratospheric nitric oxide, noting estimates use as yardstick for artificial source N71-63347

NOISE INJURIES
Determining sound pressure and noise spectra of turboshaft engines to assess potential noise injury [AD-727886] N71-37113

NOISE REDUCTION
Prop rotor and lift fan VSW aircraft ground noise level reduction, using flight trajectory management [AIAA PAPER 71-991] N71-45265
Noise reduction effectiveness of mixer nozzle for increasing lift capability in STOL aircraft [NASA-TM-X-67938] N71-36424
Exhaust jet mixing flow nozzles with peak axial velocity degradation for noise suppression [NASA-TM-X-67938] N71-37379
Noise reduction studies involving variable geometry inlet guide vanes for choking using two-sector cascade apparatus with three inlet configurations [NASA-TM-X-2392] N71-37601

NOISE SPECTRA
Acoustic noise output from round interferring subsonic jets, considering suppressor nozzle attenuation N71-64560
Determining sound pressure and noise spectra of turboshaft engines to assess potential noise injury [AD-727886] N71-37113

NONDESTRUCTIVE TESTS
Nondestructive detection of hot corrosion-sulfidation in U.S. Navy aircraft turbine engines N71-45280

NONSEQUILIBRIUM FLOW
Condensate particle crystallization retardation effect on energy characteristics of jet engine, calculating nonequilibrium flows of two phase combustion products in nozzle N71-65004

NOILINEAR SYSTEMS
Suboptimal fixed point data smoothing algorithm for parameter and initial state estimation of nonlinear dynamic systems N71-44113

NORTH AMERICA

NORTH ATLANTIC THERAPY ORGANISATION (NATO)
AGARD report on engine-airplane interference and wall correction in transonic wind tunnel tests [AGARD-AB-36-71] N71-36400

NOZZLE DESIGN
Nozzle design procedure and calculations for hypervelocity wind tunnel including thermodynamic properties of nitrogen and inviscid core and boundary layer calculations [AD-727591] N71-37821
Technique for relating transient tolerances in inlet throat Mach number and shock position to supersonic start frequency due to atmospheric turbulence for supersonic inlet design [NASA-CR-116372] N71-37835

NOZZLE EFFICIENCY
Supercritical propulsion system inlet, engine and exhaust nozzle in wind tunnel and flight tests, discussing boundary layer effects on performance N71-43599
Noise reduction effectiveness of mixer nozzle for increasing lift capability in STOL aircraft [NASA-TM-X-67938] N71-36421

NOZZLE FLOW
Exhaust jet mixing flow nozzles with peak axial velocity degradation for noise suppression [NASA-TM-X-67938] N71-37378

NOZZLE GEOMETRY
Two dimensional supersonic variable area nozzle geometry calculation as function of Mach number N71-64071
Thrust-minus-drag forces and pressure distributions of closely spaced twin-jet afterbodies with different inboard-outboard fairing and nozzle shapes [NASA-TM-X-2329] N71-36412

NUCLEAR PROPELLED AIRCRAFT
Performance and costs of nuclear aircraft used in transoceanic commerce [NASA-TM-X-2386] N71-30277

NUMERICAL ANALYSIS

OCEAN BOTTOM
Shallow ocean depth measurements by aerial photographs of wave refraction and wavelength changes and by multispectral scanning of wave reflection [NASA-CR-123194] N71-37862

OCEAN CURRENTS
Development of operational system for measuring ocean surface current from aircraft using floats and fluorescent dyes [AD-725659] N71-37922

OCEAN SURFACE
Development of operational system for measuring ocean surface current from aircraft using floats and fluorescent dyes [AD-725659] N71-37922

ONE DIMENSIONAL FLOW
One dimensional channel flow theory for designing ram wing surface effect vehicle [AD-727778] N71-36419

OPERATIONS RESEARCH
Automatic data processing systems for air traffic control, health services, operations research, management planning, information systems, and reading machines N71-37742

OPTICAL MEASUREMENT
Aeronautical radio navigation aids photo-optical calibration, describing photogrammetric procedure and ground equipment for checking out airport ILS systems N71-43587

OPTICAL REFLECTION
Pilot performance in recognizing electronic display systems under varying dazzle and color conditions in cockpits [RAE-LIB-TRANS-1545] N71-37621

OPTIMAL CONTROL
Helicopter optimal autorotation landing parameters for touchdown at zero speed, including rotor rpm drop due to flow separation on blades [AIAA PAPER 71-983] N71-43090

Minimum order state vector reconstruction linear filters for constant plants optimal control, applying to aircraft flight multiple control-point problem
The document contains various technical papers and articles related to aerospace engineering. The topics covered include:

- Performance tests of compresor seals and stator pivot seals used with air breathing propulsion systems.
- Guidance parachute-payload system analog simulation device for pilot training in maneuvering remotely controlled parachute-payloads.
- Partial admission performance of single stage radial turbine configurations.
- Performance of terminal area air traffic control personnel.
- Aircraft permanent magnetic fields strength determination.
- Aircraft accelerate-stop factors and regulations.
- Automatic flight control systems, discussing pilot involvement.
- Attitudes and motivational factors in job performance.

The references in the document are marked with unique identifiers, such as [AIAA PAPER 71-990]. The full content of the document spans various pages, with this snippet providing a glimpse of the overall technical and engineering focus.
PILOT SELECTION

Flight simulator for studying problems of aircraft during approaches and landings at night under category 2 visual conditions [NAA-TM-AVIONIC-59(DNR) ] N71-37606

Pilot performance in recognizing electronic display systems under varying dazzle and color conditions in cockpits [NAA-LIB-TRANS-1545] N71-37621

Pilot transition from conventional visual cross pointer display to aural glide slope cues [FIA-AM-71-24] N71-37682

PILOT SELECTION

Corporate aircraft 1970 accident statistics analysis stressing pilot selection, training and supervision A71-43227

Corporate aircraft 1970 accident statistics analysis stressing pilot selection, training and supervision A71-63227

Guided parachute-payload system analog simulation device for pilot training in maneuvering remotely controlled parachute-payloads [SC-DS-710097] N71-36427

PILOTS (PERSONNEL)

Guide to private and commercial multiengine aircraft pilot certification [FIA-AC-61-6C] N71-36438

PISTON ENGINES

Technical aviation handbook covering aircraft maintenance, navigation aids, airframes, lubricants, piston and gas turbine engines, and checkout procedures [AD-727955] N71-37613

PITCH (INCINERATION)

Angle of attack intrusstration for evaluating aircraft lift performance and phugoid oscillations A71-63382

PITCHING MOMENTS

Design, construction, and performance of water tunnel for two dimensional testing of pitching airfoils [D180-14130-1] N71-37827

PILOT TUBES

Aircraft pilot static systems design with removable drain plug, noting line installation problems A71-63387

PLAN POSITION INDICATORS

Radar observation of convective process in clear air, presenting turreted top cell contour tracings from PPI sequence A71-63088

PLASTIC COATINGS

Development of rain erosion resistant plastic coatings as high speed aircraft surface finish [AD-727750] N71-38133

PLASTICS

Simulated JP-4 jet fuel fire tests of high temperature cabin pressure seals and insulating plastics and rubbers [FIA-NA-71-22] N71-38199

PLATES (STRUCTURAL MEMBERS)

Equations of motion for elastic plate foundation system under dynamic load applied to aircraft landing N71-37583

POLICIES

Guidelines for national aviation system planning and B and D policy [FIA-AV-71-2] N71-38798

POROUS WALLS

Comparison of blockage corrections in porous tunnel wall to closed wall tunnel at subsonic Mach numbers [AB-19-9] N71-37853

POSSIBLE FLOW

Computer program development for potential flow calculation about lifting bodies [AD-727628] N71-37597

POWER EFFICIENCY

Compressors and turbines centrifugal stages operational characteristics, investigating airflow rate and pressure ratio effects on power A71-45380

Transonic airfoil cascade analytical design, determining efficiency from velocity distribution A71-45381

PRECIPIATION (METEOROLOGY)

Development, testing, and utilization of silver iodide pyrotechnic cloud seeding system [N52A-TH-BLTH-APCL-5] N71-36985

PREDICTIONS

Prediction formulations for transonic fluctuating pressure environments including protuberance induced turbulent boundary layer flows [NASA-CR-119947] N71-36677

PREDICTIONS (METEOROLOGY)

Aerodynamic combustion noise generation from premixed or diffusion open turbulent flares, using fluid mechanics and lighthill method A71-43488

PRESSURE DISTRIBUTION

Thrust-minus-drag forces and pressure distributions of closely spaced twin-jet afterbodies with different inboard-outboard fairing and nozzle shapes [NAA-TN-2-2329] N71-36412

Pressure distributions and drag coefficients of 10 constant length and volume slender bodies of revolution at zero incidence for Mach numbers 2.0 to 12.0 - graphs [NASA-TN-D-6536] N71-36416

Methods for prediction of centerline shock layer thickness and pressure distribution on delta wing body configurations [NASA-TN-D-6550] N71-36418

PRESSURE EFECTS

Leading edge suction of thin aerofoil theory [ABL/SM-BOTR-360] A71-36399

PRESSURE OSCILLATIONS

Prediction formulations for transonic fluctuating pressure environments including protuberance induced turbulent boundary layer flows [NASA-CR-119947] N71-36677

PRESSURE SENSORS

Fluid amplifiers theory and use as temperature and pressure sensors, discussing applications in chemical and ammunition industries and jet aircraft control [IEEE-PAPER 70-TP-120-IGA] A71-42921

PROJECT PLANNING

Manual for development of needs estimates and capital improvement programs for airports and other intercity terminals for 1970 to 1990 DMS-64-571002 N71-37824

PROPORTION SYSTEM CONFIGURATIONS

Performance tests of compressor seals and stator pivot seals used with air breathing propulsion systems - Part 2 [NASA-CR-72887] N71-37373

PROPORTION SYSTEM PERFORMANCE

Supersonic propulsion system inlet, engine and exhaust nozzle in wind tunnel and flight tests, discussing boundary layer effects on performance A71-43599

