

BIBLIOGRAPHY OF NASA PUBLISHED REPORTS ON GENERAL AVIATION, 1975 TO 1981

(1981 EDITION)

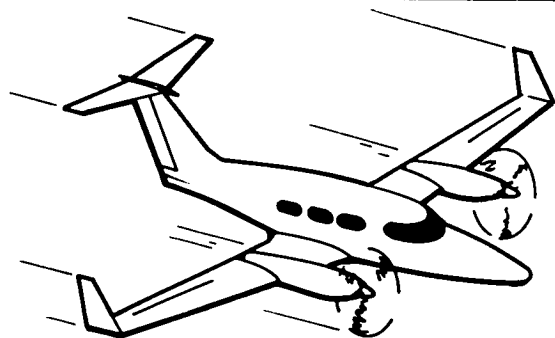
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**BIBLIOGRAPHY OF
NASA PUBLISHED REPORTS
ON GENERAL AVIATION,
1975 TO 1981**

(1981 EDITION)

NASA
National Aeronautics and
Space Administration

NASA Headquarters
Washington, DC 20546

OAST
Office of Aeronautics
and Space Technology



FOREWORD

This bibliography lists 478 documents generated by the NASA aeronautics program during the period 1975 through the first quarter of 1981, which relate to general aviation or which are judged to be of specific interest to those involved in general aviation. General aviation in this context includes all heavier-than-air fixed wing aircraft exclusive of military types and those used for commercial air transport. An exception is the recent inclusion of commuter transport aircraft types within the general aviation category.

NASA publications included in this bibliography are:

- o Conference Publications (CP)
- o Reference Publications (RP)
- o Technical Memorandums (TM, TMX)
- o Technical Notes (TN)
- o Technical Papers (TP)
- o Contractor Reports (CR)

In addition, papers and articles on NASA general aviation programs published by technical societies (AIAA, SAE, etc.) are included, as well as those listed in NASA's Scientific and Technical Aerospace Reports (STAR) Journal. Author and subject indexes are also provided to facilitate use of the bibliography.

This bibliography was compiled and edited by Dr. Raymond E. Rose, Program Manager, General Aviation Office, NASA Headquarters, Washington, D. C. He expresses his appreciation to Mr. Philip F. Eckert, Manager, Reference and Retrieval Department, and Ms. June Silvester, Reference Analyst, both of the NASA Scientific and Technical Information (NSTI) Facility for help in compiling the report bibliography and author and subject indexes, and to Mr. John H. Wilson, Jr., Information Systems Specialist, NSTI Branch, for his special assistance in developing the bibliography.



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NASA'S GENERAL AVIATION RESEARCH AND TECHNOLOGY PROGRAM

Over the years, much of the NASA and the predecessor NACA research in aeronautics has had wide applicability to general aviation even though largely focussed on other aircraft types and applications. In addition, from time to time and particularly within the last decade, NASA has allocated a portion of its research resources to technical opportunities and needs specifically applicable to general aviation aircraft and their operation. This research has been focussed on the broad objectives of improved safety, greater energy efficiency, increased utility and productivity, and environmental compatibility. To accomplish these broad objectives, the program has aimed at obtaining greater understanding of the basic phenomena and processes involved in the design and operation of general aviation aircraft, through obtaining useful physical data from laboratory and flight research, and developing useful theories, analysis and design methods.

Resources allocated annually to general aviation needs and applications in the last decade have ranged from about 2 to 5 percent of the NASA aeronautics funding and manpower budgets. In Fiscal Year 1981, approximately \$8.5 million has been allocated specifically to commuter and general aviation research and technology, and it is estimated that approximately another \$2 million devoted to aeronautics fundamentals and/or to other specific air vehicle types is also applicable to commuter and general aviation.

NASA's commuter and general aviation programs are conducted by the Langley Research Center, Hampton, Virginia, and the Lewis Research Center, Cleveland, Ohio, with the support of the Ames Research Center, Moffett Field, California, and the Wallops Flight Center, Wallops Island, Virginia. Approximately 40 percent of the general aviation program is conducted in-house at NASA Centers by Civil Service employees (researchers, engineers, technicians and other support staff) and support service contractors using NASA facilities. Approximately 60 percent of the program is conducted by industry and universities under research contracts and grants from the NASA Centers, and is monitored and managed by NASA Center personnel.

The commuter and general aviation program encompasses all the aeronautical disciplines. Current research emphases are as follows:

- o Aerodynamics and Flight Dynamics
 - Stall/spin avoidance and/or alleviation
 - Airfoil and wing technology
 - Drag reduction techniques
 - Improved configurations for efficiency, handling qualities, ride qualities, aerodynamic integration
- o Propulsion
 - Propellers: increased efficiency, reduced noise
 - Engines: combustion and heat transfer, advanced engines (increased fuel efficiency, reduced weight and cost, lower emissions, improved controls and operation)
- o Structures and Materials
 - Crash dynamics, energy absorbing and load limiting structures
 - Low cost composites
- o Avionics and Human Factors
 - Improved sensors, displays, navigation concepts
 - Single pilot IFR system improvements
- o Agricultural Aerial Applications
 - Wake prediction and modification for improved uniformity, accuracy, productivity, and safety
 - Improved liquid and solid material dispersal systems

- o Icing
 - Fundamentals of ice formation and accretion
 - Anti-icing and deicing system concepts
- o Interior Noise Reduction
 - Source and transmission
 - Noise reduction design technology

Current year program objectives are described in the Research and Technology Objectives and Plans (RTO) Summary (NASA-TM-82189, Accession No. N81-19959).



NASA BIBLIOGRAPHY OF GENERAL AVIATION REPORTS

This is the second publication of a NASA bibliography of general aviation reports and covers the period from 1975 to early 1981. The first publication covered the period from 1966 to 1975. This bibliography contains abstracts of published works as primarily obtained from the NASA/RECON (Remote Console for the bibliographical retrieval data base system) reporting system. The abstracts are preceded by a listing of document numbers and titles according to report category. General aviation reports in publication are not listed (this could include some reports from late 1980) and will appear in the next general aviation bibliography publication.

Most of the published reports cited are available in either hard copy or microfiche through the National Technical Information Service (NTIS), Springfield, VA 22151; the Government Printing Office (GPO), Washington, D.C. 20402; or the Technical Information Service, AIAA Inc., 750 3rd Ave., New York, N.Y. 10017, (212) 867-8300. In particular, reports containing the letter "N", in the Accession No., such as 78N31874, can be obtained from NTIS, while reports containing the letter, "A", in the Accession No. (77A17069) are more readily obtained from the Technical Information Service, AIAA Inc. Please refer to the Accession No. when requesting publications.

Notations

The following notations are used in the report title listings and bibliography:

ABS	Abstract
AUTH	Author(s)
IAA	International Aerospace Abstracts (refers to IAA Journal produced for NASA by the AIAA, issued on the 1st and 15th of each month)
MAJS	Major subject
MINS	Minor subject
RPT#	Report number
STAR	Scientific and Technical Aerospace Reports (refers to NASA's STAR Journal* publication, issued on the 8th and 23rd of each month)
UTTL	Unclassified report title

- 78AXXXXX Report accession number. The number, "78", or a corresponding number, refers to the calendar year in which the report was entered into the NASA/RECON reporting system. The letter, "A", indicates that the report is published in the IAA Journal. The remaining five digits complete the accession number.
- 79NXXXXX Report accession number. The letter, "N", indicates that the report is published in NASA's STAR publication. (In many cases the letter "N" or "A" in the accession number is interchanged with the calendar year number, such as N79-XXXXX.)
- 80/11/21 Example of an official report publication date - year/month/day

* The NASA STAR Journal is a journal of abstracts and is a major component of a comprehensive NASA information system covering aeronautics, space and supporting disciplines. The STAR is issued on the 8th and 23rd of each month and announces current publications of the following types:

- o NASA, NASA contractor, and NASA grantee reports
- o Reports issued by other U.S. Government agencies, domestic and foreign institutions, universities, and private firms
- o Translations in report form
- o NASA-owned patents and patent applications
- o Dissertations and theses

A separate section of information on aerospace-related on-going research projects is also included in STAR. Cumulative index volumes of STAR are published semiannually and annually.

Use of Bibliography

This bibliography is presented in four sections: Section 1, Title Listings by Report Category; Section 2, Report Abstracts; Section 3, Subject Index Listing; and Section 4, Personal Author Index.

Section 1, Title Listings by Report Category, contains the report titles grouped according to the category of the report - CP, TM, etc. The titles are presented by report number in increasing

numerical sequence and, in general, are grouped according to calendar year (starting with 1975, where applicable) as indicated by the report accession number. An exception to the increasing numerical sequence rule occurs with some contractor reports (CR). Because of the peculiarities of the computer system used in the NASA/RECON reporting system, the first digit of the CR report numbers are listed in increasing numerical sequence, but all CR reports having the same first digit are listed before the CR reports having a larger first digit regardless of the size of the total report number. For example, CR's such as NASA CR-132531 (starting with the digit "1") will be listed ahead of CR's starting with a higher digit, such as NASA CR-2523, regardless of the size of the report number. However, following the first digit the reports are still listed in increasing numerical sequence.

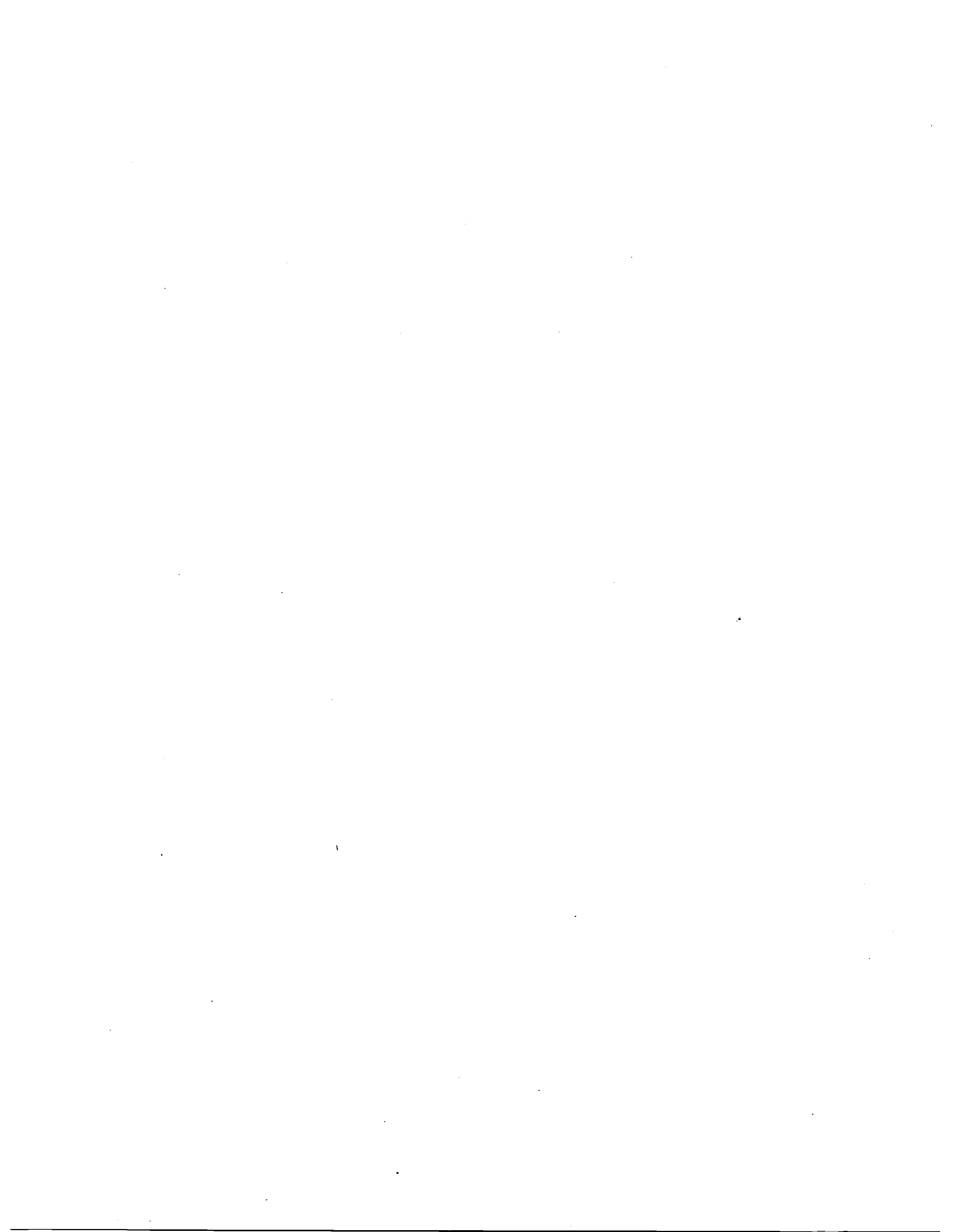
If the NASA report number or title is known and the approximate year of publication, the page containing the report abstract and other pertinent information, can be found from the report title listings. As an example, if a particular Technical Memorandum (TM) is required, one can look in the TM section of the report listings in the calendar year group indicated by the accession numbers. In some cases where the report publication date is near the end of the calendar year, it may not have been entered into the NASA/RECON reporting system until the following calendar year and would, therefore, appear in that year's grouping as indicated by accession number.

In the case of AIAA, SAE and other papers, the papers are grouped according to calendar year of publication, alphabetically and in increasing numerical sequence.

Section 2, Report Abstracts, contains a definition of the various report categories -- CP, TM, CR, etc.; and in addition to information given in Section 1, presents the report author(s), major and minor subjects discussed in the report, and report abstracts.