PSYCHOLOGY

Attitudes and motivational factors in job performance of terminal area air traffic control personnel [FIA-AN-71-30] N71-37041

RADAR BEAMS

Range and azimuth resolution characteristics and aircraft separation measurement capability of radar beacon-digitizer subsystem [FIA-NA-71-16] N71-37038

RADAR EQUIPMENT

Solid state airborne weather radar for civil aviation, discussing design, weight and power requirement reduction A71-44273

C band radar transmitter for airborne radar system [AD-727086] N71-37707

RADAR RESOLUTION

Range and azimuth resolution characteristics and aircraft separation measurement capability of radar beacon-digitizer subsystem [FIA-NA-71-16] N71-37038

RADAR TRACKING

Radar observation of convective process in clear air, presenting turreted top cell contour tracings

A-22
RADIAL DISTRIBUTION
Temperature field profiling along radius in front of gas turbine stage, applying to regeneratively cooled turbine engine

RADIATION DOSAGE
Jet aircraft measurements of galactic cosmic radiation dose and comparison with theoretical values for supersonic flights

[UCCH-2009] W71-38552

RADIO EQUIPMENT
Mobile LP air navigation AN/ENR-13 equipment, operation and maintenance

W71-43878

RADIO FREQUENCY INTERFERENCE
Alternate air traffic control co-channel separation criteria based on probability-of-interference considerations

[ISTT-101] W71-37712

AERONAUTICAL RADIO NAVIGATION
Aeronautical radio navigation aids photo-optical calibration, describing photogrammetric procedure and ground equipment for checking out airport ILS systems

W71-43587

RADIOSONDES
Relation between turbulence in stratosphere causing aircraft buffeting, and vertical distribution of meteorological parameters calculated from radiosonde data

[NASA-TT-P-13981] W71-36398

RAMP S (STRUCTURES)
One dimensional channel flow theory for designing ram wing surface effect vehicle

[AD-72777a] W71-36419

RANS (POMPE)
Flexible ram air inflated keel and leading edge parafoil design optimization for increased stability and reliability, introducing semirigid keel concept

[AIAA PAPER 71-986] W71-44582

RAREIFIED GAS DYNAMICS
Two dimensional and three dimensional wakes in supersonic and hypersonic rarefied gas wind tunnels, comparing cone and dihedron configurations

W71-43357

READERS
Automatic data processing systems for air traffic control, health services, operations research, management planning, information systems, and reading machines

W71-37742

RECTANGULAR PLANEBOARDS
Lifting rectangular thin airfoil in symmetrical incompressible steady uniform orthogonal flow at small angle of attack, deriving Weissinger integral equation

W71-43487

Computer program for numerical integration of downwash subsonic flow about rectangular planforms, for different aspect ratios

[NPL-MA-99] W71-36405

RECTANGULAR WINGS
Subsonic force effect calculations on rectangular wings, using downwash velocity potential method

W71-44613

REFERENCE SYSTEMS
Nitrogen oxide dissociation as a natural source of stratospheric nitric oxide, noting estimates use as yardstick for artificial source

W71-43347

REGENERATIVE COOLING
Temperature field profiling along radius in front of gas turbine stage, applying to regeneratively cooled turbine engine

W71-45011

RELIABILITY
Reliability estimation, including failure effect analysis of avionic systems

W71-36777

Effectiveness of reliability programs for avionic equipment

W71-36779

RELIABILITY ANALYSIS
Digital computer bibliography, programming techniques and applications, and software standardization and reliability

[AD-727605] W71-37766

RELIABILITY ENGINEERING
In-flight monitoring of aircraft turbine engine reliability

W71-43233

Cost effectiveness, failure analysis, and design techniques for measuring reliability of avionics systems

[AGAREL-65-47-71] W71-36776

REMOTE CONTROL
Guided parachute-payload system analog simulation device for pilot training in maneuvering remotely controlled parachute-payloads

[SC-DR-710097] W71-36427

REMOTE SENSORS
Airborne remote sensing of Mojave Desert plays for use as natural landing areas

[AD-727031] W71-36748

Remote aerial sensing and automatic mapping for forest resources information system


Characteristics of sensors for aerial observation of ice formations and comparison of effectiveness of various methods

[JFRS-56462] W71-36801

REQUIREMENTS
Manual for development of needs estimates and capital improvement programs for airports and other intercity terminals for 1970 to 1990

[ORB-04-57002] W71-37824

RESCUE OPERATIONS
Airport crash fire fighting equipment requirements and rescue operations

W71-43389

Helicopter, tilt wing and jet lift hovering aircraft outflow measurements to determine suitability as rescue vehicles

[AIAA PAPER 71-992] W71-44586

Aircraft takeoff, navigation, and landing aids, aerodynamics characteristics, and crew rescue equipment

[AD-727860] W71-37618

RESEARCH AERONautical
Feasibility study of combined laminar and turbulent boundary layer control system using distributed suction with application to low-speed research aircraft of glass reinforced plastic

[AD-727767] W71-37609

Development of operational system for measuring ocean surface current from aircraft using floats and fluorescent dyes

[AD-726568] W71-37922

RESEARCH AND DEVELOPMENT
Soviet aircraft industry R and D organizations and management

W71-44189

Civil aviation research and development policy review covering aircraft noise, congestion, ATC, runway capacity and airport development problems

[AIAA PAPER 71-1024] W71-44602

Evaluation of visual landing aids involving visibility meters and airfield lighting and marking

[RBS-10604] W71-38211

Summaries of air force research activities

[AD-727330] W71-38789

Guidelines for national aviation system planning and R and D policy


RESONANT VIBRATION
Reduction of resonant vibrations in integrally stiffened skin-stringer panels using viscoelastic materials

[AD-727733] W71-37540

RIGID MOTORS
Development of methods for measuring and predicting behavior of rigid rotors with stiff blades at high advance ratios and low rotor speeds


ROLL
Single degree of freedom roll response due to vertical random two dimensional gusts
SAFETY DEVICES
Aircraft ditching and flying personnel survival, stressing passenger briefing and crew jacket equipment with VHF transceiver for rescue operations coordination

S

SAFETY FACTORS
Jet engine advent impact on aviation fuels safety, discussing gasoline hazards in prejet aircraft

SAFETY MANAGEMENT
Airport certification and safety inspection program mandated by Airport and Airway Development Act of 1971

SANDWICH STRUCTURES
Design data for regeneratively cooled panels from low cycle fatigue evaluation of Inconel 718 and Inconel 625 sheet and sandwich panel specimens

SCHEDULING
Stochastic optimal control theory application to airplace rescheduling model, obtaining dynamic programming algorithm for optimal landing and takeoff rules

SE-210 AIRCRAFT
European automatic flight control systems for landing in category IIIA conditions, discussing triple system in Trident and simplex in Caravelle

SEALERS
Simulated JP-4 jet fuel fire tests of high temperature cabin pressure sealant and insulating plastics and rubbers

SEALS (STOPSHEW)
Compressible flow across shaft face seals and narrow slots, examining fluid inertia, viscous friction and entrance losses

SEAPLANES
Analysis of seaplane impact on planing deadrise in smooth and rough water

SELF SEALING
Analysis and tests of self-acting mainshaft seals to provide gas film lubrication for advanced gas turbine engines

SEPARATION
Shrouded step pads for separating seal surfaces

SERVICE LIFE
Automatic pilots for control of rotary and fixed wing aircraft

SHARK FLOW
Minimum drag and lifting line characteristics of large aspect ratio wing in uniform shear flow with velocity variations along span

SHOCK LAYERS
Methods for prediction of centerline shock layer thickness and pressure distribution on delta wing body configurations

SHOCK WAVE ATTENUATION
Supersonic aircraft shape for shock waves minimization based on channel configuration with converging inlet and diverging outlet section

SHOCK WAVE INTERACTION
Flare induced laminar boundary layer/shock wave interactions on axi-symmetric bodies at zero incidence in supersonic flow under adiabatic conditions

SHOCK WAVE PROPAGATION
Numerical analysis of two-dimensional steady gas flow around thin symmetrical wings and shock wave formation during transition from sonic to supersonic flow
Approximate solution for position and strength of shock waves about cones in steady supersonic flow

Technique for relating transient tolerances in inlet throat Mach number and shock position to supersonic unstart frequency due to atmospheric turbulence for supersonic inlet design

Wind tunnel tests of stability and control characteristics of STOL aircraft, considering weight, thrust and wing loading

Wind tunnel tests of propulsive-augmented high lift systems for STOL aircraft, evaluating noise reduction, air traffic and short haul productivity

Performance prediction and evaluation of stainless steel structural elements and techniques for shock wave control

Planning short-haul intercity commercial air transportation with STOL aircraft

Wind tunnel tests of propulsive driven, deflected slipstream, short takeoff aircraft model to determine longitudinal and lateral-directional stability when in ground effect

Planning short-haul intercity commercial air transportation with STOL aircraft

Noise reduction effectiveness of mixer nozzle for increasing lift capability in STOL aircraft

Planning short-haul intercity commercial air transportation with STOL aircraft

Wind tunnel tests of propulsive driven, deflected slipstream, short takeoff aircraft model to determine longitudinal and lateral-directional stability when in ground effect

Planning short-haul intercity commercial air transportation with STOL aircraft

Noise characteristics of model STOL wing with externally blown flaps in vicinity of aircraft propulsor

Planning short-haul intercity commercial air transportation with STOL aircraft

Shrouded step pads for separating seal surfaces

Digital simulation and implementation techniques for Doppler radar altimeter signal processing

Broadband models of silicon carbide junction field effect transistor amplifiers

Development, testing, and utilization of silver iodide pyrotechnic cloud seeding system

Aircraft skidding accidents investigation, comparing airplane stopping distance computations and observations

Minimun drag and lifting line characteristics of large aspect ratio wing in uniform shear flow with velocity variations along span

Slender two dimensional wedge wings aerodynamic characteristics in hypersonic strong interaction flow, determining wall shear stress and lift drag ratio effects

Compressible flow across shaft face seals and narrow slots, examining fluid inertia, viscous friction and entrance losses

Feasibility study of combined laminar and turbulent boundary layer control system using distributed suction with application to low-speed research aircraft of glass reinforced plastic

Solid state devices

Solid state airborne weather radar for civil aviation, discussing design, weight and power requirement reduction

Determining sound pressure and noise spectra of turboshaft engines to assess potential noise injury

Aerodynamic sound radiation from lifting surfaces in smooth and turbulent flow

Quantity and quality of geodetic information transmitted by space photography compared with low altitude aerial photography

Flight dynamics and calculation of flight trajectories of various aircraft and spacecraft

Aircraft pilot static systems design with removable drain plug, noting line installation problems

Spin tunnel tests to determine effectiveness of deployable, flexible ventral fins for spin recovery device on fighter aircraft

Minimum order state vector reconstruction linear filters for constant plants optimal control, applying to aircraft flight multiple control-point problem

Flight test measurements for improved estimations of aircraft states and aerodynamic parameters, using relinearized Kalman filter

Statistical analysis of spot welded and adhesive joints of high strength Al alloy sheet in aircraft structures

Digital computer bibliography, programming techniques and applications, and software standardization and reliability

Statistical analysis of spot welded and adhesive joints of high strength Al alloy sheet in aircraft structures

Flight test measurements for improved estimations of aircraft states and aerodynamic parameters, using relinearized Kalman filter

Approximate solution for position and strength of shock waves about cones in steady supersonic flow

Stochastic optimal control theory application to airplane rescheduling model, obtaining dynamic programming algorithm for optimal landing and takeoff rules

Aircraft accelerate-stop factors and regulations, pilot reaction times and accidents during takeoff

Nitrous oxide dissociation as natural source of...
stratospheric nitric oxide, noting estimates use as yardstick for artificial source A71-43397

Relation between turbulence in stratosphere causing aircraft buffeting, and vertical distribution of meteorological parameters calculated from radiosonde data [NASA-TM-F-13959] A71-36398

Horizontal temperature and wind distribution effects on aircraft buffetting in stratosphere [NASA-TM-F-13978] A71-37600

STRUCTURAL ANALYSIS

Structural analysis of corrugated aircraft wing skin panels to determine effects of corrosion damage [AD-728009] A71-37619

STRUCTURAL DESIGN

Development and characteristics of lightweight, mobile structures for aircraft storage and maintenance [AD-727056] A71-36674

Aircraft fuselage asymmetrical loading strain effects on small aspect delta wing performance A71-45018

STRUCTURAL WEIGHT

Civil transport aircraft and equipment maintenance and reliability problems solutions with best time, cost and weight compromise A71-44765

Ideal weight of asymmetrical fuselage shells, taking into account load distribution and cable pressurization A71-45180

SUBSONIC FLOW

Resultant aerodynamic forces on circular arc profile with normal jet in subsonic steady compressible flow, using semi-empirical approximation method A71-44271

Streamline curvature analysis of compressible subsonic, transonic and supersonic cascade flows in axial turbine blades A71-44347

Acoustic noise output from round interfering subsonic jets, considering suppressor nozzle attenuation A71-44560

Subsonic force effect calculations on rectangular wings, using downwash velocity potential method A71-44613

SUBSONIC SPEED

Nonreversible hydraulic control design and emergency maintenance for Tu 154 aircraft subsonic cruising at 11 km altitude A71-42927

SUBSONIC WIND TUNNELS

Low speed wind tunnel measurements correction for acoustic effects due to fan noise propagation A71-44763

SUCTION

Leading edge suction of thin aerofoil theory [AHL/58-R032-360] A71-36399

Possibility study of combined laminar and turbulent boundary layer control system using distributed suction with application to low-speed research aircraft of glass reinforced plastic [AD-727767] A71-37609

SULFIDES

Nondestructive detection of hot corrosion-sulfidation in U.S. Navy aircraft turbine engines A71-45280

SUPERSONIC AIRCRAFT

Supersonic aircraft shape for shock waves minimization based on channel configuration with converging inlet and diverging outlet section A71-44572

Jet aircraft measurements of galactic cosmic radiation dose and comparison with theoretical values for supersonic flights [UCRL-20209] A71-38552

SUPERSONIC AIRFOILS

Minimizing drag aerofoil shape solutions with supersonic flow and turbulent boundary layers for given chord length and heat transfer rate [AD-726767] A71-36409

SUPERSONIC FLOW

Flow angularity prediction near supersonic fuselage forebody with arbitrary cross section and zero sideslip, using small perturbation theory [AIAA PAPER 71-996] A71-44588

Plume induced laminar boundary layer/shock wave interactions on axisymmetric bodies at zero incidence in supersonic flow under adiabatic conditions A71-44604

Approximate solution for position and strength of shock waves about cones in steady supersonic flow A71-44624


Method of lines technique for computing flow field about conical configurations at incidence in supersonic flow [NASA-TR-R-374] A71-36697

Numerical analysis of two-dimensional steady gas flow around this symmetrical wing and shock wave formation during transition from sonic to supersonic flow [AD-727054] A71-37850

SUPERSONIC INLETS

Supersonic aircraft shape for shock waves minimization based on channel configuration with converging inlet and diverging outlet section A71-44572

Noise reduction studies involving variable geometry inlet guide vanes for choking using two-sector cascade apparatus with three inlet configurations [NASA-TM-F-2392] A71-37601

Technique for relating transient tolerances in inlet throat Mach number and shock position to supersonic start-up frequency due to atmospheric turbulence for supersonic inlet design [NASA-CS-114372] A71-37835

SUPERSONIC NOZZLES

Supersonic propulsion system inlet, engine and exhaust nozzle in wind tunnel and flight tests, discussing boundary layer effects on performance A71-43599

Two dimensional supersonic variable area nozzle geometry calculation as function of Mach number A71-44071

SUPERSONIC SPEEDS

Supersonic combustion chemistry and mixing of high energy density fuels related to advanced air-breathing engine design, using boron particles [AD-727782] A71-38530

SUPERSONIC TRANSPORTS

SST handling qualities, takeoff speeds and performance evaluation on six degree of freedom flight simulator A71-42922

Supersonic transports and ATC, discussing takeoff, landing and terminal area operations A71-43835

SST operation climatic impact assessment program, considering carbon dioxide, water vapor, contrails, particulates, nitrogen oxides and carbon monoxide A71-44982

SUPERSONIC TURBINES


SUPERSONIC WAKES

Two dimensional and three dimensional wakes in supersonic and hypersonic rarefied gas wind tunnels, comparing cone and dihedral configurations A71-43357

SUSPENSION

Acoustic noise output from round interfering subsonic jets, considering suppressor nozzle attenuation A71-44572

SURFACE FINISHING

Development of rain erosion resistant plastic coatings as high speed aircraft surface finish [AD-727750] A71-38133

SURFACE ROUGHNESS

Analysis of seaplane impact on planing deadrise in smooth and rough water [AD-727753] A71-37614

SURFACE VEHICLES

Liquid hydrogen as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion A71-44588
Future transportation technology impact, considering
Aircraft accelerate-stop factors and regulations,
Adaptive guaranteed cost control for systems with
technology developments in rotor, drive, flight
Aircraft takeoff, navigation, and landing aids,
Tu-134 aerodynamic characteristics during takeoff,
Growth rate of US air cargo markets - tables
Graphs and tables of aircraft traffic over North
Azial flow compressors stable operation, using
design and tests of high temperature, air cooled
Future transportation technology impact, considering
Aircraft pitot static systems design with removable
Evaluation of visual landing aids involving
Algorithm for dual compromise control problems
SST handling qualities, takeoff speeds and
Statistical, cause/factor and injury tables,
Accident rates, and briefs of accidents involving
US carriers in 1969
Graphs and tables of aircraft traffic over North
America - 1966 through 1969
Growth rate of US air cargo markets - tables
Adaptive guaranteed cost control for systems with
paranetic variation, demonstrating system
stability and airframe pitch control
SST handling qualities, takeoff speeds and
performance evaluation on six degree of freedom
flight simulator
Tu-134 aerodynamic characteristics during takeoff,
climb, horizontal flight, landing stability and
maneuverability, and strength under various loads
Aircraft takeoff, navigation, and landing aids,
aerodynamics characteristics, and crew rescue
equipment
Aircraft accelerate-stop factors and regulations,
pilot reaction times and accidents during takeoff
Technology developments in rotor, drive, flight
tests and cargo handling systems of heavy lift
copter system, noting military and commercial applications
Stability augmentation system for aircraft elastic
nodes control, discussing active flutter
suppression technology
Future transportation technology impact, considering
system design evaluation criteria and civil
aviation and urban mass transit systems
Contributions
Environment degradation relation to technology,
discussing priorities
Air traffic control, communications, navigation,
freight management, systems analysis, and
aircraft SDoS program developments
Development of procedure for scaling of experimental
turbinevane airfoil temperatures from low to high
gas temperatures
Horizontal temperature and wind distribution effects
on aircraft buffet ing in stratosphere
Technique for experimental determination of fluid
viscosity of synthetic turbine engine lubricants
over temperature range of 100 to 700 F
Temperature measurement
Development of procedure for scaling of experimental
turbine vane airfoil temperatures from low to high
gas temperatures
Temperature profiles
Temperature field profiling along radius in front of
gas turbine stage, applying to regeneratively
cooled turbine engine
Fluid amplifiers theory and use as temperature and
pressure sensors, discussing applications in
chemical and ammunition industries and jet
aircraft control
Arctic ocean pack ice terrain profiling by airborne
laser altimeter and coincident photography,
analyzing data for ice development stages
interpretation
Test bed engine studies of overall excess air ratio
permissible deviation, obtaining diagram for
constraints calculation
Effectiveness of reliability programs for avionic
equipment
Cost effectiveness of built in test provisions in
aircraft operations
Analysis and validation of characteristics of
general purpose airborne simulator for simulation
of aerodynamic characteristics of large transport
aircraft
Textbook on combustion chambers of gas turbine
engines
Textbook on combustion chambers of gas turbine
engines
Simulated JP-4 jet fuel fire tests of high
temperature cabin pressure sealant and insulating
plastics and rubbers
Simulated JP-4 jet fuel fire tests of high
temperature cabin pressure sealant and insulating
THRESHOLD RESPONSE