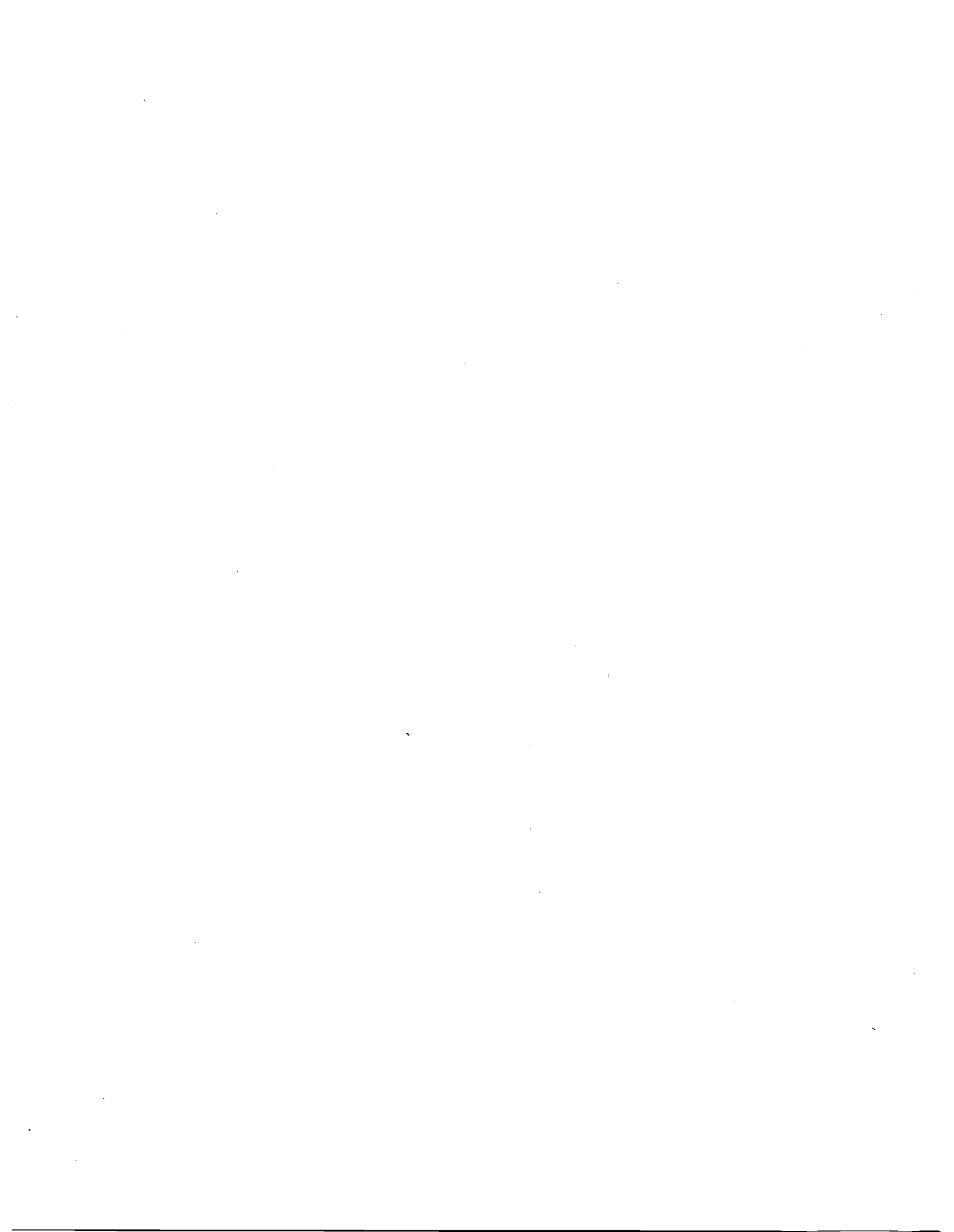
Section 3, Subject Index Listing, can be used to locate reports dealing with a particular subject. The report numbers and the accession numbers for a particular subject are listed in the subject index on the left and right hand sides of the subject columns, respectively. The report numbers can then be used to find the report abstracts, etc., by using Section 1, Title Listings by Report Category, as previously explained.

Section 4, Personal Author Index, can be used to locate reports written by a particular author. The report numbers listed can be used to find the report abstracts as explained above.



SECTION 1

TITLE LISTINGS BY REPORT CATEGORY



TITLE LISTINGS BY REPORT CATEGORY

Conference and Reference Publications (CP, RP):

<u>Report Nos. and Title</u>	<u>Page No.</u>
RPT#: NASA-CP-2045-PT-2 L-12232-VOL-1-PT-2 79N19689 UTTL: Advanced technology airfoil research, volume 1, part 2 78/00/00	49
RPT#: NASA-CP-2057 E-9900 79N15961 UTTL: The rotary combustion engine: A candidate for general aviation 78/00/00	49
RPT#: NASA-CP-2046 L-12232 BON21283 UTTL: Advanced technology airfoil research, volume 2 79/00/00	49
RPT#: NASA-CP-2119 L-13503 BON19193 UTTL: Assessment of Carbon Fiber Electrical Effects 80/03/00	49
RPT#: NASA-CP-2120 BON22283 UTTL: Resource management on the flight deck 80/03/00	49
RPT#: NASA-CP-2126 E-310 BON22327 UTTL: General Aviation Propulsion 80/03/00	49
RPT#: NASA-CP-2149 E-489 B1N12978 UTTL: Impact for the 80's: Proceedings of a Conference on Selected Technology for Business and Industry 80/11/00	49
RPT#: NASA-RP-1020 79N25043 UTTL: Precision positional data of general aviation air traffic in terminal air space 78/05/00	49

Technical Memorandums (TM, TMX):

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<u>Report Nos. and Title</u>	<u>Page No.</u>	<u>Report Nos. and Title</u>	<u>Page No.</u>
RPT#: NASA-TM-X-3213 A-5863 75N18181 UTTL: Application of numerical optimization to the design of low speed airfoils 75/03/00	53	RPT#: NASA-TM-X-3445 A-6743 OR-76-1 76N33845 UTTL: NASA aviation safety reporting system 76/09/00	55
RPT#: NASA-TM-X-62398 FAA-NA-75-151 75N17340 UTTL: Flight test investigation of the vortex wake characteristics behind a Boeing 727 during two-segment and normal ILS approaches (A joint NASA/FAA report) 75/01/00	53	RPT#: NASA-TM-X-72811 76N15158 UTTL: Description of a landing site indicator (LASI) for light aircraft operation 76/01/00	55
RPT#: NASA-TM-X-72641 75N18231 UTTL: Noise reduction studies for the Cessna model 337 (0-2) airplane 75/04/00	53	RPT#: NASA-TM-X-72838 76N20940 UTTL: Prediction of light aircraft interior noise 76/04/00	55
RPT#: NASA-TM-X-72642 75N18234 UTTL: Ground noise measurements during static and flyby operations of the Cessna Q2-T turbine powered airplane 75/04/00	53	RPT#: NASA-TM-X-72839 76N21990 UTTL: Sources and characteristics of interior noise in general aviation aircraft 76/04/00	55
RPT#: NASA-TM-X-72716 75N28066 UTTL: Interior noise levels of two propeller-driven light aircraft 75/07/00	54	RPT#: NASA-TM-X-72997 76N20065 UTTL: Domestic and world trends affecting the future of aviation (1980 - 2000), appendix C 76/03/00	56
		RPT#: NASA-TM-X-72998 76N20066 UTTL: The outlook for aeronautics, 1980 - 2000: Executive summary 76/03/00	56
		RPT#: NASA-TM-X-73051 NASA-NEWS-RELEASE-76-51 76N20106 UTTL: General aviation technology program 76/03/00	56
		RPT#: NASA-TM-X-73124 FAA-RD-76-100 76N30200 UTTL: Progress toward development of civil airworthiness criteria for powered-lift aircraft 76/05/00	56

<u>Report Nos. and Title</u>	<u>Page No.</u>	<u>Report Nos. and Title</u>	<u>Page No.</u>
RPT#: NASA-TM-X-3546 A-7001 77N24076 UTTL: NASA aviation safety reporting system 77/05/00	57	RPT#: NASA-TM-X-74687 77N24010 UTTL: FY 1978 aeronautics and space technology program summary 77/03/07	58
RPT#: NASA-TM-X-72697 77N23049 UTTL: Low-speed aerodynamic characteristics of a 13-percent-thick airfoil section designed for general aviation applications 75/05/00	57	RPT#: NASA-TM-X-3561 L-11472 78N11052 UTTL: Experimental and analytical determination of characteristics affecting light aircraft landing-gear dynamics 77/11/00	59
RPT#: NASA-TM-X-73228 A-6947 77N24052 UTTL: Dynamics of ultralight aircraft: Motion in vertical gusts 77/04/00	57	RPT#: NASA-TM-73507-VOL-1 E-8916-2 78N29100 UTTL: Effect of air temperature and relative humidity at various fuel-air ratios on exhaust emissions on a per-mode basis of an AVCO Lycoming O-320 diad light aircraft engine: Volume 1: Results and plotted data 78/07/00	59
RPT#: NASA-TM-X-73229 A-6989 77N24053 UTTL: Dynamics of ultralight aircraft: Dive recovery of hang gliders 77/05/00	57	RPT#: NASA-TM-73831 78N16055 UTTL: A review of NASA's propulsion programs for aviation 79/00/00	59
RPT#: NASA-TM-X-73500 77N19058 UTTL: Emissions of an AVCO Lycoming O-320-DIAD air cooled light aircraft engine as a function of fuel-air ratio, timing, and air temperature and humidity 76/08/00	57	RPT#: NASA-TM-73884 78N17060 UTTL: General aviation energy-conservation research programs at NASA-Lewis Research Center 77/00/00	59
RPT#: NASA-TM-X-73507 E-8916-VOL-2 77N10066 UTTL: Effect of air temperature and relative humidity at various fuel-air ratios on exhaust emissions on a per-mode basis of an Avco Lycoming O-320 DIAD light aircraft engine. Volume 2: Individual data points 76/09/00	58	RPT#: NASA-TM-74055 78N13040 UTTL: A preliminary study of the performance and characteristics of a supersonic executive aircraft 77/03/00	60
RPT#: NASA-TM-X-73564 E-9008 77N23109 UTTL: NASA Quiet Clean General Aviation Turbofan (QCGAT) program status 77/00/00	58	RPT#: NASA-TM-74097 L-11695 79N13011 UTTL: Aerodynamic characteristics of airplanes at high angles of attack 77/12/00	60
RPT#: NASA-TM-X-73671 E-9190 77N26153 UTTL: Exploratory investigation of the incipient spinning characteristics of a typical light general aviation airplane 77/00/00	58	RPT#: NASA-TM-75052 78N11702 UTTL: Provisional standards of radiation safety of flight personnel and passengers in air transport of the civil aviation 77/10/00	60

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<u>Report Nos. and Title</u>	<u>Page No.</u>	<u>Report Nos. and Title</u>	<u>Page No.</u>
RPT#: NASA-1M-75323 PAPER-77-027 78N32054 UTTL: Profile design for an advanced-technology airfoil for general aviation aircraft 78/08/00	60	RPT#: NASA-1M-79073 E-9890 79N16849 UTTL: New opportunities for future small civil turbine engines: Overviewing the GATE studies 79/00/00	63
RPT#: NASA-TM-78638 L-11918 78N19059 UTTL: Dynamic wind-tunnel tests of an aeromechanical gust-alleviation system using several different combinations of control surfaces 78/03/00	61	RPT#: NASA-TM-79075 E-9892 79N15958 UTTL: The gate studies: Assessing the potential of future small general aviation turbine engines 79/00/00	63
RPT#: NASA-TM-78748 78N33731 UTTL: Adaptation of time line analysis program to single pilot instrument flight research 78/08/00	61	RPT#: NASA-1M-79254 E-165 AIAA-79-1824 79N31210 UTTL: An overview of NASA research on positive displacement type general aviation engines 79/00/00	63
		RPT#: NASA-1M-80133 79N28158 UTTL: Potential applications of advanced aircraft in developing countries 79/07/00	63
RPT#: NASA-1M-X-72843 79N13000 UTTL: Effects of thickness on the aerodynamic characteristics of an initial low-speed family of airfoils for general aviation applications 76/06/00	62	RPT#: NASA-TM-80510 79N30173 UTTL: Radio-controlled model design and testing techniques for stall/spin evaluation of general-aviation aircraft 75/00/00	64
RPT#: NASA-1M-X-74018 79N24960 UTTL: Low-speed wind tunnel results for a modified 13-percent-thick airfoil 77/05/00	62		
RPT#: NASA-TM-78811 A-7920 79N32205 UTTL: Low-cost inertial navigation for moderate-g missions 79/09/00	62		
RPT#: NASA-TM-79013 E-9802 79N15051 UTTL: Preliminary QCGAT program test results 79/00/00	62		
RPT#: NASA-1M-79031 E-9820 79N12083 UTTL: NASA research on general aviation power plants 78/00/00	62		