Transient dynamic characteristics of aircraft under unsteady flight, using Laplace-Carson integral transforms

A71-45016

THRESHOLDS

Technique for relating transient tolerances in inlet throat Mach number and shock position to supersonic unstart frequency due to atmospheric turbulence for supersonic inlet design

[A71-114372] N71-37835

TRANSIENT RESPONSE

Guided parachute-payload system analog simulation device for pilot training in maneuvering remotely controlled parachute-payloads

[SC-DR-710997] N71-36427

TRADE-BOUNDARY

Survey of domestic air passenger trip length including number of passengers and aircraft types

[AGARD-AR-36-71] N71-37823

1-34 AIRCRAFT

To-134 aircraft

A71-38795

To-134 aerodynamic characteristics during takeoff,

A71-45016
TURBINE ENGINES

Aerodynamic sound radiation from lifting surfaces in smooth and turbulent flow (NASA-CH-114370) A71-36422

TURBULENT JETS

Canadian National Science Council research in low speed aerodynamics, machine learning, and turbulent jet transducer [DDE/MAE-1971(2)] A71-38626

TURBULENT WAKES

Aircraft generated vortex wakes and core air motions hazards for encountering light airplane A71-43381

TWO DIMENSIONAL BODIES

Transonic flows about two dimensional airfoils, calculating far field boundary conditions with coordinate transformation A71-44620

Slender two dimensional wedge wings aerodynamic characteristics in hypersonic strong interaction flow, determining wall shear stress and lift drag ratio effects A71-44621

TWO DIMENSIONAL FLOW

Two dimensional and three dimensional wakes in supersonic and hypersonic rarefied gas wind tunnels, comparing cone and dihedral configurations A71-43357

Single degree of freedom roll response due to vertical random two dimensional vertical gusts (NASA-CH-119664) A71-36421

Two dimensional flow tests of transonic airfoils [NASA-TP-T-13986] A71-37593

Design, construction, and performance of water tunnel for two dimensional testing of pitching airfoils P180-1331-1 A71-37827

Numerical analysis of two-dimensional steady gas flow around thin symmetrical wings and shock wave formation during transition from sonic to supersonic flow (AD-727854) A71-37850

UNITED STATES OF AMERICA

Statistical, cause/factor and injury tables, accident rates, and briefs of accidents involving 05 carriers in 1969 [N300-ARC7-7L-1] A71-36437

Freight, express, and mail tonnage forecasts for domestic airline operations A71-38793

Growth rate of US air cargo markets - tables A71-38794

UNSTEADY FLOW

Analytical investigation of effects of blade flexibility, unsteady aerodynamics, and variable inflow on helicopter rotor stall characteristics (NASA-CR-1769) A71-36404

UBERN TRANSPORTATION

Future transportation technology impact, considering system design evaluation criteria and civil aviation and urban mass transit systems contributions [AIAA PAPER 71-1010] A71-44594

V/STOL AIRCRAFT

V/STOL aircraft lift fan aerodynamics, discussing optimum fan pressure ratios, augmentation ratio, noise constraints, wing loading and fan configurations [AIAA PAPER 71-981] A71-44577

AIAA members comments on STOL, VTOL and V/STOL aircraft serics and developments [AIAA PAPER 71-1015] A71-44596

Flight dynamics of noise optimal flight profiles for V/STOL aircraft, minimization of gust effects on aircraft and nonlinear dynamic stability of parachute-load systems A71-44761

VARIABLE SWEET WINGS

Panavia 200 multipurpose military aircraft, A71-37596

AERODYNAMIC COMBUSTION NOISE GENERATION FROM FEASIBILITY STUDY OF COMBINED LAMINAR AND TURBULENT PREDICTION FORMULATIONS FOR TRANSONIC FLUCTUATING AIRCRAFT WAKE TURBULENCE AND TRAILING VORTICES, AXIAL FLOW COMPRESSORS STABLE OPERATION, USING COMPRESSORS AND TURBINES CENTRIFUGAL STAGES OPERATING VARIABLES EFFECT ON POLLUTANT EXHAUST FROM NONREVERSIBLE HYDRAULIC CONTROL DESIGN AND EMERGENCY MAINTENANCE FOR T4 714 AIRCRAFT SUBSONIC CRUISEING AT 11 KS ALTITUDE
VARIANCE (STATISTICS)

- describing variable geometry design concept, performance characteristics, engine, armament and electronics
  A71-44766

Aerodynamic characteristics of variable sweep wings under a variety of operating conditions
  [AD-727210] N71-37615

VARIANCE (STATISTICS)

Tests on scale model configurations of C-5 aircraft to obtain data correlation on three transonic wind tunnels
  [AD-727005] N71-36408

VELOCITY DISTRIBUTION

Minimum drag and lifting line characteristics of large aspect ratio wing in uniform shear flow with velocity variations along span
  A71-43312

Subsonic force effect calculations on rectangular wings, using downwash velocity potential method
  A71-44613

VELOCITY MEASUREMENT

Pressure altimeter, airspeed and vertical velocity instruments, discussing selection, installation, pitot verification, error identification, repair and use
  A71-43385

Hot-wire anemometer measurements of streamwise magnitudes and normal velocity components of wing tip vortex
  [NASA-TW-X-62087] N71-36679

Factors effecting volume from which data originate in laser Doppler velocimeter dual scatter probe
  [AD-727005] N71-36408

VERTICAL DISTRIBUTION

Relation between turbulence in stratosphere causing aircraft buffeting, and vertical distribution of meteorological parameters calculated from radiosonde data
  [NASA-TT-F-13981] N71-36408

VERTICAL LANDING

Helicopter optimal autorotation landing parameters for touchdown at zero speed, including rotor rpm drop due to flow separation on blades
  A71-43090

VERTICAL TAKE-OFF AIRCRAFT

AIAA members comments on STOL, VTOL and V/STOL aircraft merits and developments
  [AIAA PAPER 71-1015] A71-44596

Prop rotor and lift fan VTOL aircraft ground noise level reduction, using flight trajectory management
  [AIAA PAPER 71-991] A71-45295

Combustion efficiency and performance of swirl can modules under conditions simulating operation of 10,000 pound thrust lift engine for vertical takeoff
  [NASA-TW-D-6542] N71-36767

VIBRATION DAMPING

Stability augmentation system for aircraft elastic modes control, discussing active flutter suppression technology
  A71-44107

Control surfaces and direct jet force flutter suppression system shown to increase flutter speed of wing
  A71-44108

Lifting rotors aerodynamic damping in forward flight, describing methods for blade response variance matrix computation
  A71-44108

Reduction of resonant vibrations in integrally stiffened skin-stringer panels using viscoelastic materials
  A71-44559

- VIBRATION DAMPING

Reduction of resonant vibrations in integrally stiffened skin-stringer panels using viscoelastic materials
  [AD-727773] N71-37540

VIBRATION MODE

Active flutter mode control system synthesis for flight test, showing mass balancing as possible artificial symmetrical wing destabilization
  A71-44106

VISCOELASTICITY

Reduction of resonant vibrations in integrally stiffened skin-stringer panels using viscoelastic materials
  [AD-727773] N71-37540

VISCOSITY

Aircraft fuel lubricating characteristics, discussing refining methods, viscosity, service performance and load testing
  A71-45383

VISCOSITY DRAG

Compressible flow across shaft face seals and narrow slots, examining fluid inertia, viscous friction and entrance losses
  A71-43592

VISIBILITY

Laser technique for runway and slant visibility orange, lower cloud boundary and atmospheric damping coefficient
  A71-43389

American development in automatic flight control, noting FAA requirements, pilot involvement and visibility enhancement
  A71-44856

Flight simulator for studying problems of aircraft during approaches and landings at night under category 2 visual conditions
  [RAE-AVIONICS-59(BLEU)] N71-37606

VISUAL FLIGHT RULES

European automatic flight control systems for landing in category IIIa conditions, discussing triplex system in Trident and simplex in Caravelle
  A71-44856

VISUAL PERCEPTION

Motion cue and simulation fidelity aspects of validation of general purpose airborne simulator
  [NASA-TN-D-6432] N71-36679

VOICE COMMUNICATION

Environmental and performance tests of voice initiated cockpit control and interrogation system
  [AD-72757] N71-37723

VERTICAL STRENGTHS

Aircraft generated vortex wakes and core air motions hazards for encountering light airplanes
  A71-43381

VORTICES

Aircraft wake turbulence and trailing vortices, investigating physical characteristics, hazard potential and avoidance techniques
  A71-43381

Vortex shedding from blunt trailing edge of flat plate spanning wind tunnel under oscillating flap and acoustic resonance excitations
  A71-44558

Wind tunnel study of tip vortex modification by mass flow injection
  [AD-726736] N71-36406

Hot-wire anemometer measurements of streamwise magnitudes and normal velocity components of wing tip vortex
  [NASA-TW-X-62087] N71-36679

VULNERABILITY

Computer program for analyzing and simulating attack of low flying aircraft by anti-aircraft missiles and probability of aircraft survival
  [RAE-LIB-TRANS-1578] N71-37774

WALL FLOW

AGARD report on engine-airplane interference and wall correction in transonic wind tunnel tests
  [AGARD-AR-36-71] N71-36400

WATER EROSION

Development of rain erosion resistant plastic coatings as high speed aircraft surface finish
  [AD-727750] N71-38133

WATER WAVES

Analysis of seaplane impact on planing deadrise in smooth and rough water
  [AD-727753] N71-37614

WEATHER

Weather interruption effects on air transportation operations and economics, considering fog, snow, freezing rain, thunderstorms, winds, CAT and runway conditions
  A71-49983

WEATHER MODIFICATION

SSS operation climatic impact assessment program, considering carbon dioxide, water vapor, contrails, particulates, nitrogen oxides and carbon monoxide
  A71-49982

WIND (METEOROLOGY)

Computing dispersal of atmospheric pollutants near airports by use of mean wind and temperature profiles
  [NASA-CR-11962] N71-36792
Effect of wet, icy, and snow covered runways on aircraft stopping distance and directional control in crosswinds, effect of surface texture and contamination on runway slipperiness