<u>Report Nos. and Title</u>	<u>Page No.</u>	<u>Report Nos. and Title</u>	<u>Page No.</u>
RPT#: NASA-TM-75937 BON16042 UTTL: Possible markets for dirigibles 79/12/00	65	RPT#: NASA-TM-80206 L-13548 BON33384 UTTL: Analysis of general aviation single-pilot IFR incident data obtained from the NASA aviation safety reporting system 80/10/00	66
RPT#: NASA-TM-78709 L-12264 BON21294 UTTL: NASA low- and medium-speed airfoil development 79/03/00	65	RPT#: NASA-TM-80208 BON18011 UTTL: The aerial relay system: An energy-efficient solution to the airport congestion problem 80/01/00	67
RPT#: NASA-TM-80117 BON28446 UTTL: Carbon fiber counting 80/06/00	65	RPT#: NASA-TM-80235 L-13615 BON21293 UTTL: Emergency in-flight egress opening for general aviation aircraft 80/04/00	67
RPT#: NASA-TM-80163 BON10225 UTTL: Comparison of stability and control parameters for a light, single-engine, high-winged aircraft using different flight test and parameter estimation techniques 79/09/00	65	RPT#: NASA-TM-80237 L-13585 BON20227 UTTL: A spin-recovery parachute system for light general-aviation airplanes 80/04/00	67
RPT#: NASA-TM-80178 BON12732 UTTL: Single pilot scanning behavior in simulated instrument flight 79/10/00	65	RPT#: NASA-TM-81017 BON21299 UTTL: Global positioning system for general aviation: Joint FAA-NASA Seminar 78/00/00	67
RPT#: NASA-TM-80189 BON14110 UTTL: Wind-tunnel investigation of the flow correction for a model-mounted angle of attack sensor at angles of attack from -10 deg to 110 deg 79/11/00	66	RPT#: NASA-TM-81482 E-419 BON21285 UTTL: High speed turboprops for executive aircraft, potential and recent test results 80/00/00	67
RPT#: NASA-TM-80197 BON15874 UTTL: A study of partial coherence for identifying interior noise sources and paths on general aviation aircraft 79/12/00	66	RPT#: NASA-TM-81805 BON24260 UTTL: Development of test methods for scale model simulation of aerial applications in the NASA Langley Vortex Research Facility 80/04/00	68
RPT#: NASA-TM-80203 L-13371 BON19023 UTTL: Aeroacoustic wind-tunnel tests of a light twin-boom general-aviation airplane with free or shrouded-pusher propellers 80/04/00	66	RPT#: NASA-TM-81817 BON28370 UTTL: Exploratory piloted simulator study of the effects of winglets on handling qualities of a representative agricultural airplane 80/04/00	68

Report Nos. and Title

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RPT#: NASA-TM-75823
81N10577
UTTL: Annoyance from light aircraft investigation carried
out around four airports near Paris 80/04/00 69

RPT#: NASA-TM-80064
81N13959
UTTL: Development of a computer program data base of a
navigation aid environment for simulated IFR flight
and landing studies 80/11/00 69

RPT#: NASA-TM-81225 A-8311 QR-11
81N10021
UTTL: NASA Aviation Safety Reporting System 80/04/00 69

RPT#: NASA-TM-81260 A-8432
81N16022
UTTL: Human Factors of Flight-deck Automation:
NASA/Industry Workshop 81/01/00 69

RPT#: NASA-TM-81584 E-561
81N10067
UTTL: Comparisons of four alternative powerplant types for
future general aviation aircraft 80/10/00 69

RPT#: NASA-TM-81610 E-607
81N11769
UTTL: Core noise measurements from a small, general aviation
turbofan engine 80/11/21 70

RPT#: NASA-TM-81666 E-686
81N16052
UTTL: An overview of general aviation propulsion research
programs at NASA Lewis Research Center 81/00/00 70

RPT#: NASA-TM-81892 L-13960
81N12012
UTTL: Flight evaluation of the effect of winglets on
performance and handling qualities of a single-engine
general aviation airplane 80/12/00 70

Technical Notes (TN):

<u>Report Nos. and Title</u>	<u>Page No.</u>	<u>Report Nos. and Title</u>	<u>Page No.</u>
RPT#: NASA-TN-D-7712 L-9411 75N17368 UTTL: Monte Carlo analysis of inaccuracies in estimated aircraft parameters caused by unmodeled flight instrumentation errors 75/02/00	73	RPT#: NASA-TN-D-8283 L-10878 77N11033 UTTL: Landing practices of general aviation pilots in single-engine light airplanes 76/10/00	76
RPT#: NASA-TN-D-7928 75N18169 UTTL: Pilot preference and procedures at uncontrolled airports 75/03/00	73	RPT#: NASA-TN-D-8521 L-11352 77N31072 UTTL: A comparison of the results of dynamic wind-tunnel tests with theoretical predictions for an aeromechanical gust-alleviation system for light airplanes 77/09/00	76
RPT#: NASA-TN-D-8058 L-10355 76N15083 UTTL: A review of the NASA V-G/VGH general aviation program 75/12/00	74	RPT#: NASA-TN-D-8524 L-11305 77N28094 UTTL: Aerodynamic characteristics of wing-body configuration with two advanced general aviation airfoil sections and simple flap systems 77/08/00	76
RPT#: NASA-TN-D-8179 L-10514 76N21173 UTTL: Impact dynamics research facility for full-scale aircraft crash testing 76/04/00	74		
RPT#: NASA-TN-D-8206 L-10735 76N26165 UTTL: Review of drag cleanup tests in Langley full-scale tunnel (from 1935 to 1945) applicable to current general aviation airplanes 76/06/00	74		
RPT#: NASA-TN-D-8234 L-10635 76N31134 UTTL: An analytical study and wind tunnel tests of an aeromechanical gust-alleviation system for a light airplane 76/08/00	74		
RPT#: NASA-TN-D-8236 L-10736 76N26218 UTTL: Wind-tunnel investigation of a Fowler flap and spoiler for an advanced general aviation wing 76/06/00	75		

Technical Papers (TP):

<u>Report Nos. and Title</u>	<u>Page No.</u>	<u>Report Nos. and Title</u>	<u>Page No.</u>
RPT#: NASA-TP-1009 L-11227 77N33111 UTTL: Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 1. Low-wing model A; Effects of tail configurations 77/09/00	79	RPT#: NASA-TP-1306 L-12291 79N20071 UTTL: Determination of stability and control parameters of a light airplane from flight data using two estimation methods 79/03/00	81
RPT#: NASA-TP-1054 E-9098 77N32432 UTTL: Effect of fin passage length on optimization of cylinder head cooling fins 77/09/00	79	RPT#: NASA-TP-1321 L-12439 79N14874 UTTL: Noise transmission through flat rectangular panels into a closed cavity 78/12/00	81
RPT#: NASA-TP-1043 L-11355 78N13071 UTTL: Effects of control inputs on the estimation of stability and control parameters of a light airplane 77/12/00	80	RPT#: NASA-TP-1324 AVRADCOM-TR-78-45 79N14018 UTTL: Low-speed aerodynamic characteristics of a 16-percent-thick variable-geometry airfoil designed for general aviation applications 78/12/00	81
RPT#: NASA-TP-1076 L-11804 78N12040 UTTL: Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 2: low-wing model A; tail parachute diameter and canopy distance for emergency spin recovery 77/11/00	80		
RPT#: NASA-TP-1157 L-12008 78N20115 UTTL: Ground distance covered during airborne horizontal deceleration of an airplane 78/04/00	80		
RPT#: NASA-TP-1276 L-12197 78N31101 UTTL: Simulation and flight evaluation of a head-up landing aid for general aviation 78/09/00	80		

<u>Report Nos. and Title</u>	<u>Page No.</u>	<u>Report Nos. and Title</u>	<u>Page No.</u>
RPT#: NASA-TP-1477 L-12770 BON10512 UTTL: Light airplane crash tests at three roll angles 79/10/00	82	RPT#: NASA-TP-1498 L-12976 B1N12015 UTTL: Low-speed aerodynamic characteristics of a 13 percent thick medium speed airfoil designed for general aviation applications 79/08/00	83
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REPORT ABSTRACTS

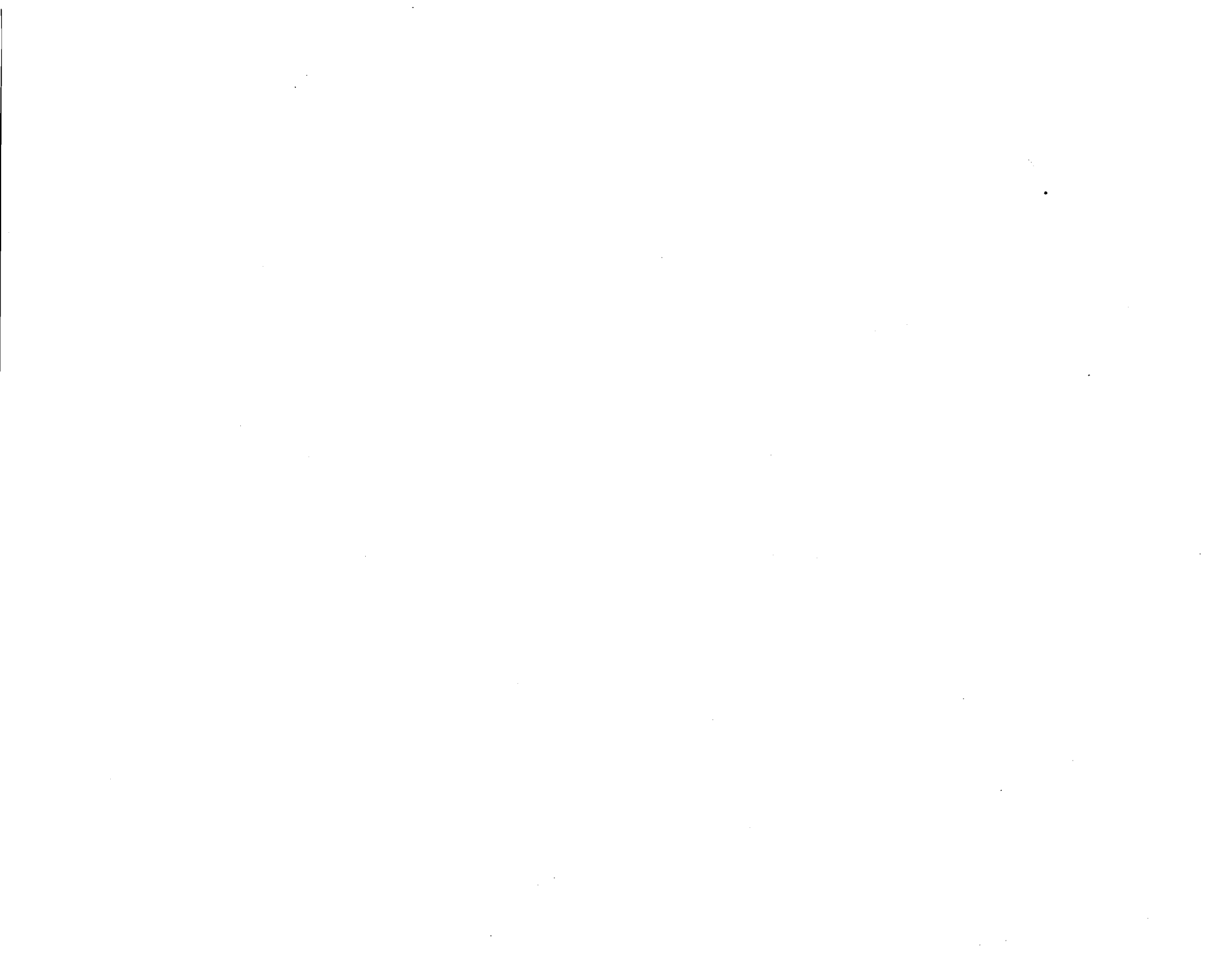


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RPT#: NASA-CP-2045-PT-2 L-12232-VOL-1-PT-2
79N19989

UTTL: Advanced technology airfoil research, volume 1, part 2
MAJS: /*AIRFOILS/*WIND TUNNEL TESTS
MINS: / AERODYNAMICS/ GENERAL AVIATION AIRCRAFT/ PROPELLERS/
SUPERCRITICAL WINGS/ TEST FACILITIES

RPT#: NASA-CP-2067 E-9800
79N15961

UTTL: The rotary combustion engine: A candidate for general aviation
MAJS: /*AIRCRAFT ENGINES/*CONFERENCES/*ENGINE DESIGN/*
GENERAL AVIATION AIRCRAFT/*MECHANICAL DRIVES
MINS: / AUTOMOBILE ENGINES/ ENERGY CONSERVATION/ FUEL
CONSUMPTION/ NOISE REDUCTION/ POLLUTION CONTROL/
TECHNOLOGICAL FORECASTING/ TECHNOLOGY TRANSFER

RPT#: NASA-CP-2046 L-12232
80N21283

UTTL: Advanced technology airfoil research, volume 2
MAJS: /*AIRFOILS/*CONFERENCES/*TECHNOLOGY ASSESSMENT/*
TECHNOLOGY UTILIZATION
MINS: / AERODYNAMIC CHARACTERISTICS/ COMPUTERIZED DESIGN/
GENERAL AVIATION AIRCRAFT/ ROTARY WING AIRCRAFT/
STRUCTURAL DESIGN/ SYSTEMS ENGINEERING/ TEST
FACILITIES
ABS: A comprehensive review of airfoil research is
presented. The major thrust of the research is in
three areas: development of computational aerodynamic
codes for airfoil analysis and design, development of
experimental facilities and test techniques, and all
types of airfoil applications.