Effect of wet, icy, and snow covered runways on aircraft stopping distance and directional control in crosswinds, effect of surface texture and contamination on runway slipperiness


WIND EFFECTS
Horizontal temperature and wind distribution effects on aircraft buffeting in stratosphere

[RASA-TP-13978] N71-37600

WIND TUNNEL CALIBRATION
Low speed wind tunnel measurements correction for acoustic effects due to fan noise propagation

A71-44763

WIND TUNNEL MODELS
Two dimensional and three dimensional wakes in supersonic and hypersonic rarefied gas wind tunnels, comparing cone and dihedron configurations

A71-43357

Wind tunnel study of tip vortex modification by mass flow injection

[AD-726736] N71-36406

Tests on scale model configurations of C-5 aircraft to obtain data correlation on three transonic wind tunnels

[AD-727006] N71-36406

Aerodynamic characteristics of twin jet, swept wing fighter aircraft model with leading edge Kreuger flaps at subsonic speeds

[RASA-TM-I-2325] N71-36426

Wind tunnel tests of propeller driven, deflected slipstream, short takeoff aircraft model to determine longitudinal and lateral-directional stability when in ground effect

[RASA-TM-I-2313] N71-36436

Wind tunnel interference estimation for model design applications using chart method

[RASA-TM-D-6416] N71-36675

Magnus force and moment data for standard 30 degree cone calibration model as determined in supersonic wind tunnel

[SC-DC-71-3821] N71-36680

Hypersonic wind tunnel test of two delta wing orbiter models

[RASA-CR-119984] N71-38668

WIND TUNNEL STABILITY TESTS
Wind tunnel static longitudinal stability and control characteristics of cruciform delta winged missile with various horizontal canards and trailing-edge flap control between Mach 1.50 and 4.63

[RASA-TM-I-2367] N71-36415

Wind tunnel tests of stability and control characteristics of large scale model representative of propeller-driven STOL transport aircraft

[RASA-TM-D-6393] N71-36435

Wind tunnel tests of propeller driven, deflected slipstream, short takeoff aircraft model to determine longitudinal and lateral-directional stability when in ground effect

[RASA-TM-I-2313] N71-36436

Spin tunnel tests to determine effectiveness of deployable, flexible ventral fins for spin recovery device on fighter aircraft

[RASA-TM-D-6509] N71-37603

WIND TUNNELS
Computer program for calculating lift interference factors of wind tunnel test sections by vortex lattice method

[TAR-128] N71-36407

Wind tunnel interference estimation for model design applications using chart method

[RASA-TM-B-6416] N71-36675

Mach 8 variable-density tunnel used for determination of aerodynamic heating of attached inflatible decelerator configurations

[RASA-TM-I-2355] N71-38758

WING PANELS
Structural analysis of corrugated aircraft wing skin panels to determine effects of corrosion damage

[AD-728009] N71-37619

WING PROFILES
Some aspects of propulsion for augmentor wind concept

[RASA-TH-D-14005] N71-38535

WING SPAN
Minimum drag and lifting line characteristics of large aspect ratio wing in uniform shear flow with velocity variations along span

A71-43312

WINGS
Theoretical method for calculating aerodynamic loading on wing-body combinations

[RASA-TM-D-6441] N71-36411

Noise characteristics of model STOL wing with externally blown flaps in vicinity of aircraft propulsor

[RASA-CR-111956] N71-38283

WING OSCILLATIONS
Active feedback wing/store flutter control for fighter aircraft, using computer programs based on frequency and time domain for linear analysis

A71-44109

A-31
## Personal Author Index

**AERONAUTICAL ENGINEERING / A Special Bibliography (Suppl. 13)**

**January 1972**

### Typical Personal Author Index Listing


### 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., N71-11019. Under any one author's name the accession numbers are arranged in sequence with the IAA accession numbers appearing first.

### A

| ABBABS, H. | FAA flight test research approach to the SST airworthiness standards | A71-42922 |
| ADLER, M. V. | Possible roles of operation of a centrifugal stage | A71-45380 |
| ALEX, T. N. | Stability and control characteristics of a large scale deflected slipstream STOL model with a wing of 5.7 aspect ratio | [NASA-TN-D-6393] N71-36435 |
| ALTON, R. T. | The lubricating quality of aviation fuels | A71-45383 |
| AKHMEDAIEV, A. A. | Substantiation of the constraints placed on the overall excess air ratio | A71-45022 |
| AKSVYBON, A. F. | Aviation fuels, lubricants and special liquids | A71-36531 |
| ALATROTS, Y. P. | Substantiation of the constraints placed on the overall excess air ratio | A71-45022 |
| ALEXANDROV, V. O. | Technical aviation handbook | [AD-727195] N71-37613 |
| ALEXANDER, A. J. | R and B in Soviet aviation | A71-44189 |
| ALEXANDER, J. N. | Advanced lightweight portable structural concepts for shelters, hangars and maintenance docks | [AD-727055] N71-36674 |
| ALLBRE, J. | Comparative study of two-dimensional and three-dimensional wakes in supersonic and hypersonic rarefied-gas flows | A71-3357 |
| ARIBS, G. E. | Survivable flight control systems. Studies, analyses and approach. Supplement for hydraulic power and actuation studies | [AD-727761] N71-37608 |
| ANDERSON, T. | An evaluation of the automatic flight progress strip cutter and loader | A71-38215 |
| ANGER, J. W. | Pressure instruments - Their use and misuse | A71-43385 |
| ARNO, R. D. | Some considerations in the selection of aircraft for earth resource observations | [NASA-TH-X-2418] N71-37928 |
| ATHER, R. | An approach to semi-automated optimal scheduling and holding strategies for air traffic control | A71-44105 |
| AVDAMITRA, N. | The trends of the STOL system | [AIAA PAPER 71-983] A71-44579 |
| BAILEY, D. B. | Mathematical modeling of F22 wave off trajectories for TSP (Terminal State Predictor) | [AD-727121] N71-36439 |
| BALCH, J. C. | Development of atmospheric gust criteria for supersonic inlet design | [NASA-CR-113727] N71-36406 |
| BARRON, R. | Transonic flows by coordinate transformation | A71-44620 |
| BARTOS, R. | Development of atmospheric gust criteria for supersonic inlet design | A71-37381 |
| BAZIK, A. | Review of testing techniques for transonic airfoils | [NASA-TH-P-11968] N71-37593 |
| BAZOV, D. | Helicopter aerodynamics | A71-36429 |
| BECK, S. C. | Design and experimental evaluation of a high-temperature radial turbine, Phase 2 | A71-37381 |
| BECK, W. B. | The effect of weather on the operations and economics of air transportation today | A71-44983 |
| BELLBROSD, E. D. | Analytical investigation of the effects of blade flexibility, unsteady aerodynamics, and variable inflow on helicopter rotor stall characteristics | [NASA-CR-1769] N71-36404 |
| BERNHARD, R. | High temperature electronics | A71-37792 |
| BERNARD, L. | Structural integrity investigation of reworked S-2 corrugated wing skin panels | [AD-728009] N71-37619 |
| BILLINGTON, A. E. | On the fiction of leading edge suction | [ABL/SM-NOTE-360] N71-36399 |
| BINDON, J. P. | Streamline curvature analysis of compressible and high Mach number cascade flows | A71-44367 |
| BLOY, D. R. | Exploratory wind-tunnel investigation of deployable flexible ventral fins for use as an emergency spin-recovery device | NASA-TN-D-6509 | 171-37603 |
| BURSTYNOV, V. F. | Applicability of statistical methods to the analysis of the characteristics of sheet joints in aircraft structures | NASA-TN-D-6509 | 171-45012 |
| BUSI, R. M. | An airborne traffic situation display system | NASA-TN-D-6509 | 171-37042 |
| BUTLER, R. D. | The aerodynamic of synthetic turbine engine lubricants from 100 F to 700 F | NASA-TN-D-6509 | 171-36930 |
| CALVEIT, G. S. | Design and experimental evaluation of a high-temperature radial turbine, Phase 2 | NASA-TN-D-6509 | 171-37381 |
| CAMPBELL, R. E. | High temperature electronics | NASA-TN-D-6509 | 171-37792 |
| CAMPON, R. S., Jr. | Planning a program for assessing the possibility that SST aircraft might modify climate | NASA-TN-D-6509 | 171-44982 |
| CANTIMO, L. R. B. | Cloud photogrammetry from airborne time lapse photography | NASA-TN-D-6509 | 171-36990 |
| CARRICHER, A. D. | Streamline curvature analysis of compressible and high Mach number cascade flows | NASA-TN-D-6509 | 171-44347 |
| CARRICHER, J. G., Jr. | Subsonic characteristics of a twin-jet swept-wing fighter model with leading edge Krueger flaps | NASA-TN-D-6509 | 171-36426 |
| CARROLL, J. J. | Altitude... or pressure | NASA-TN-D-6509 | 171-44384 |
| CARSON, E. C. | Some measurements of porous tunnel wall interference in the 8 ft. by 9 ft. tunnel | NASA-TN-D-6509 | 171-37853 |
| CHAPMAN, C. | Digital radar system errors | NASA-TN-D-6509 | 171-37036 |
| CHARRIÈRE, P. | On the variation of intensity of aircraft radiation for night landings | NASA-TN-D-6509 | 171-42923 |
| CHATTOPADHYAY, T. K. | Aerodynamic characteristics of slender wedge wings in hypersonic strong interaction flows | NASA-TN-D-6509 | 171-44621 |
| CHEN, B. T. N. | Parameter and model identification of nonlinear dynamical systems using a suboptimal fixed-point smoothing algorithm | NASA-TN-D-6509 | 171-44113 |
| CHESTNOV, I. B. | Additives to fuels for jet-propelled aircraft | NASA-TN-D-6509 | 171-45325 |
| CHESTNUT, D. | Noise reduction by means of variable-geometry inlet guide vanes in a cascade apparatus | NASA-TN-D-6509 | 171-37601 |
| CHEY, W. A. | Tip vortices: Velocity distributions | NASA-TN-D-6509 | 171-36679 |
Comparison of thin plate and thick aerofoil blades in a centrifugal fan (NASA-238) [N71-36410]
Aerodynamic tests on a centrifugal fan impeller model with swept-back blades [NASA-CR-12020] [N71-37596]

Another look at accelerate-stop criteria

Personnel Author Index

G
GABBE, A. S.
Comparison of thin plate and thick aerofoil blades in a centrifugal fan [NASA-238] N71-36410
Aerodynamic tests on a centrifugal fan impeller model with swept-back blades [NASA-CR-12020] N71-37596

Foxborough, T. G.