RPT#: NASA-CP-2119 L-13503
80N19193

UTTL: Assessment of Carbon Fiber Electrical Effects
MAJS: /*AIRCRAFT ACCIDENTS/*CARBON FIBERS/*COMPOSITE
MATERIALS/*ELECTRIC EQUIPMENT/*FIRES
MINS: / AIRCRAFT CONSTRUCTION MATERIALS/ ATMOSPHERIC
DIFFUSION/ CIVIL AVIATION/ ELECTRICAL FAULTS/
ELECTRICAL INSULATION/ VULNERABILITY

RPT#: NASA-CP-2120
80N22283

UTTL: Resource management on the flight deck
AUTH: A/COOPER, G. E.; B/WHITE, M. D.; C/LAUBER, J. K.
MAJS: /*CONFERENCES/*FLIGHT CREWS/*FLIGHT TRAINING/*
PERSONNEL MANAGEMENT/*PILOT PERFORMANCE/*PILOT
SELECTION
MINS: / CIVIL AVIATION/ COMPUTER ASSISTED INSTRUCTION/
EMERGENCIES/ FLIGHT SIMULATORS/ GROUP DYNAMICS/
PERSONALITY TESTS/ PILOT TRAINING/ PSYCHOLOGICAL
FACTORS/ PSYCHOLOGICAL TESTS/ PSYCHOMOTOR PERFORMANCE/
SOCIAL FACTORS

RPT#: NASA-CP-2126 E-310
80N22327

UTTL: General Aviation Propulsion
MAJS: /*AIRCRAFT ENGINES/*AIRCRAFT NOISE/*CONFERENCES/*
ENGINE DESIGN/*GENERAL AVIATION AIRCRAFT/*PROPULSION
SYSTEM CONFIGURATIONS
MINS: / AEROACOUSTICS/ AEROELASTICITY/ NOISE REDUCTION/
PROPELLERS/ QUIET ENGINE PROGRAM/ SPARK IGNITION

RPT#: NASA-CP-2149 E-489
81N12978

UTTL: Impact for the 80's: Proceedings of a Conference on
Selected Technology for Business and Industry
MAJS: /*CONFERENCES/*ELECTRIC HYBRID VEHICLES/*ELECTRIC
MOTOR VEHICLES/*ENERGY TECHNOLOGY/*PROPULSION SYSTEM
PERFORMANCE
MINS: / AUTOMOBILES/ CIVIL AVIATION/ COMMERCIAL AIRCRAFT/
ENERGY CONVERSION/ TECHNOLOGY UTILIZATION

RPT#: NASA-RP-1020
78N25048

UTTL: Precision positional data of general aviation air
traffic in terminal air space
AUTH: A/MELSON, W. E., JR.; B/PARKER, L. C.; C/NORTHAM, A.
M.; D/SINGH, R. P.
MAJS: /*AIR TRAFFIC CONTROL/*AIRPORTS/*CIVIL AVIATION/*RADAR
TRACKING/*TABLES (DATA)
MINS: / AIRLINE OPERATIONS/ FLIGHT TIME/ RUNWAYS/ SCHEDULING
ABS: Three dimensional radar tracks of general aviation air
traffic at three uncontrolled airports are considered.
Contained are data which describe the position-time
histories, other derived parameters, and reference
data for the approximately 1200 tracks. All
information was correlated such that the date, time,
flight number, and runway number match the pattern
type, aircraft type, wind, visibility, and cloud
conditions.



TECHNICAL MEMORANDUMS (TM, TMX)

These documents record scientific and technical findings that do not warrant broad dissemination or that cannot be given broad dissemination due to security or restricted-audience considerations. This series includes quick-release reports that typically contain preliminary data and were designated TMX until 1978, when the "X" designation was dropped.



RPT#: NASA-TM-X-3213 A-5863
75N18181

UTTL: Application of numerical optimization to the design of low speed airfoils

AUTH: A/HICKS, R. M.; B/VANDERPLAATS, G. N.

MAJS: /*AERODYNAMIC CONFIGURATIONS/*AIRFOIL PROFILES/*
COMPUTERIZED DESIGN/*GENERAL AVIATION AIRCRAFT

MINS: / AERODYNAMIC CHARACTERISTICS/ FLIGHT CHARACTERISTICS/
NUMERICAL ANALYSIS/ OPTIMIZATION

ABS: A practical procedure for the optimum design of low-speed airfoils is demonstrated. The procedure uses an optimization program based on the method of feasible directions coupled with an aerodynamic analysis program that uses a relaxation solution of the inviscid, full potential equation. Results are presented for airfoils designed to have small adverse pressure gradients, high maximum lift, and low pitching moment.

RPT#: NASA-TM-X-62398 FAA-NA-75-151
75N17340

UTTL: Flight test investigation of the vortex wake characteristics behind a Boeing 727 during two-segment and normal ILS approaches (A joint NASA/FAA report)

AUTH: A/BARBER, M. R.; B/KURKOWSKI, R. L.; C/GARODZ, L. J.;
D/ROBINSON, G. H.; E/SMITH, H. J.; F/JACOBSEN, R. A.;
G/STINNETT, G. W., JR.; H/MCMURTRY, T. C.;
I/TYMCZYSZYN, J. J.; J/DEVEREAUX, R. L.

MAJS: /*AIRCRAFT LANDING/*BOEING 727 AIRCRAFT/*FLIGHT
HAZARDS/*TURBULENT WAKES/*VORTEX STREETS

MINS: / AIRCRAFT CONTROL/ DATA ACQUISITION/ FLOW
VISUALIZATION/ GENERAL AVIATION AIRCRAFT

ABS: Flight tests were performed to evaluate the vortex wake characteristics of a Boeing 727 aircraft during conventional and two-segment instrument landing approaches. Smoke generators were used for vortex marking. The vortex was intentionally intercepted by a Lear jet and a Piper Comanche aircraft. The vortex location during landing approach was measured using a system of phototheodolites. The tests showed that at a given separation distance there are no readily apparent differences in the upsets resulting from deliberate vortex encounters during the two types of approaches. The effect of the aircraft configuration on the extent and severity of the vortices is discussed.

RPT#: NASA-TM-X-72641
75N18231

UTTL: Noise reduction studies for the Cessna model 337 (0-2) airplane

AUTH: A/HILTON, D. A.; B/CONNOR, A. B.; C/DINGELDEIN, R. C.

MAJS: /*ACOUSTIC MEASUREMENTS/*AIRCRAFT NOISE/*CESSNA
AIRCRAFT/*LIGHT AIRCRAFT/*NOISE REDUCTION

MINS: / AERODYNAMIC CONFIGURATIONS/ ENGINE NOISE/ FLIGHT
TESTS/ MUFFLERS/ PROPELLERS/ SOUND PROPAGATION

ABS: A study was undertaken to determine the noise reduction potential of the 0-2 airplane in order to reduce its aural detection distance. Static and flyover noise measurements were made to document the noise signature of the unmodified airplane. The results show that significant reductions in aural detection distance can be achieved by the combination of propeller geometry changes and the addition of engine exhaust mufflers. The best results were estimated for the aircraft equipped with a six-blade propeller operating at 3/4 engine speed in combination with a 3.49 cubic foot exhaust muffler installed on each engine. Detection distance for the modified aircraft is estimated to be reduced from about 4-1/4 miles to about 1-1/2 miles when the aircraft is operating at an altitude of 1,000 ft over grassy terrain. Reducing the altitude to 300 ft over a leafy jungle ground cover should reduce the aural detection distance to 0.9 miles. Reduced aural detection distances were also indicated for a modification utilizing a direct-drive six-blade propeller of reduced radius along with smaller exhaust mufflers.

RPT#: NASA-TM-X-72642
75N18234

UTTL: Ground noise measurements during static and flyby operations of the Cessna 02-T turbine powered airplane

AUTH: A/HILTON, D. A.; B/HENDERSON, H. R.; C/LAWTON, B. W.

MAJS: /*ACOUSTIC MEASUREMENTS/*AIRCRAFT NOISE/*CESSNA
AIRCRAFT/*ENGINE NOISE/*GAS TURBINE ENGINES/*LIGHT
AIRCRAFT/*NOISE REDUCTION

ABS: The field noise measurements on the Cessna 02-T turbine powered propeller aircraft are presented. The objective of the study was to obtain the basic noise characteristics of the aircraft during static ground runs and flyover tests, to identify the sources of the noise, and to correlate the noises with the aircraft operating conditions. The results are presented in the form of overall noise levels, radiation patterns, and frequency spectra. The noise characteristics of the turbine powered aircraft are compared with those of the reciprocating engine powered aircraft.

RPT#: NASA-TM-X-72716

75N28066

UTTL: Interior noise levels of two propeller-driven light aircraft

AUTH: A/CATHERINES, J. J.; B/MAYES, W. H.

MAJS: /*AIRCRAFT COMPARTMENTS/*AIRCRAFT NOISE/*LIGHT
AIRCRAFT/*NOISE MEASUREMENT/*PROPELLER DRIVE

MINS: / ACOUSTICS/ AERODYNAMIC CONFIGURATIONS/ ENGINE NOISE/
GROUND TESTS

ABS: The relationships between aircraft operating conditions and interior noise and the degree to which ground testing can be used in lieu of flight testing for performing interior noise research were studied. The results show that the noise inside light aircraft is strongly influenced by the rotational speed of the engine and propeller. Both the overall noise and low frequency spectra levels were observed to decrease with increasing high speed rpm operations during flight. This phenomenon and its significance is not presently understood. Comparison of spectra obtained in flight with spectra obtained on the ground suggests that identification of frequency components and relative amplitude of propeller and engine noise sources may be evaluated on stationary aircraft.

RPT#: NASA-TM-X-3445 A-6743 QR-76-1
76N33845

UTTL: NASA aviation safety reporting system
AUTH: A/BILLINGS, C. E.; B/LAUBER, J. K.; C/FUNKHOUSER, H.
; D/LYMAN, E. G.; E/HUFF, E. M.
MAJS: /*AIRCRAFT SAFETY/*DATA BASES/*FLIGHT HAZARDS
MINS: / CIVIL AVIATION/ HUMAN FACTORS ENGINEERING/ SAFETY
MANAGEMENT/ WARNING SYSTEMS
ABS: The origins and development of the NASA Aviation
Safety Reporting System (ASRS) are briefly reviewed.
The results of the first quarter's activity are
summarized and discussed. Examples are given of
bulletins describing potential air safety hazards, and
the disposition of these bulletins. During the first
quarter of operation, the ASRS received 1464 reports;
1407 provided data relevant to air safety. All reports
are being processed for entry into the ASRS data base.
During the reporting period, 130 alert bulletins
describing possible problems in the aviation system
were generated and disseminated. Responses were
received from FAA and others regarding 108 of the
alert bulletins. Action was being taken with respect
to 70 of the 108 responses received. Further studies
are planned of a number of areas, including human
factors problems related to automation of the ground
and airborne portions of the national aviation system.

RPT#: NASA-TM-X-72811
76N15158

UTTL: Description of a landing site indicator (LASI) for
light aircraft operation
AUTH: A/FULLER, H. V.; B/OUTLAW, B. K. E.
MAJS: /*HEAD-UP DISPLAYS/*LANDING AIDS/*LIGHT AIRCRAFT
MINS: / AIRSPEED/ ANGLE OF ATTACK/ ENVIRONMENTAL TESTS/
PERFORMANCE TESTS/ SIDESLIP
ABS: An experimental cockpit mounted head-up type display
system was developed and evaluated by LaRC pilots
during the landing phase of light aircraft operations.
The Landing Site Indicator (LASI) system display
consists of angle of attack, angle of sideslip, and
indicated airspeed images superimposed on the pilot's
view through the windshield. The information is made
visible to the pilot by means of a partially
reflective viewing screen which is suspended directly
in front of the pilot's eyes. Synchron transmitters are
operated by vanes, located at the left wing tip, which
sense angle of attack and sideslip angle. Information
is presented near the center of the display in the
form of a moving index on a fixed grid. The airspeed
is sensed by a pitot-static pressure transducer and is
presented in numerical form at the top center of the

display.

RPT#: NASA-TM-X-72838
76N20940

UTTL: Prediction of light aircraft interior noise
AUTH: A/HOWLETT, J. T.; B/MORALES, D. A.
MAJS: /*AIRCRAFT NOISE/*COMPUTER PROGRAMS/*LIGHT AIRCRAFT/*
LOW FREQUENCIES/*PREDICTION ANALYSIS TECHNIQUES
MINS: / GENERAL AVIATION AIRCRAFT/ NOISE REDUCTION/
STRUCTURAL VIBRATION
ABS: A computerized interior noise prediction method for
light aircraft is described. An existing analytical
program, development for commercial jets, forms the
basis of some modal analysis work which is described.
The accuracy of this modal analysis technique for
predicting low-frequency coupled acoustic-structural
natural frequencies is discussed along with trends
indicating the effects of varying parameters such as
fuselage length and diameter, structural stiffness,
and interior acoustic absorption.

RPT#: NASA-TM-X-72839
76N21990

UTTL: Sources and characteristics of interior noise in
general aviation aircraft
AUTH: A/CATHERINES, J. J.; B/JHA, S. K.
MAJS: /*AIRCRAFT ENGINES/*AIRCRAFT NOISE/*GENERAL AVIATION
AIRCRAFT/*NOISE GENERATORS/*PROPELLERS
MINS: / EXHAUST GASES/ LOW FREQUENCIES/ STRUCTURAL VIBRATION
ABS: A field study was conducted to examine the interior
noise characteristics of a general aviation aircraft.
The goals were to identify the major noise sources and
their relative contribution and to establish the noise
transmission paths and their relative importance.
Tests were performed on an aircraft operating under
stationary conditions on the ground. Results show that
the interior noise level of light aircraft is
dominated by broadband, low frequencies (below 1,000
Hz). Both the propeller and the engine are dominant
sources, however, the contribution from the propeller
is significantly more than the engine at its
fundamental blade passage frequency. The data suggest
that the airborne path is more dominant than the
structure-borne path in the transmission of broadband,
low frequency noise which apparently results from the
exhaust.