Gorden, R. N.
Voice Initiated Cockpit Control and Interrogation (VICCI) system test for environmental factors [AD-727576] N71-37723

Graham, J. M. E.
The effects of an oscillating flap and an acoustic resonance on vortex shedding N71-44558

Grosbeck, D.
Peak axial-velocity decay with mixer-type exhaust nozzles [NASA-TM-X-67934] N71-37378

Gruszczynski, E.
Damage of aircraft parts by corrosion N71-44574

H
Hach, J. P.
Problems of navigation N71-37996

Hady, W. F.

Hakoda, T.
Solid-state airborne weather radar fully satisfying ARINC and TSO specifications N71-44273

Hall, L. F.
Aerodynamics of lift fan V/STOL aircraft A71-44577

Halton, C. C.
Canada's STOL program - A progress report [AIAA PAPER 71-981] N71-44578

Hanel, F.
Some new results of flight dynamics. II A71-44761

Hardies, C. E.
High temperature electronics [NASA-CR-72887] N71-37373

Harris, W. P. A.
Factors in STOL flight control configuration [AIAA PAPER 71-993] N71-45297

Hart, G. M.
Latex modification of fast-fix C-1 cement for the rapid repair of bomb-damaged runways [NASA-CR-72728] N71-38132

Hashbrook, A. S.
Aural glide slope cues: Their effect on pilot performance during in-flight simulated ILS instrument approaches [FAA-AN-71-24] N71-37682

Hayland, J. K.
Downwash-velocity potential method for lifting surfaces N71-44613

Hawkins, R. M.
Development of compressor end seals stator interstage seals, and stator pivot seals in advanced air breathing propulsion systems. Part 2: Experimental data and analysis [NASA-CR-728077] N71-37373

Hayer, R. E.
Aerodynamic sound radiation from lifting surfaces with and without leading-edge serrations [NASA-CR-714370] N71-36422

Hazarovsey, D.
Calculation of lift interference corrections due to wind tunnel test section boundaries by the vortex lattice method [TAE-124] N71-36407

Heringway, J. L.
Trust your altimeter N71-43366

Hersh, A. S.
Aerodynamic sound radiation from lifting surfaces with and without leading-edge serrations [NASA-CR-714370] N71-36422

Hersh, S.
Supersonic combustion chemistry and mixing of high energy density fuels related to advanced air-breathing engine design [AD-727882] N71-38530
NEILL, C. L.
Calculation of potential flow about arbitrary three-dimensional lifting bodies [AD-727620] N71-37597

HAYSON, R. H.

HILST, G. R.
Computing dispersal of atmospheric pollutants near airports [NASA-CR-111962] N71-36720

HODDIN, R. K.
Aerodynamics of lift fan V/STOL aircraft [AIAA PAPER 71-981] A71-44577

HOPKINS, M. E.
Alternative ATA co-channel separation criteria based on probability-of-interference considerations [IST-1013] N71-37712

HOPPARTH, L. G.
Minimum order state reconstruction filters for constant plants A71-44077

HORNE, W. B.
Determining causation of aircraft skidding accidents or incidents A71-43228

HOSTON, R. P.
Adiabatic laminar boundary-layer/shock-wave interactions on flared axisymmetric bodies A71-44604

HOBOLT, J. C.

HODGE, D.
The feasibility of the large freighthouse [REPT-5] N71-36425

HUFF, R.
Peak axial-velocity decay with mixer-type exhaust nozzles [NASA-TH-6-67934] N71-37378

HULL, D. J.
Supersonic airfoils of minimum total drag [AD-726767] N71-36409

BUTCHERSON, E. L.
Corporate training A71-43388

ILLSTON, F.
Altitude awareness A71-43383

IYANOVA, R. A.
Influence of fuselage strains on the work of a small-aspect-ratio wing A71-45018

JAAAS, M.
Engine-airplane interference in transonic tests N71-36402

JACKSON, C. R., Jr.
A method for calculating the aerodynamic loading on wing-body combinations at small angles of attack in supersonic flow [NASA-TH-9-6441] N71-36411

JACKSON, R. Y.
Development of rain-erosion-resistant coatings for high-speed aircraft [AD-727750] N71-38133

JAIN, R.
The effect of dazzle on electronic displays [RAE-TR-738-1565] N71-37621

JOHANNES, R. P.
Active flutter control - Flight test system synthesis A71-44106

JOHNSON, R. L.
Compressible flow across shaft face seals A71-43592

JONES, C.
Exploratory development program on the rotating combustion engine using the RC1-90 test rig [AD-727745] N71-36760

JONES, C. L.
Survivable flight control system. Studies, analyses and approach. Supplement for hydraulic power and actuation studies [AD-727763] N71-37608

JONES, L. W.
Liquid hydrogen as a fuel for the future A71-44365

JOHST, G. S.
A survey of fatigue life variability in aluminum alloy aircraft structures [AIRSMKR-REPORT-329] N71-37524

JOHNER, G. T.
Determining causation of aircraft skidding accidents or incidents A71-43228

JOLLIFF, R. J.
Integrated system of control and operation of aircraft A71-44353

K.

KAATARI, G. K.
Prediction of centerline shock-layer thickness and pressure distribution on delta wing-body configurations [NASA-TH-D-6550] N71-36418

KARPOV, Y. V.
Experimental study of the operation of axial-flow compressors during rotation of the guide vanes A71-43554

KASPER, A.
Proceedings of the National Conference on Data Processing N71-37742

KASS, G. J.
Active flutter suppression - An emerging technology A71-44107

KEEGAN, E. W.
The challenge of aircraft crash fire rescue A71-43389

KETCHUM, R. D., Jr.
Airborne laser profiling of the Arctic pack ice A71-44986

KHODKOV, V. A.
Retardation of condensate particle crystallization in a jet engine nozzle A71-45004

KIRK, J. V.
Aerodynamics of lift fan V/STOL aircraft [AIAA PAPER 71-981] A71-44577

KISSLINGER, R. L.
Survivable flight control systems. Studies, analyses and approach. Supplement for control criteria studies [AD-727762] N71-37616

KLOPPER, R. B.
Calculation of nonlinear conical flows by the method of lines [NASA-TR-8-374] N71-36697

KONAROV, V. A.
Influence of fuselage strains on the work of a small-aspect-ratio wing A71-45018

KONRAD, T. G.
Radar observations of the convective process in the clear air - A review. II A71-43088

KORNETZ, I. N.
Conversion of several computational algorithms for decreasing the length of the word form at of control computers for aircraft [AD-727917] N71-37772

KOSTIN, V. E.
Retardation of condensate particle crystallization in a jet engine nozzle A71-45004

KOSHERNOVA, L. P.
Selecting the geometry of a two-dimensional variable-geometry nozzle for a supersonic wind tunnel A71-44071

KROY, W. H., Jr.
Identification of aircraft states and parameters A71-44089

KUHOKAWA, A.
Solid-state airborne weather radar fully satisfying ABNC and TSO specifications A71-44273
### PERSONAL AUTHOR INDEX

<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILLER, H. E.</td>
<td>The ram-wing surface effect vehicle comparison of one-dimensional theory with wind tunnel and free flight results</td>
<td>N71-36469</td>
</tr>
<tr>
<td>MILLER, W. W.</td>
<td>A versatile C band radar transmitter</td>
<td>N71-36419</td>
</tr>
<tr>
<td>MISSENBOD, R.</td>
<td>Aerodynamic heating at Mach 6 of attached inflatable decelerator configurations</td>
<td>N71-38758</td>
</tr>
<tr>
<td>MOIWARD, J.</td>
<td>Measurements of velocities in a subsonic wind tunnel /0.10 less than V less than 20 m/sec/</td>
<td>N71-44763</td>
</tr>
<tr>
<td>NOLDESKJ, C. M.</td>
<td>A remote-sensing investigation of four Mojave playas. Environmental research papers</td>
<td>N71-36748</td>
</tr>
<tr>
<td>NOYI, R.</td>
<td>Wall corrections for airplanes with lift in transonic wind tunnel tests</td>
<td>N71-36403</td>
</tr>
<tr>
<td>ORBITA, K.</td>
<td>Lifting line theory of a wing in uniform shear flow</td>
<td>N71-43312</td>
</tr>
<tr>
<td>ROSCHETZKY, G.</td>
<td>Voice Initiated Cockpit Control and Interrogation (VICCI) system test for environmental factors</td>
<td>N71-37723</td>
</tr>
<tr>
<td>ROYTSLOV, L. A.</td>
<td>Integration of the kinematic equations of an astatic gyroscope</td>
<td>N71-45160</td>
</tr>
<tr>
<td>NREL, J. T.</td>
<td>A remote-sensing investigation of four Mojave playas. Environmental research papers</td>
<td>N71-36748</td>
</tr>
<tr>
<td>NEWART, J. E.</td>
<td>The detection of hot corrosion-sulfidation in Navy aircraft turbine engines</td>
<td>N71-45280</td>
</tr>
<tr>
<td>NIXON, R.</td>
<td>Convention for the suppression of unlawful seizure of aircraft</td>
<td>N71-37590</td>
</tr>
<tr>
<td>OGSTON, A. E.</td>
<td>Aviation feals and their safety aspects</td>
<td>N71-43231</td>
</tr>
<tr>
<td>OAKPU, O.</td>
<td>Design and experimental evaluation of a high-temperature radial turbine, PHASE 2</td>
<td>N71-37381</td>
</tr>
<tr>
<td>OLSEN, J. B.</td>
<td>Design and operation of the BSBL water tunnel</td>
<td>N71-37827</td>
</tr>
<tr>
<td>OLSEN, W. A.</td>
<td>Preliminary tests of the mixer nozzle concept for reducing blowout flame noise</td>
<td>N71-36424</td>
</tr>
<tr>
<td>OSTRAVSKYI, I. V.</td>
<td>Flight dynamics: Aircraft trajectories</td>
<td>N71-37602</td>
</tr>
<tr>
<td>PADAEKANATA, S.</td>
<td>Experimental study of rotor unsteady airloads due to blade-vortex interaction</td>
<td>N71-37598</td>
</tr>
<tr>
<td>PAGN, W. B.</td>
<td>Stability and control characteristics of a large scale deflected slipstream STOL model with a wing of 5.7 aspect ratio</td>
<td>N71-36435</td>
</tr>
<tr>
<td>PARK, J. K.</td>
<td>Large-scale wind-tunnel tests of a propeller-driven deflected slipstream STOL model in ground effect</td>
<td>N71-36618</td>
</tr>
<tr>
<td>PALEJ, J.</td>
<td>TUG-3: A computer program for simulating the attack of low flying aircraft by anti-aircraft missiles</td>
<td>N71-36688</td>
</tr>
<tr>
<td>PAPAGELIS, B. S., JR.</td>
<td>The design and analysis of a fully-flexible ram-air inflated parawing</td>
<td>N71-37774</td>
</tr>
<tr>
<td>PAPADAKIS, Y. M.</td>
<td>Combustion chambers of gas turbine engines</td>
<td>N71-38542</td>
</tr>
<tr>
<td>PFEFFER, J. C.</td>
<td>Integrated system of control and operation of aircraft</td>
<td>N71-44353</td>
</tr>
<tr>
<td>PENG, T. K. C.</td>
<td>Adaptive guaranteed cost control of systems with uncertain parameters</td>
<td>N71-44111</td>
</tr>
<tr>
<td>PETT, N. I.</td>
<td>US international air cargo markets, 1970</td>
<td>N71-38794</td>
</tr>
<tr>
<td>PHILLIPS, W. P.</td>
<td>Evaluation of breaking performance of a light, twin-engine airplane on grooved and ungrooved pavements</td>
<td>N71-36631</td>
</tr>
<tr>
<td>POLCH, P. C.</td>
<td>Water-depth measurement by wave refraction and multispectral techniques</td>
<td>N71-37862</td>
</tr>
<tr>
<td>POLWAR, A. N.</td>
<td>Rocket carrying aviation (selected chapters)</td>
<td>N71-37618</td>
</tr>
<tr>
<td>POPE, J. C.</td>
<td>Don't call them air carrier airports</td>
<td>N71-43235</td>
</tr>
<tr>
<td>POSTER, L. W.</td>
<td>An approach to semi-automated optimal scheduling and holding strategies for air traffic control</td>
<td>N71-44105</td>
</tr>
<tr>
<td>POVINELLI, V. F.</td>
<td>Development of mainshaft seals for advanced air breathing propulsion systems, phase 3</td>
<td>N71-38022</td>
</tr>
<tr>
<td>POWERS, J. O.</td>
<td>Federal policy and planning on the aircraft environment</td>
<td>N71-38792</td>
</tr>
<tr>
<td>PSZPENICZNY, V. D.</td>
<td>The efficiency of single-row impulse stages on the basis of Soviet test data</td>
<td>N71-36704</td>
</tr>
<tr>
<td>PURKINGE, R. W.</td>
<td>STOL: The agony and the ecstasy</td>
<td>N71-37605</td>
</tr>
<tr>
<td>PYERFORD, T. A.</td>
<td>Use of a correlation system of equations for accuracy analysis in flight dynamics problems</td>
<td>N71-46992</td>
</tr>
<tr>
<td>RADOVSKY, M. P.</td>
<td>An algorithm for search of compromise control in static hierarchical systems</td>
<td>N71-44393</td>
</tr>
<tr>
<td>RAPPIN, E.</td>
<td>Comparative study of two-dimensional and three-dimensional wakes in supersonic and hypersonic rarefied-gas flows</td>
<td>N71-43357</td>
</tr>
<tr>
<td>RAGSDALE, W. C.</td>
<td>Magnus data on the standard 10 deg cone calibration model</td>
<td>N71-36688</td>
</tr>
<tr>
<td>RANG, E. E.</td>
<td>A nonvarying-C&quot; control scheme for aircraft</td>
<td>N71-44093</td>
</tr>
<tr>
<td>RASUDSENN, P. C.</td>
<td>Aural glide slope cues: Their effect on pilot performance during in-flight simulated ILS instrument approaches</td>
<td>N71-37682</td>
</tr>
<tr>
<td>RAY, R. J.</td>
<td>Subsonic characteristics of a twin-jet swept-wing fighter model with leading edge Krueger flaps</td>
<td>N71-36426</td>
</tr>
<tr>
<td>REED, J. F.</td>
<td>Magnus data on the standard 10 deg cone calibration model</td>
<td>N71-36688</td>
</tr>
</tbody>
</table>
**PERSONAL AUTHOR INDEX**

<table>
<thead>
<tr>
<th>Name</th>
<th>Paper Title</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEES, G. E.</td>
<td>Analog simulation of a guided parachute-payload system</td>
<td>[NASA-DR-710097] N71-36427</td>
</tr>
<tr>
<td>BEFFOT, G.</td>
<td>Photo-optical calibration of aeronautics radio navigation aids</td>
<td>A71-43587</td>
</tr>
<tr>
<td>BEHABT, S. A.</td>
<td>Low-cycle fatigue evaluation for regeneratively cooled panels</td>
<td>[NASA-CR-1884] N71-38734</td>
</tr>
<tr>
<td>BEHABT, D. B.</td>
<td>Forecast of scheduled domestic air cargo for the 50 States, 1971 - 1975</td>
<td>N71-38793</td>
</tr>
<tr>
<td>BISS, G. E.</td>
<td>Development of an operational system for measuring ocean surface current from aircraft</td>
<td>[AD-726568] N71-37922</td>
</tr>
<tr>
<td>BISE, B. B.</td>
<td>An experimental study of tip vortex modification by mass flow injection</td>
<td>[AD-726736] N71-36406</td>
</tr>
<tr>
<td>BISHEL, B. 8.</td>
<td>An application of stochastic optimal control theory to the optimal rescheduling of airplanes</td>
<td>N71-44704</td>
</tr>
<tr>
<td>BODKIERICZ, C. B.</td>
<td>Prediction of in flight fluctuating pressure environments including protuberance induced flow</td>
<td>[NASA-CR-119447] N71-36677</td>
</tr>
<tr>
<td>BODKIERICZ, F. B.</td>
<td>Aerodynamic characteristics of slender wedge wings in hypersonic strong interaction flows</td>
<td>A71-4621</td>
</tr>
<tr>
<td>BOW, E.</td>
<td>Large nuclear-powered subsonic aircraft for transoceanic commerce</td>
<td>[NASA-TM-1-2386] N71-38277</td>
</tr>
<tr>
<td>BOW, J. J.</td>
<td>Calculation of lift interference corrections due to wind tunnel test section boundaries by the vortex lattice method</td>
<td>[TAE-124] N71-36407</td>
</tr>
<tr>
<td>BURGEL, B. M.</td>
<td>Remote sensing applications in forestry. The development of an earth resources information system using aerial photographs and digital computers</td>
<td>[NASA-CR-122922] N71-36770</td>
</tr>
<tr>
<td>BURK, W.</td>
<td>In-flight monitoring and engine reliability</td>
<td>A71-43233</td>
</tr>
<tr>
<td>SAGINOR, I.</td>
<td>Forecast of scheduled domestic air cargo for the 50 States, 1971 - 1975</td>
<td>N71-38793</td>
</tr>
<tr>
<td>SANKOV, V. A.</td>
<td>Determination of transient functions and impulse transient functions for an aircraft in its steady motion by the method of Laplace-Carson integral transforms</td>
<td>A71-45016</td>
</tr>
<tr>
<td>SARKES, C.</td>
<td>Performance and fire tests of high temperature cabin pressure sealant and insulating materials</td>
<td>[FAA-R-71-22] A71-38169</td>
</tr>
<tr>
<td>SAWEH, W. C.</td>
<td>A method for calculating the aerodynamic loading on wing-body combinations at small angles of attack in supersonic flow</td>
<td>[NASA-TM-0-69441] N71-36411</td>
</tr>
<tr>
<td>SCHIFFER, R. S.</td>
<td>An airborne pyrotechnic cloud seeding system and its use</td>
<td>[ESSA-TM-EELTM-APCL-5] N71-36985</td>
</tr>
<tr>
<td>SCHMIDT, M. H.</td>
<td>Remarks on the paper of M. D. C. Whitley (paper no. 15): Some aspects of propulsion for the augmentor wing concept</td>
<td>N71-38535</td>
</tr>
</tbody>
</table>

**Note:** The papers are represented in a formatted table for clarity. Each entry includes the author's name, the title of the paper, and the citation in the format used in the document.
PERSONAL AUTHOR INDEX

SOLOVEV, G. S.
Possible roles of operation of a centrifugal stage
A71-45380

SOUTH, J. C., JR.
Calculation of nonlinear conical flows by the method of lines
[NASA-TR-8-374]
A71-36697

STANLEY, W. B.
Doppler radar simulation studies
[NASA-CH-1776]
A71-36548

STARK, D. A.
Analog simulation of a guided parachute-payload system
[SC-DR-710097]
A71-36427

STEPHENSKI, W. E.
The reduction of VTO operational noise through flight trajectory management
[AIAA PAPER 71-991]
A71-45295

STEWART, S. R.
Water-depth measurement by wave refraction and multi-spectral techniques
[NASA-CR-123794]
A71-37862

STIVERS, L. S., JR.
Calculated pressure distributions and components of total-drag coefficients for 18 constant-volume, slender bodies of revolution at zero incidence for Mach numbers from 2.0 to 12.0, with experimental aerodynamic characteristics for three of the bodies
[NASA-TR-8-6536]
A71-36416

STONG, R. A.
Noise survey: A turboshaft power plant coupled to a mobile test bed
[DET-N-788]
A71-37113