RPT#: NASA-TM-X-72997
76N20065

UTTL: Domestic and world trends affecting the future of aviation (1980 - 2000), appendix C
MAJS: /*AIR DEFENSE/*AIR TRANSPORTATION/*CIVIL AVIATION/*FORECASTING/*MARKET RESEARCH
MINS: / AIRCRAFT INDUSTRY/ ECOLOGY/ ECONOMIC FACTORS/ ENERGY TECHNOLOGY/ GOVERNMENT/INDUSTRY RELATIONS/ INTERNATIONAL RELATIONS/ SOCIAL FACTORS
ABS: The results are presented of a study of variables affecting aviation in the United States during the last fifth of the twentieth century. A series of key trends relating to economic, social, political, technological, ecological, and environmental developments are identified and discussed with relation to their possible effects on aviation. From this analysis a series of scenarios is developed representing an array of possibilities ranging from severe economic depression and high international tension on the one hand to a world of detente which enjoys an unprecedented economic growth rate and relaxation of tensions on the other. A scenario is presented which represents the manner in which events will most probably develop and their effect on the aviation industry.

RPT#: NASA-TM-X-72998
76N20066

UTTL: The outlook for aeronautics, 1980 - 2000: Executive summary
MAJS: /*AIR DEFENSE/*AIR TRANSPORTATION/*CIVIL AVIATION/*FORECASTING/*RESEARCH MANAGEMENT
MINS: / AIRCRAFT INDUSTRY/ ECONOMIC FACTORS/ ENERGY TECHNOLOGY/ GOVERNMENT/INDUSTRY RELATIONS/ MARKET RESEARCH/ SOCIAL FACTORS
ABS: For abstract, see N76-20062.

RPT#: NASA-TM-X-73051 NASA-NEWS-RELEASE-76-51
76N20106

UTTL: General aviation technology program
MAJS: /*CIVIL AVIATION/*GENERAL AVIATION AIRCRAFT/*TECHNOLOGY ASSESSMENT
MINS: / AERODYNAMIC CHARACTERISTICS/ AIRCRAFT SAFETY/ AVIONICS/ NASA PROGRAMS/ RESEARCH AND DEVELOPMENT
ABS: The research and technology program of the civil air transportation system is reported. Research is discussed for stall/spin, crashworthiness, pilot operations, flight efficiency, propulsion, and avionics.

RPT#: NASA-TM-X-73124 FAA-RD-76-100
76N30200

UTTL: Progress toward development of civil airworthiness criteria for powered-lift aircraft
AUTH: A/SCOTT, B. C.; B/MARTIN, P. W.; C/HYNES, C. S.; D/BRYDER, R. B.
MAJS: /*AIRCRAFT CONFIGURATIONS/*AIRCRAFT RELIABILITY/*ANGLE OF ATTACK/*CIVIL AVIATION/*LIFT AUGMENTATION/*SHORT TAKEOFF AIRCRAFT
MINS: / COMMERCIAL AIRCRAFT/ LIFT/ THRUST VECTOR CONTROL
ABS: The results of a joint research program directed toward development of civil airworthiness flight criteria for power lift transports are summarized. Tentative criteria are proposed for performance and handling characteristics for powered lift transport aircraft in commercial service. The aircraft considered are primarily wing supported vehicles which rely upon the propulsion system for a significant portion of lift and control. VTOL aircraft are excluded. The flight criteria treat primarily the approach and landing flight phases.

RPT#: NASA-TM-X-3546 A-7001
77N24076

UTTL: NASA aviation safety reporting system
MAJS: /*AIRCRAFT SAFETY/*CIVIL AVIATION/*FLIGHT SAFETY
MINS: / AIR TRAFFIC CONTROL/ DATA BASES/ SAFETY MANAGEMENT
ABS: During the third quarter of operation of the Aviation Safety Reporting System (ASRS), 1429 reports concerning aviation safety were received from pilots, air traffic controllers, and others in the national aviation system. Details of the administration and results of the program are discussed. The design and construction of the ASRS data base are briefly presented. Altitude deviations and potential aircraft conflicts associated with misunderstood clearances were studied and the results are discussed. Summary data regarding alert bulletins, examples of alert bulletins and responses to them, and a sample of deidentified ASRS reports are provided.

RPT#: NASA-TM-X-72697
77N23049

UTTL: Low-speed aerodynamic characteristics of a 13-percent-thick airfoil section designed for general aviation applications
AUTH: A/MCGHEE, R. J.; B/BEASLEY, W. D.; C/SOMERS, D. M.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRFOIL PROFILES/*GENERAL AVIATION AIRCRAFT/*LOW SPEED
MINS: / AERODYNAMIC COEFFICIENTS/ AIRCRAFT MODELS/ REYNOLDS NUMBER/ WIND TUNNEL STABILITY TESTS
ABS: Wind-tunnel tests were conducted to determine the low-speed section characteristics of a 13 percent-thick airfoil designed for general aviation applications. The results were compared with NACA 12 percent-thick sections and with the 17 percent-thick NASA airfoil. The tests were conducted over a Mach number range from 0.10 to 0.35. Chord Reynolds numbers varied from about 2,000,000 to 9,000,000.

RPT#: NASA-TM-X-73228 A-6947
77N24052

UTTL: Dynamics of ultralight aircraft: Motion in vertical gusts
AUTH: A/JONES, R. T.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*GLIDERS/*GUST LOADS/*LIGHT AIRCRAFT/*VERTICAL MOTION
MINS: / AERODYNAMIC STABILITY/ JET AIRCRAFT/ LIFT/ WING LOADING
ABS: Gust load calculations are extended to the range of conditions encountered by ultralight aircraft such as hang gliders. Having wing loadings of the order of 5 kg/sq m, these gliders acquire a substantial fraction

of the motion of a gust within a distance of 1 or 2 m. Comparative loads and displacements for a small powered airplane having a wing loading of 50 kg sq m and for a commercial jet with 500 kg sq m are shown.

RPT#: NASA-TM-X-73229 A-6989
77N24053

UTTL: Dynamics of ultralight aircraft: Dive recovery of hang gliders
AUTH: A/JONES, R. T.
MAJS: /*AERODYNAMIC STABILITY/*CLIMBING FLIGHT/*GLIDERS/*LIFT/*LIGHT AIRCRAFT/*PITCH (INCLINATION)
MINS: / AERODYNAMIC COEFFICIENTS/ LIFT DEVICES/ WING LOADING
ABS: Longitudinal control of a hang glider by weight shift is not always adequate for recovery from a vertical dive. According to Lanchester's phugoid theory, recovery from rest to horizontal flight ought to be possible within a distance equal to three times the height of fall needed to acquire level flight velocity. A hang glider, having a wing loading of 5 kg sq m and capable of developing a lift coefficient of 1.0, should recover to horizontal flight within a vertical distance of about 12 m. The minimum recovery distance can be closely approached if the glider is equipped with a small all-moveable tail surface having sufficient upward deflection.

RPT#: NASA-TM-X-73500
77N10058

UTTL: Emissions of an AVCO Lycoming O-320-DIAD air cooled light aircraft engine as a function of fuel-air ratio, timing, and air temperature and humidity
AUTH: A/MENG, P. R.; B/SKOROBATCKYI, M.; C/COSGROVE, D. V.; D/KEMPKE, E. E., JR.
MAJS: /*AIR COOLING/*AIRCRAFT ENGINES/*ATMOSPHERIC TEMPERATURE/*EXHAUST GASES/*FUEL-AIR RATIO/*LIGHT AIRCRAFT
MINS: / AIR POLLUTION/ CARBON MONOXIDE/ HUMIDITY/ HYDROCARBONS/ NITROGEN OXIDES/ PISTON ENGINES
ABS: A carbureted aircraft engine was operated over a range of test conditions to establish the exhaust levels over the EPA seven-mode emissions cycle. Baseline (full rich production limit) exhaust emissions at an induction air temperature of 59 F and near zero relative humidity were 90 percent of the EPA standard for HC, 35 percent for NOx, and 161 percent for CO. Changes in ignition timing around the standard 25 deg BTDC from 30 deg BTDC to 20 deg BTDC had little effect on the exhaust emissions. Retarding the timing to 15 deg BTDC increased both the HC and CO emissions and decreased NOx emissions. HC and CO emissions decreased as the carburetor was leaned out, while NOx emissions

increased. The EPA emission standards were marginally achieved at two leanout conditions. Variations in the quantity of cooling air flow over the engine had no effect on exhaust emissions. Temperature-humidity effects at the higher values of air temperature and relative humidity tested indicated that the HC and CO emissions increased significantly, while the NOx emissions decreased.

RPT#: NASA-TM-X-73507 E-8916-VOL-2
77N10066

UTTL: Effect of air temperature and relative humidity at various fuel-air ratios on exhaust emissions on a per-mode basis of an Avco Lycoming O-320 DIAD light aircraft engine. Volume 2: Individual data points

AUTH: A/SKOROBATCKYI, M.; B/COSGROVE, D. V.; C/MENG, P. R.; D/KEMPKE, E. R.

MAJS: /*AIRCRAFT ENGINES/*CARBURETORS/*EXHAUST GASES/*FUEL-AIR RATIO

MINS: / AIR POLLUTION/ ATMOSPHERIC COMPOSITION/ COMBUSTION PRODUCTS/ ENGINE TESTS/ LIGHT AIRCRAFT/ TABLES (DATA)

ABS: A carbureted four cylinder air cooled O-320 DIAD Lycoming aircraft engine was tested to establish the effects of air temperature and humidity at various fuel-air ratios on the exhaust emissions on a per-mode basis. The test conditions included carburetor lean-out at air temperatures of 50, 59, 80, and 100 F at relative humidities of 0, 30, 60, and 80 percent. Temperature-humidity effects at the higher values of air temperature and relative humidity tested indicated that the HC and CO emissions increased significantly, while the NOx emissions decreased. Even at a fixed fuel-air ratio, the HC emissions increase and the NOx emissions decrease at the higher values of air temperature and humidity. Volume II contains the data taken at each of the individual test points.

RPT#: NASA-TM-X-73564 E-9008
77N23109

UTTL: NASA Quiet Clean General Aviation Turbofan (QCGAT) program status

AUTH: A/BRESNAHAN, D. L.; B/SIEVERS, G. K.

MAJS: /*CLEAN ENERGY/*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS/*QUIET ENGINE PROGRAM/*TURBOFAN ENGINES

MINS: / AIRCRAFT ENGINES/ EXHAUST GASES/ FUEL CONSUMPTION/ NOISE REDUCTION

ABS: The suitability of large engine technology to reduce noise, emissions, and fuel consumption of small turbine engines and develop new technology where required is determined. The design, fabrication, assembly, test, and delivery of the experimental engines to NASA are discussed.

RPT#: NASA-TM-X-73671 E-9190
77N26153

UTTL: Exploratory investigation of the incipient spinning characteristics of a typical light general aviation airplane

AUTH: A/RANAUDO, R. J.

MAJS: /*AERODYNAMIC STALLING/'GENERAL AVIATION AIRCRAFT/* SPIN DYNAMICS

MINS: / AIRCRAFT CONTROL/ ANGLE OF ATTACK/ ANGULAR MOMENTUM/ PITCHING MOMENTS/ YAW

ABS: The incipient spinning characteristics of general aviation airplanes were studied. Angular rates in pitch, yaw, and roll were measured through the stall during the incipient spin and throughout the recovery along with control positions, angle of attack, and angle of sideslip. The characteristic incipient spinning motion was determined from a given set of entry conditions. The sequence of recovery controls were varied at two distinct points during the incipient spin, and the effect on recovery characteristics was examined. Aerodynamic phenomena associated with flow over the aft portion of the fuselage, vertical stabilizer, and rubber are described.

RPT#: NASA-TM-X-74687
77N24010

UTTL: FY 1978 aeronautics and space technology program summary

MAJS: /*AERONAUTICS/*AEROSPACE SCIENCES

MINS: / AIRCRAFT DESIGN/ ELECTRONICS/ ENERGY CONSERVATION/ MATERIALS/ PROPULSION SYSTEM CONFIGURATIONS/ SPACE ERECTABLE STRUCTURES/ SPACECRAFT/ V/STOL AIRCRAFT

ABS: Highlights of the aeronautics program include research on aircraft energy efficiency, supersonic cruise aircraft, vertical takeoff and landing aircraft, short haul/short takeoff and landing aircraft, and general aviation aircraft. The space technology program includes work on space structures, propulsion systems, power systems, materials, and electronics.

RPT#: NASA-TM-X-3561 L-11472
78N11052

UTTL: Experimental and analytical determination of characteristics affecting light aircraft landing-gear dynamics

AUTH: A/FASANELLA, E. L.; B/MCGEHEE, J. R.; C/PAPPAS, M. S.

MAJS: /*LANDING GEAR/*LANDING LOADS/*LIGHT AIRCRAFT
MINS: / COEFFICIENT OF FRICTION/ DROP TESTS/ DYNAMIC CHARACTERISTICS

ABS: An experimental and analytical investigation was conducted to determine which characteristics of a light aircraft landing gear influence gear dynamic behavior significantly. The investigation focused particularly on possible modification for load control. Pseudostatic tests were conducted to determine the gear fore-and-aft spring constant, axial friction as a function of drag load, brake pressure-torque characteristics, and tire force-deflection characteristics. To study dynamic tire response, vertical drops were conducted at impact velocities of 1.2, 1.5, and 1.8 m/s onto a level surface; to determine axial-friction effects, a second series of vertical drops were made at 1.5 m/s onto surfaces inclined 5 deg and 10 deg to the horizontal. An average dynamic axial-friction coefficient of 0.15 was obtained by comparing analytical data with inclined surface drop test data. Dynamic strut bending and associated axial friction were found to be severe for the drop tests on the 10 deg surface.

RPT#: NASA-TM-73507-VOL-1 E-8916-2
78N29100

UTTL: Effect of air temperature and relative humidity at various fuel-air ratios on exhaust emissions on a per-mode basis of an AVCO Lycoming O-320 diad light aircraft engine: Volume 1: Results and plotted data

AUTH: A/SKOROBATCKYI, M.; B/COSGROVE, D. V.; C/MENG, P. R.; D/KEMPE, E. E., JR.

MAJS: /*AIRCRAFT ENGINES/*ATMOSPHERIC TEMPERATURE/*EXHAUST GASES/*FUEL-AIR RATIO/*HUMIDITY
MINS: / ATMOSPHERIC DENSITY/ CARBON MONOXIDE/ ENGINE TESTS/ LIGHT AIRCRAFT/ NITROGEN OXIDES

ABS: A carbureted four cylinder air cooled O-320 DIAD Lycoming aircraft engine was tested to establish the effects of air temperature and humidity at various fuel-air ratios on the exhaust emissions on a per-mode basis. The test conditions include carburetor lean out at air temperatures of 50, 59, 80, and 100 F at relative humidities of 0, 30, 60, and 80 percent. Temperature humidity effects at the higher values of air temperature and relative humidity tested indicated

that the HC and CO emissions increased significantly, while the NOx emissions decreased. Even at a fixed fuel air ratio, the HC emissions increase and the NOx emissions decrease at the higher values of air temperature and humidity.

RPT#: NASA-TM-73831
78N16055

UTTL: A review of NASA's propulsion programs for aviation
AUTH: A/STEWART, W. L.; B/JOHNSON, H. W.; C/WEBER, R. J.
MAJS: /*CIVIL AVIATION/*JET PROPULSION/*NASA PROGRAMS/* VARIABLE CYCLE ENGINES

MINS: / ENERGY CONSERVATION/ FUEL CONSUMPTION/ SUPERSONIC AIRCRAFT/ TURBOFAN ENGINES

ABS: A review of five NASA engine-oriented propulsion programs of major importance to civil aviation are presented and discussed. Included are programs directed at exploring propulsion system concepts for (1) energy conservation subsonic aircraft (improved current turbofans, advanced turbofans, and advanced turboprops); (2) supersonic cruise aircraft (variable cycle engines); (3) general aviation aircraft (improved reciprocating engines and small gas turbines); (4) powered lift aircraft (advanced turbofans); and (5) advanced rotorcraft.

RPT#: NASA-TM-73884
78N17060

UTTL: General aviation energy-conservation research programs at NASA-Lewis Research Center

AUTH: A/WILLIS, E. A.

MAJS: /*AIRCRAFT ENGINES/*ENERGY CONSERVATION/*ENGINE TESTING LABORATORIES/*FUEL CONSUMPTION/*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS

MINS: / DIESEL ENGINES/ ECONOMIC IMPACT/ EXHAUST GASES/ WANKEL ENGINES

ABS: The major thrust of NASA's nonturbine general aviation engine programs is directed toward (1) reduced specific fuel consumption, (2) improved fuel tolerance; and (3) emission reduction. Current and planned future programs in such areas as lean operation, improved fuel management, advanced cooling techniques and advanced engine concepts, are described. These are expected to lay the technology base, by the mid to latter 1980's, for engines whose total fuel costs are as much as 30% lower than today's conventional engines.

RPT#: NASA-TM-74055
78N13040

UTTL: A preliminary study of the performance and characteristics of a supersonic executive aircraft

AUTH: A/MASCITTI, V. R.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRCRAFT DESIGN/*AIRCRAFT PERFORMANCE/*GENERAL AVIATION AIRCRAFT/*SUPERSONIC CRUISE AIRCRAFT RESEARCH

MINS: / AIRCRAFT CONFIGURATIONS/ ARROW WINGS/ LEAR JET AIRCRAFT/ TITANIUM/ TURBOJET ENGINES/ VARIABLE CYCLE ENGINES

ABS: The impact of advanced supersonic technologies on the performance and characteristics of a supersonic executive aircraft was studied in four configurations with different engine locations and wing/body blending and an advanced nonafterburning turbojet or variable cycle engine. An M 2.2 design Douglas scaled arrow-wing was used with Learjet 35 accommodations. All four configurations with turbojet engines meet the performance goals of 5926 km (3200 n.mi.) range, 1981 meters (6500 feet) takeoff field length, and 77 meters per second (150 knots) approach speed. The noise levels of turbojet configurations studied are excessive. However, a turbojet with mechanical suppressor was not studied. The variable cycle engine configuration is deficient in range by 555 km (300 n.mi) but nearly meets subsonic noise rules (FAR 36 1977 edition), if coannular noise relief is assumed. All configurations are in the 33566 to 36287 kg (74,000 to 80,000 lbm) takeoff gross weight class when incorporating current titanium manufacturing technology.

RPT#: NASA-TM-74097 L-11695
78N13011

UTTL: Aerodynamic characteristics of airplanes at high angles of attack

AUTH: A/CHAMBERS, J. R.; B/GRAFTON, S. B.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRCRAFT PERFORMANCE/*AIRCRAFT STABILITY/*ANGLE OF ATTACK

MINS: / AERODYNAMIC STABILITY/ AERODYNAMIC STALLING/ FLIGHT CONTROL/ MILITARY AIRCRAFT/ SPIN STABILIZATION

ABS: An introduction to, and a broad overview of, the aerodynamic characteristics of airplanes at high angles of attack are provided. Items include: (1) some important fundamental phenomena which determine the aerodynamic characteristics of airplanes at high angles of attack; (2) static and dynamic aerodynamic characteristics near the stall; (3) aerodynamics of the spin; (4) test techniques used in stall/spin studies; (5) applications of aerodynamic data to problems in flight dynamics in the stall/spin area; and (6) the outlook for future research in the area.

Although stalling and spinning are flight dynamic problems of importance to all aircraft, including general aviation aircraft, commercial transports, and military airplanes, emphasis is placed on military configurations and the principle aerodynamic factors which influence the stability and control of such vehicles at high angles of attack.

RPT#: NASA-TM-75052
78N11702

UTTL: Provisional standards of radiation safety of flight personnel and passengers in air transport of the civil aviation

MAJS: /*AIR TRANSPORTATION/*CIVIL AVIATION/*PASSENGER AIRCRAFT/*RADIATION HAZARDS/*REGULATIONS

MINS: / FLYING PERSONNEL/ RADIATION DOSAGE/ RADIATION SOURCES

ABS: Provisional standards for radiation affecting passenger aircraft are considered. Agencies responsible for seeing that the regulations are enforced are designated while radiation sources and types of radiation are defined. Standard levels of permissible radiation are given and conditions for radiation safety are discussed. Dosimetric equipment on board aircraft is delineated and regulation effective dates are given.

RPT#: NASA-TM-75323 PAPER-77-027
78N32054

UTTL: Profile design for an advanced-technology airfoil for general aviation aircraft

AUTH: A/WELTE, D.

MAJS: /*AIRCRAFT DESIGN/*AIRFOIL PROFILES/*GENERAL AVIATION AIRCRAFT

MINS: / BOUNDARY LAYERS/ LIFT AUGMENTATION/ PRESSURE DISTRIBUTION/ TRAILING-EDGE FLAPS/ WIND TUNNEL TESTS

ABS: A profile from the NASA General Aviation Whitcomb series and NACA profiles are used as a starting point in designing an advanced airfoil for general aviation aircraft. Potential theory pressure distribution calculations, together with boundary layer calculations, permit a decrease in the null moment and an optimization of the lift characteristics of the wing. Trailing edge flap design is also improved. Wind tunnel tests are used to compare the conventional profiles, the NASA profile, and the improved design.

RPT#: NASA-TM-78638 L-11918
78N19059

UTTL: Dynamic wind-tunnel tests of an aeromechanical gust-alleviation system using several different combinations of control surfaces

AUTH: A/STEWART, E. C.; B/DOGGETT, R. V., JR.

MAJS: /*AERODYNAMICS/*CONTROL SURFACES/*GUST ALLEVIATORS/*
WIND TUNNEL MODELS/*WIND TUNNEL TESTS

MINS: / AERODYNAMIC LOADS/ ATMOSPHERIC TURBULENCE/ FLAPS
(CONTROL SURFACES)/ GUSTS/ LIGHT AIRCRAFT

ABS: Some experimental results are presented from wind tunnel studies of a dynamic model equipped with an aeromechanical gust alleviation system for reducing the normal acceleration response of light airplanes. The gust alleviation system consists of two auxiliary aerodynamic surfaces that deflect the wing flaps through mechanical linkages when a gust is encountered to maintain nearly constant airplane lift. The gust alleviation system was implemented on a 1/6-scale, rod mounted, free flying model that is geometrically and dynamically representative of small, four place, high wing, single engine, light airplanes. The effects of flaps with different spans, two size of auxiliary aerodynamic surfaces, plain and double hinged flaps, and a flap elevator interconnection were studied. The model test results are presented in terms of predicted root mean square response of the full scale airplane to atmospheric turbulence. The results show that the gust alleviation system reduces the root mean square normal acceleration response by 30 percent in comparison with the response in the flaps locked condition. Small reductions in pitch-rate response were also obtained. It is believed that substantially larger reductions in normal acceleration can be achieved by reducing the rather high levels of mechanical friction which were extant in the alleviation system of the present model.

appears to be too small. Included in the needed refinements are models to show the workload when in turbulence, when overshooting a radial or glideslope, and when copying air traffic control clearances.

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RPT#: NASA-TM-78748
78N33731

UTTL: Adaptation of time line analysis program to single pilot instrument flight research

AUTH: A/HINTON, D. A.; B/SHAUGHNESSY, J. D.

MAJS: /*COMPUTERIZED SIMULATION/*HUMAN FACTORS ENGINEERING/*
INSTRUMENT FLIGHT RULES/*PILOT PERFORMANCE/*WORKLOADS
(PSYCHOPHYSIOLOGY)

MINS: / DATA BASES/ GENERAL AVIATION AIRCRAFT/ MATHEMATICAL
MODELS/ TERMINAL CONFIGURED VEHICLE PROGRAM

ABS: A data base was developed for SPIFR operation and the program was run. The outputs indicated that further work was necessary on the workload models. In particular, the workload model for the cognitive channel should be modified as the output workload

RPT#: NASA-TM-X-72843
79N13000

UTTL: Effects of thickness on the aerodynamic characteristics of an initial low-speed family of airfoils for general aviation applications
AUTH: A/MCGHEE, R. J.; B/BEASLEY, W. D.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRFOILS/*THICKNESS RATIO/*WIND TUNNEL TESTS
MINS: / GENERAL AVIATION AIRCRAFT/ LOW SPEED/ MACH NUMBER/ REYNOLDS NUMBER/ VISCOUS FLOW/ WIND TUNNEL TESTS
ABS: Wind tunnel tests were conducted to determine the effects of airfoil thickness-ratio on the low speed aerodynamic characteristics of an initial family of airfoils. The results were compared with theoretical predictions obtained from a subsonic viscous method. The tests were conducted over a Mach number range from 0.10 to 0.28. Chord Reynolds numbers varied from about 2.0 x 1 million to 9.0 x 1 million.

RPT#: NASA-TM-X-74018
79N24960

UTTL: Low-speed wind tunnel results for a modified 13-percent-thick airfoil
AUTH: A/MCGHEE, R. J.; B/BEASLEY, W. D.
MAJS: /*AIRFOIL PROFILES/*AIRFOILS/*GENERAL AVIATION AIRCRAFT/*LOW SPEED WIND TUNNELS
MINS: / BOUNDARY LAYER SEPARATION/ PRESSURE DISTRIBUTION/ REYNOLDS NUMBER
ABS: Wind-tunnel tests were conducted to evaluate the effects on performance of modifying a 13-percent-thick low-speed airfoil. The airfoil contour was altered to reduce the aft upper surface pressure gradient and hence delay boundary layer separation at typical lift coefficients for light general aviation airplanes. The tests were conducted at a Mach number of 0.15 or less over a Reynolds number range from about 1,000,000 to 9,000,000.

RPT#: NASA-TM-78611 A-7920
79N32205

UTTL: Low-cost inertial navigation for moderate-g missions
AUTH: A/MERHAV, S.
MAJS: /*AIR NAVIGATION/*ATTITUDE GYROS/*GIMBALS/*GYROCOMPASSES/*HYBRID NAVIGATION SYSTEMS/*INERTIAL NAVIGATION/*LOW COST
MINS: / ACCELEROMETERS/ GENERAL AVIATION AIRCRAFT/ GYROSCOPIC PENDULUMS/ MATHEMATICAL MODELS/ MICROCOMPUTERS/ POSITION ERRORS/ STRAPDOWN INERTIAL GUIDANCE/ TORQUERS
ABS: A low cost inertial navigation system (INS) concept is described for flight missions characterized by

moderate accelerations and limited attitude variations. These missions involve general aviation aircraft, helicopters, or remotely piloted vehicles. The significance of the moderate acceleration and limited attitude is reviewed with respect to platform mechanization and instrumentation. A hybrid mechanization, partially gimballed and partially strapdown, is presented. The INS is implemented by an unbalanced two axis gimbal system and controlled by a two degree of freedom gyro. The INS provides locally level two axis acceleration information along with pitch and roll measurements. Heading information is provided by a second gyro mounted in the inner gimbal. The system error model is equivalent to that of a conventional platform with a tilt error determined by the integral of the gyro drift rate and an equivalent accelerometer type errors are also cancelled. Rapid gyro-compassing, implemented with opened gimbal control loops, and a strapdown procedure provides calibration of gyro drift rate biases.

RPT#: NASA-TM-79013 E-9802
79N15051

UTTL: Preliminary OCGAT program test results
AUTH: A/KOENIG, R. W.; B/SIEVERS, G. K.
MAJS: /*CONFERENCES/*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS/*TURBOFAN ENGINES
MINS: / ACOUSTICS/ DESIGN ANALYSIS/ FUEL CONSUMPTION/ PERFORMANCE TESTS/ PROJECT PLANNING/ TECHNOLOGY ASSESSMENT
ABS: NASA Lewis Research Center is conducting a program to demonstrate that large commercial engine technology can be applied to general aviation engines to reduce noise, emissions and fuel consumption and to develop new technology where required. The overall engine program, design, and technology incorporated into the OCGAT engines are described. In addition, preliminary engine test results are presented and compared to the technical requirements the engines were designed to meet.