STRAHL, W. C.
On combustion generated noise
A71-43448

SUBELJ, Y.
Solid-state airborne weather radar fully satisfying ARINC and TSO specifications
A71-44273

SUNILKOVIC, W. T.
Techniques of system reliability estimation, including failure effect analysis (failure consequence)
A71-36777

Scheinberg, E.
Effectiveness of reliability program elements
A71-36779

SYCHOWICZ, B.
Damage of aircraft parts by corrosion
A71-44574

SYVERTON, C. A.
The CAND Study - What is its impact
A71-44602

SIALA, L. J.
Motion cue and simulation fidelity aspects of the validation of a general purpose airborne simulator
[NASA-TR-8-6432]
A71-36677

Validation of a general purpose airborne simulator for simulation of large transport aircraft handling qualities
[NASA-TR-8-6431]
A71-37823

SZUBANSKI, K.
Optimum autorotation landing parameters for a helicopter
A71-43090

TALL, R. N.
Cost effectiveness of built-in-test provisions
A71-36780

Relationships between program test and user support costs
A71-36784

TANQUERTY, A. C.
Development of rain-erosion-resistant coatings for high speed aircraft
AD-727950
A71-38133

TEMPEL, W. B.
Low speed aerodynamics and the Science Council's national goals
A71-38627

THEORETICAL, B.
The heavy lift helicopter program - An advanced technology solution to transportation problems
A71-45296

TENG, J.
Chemical and physical study of fuels gelled with carbohydrate resins
[FFRA-NA-71-18]
A71-37369

THOMPSON, G. O.
Active flutter suppression - An emerging technology
A71-49107

TISHCH, A. F.
Retardation of condensed particle crystallization in a jet engine nozzle
A71-45930

TITENSKE, V. I.
Experimental study of the operation of axial-flow compressors during rotation of the guide vanes
A71-43554

TOPP, L. J.
Potential performance gains by use of a flutter suppression system
A71-44108

TOPTUNOV, A. N.
Profiling the temperature field along the radius in front of a turbine stage
A71-45011

TRESCOT, C. D., JR.
Longitudinal aerodynamic characteristics at Mach 1.50 to 4.63 of a missile model employing various canards and a trailing edge flap control
[NASA-TR-8-2367]
A71-36415

TREPLITT, W. E.
A feasibility study of active wing/store flutter control
A71-44109

THOMAS, D. H.
An investigation of the flow around rectangular cylinders
[IC-AERO-71-15]
A71-36695

USKOV, G. V.
The use of a correlation system of equations for accuracy analysis in flight dynamics problems
A71-44692

VAGLIO-LAUDON, R.
Transonic flows by coordinate transformation
A71-44620

VAN BOSSEL, J.
Remote sensing applications in forestry. The development of an earth resources information system using aerial photographs and digital computers photographs and digital computers
[NASA-CR-122922]
A71-36770

VAUGHN, H.
Analog simulation of a guided parachute-payload system
[SC-DR-710097]
A71-36427

VERMEER, P. E.
A survey of fatigue life variability in aluminum alloy aircraft structures
A71-37524

VOLKOVICH, V. L.
An algorithm for search of compromise control in static hierarchical systems
A71-44939

VOGHL, U.
Peak axial-velocity decay with mixer-type exhaust nozzles
[NASA-TR-8-67938]
A71-37378

WAGNER, P. M.
Folding sidewall aircraft tires
A71-44975

WAITEFIELD, W. B.
Advanced lightweight portable structural concepts for shelters, hangars and maintenance docks
[AD-727956]
A71-36674

WALLACE, B.
An experimental measurement of galactic cosmic radiation dose in conventional aircraft between San Francisco and London compared to theoretical values for conventional and supersonic aircraft
[UCEE-72009]
A71-38552

WADD, A. G., III
Impact on plates on elastic foundations
A71-37543
WASSERSTROM, E.
Calculation of lift interference corrections due to wind tunnel test section boundaries by the vortex lattice method

[TEK-124] N71-36407

WATT, C. A.
Trim, control, and stability of a gyro-stabilized hingeless rotor at high advance ratio and low rotor speed
[NASA-CR-114362] N71-37594

WEBEL, B. J.
Survivable flight control system. Studies, analyses and approach. Supplement for control criteria studies
[AD-727762] N71-37616

WESTON, J. A.
A versatile C band radar transmitter
[AD-727006] N71-37707

WHITE, R. P., Jr.
An experimental study of tip vortex modification by mass flow injection
[AD-726736] N71-36406

WILCOX, R. N.
Alternative ATC co-channel separation criteria based on probability-of-interference considerations
[IST-101] N71-37712

WINDEBANK, A. E.
An evaluation of the automatic flight progress strip cutter and loader
[ACFMR-330] N71-38215

WITTIG, W.
The integral equation of the supporting rectangular plane in symmetric flow
A71-63487

WOLFF, W.
Test report—Acrostar Mk. II
A71-43887

WOLOSCHIN, F.
The control system of the Tu-154
A71-42927

WOODLEY, L. L.
An airborne pyrotechnic cloud seeding system and its use
Cloud photogrammetry from airborne time lapse photography
N71-36990

Y

YAGER, T. J.
Evaluation of breaking performance of a light, twin-engine airplane on grooved and ungrooved pavements
[NASA-TR-D-64484] N71-36431

Z

ZIEGLER, R.
Laser technique for determining the meteorological visibility range at airports
A71-43889

ZUK, J.
Compressible flow across shaft face seals
A71-43592

ZUSCHLAG, W. R.
A step toward automatic air traffic control
A71-43888
Typical Contract Number Index Listing

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>NASA Accession Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF 33/615-69-C-1359</td>
<td>N71-10021</td>
</tr>
<tr>
<td>AF-AFOSR-7146-69</td>
<td>N71-44077</td>
</tr>
<tr>
<td>DA-28-043-ARC-2811-5</td>
<td>N71-36409</td>
</tr>
<tr>
<td>DAAJ01-71-C-0503</td>
<td>N71-36432</td>
</tr>
<tr>
<td>DAAJ02-68-C-0003</td>
<td>N71-37381</td>
</tr>
<tr>
<td>DACA39-70-C-0022</td>
<td>N71-36132</td>
</tr>
<tr>
<td>DI-14-08-001-12682</td>
<td>N71-36013</td>
</tr>
<tr>
<td>DOT-CG-10377-A</td>
<td>N71-37922</td>
</tr>
<tr>
<td>DOT-FAT07KA-497</td>
<td>N71-37349</td>
</tr>
<tr>
<td>DMR-52S5/68</td>
<td>N71-43357</td>
</tr>
<tr>
<td>P19628-70-C-0203</td>
<td>N71-37042</td>
</tr>
<tr>
<td>P33615-69-C-1265</td>
<td>N71-36930</td>
</tr>
<tr>
<td>P33615-69-C-1582</td>
<td>N71-37609</td>
</tr>
<tr>
<td>P33615-69-C-1719</td>
<td>N71-36674</td>
</tr>
<tr>
<td>P33615-69-C-1927</td>
<td>N71-37608</td>
</tr>
<tr>
<td>P33615-70-C-1053</td>
<td>N71-37792</td>
</tr>
<tr>
<td>P54600-72-C-0003</td>
<td>N71-36408</td>
</tr>
<tr>
<td>P54620-70-C-0061</td>
<td>N71-36865</td>
</tr>
<tr>
<td>P61052-68-C-0027</td>
<td>N71-35350</td>
</tr>
<tr>
<td>NASA ORD88 W-12996</td>
<td>N71-36770</td>
</tr>
<tr>
<td>NASW-2035</td>
<td>N71-37593</td>
</tr>
<tr>
<td>NASW-2037</td>
<td>N71-36535</td>
</tr>
<tr>
<td>NASW-2038</td>
<td>N71-37600</td>
</tr>
<tr>
<td>NASW-2039</td>
<td>N71-36398</td>
</tr>
<tr>
<td>NASW-6350</td>
<td>N71-36404</td>
</tr>
<tr>
<td>NAS1-9200</td>
<td>N71-36421</td>
</tr>
<tr>
<td>NAS1-10192</td>
<td>N71-36720</td>
</tr>
<tr>
<td>NAS1-11019</td>
<td>N71-38283</td>
</tr>
<tr>
<td>NAS1-12002</td>
<td>N71-38734</td>
</tr>
<tr>
<td>NAS2-4515</td>
<td>N71-37835</td>
</tr>
<tr>
<td>NAS2-5168</td>
<td>N71-37594</td>
</tr>
<tr>
<td>NAS2-5976</td>
<td>N71-36422</td>
</tr>
<tr>
<td>NAS3-7605</td>
<td>N71-37373</td>
</tr>
<tr>
<td>NAS3-7609</td>
<td>N71-38022</td>
</tr>
<tr>
<td>NAS3-10482</td>
<td>N71-37836</td>
</tr>
<tr>
<td>NASB-4016</td>
<td>N71-38668</td>
</tr>
<tr>
<td>NASB-25700</td>
<td>N71-36677</td>
</tr>
<tr>
<td>NASB-3700</td>
<td>N71-37862</td>
</tr>
<tr>
<td>NGB-39-009-111</td>
<td>N71-37598</td>
</tr>
<tr>
<td>NGR-47-003-015</td>
<td>N71-36548</td>
</tr>
<tr>
<td>NOHRE-4761(00)</td>
<td>N71-37928</td>
</tr>
<tr>
<td>NSP GP-11956</td>
<td>N71-43347</td>
</tr>
</tbody>
</table>

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.
This special bibliography lists 283 reports, articles, and other documents introduced into the NASA scientific and technical information system in December 1971. Emphasis is placed on engineering and theoretical aspects for design, construction, evaluation, testing, operation and performance of aircraft (including aircraft engines) and associated components, equipment and systems. Also included are entries on research and development in aeronautics and aerodynamics and research and ground support for aeronautical vehicles.
PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA deposits its technical documents and bibliographic tools in eleven Federal Regional Technical Report Centers located in the organizations listed below. Each center is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

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

MISSOURI
Kansas City Public Library
St. Louis Public Library
NEW JERSEY
Trenton Public Library

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
Cosby-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 ST4R. 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