RPT#: NASA-TM-79031 E-9828
79N12086

UTTL: NASA research on general aviation power plants
AUTH: A/STEWART, W. L.; B/WEBER, R. J.; C/WILLIS, E. A.; D/SIEVERS, G. K.
MAJS: /*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS/*PROPULSION SYSTEM CONFIGURATIONS
MINS: / AIRCRAFT ENGINES/ DIESEL ENGINES/ EXHAUST GASES/ FUEL CONSUMPTION
ABS: Propulsion systems are key factors in the design and performance of general aviation airplanes. NASA

research programs that are intended to support improvements in these engines are described. Reciprocating engines are by far the most numerous powerplants in the aviation fleet; near-term efforts are being made to lower their fuel consumption and emissions. Longer-term work includes advanced alternatives, such as rotary and lightweight diesel engines. Work is underway on improved turbofans and turboprops.

RPT#: NASA-TM-79073 E-9890
79N16849

UTTL: New opportunities for future small civil turbine engines: Overlooking the GATE studies
AUTH: A/STRACK, W. C.
MAJS: /*ENGINE DESIGN/*GENERAL AVIATION AIRCRAFT/* TECHNOLOGICAL FORECASTING/*TURBINE ENGINES
MINS: / AIRCRAFT ENGINES/ FIXED WINGS/ HELICOPTER ENGINES/ PERFORMANCE PREDICTION/ PISTON ENGINES/ PRODUCT DEVELOPMENT
ABS: An overview of four independent studies forecasts the potential impact of advanced technology turbine engines in the post 1988 market, identifies important aircraft and missions, desirable engine sizes, engine performance, and cost goals. Parametric evaluations of various engine cycles, configurations, design features, and advanced technology elements defined baseline conceptual engines for each of the important missions identified by the market analysis. Both fixed-wing and helicopter aircraft, and turboshaft, turboprop, and turbofan engines were considered. Sizable performance gains (e.g., 20% SFC decrease), and large engine cost reductions of sufficient magnitude are predicted to challenge the reciprocating engine in the 300-500 SHP class.

RPT#: NASA-TM-79075 E-9892
79N15958

UTTL: The gate studies: Assessing the potential of future small general aviation turbine engines
AUTH: A/STRACK, W. C.
MAJS: /*GENERAL AVIATION AIRCRAFT/*TURBINE ENGINES
MINS: / AIRFRAMES/ COSTS/ ENGINE PARTS/ HELICOPTERS/ MARKETING/ TURBOFAN ENGINES
ABS: Four studies were completed that explore the opportunities for future General Aviation turbine engines (GATE) in the 150-1000 SHP class. These studies forecasted the potential impact of advanced technology turbine engines in the post-1988 market, identified important aircraft and missions, desirable engine sizes, engine performance, and cost goals. Parametric evaluations of various engine cycles,

configurations, design features, and advanced technology elements defined baseline conceptual engines for each of the important missions identified by the market analysis. Both fixed-wing and helicopter aircraft, and turboshaft, turboprop, and turbofan engines were considered. Sizable performance gains (e.g., 20% SFC decrease), and large engine cost reductions of sufficient magnitude to challenge the reciprocating engine in the 300-500 SHP class were predicted.

RPT#: NASA-TM-79254 E-165 AIAA-79-1824
79N31210

UTTL: An overview of NASA research on positive displacement type general aviation engines
AUTH: A/KEMPKE, E. E.; B/WILLIS, E. A.
MAJS: /*AIRCRAFT ENGINES/*DIESEL ENGINES/*GENERAL AVIATION AIRCRAFT/*WANKEL ENGINES
MINS: / COMBUSTION EFFICIENCY/ DRAG REDUCTION/ ENERGY CONSERVATION/ ENGINE DESIGN/ FUEL CONSUMPTION/ FUEL INJECTION/ POLLUTION CONTROL
ABS: The general aviation positive displacement engine program encompassing conventional, lightweight diesel, and rotary combustion engines is described. Lean operation of current production type spark ignition engines and advanced alternative engine concepts are emphasized.

RPT#: NASA-TM-80133
79N28158

UTTL: Potential applications of advanced aircraft in developing countries
AUTH: A/MADDALON, D. V.
MAJS: /*AIR CARGO/*AIR TRANSPORTATION/*BRAZIL/*DEVELOPING NATIONS/*INDONESIA/*REMOTE REGIONS
MINS: / AGRICULTURAL AIRCRAFT/ ECONOMIC FACTORS/ FORESTS/ INDUSTRIAL AREAS/ MINING/ SOCIAL FACTORS
ABS: Air transportation concepts for movement of cargo in developing countries are reviewed using aircraft which may appear in the future. For certain industrial applications, including mining and forestry, the relative costs of doing the job using different types of aircraft are compared with surface transportation systems. Two developing countries, Brazil and Indonesia, were taken as examples to determine what impact they might have on the aircraft markets of the future. Economic and demographic data on developing countries in general, and Brazil and Indonesia in particular, are reviewed. The concept of an industrial city in a remote area developed around an airport is discussed. It is noted that developing areas generally lack extensive surface transportation systems and that

an air transportation system can be implemented in a relatively short time. A developing nation interested in rapid expansion may thus find the role of air cargo far more important than has been true in developed nations. Technological developments which may dramatically increase the performance of agricultural aircraft are also reviewed.

RPT#: NASA-TM-80510

79N30173

UTTL: Radio-controlled model design and testing techniques for stall/spin evaluation of general-aviation aircraft

AUTH: A/BURK, S. M., JR.; B/WILSON, C. F., JR.

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT MODELS/*AIRCRAFT SPIN
/*FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT/*RADIO
CONTROL/*SPIN TESTS

MINS: / AIRCRAFT DESIGN/ COST EFFECTIVENESS/ MOMENTS OF
INERTIA/ RECOVERY PARACHUTES/ TELEVISION CAMERAS/
THRUST MEASUREMENT

ABS: A relatively inexpensive radio-controlled model stall/spin test technique was developed. Operational experiences using the technique are presented. A discussion of model construction techniques, spin-recovery parachute system, data recording system, and movie camera tracking system is included. Also discussed are a method of measuring moments of inertia, scaling of engine thrust, cost and time required to conduct a program, and examples of the results obtained from the flight tests.

RPT#: NASA-TM-75937
BON16042

UTTL: Possible markets for dirigibles
MAJS: /*AIR TRANSPORTATION/*AIRSHIPS/*MARKET RESEARCH
MINS: / AGRICULTURAL AIRCRAFT/ AIR CARGO/ FLYING PLATFORMS/
INDUSTRIES/ MATERIALS HANDLING/ MILITARY OPERATIONS
ABS: The use of mini, small, medium, and heavy dirigibles
for the transportation of passengers and cargo, for
aerial handling of materials, for the support of
scientific platforms, and for use in agriculture and
forest management is evaluated. The operational
efficiency of one or more dirigibles in view of
possible integration into the general transport system
is described.

RPT#: NASA-TM-78709 L-12264
BON21294

UTTL: NASA low- and medium-speed airfoil development
AUTH: A/MCGHEE, R. J.; B/BEASLEY, W. D.; C/WHITCOMB, R. T.
MAJS: /*AIRFOILS/*GENERAL AVIATION AIRCRAFT/*LOW SPEED/*
TECHNOLOGY ASSESSMENT
MINS: / AERODYNAMIC COEFFICIENTS/ STRUCTURAL DESIGN/
THICKNESS RATIO/ WIND TUNNEL TESTS
ABS: The status of NASA low and medium speed airfoil
research is discussed. Effects of airfoil
thickness-chord ratios varying from 9 percent to 21
percent on the section characteristics for a design
lift coefficient of 0.40 are presented for the initial
low speed family of airfoils. Also, modifications to
the 17-percent low-speed airfoil to reduce the
pitching-moment coefficient and to the 21-percent low
speed airfoil results are shown for two new medium
speed airfoils with thickness ratios of 13 percent and
17 percent and design-lift coefficients of 0.30.
Applications of NASA-developed airfoils to general
aviation aircraft are summarized.

RPT#: NASA-TM-80117
BON28446

UTTL: Carbon fiber counting
AUTH: A/PRIDE, R. A.
MAJS: /*AIRCRAFT STRUCTURES/*CARBON FIBERS/*COMPOSITE
MATERIALS
MINS: / AIRCRAFT ACCIDENTS/ CIVIL AVIATION/ FIRE DAMAGE/ JET
ENGINE FUELS
ABS: A method was developed for characterizing the number
and lengths of carbon fibers accidentally released by
the burning of composite portions of civil aircraft
structure in a jet fuel fire after an accident.
Representative samplings of carbon fibers collected on
transparent sticky film were counted from photographic

enlargements with a computer aided technique which
also provided fiber lengths.

RPT#: NASA-TM-80163
BON10225

UTTL: Comparison of stability and control parameters for a
light, single-engine, high-winged aircraft using
different flight test and parameter estimation
techniques
AUTH: A/SUIT, W. T.; B/CANNADAY, R. L.
MAJS: /*CONTROL STABILITY/*ESTIMATING/*FLIGHT STABILITY
TESTS/*LATERAL STABILITY/*LIGHT AIRCRAFT/*LONGITUDINAL
STABILITY
MINS: / AIRCRAFT LANDING/ AIRCRAFT MANEUVERS/ APPROACH AND
LANDING TESTS (STS)/ COMPUTERIZED SIMULATION/
MATHEMATICAL MODELS
ABS: The longitudinal and lateral stability and control
parameters for a high wing, general aviation, airplane
are examined. Estimations using flight data obtained
at various flight conditions within the normal range
of the aircraft are presented. The estimations
techniques, an output error technique (maximum
likelihood) and an equation error technique (linear
regression), are presented. The longitudinal static
parameters are estimated from climbing, descending,
and quasi steady state flight data. The lateral
excitations involve a combination of rudder and
ailerons. The sensitivity of the aircraft modes of
motion to variations in the parameter estimates are
discussed.

RPT#: NASA-TM-80178
BON12732

UTTL: Single pilot scanning behavior in simulated instrument
flight
AUTH: A/PENNINGTON, J. E.
MAJS: /*HUMAN FACTORS ENGINEERING/*INSTRUMENT FLIGHT RULES/*
OPTICAL TRACKING/*PILOT PERFORMANCE
MINS: / FLIGHT SIMULATION/ GENERAL AVIATION AIRCRAFT/
OCULOMETERS
ABS: A simulation of tasks associated with single pilot
general aviation flight under instrument flight rules
was conducted as a baseline for future research
studies on advanced flight controls and avionics. The
tasks, ranging from simple climbs and turns to an
instrument landing systems approach, were flown on a
fixed base simulator. During the simulation the
control inputs, state variables, and the pilots visual
scan pattern including point of regard were measured
and recorded.

RPT#: NASA-TM-80189
BON14110

UTTL: Wind-tunnel investigation of the flow correction for a model-mounted angle of attack sensor at angles of attack from -10 deg to 110 deg

AUTH: A/MOUL, T. M.

MAJS: /*ANGLE OF ATTACK/*CALIBRATING/*CORRECTION/*FLOW MEASUREMENT/*WIND TUNNEL TESTS

MINS: / AERODYNAMIC STALLING/ AIRCRAFT SPIN/ GENERAL AVIATION AIRCRAFT/ UPWASH/ WIND TUNNEL MODELS

ABS: A preliminary wind tunnel investigation was undertaken to determine the flow correction for a vane angle of attack sensor over an angle of attack range from -10 deg to 110 deg. The sensor was mounted ahead of the wing on a 1/5 scale model of a general aviation airplane. It was shown that the flow correction was substantial, reaching about 15 deg at an angle of attack of 90 deg. The flow correction was found to increase as the sensor was moved closer to the wing or closer to the fuselage. The experimentally determined slope of the flow correction versus the measured angle of attack below the stall angle of attack agreed closely with the slope of flight data from a similar full scale airplane.

RPT#: NASA-TM-80197
BON15874

UTTL: A study of partial coherence for identifying interior noise sources and paths on general aviation aircraft

AUTH: A/HOWLETT, J. T.

MAJS: /*AIRCRAFT COMPARTMENTS/*AIRCRAFT NOISE/*COHERENT ACOUSTIC RADIATION/*NOISE MEASUREMENT/*NOISE PROPAGATION

MINS: / COHERENCE COEFFICIENT/ COMPUTER PROGRAMS/ DIGITAL COMPUTERS/ NOISE SPECTRA/ REAL TIME OPERATION

ABS: The partial coherence analysis method for noise source/path determination is summarized and the application to a two input, single output system with coherence between the inputs is illustrated. The augmentation of the calculations on a digital computer interfaced with a two channel, real time analyzer is also discussed. The results indicate possible sources of error in the computations and suggest procedures for avoiding these errors.

RPT#: NASA-TM-80203 L-13371
BON19023

UTTL: Aeroacoustic wind-tunnel tests of a light twin-boom general-aviation airplane with free or shrouded-pusher propellers

AUTH: A/MCLEMORE, H. C.; B/PEGG, R. J.

MAJS: /*AEROACOUSTICS/*GENERAL AVIATION AIRCRAFT/*LIGHT

TRANSPORT AIRCRAFT/*PROPELLER EFFICIENCY/*WIND TUNNEL TESTS

MINS: / AERODYNAMIC CHARACTERISTICS/ NOISE INTENSITY/ POWER EFFICIENCY/ PROPULSION SYSTEM PERFORMANCE

ABS: Tests were conducted in the Langley full-scale tunnel to determine the aerodynamic performance and acoustic characteristics of four different pusher-propeller configurations on a twin boom, general aviation airplane. The propellers included a 2-blade free propeller, two 3-blade shrouded propellers, and a 5-blade shrouded propeller. The tests were conducted for a range of airplane angles of attack from about 0 deg to 16 deg for test speeds from 0 to about 36 m/sec and for a range of propeller blade angles and rotation speeds. The free propeller provided the best aerodynamic propulsive performance. For forward flight conditions, the free propeller noise levels were lower than those of the shrouded propellers. In the static conditions the free propeller noise levels were as low as those for the shrouded propellers, except for the propeller in-plane noise where the shrouded propeller noise levels were lower.

RPT#: NASA-TM-80206 L-13548
BON33384

UTTL: Analysis of general aviation single-pilot IFR incident data obtained from the NASA aviation safety reporting system

AUTH: A/BERGERON, H. P.

MAJS: /*AIRCRAFT PILOTS/*FLIGHT SAFETY/*GENERAL AVIATION AIRCRAFT/*INSTRUMENT FLIGHT RULES/*NASA PROGRAMS/* NATIONAL AVIATION SYSTEM

MINS: / AIR TRAFFIC CONTROL/ AIRCRAFT COMMUNICATION/ DATA BASES/ FLIGHT CONDITIONS/ HUMAN FACTORS ENGINEERING/ HUMAN PERFORMANCE/ PILOT ERROR

ABS: Data obtained from the NASA Aviation Safety Reporting System (ASRS) data base were used to determine problems in general aviation single pilot IFR operations. The data examined consisted of incident reports involving flight safety in the National Aviation System. Only those incidents involving general aviation fixed wing aircraft flying under IFR in instrument meteorological conditions were analyzed. The data were cataloged into one of five major problem areas: (1) controller judgement and response problems; (2) pilot judgement and response problems; (3) air traffic control intrafacility and interfacility conflicts; (4) ATC and pilot communications problems; and (5) IFR-VFR conflicts. The significance of the related problems, and the various underlying elements associated with each are discussed. Previous ASRS reports covering several areas of analysis are reviewed.

RPT#: NASA-TM-80208
80N18011

UTTL: The aerial relay system: An energy-efficient solution to the airport congestion problem

AUTH: A/KYSER, A. C.

MAJS: /*AIR TRANSPORTATION/*AIRCRAFT DESIGN/*CIVIL AVIATION
/*TRANSPORTATION ENERGY

MINS: / AIR TRAFFIC CONTROL/ AIRPORTS/ TECHNOLOGICAL
FORECASTING/ TRANSFERRING/ UNITED STATES OF AMERICA

ABS: The ability to transfer airline passengers between aircraft in flight, if adequately developed and integrated into the national air transportation system, could provide significant improvements in transportation-system performance, in terms of airport congestion, fuel consumption, and passenger service. The proposed Aerial Relay System concept, which was developed as a means of exploiting inflight transfer, makes use of large 'cruise liner' aircraft which fly continuously along their routes, docking periodically with short-haul feeder aircraft for exchange of payloads. Preliminary vehicle designs for a representative system are described and the operational feasibility of the concept for the United States in the 1990's is discussed.

RPT#: NASA-TM-80235 L-13615
80N21293

UTTL: Emergency in-flight egress opening for general aviation aircraft

AUTH: A/BEMENT, L. J.

MAJS: /*ABORT APPARATUS/*EGRESS/*GENERAL AVIATION AIRCRAFT

MINS: / ACTUATION/ AIRCRAFT CONSTRUCTION MATERIALS/ AIRCRAFT
STRUCTURES/ PYROTECHNICS/ SKIN (STRUCTURAL MEMBER)

ABS: In support of a stall/spin research program, an emergency in-flight egress system is being installed in a light general aviation airplane. To avoid a major structural redesign for a mechanical door, an add-on 11.2 kg pyrotechnic-actuated system was developed to create an opening in the existing structure. The airplane skin will be explosively severed around the side window, across a central stringer, and down to the floor, creating an opening of approximately 76 by 76 cm. The severed panel will be jettisoned at an initial velocity of approximately 13.7 m/sec. System development included a total of 68 explosive severance tests on aluminum material using small samples, small and full scale flat panel aircraft structural mock-ups, and an actual aircraft fuselage. These tests proved explosive sizing/severance margins, explosive initiation, explosive product containment, and system dynamics.

RPT#: NASA-TM-80237 L-13585
80N20227

UTTL: A spin-recovery parachute system for light general-aviation airplanes

AUTH: A/BRADSHAW, C.

MAJS: /*AIRCRAFT SPIN/*GENERAL AVIATION AIRCRAFT/*RECOVERY
PARACHUTES

MINS: / ACTUATORS/ MECHANICAL DEVICES/ WAKES

ABS: A tail mounted spin recovery parachute system was designed and developed by the NASA Langley Research Center for use on light general aviation airplanes. The system was designed for use on typical airplane configurations, including low wing, single engine, and twin-engine design. A mechanically triggered pyrotechnic slug gun is used to forcibly deploy a pilot parachute which extracts a bag that deploys a ring slot spin recovery parachute. The total system weighs 8.2 kg (18 lb). System design factors included airplane wake effects on parachute deployment, prevention of premature parachute deployment, positive parachute jettison, compact size, low weight, system reliability, and pilot and ground crew safety. Extensive ground tests were conducted to qualify the system. The recovery parachute was used successfully in flight 17 times.

RPT#: NASA-TM-81017
80N21299

UTTL: Global positioning system for general aviation: Joint FAA-NASA Seminar

MAJS: /*AIR NAVIGATION/*CONFERENCES/*GENERAL AVIATION
AIRCRAFT/*GLOBAL POSITIONING SYSTEM/*NAVIGATION AIDS

MINS: / ANTENNAS/ NASA PROGRAMS/ NAVIGATION SATELLITES/
RADIO RECEIVERS/ TECHNOLOGY UTILIZATION

RPT#: NASA-TM-81482 E-419
80N21285

UTTL: High speed turboprops for executive aircraft, potential and recent test results

AUTH: A/MIKKELSON, D. C.; B/MITCHELL, G. A.

MAJS: /*GENERAL AVIATION AIRCRAFT/*PROPELLER EFFICIENCY/*
TURBOPROP AIRCRAFT

MINS: / AERODYNAMIC CONFIGURATIONS/ HIGH SPEED/ NACELLES/
POWER EFFICIENCY/ THICKNESS RATIO/ WIND TUNNEL TESTS

ABS: Four high speed propeller models were designed and tested in an 8x6 foot wind tunnel in order to evaluate the potential of advanced propeller technology. Results from these tests show that the combination of: increased blade number, aerodynamically integrated propeller/nacelles, reduced blade thickness, spinner area ruling, and blade sweep are important in achieving high propeller efficiency at the high cruise

speeds.

RPT#: NASA-TM-81805
BON24260

UTTL: Development of test methods for scale model simulation of aerial applications in the NASA Langley Vortex Research Facility

AUTH: A/JORDAN, F. L., JR.

MAJS: /*AGRICULTURAL AIRCRAFT/*AIRCRAFT WAKES/*COMPUTERIZED SIMULATION/*SCALE MODELS/*VORTICES/*WIND TUNNEL TESTS

ABS: As part of basic research to improve aerial applications technology, methods were developed at the Langley Vortex Research Facility to simulate and measure deposition patterns of aerially-applied sprays and granular materials by means of tests with small-scale models of agricultural aircraft and dynamically-scaled test particles. Interactions between the aircraft wake and the dispersed particles are being studied with the objective of modifying wake characteristics and dispersal techniques to increase swath width, improve deposition pattern uniformity, and minimize drift. The particle scaling analysis, test methods for particle dispersal from the model aircraft, visualization of particle trajectories, and measurement and computer analysis of test deposition patterns are described. An experimental validation of the scaling analysis and test results that indicate improved control of chemical drift by use of winglets are presented to demonstrate test methods.

RPT#: NASA-TM-81817
BON28370

UTTL: Exploratory piloted simulator study of the effects of winglets on handling qualities of a representative agricultural airplane

AUTH: A/OGBURY, M. E.; B/BROWN, P. W.

MAJS: /*AGRICULTURAL AIRCRAFT/*BODY-WING CONFIGURATIONS/*CONTROLLABILITY/*MANEUVERABILITY/*WIND TUNNEL TESTS/*WINGS

MINS: / AIRCRAFT DESIGN/ AIRCRAFT MANEUVERS/ CONTROL SURFACES/ CROP DUSTING/ PERFORMANCE TESTS

ABS: The effects on handling qualities of adding winglets to a representative agricultural aircraft configuration during swath-run maneuvering were evaluated. Aerodynamic data used in the simulation were based on low-speed wind tunnel tests of a full scale airplane and a subscale model. The Cooper-Harper handling qualities rating scale, supplementary pilot comments, and pilot vehicle performance data were used to describe the handling qualities of the airplane with the different wing-tip configurations. Results showed that the lateral-directional handling qualities

of the airplane were greatly affected by the application of winglets and winglet cant angle. The airplane with winglets canted out 20 deg exhibited severely degraded lateral directional handling qualities in comparison to the basic airplane. When the winglets were canted inward 10 deg, the flying qualities of the configuration were markedly improved over those of the winglet-canted-out configuration or the basic configuration without winglets, indicating that proper tailoring of the winglet design may afford a potential benefit in the area of handling qualities.

RPT#: NASA-TM-75823
81N10577

UTTL: Annoyance from light aircraft investigation carried out around four airports near Paris

MAJS: /*AIRPORTS/*FRANCE/*LIGHT AIRCRAFT/*NOISE POLLUTION

MINS: / AIRPORT PLANNING/ ENVIRONMENTAL ENGINEERING/
OPERATIONS RESEARCH/ RESIDENTIAL AREAS

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

RPT#: NASA-TM-80064
81N13959

UTTL: Development of a computer program data base of a navigation aid environment for simulated IFR flight and landing studies

AUTH: A/BERGERON, H. P.; B/HAYNIE, A. T.; C/MCDEDE, J. B.

MAJS: /*COMPUTER PROGRAMS/*FLIGHT SIMULATION/*INSTRUMENT
FLIGHT RULES/*NAVIGATION AIDS

MINS: / AIRPORTS/ COMPUTERIZED SIMULATION/ FLIGHT CONDITIONS
/ GENERAL AVIATION AIRCRAFT

ABS: A general aviation single pilot instrument flight rule simulation capability was developed. Problems experienced by single pilots flying in IFR conditions were investigated. The simulation required a three dimensional spatial navaid environment of a flight navigational area. A computer simulation of all the navigational aids plus 12 selected airports located in the Washington/Norfolk area was developed. All programmed locations in the list were referenced to a Cartesian coordinate system with the origin located at a specified airport's reference point. All navigational aids with their associated frequencies, call letters, locations, and orientations plus runways and true headings are included in the data base. The simulation included a TV displayed out-the-window visual scene of country and suburban terrain and a scaled model runway complex. Any of the programmed runways, with all its associated nav aids, can be referenced to a runway on the airport in this visual scene. This allows a simulation of a full mission scenario including breakout and landing.

RPT#: NASA-TM-81225 A-8311 QR-11
81N10021

UTTL: NASA Aviation Safety Reporting System

MAJS: /*AIR TRAFFIC CONTROL/*AIRCRAFT SAFETY/*AIRFIELD
SURFACE MOVEMENTS/*AIRPORTS/*CIVIL AVIATION/*FLIGHT
SAFETY/*MIDAIR COLLISIONS

MINS: / AIRCRAFT LANDING/ AIRLINE OPERATIONS/ AIRPORT TOWERS
/ LANDING AIDS/ RUNWAYS/ TAKEOFF

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

RPT#: NASA-TM-81260 A-8432
81N16022

UTTL: Human Factors of Flight-deck Automation:
NASA/Industry Workshop

AUTH: A/BOEHM-DAVIS, D. A.; B/CURRY, R. E.; C/WIENER, E.
L.; D/HARRISON, R. L.

MAJS: /*AUTOMATIC PILOTS/*BOREDOM/*COCKPITS/*FLIGHT
OPERATIONS/*HUMAN FACTORS ENGINEERING/*SAFETY FACTORS

MINS: / CIVIL AVIATION/ DECISION MAKING/ PILOT TRAINING/
SYSTEMS ENGINEERING/ TASK COMPLEXITY

ABS: The scope of automation, the benefits of automation, and automation-induced problems were discussed at a workshop held to determine whether those functions previously performed manually on the flight deck of commercial aircraft should always be automated in view of various human factors. Issues which require research for resolution were identified. The research questions developed are presented.

RPT#: NASA-TM-81584 E-561
81N10067

UTTL: Comparisons of four alternative powerplant types for future general aviation aircraft

AUTH: A/WICKENHEISER, T. J.; B/KNIP, G.; C/PLENCNER, R. M.
; D/STRACK, W. C.

MAJS: /*AIRCRAFT ENGINES/*DIESEL ENGINES/*GAS TURBINE
ENGINES/*PISTON ENGINES/*TECHNOLOGY ASSESSMENT

MINS: / COMPARISON/ COST ANALYSIS/ ENGINE TESTS/ PRODUCT
DEVELOPMENT/ TURBINE ENGINES

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

RPT#: NASA-TM-81610 E-607
81N11769

UTTL: Core noise measurements from a small, general aviation turbofan engine

AUTH: A/RESHOTKO, M.; B/KARCHMER, A.

MAJS: /*ENGINE NOISE/*JET AIRCRAFT NOISE/*NOISE MEASUREMENT
/*TURBOFAN ENGINES

MINS: / FAR FIELDS/ GENERAL AVIATION AIRCRAFT/ LOW
FREQUENCIES/ PRESSURE MEASUREMENTS

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

RPT#: NASA-TM-81666 E-686
81N16052

UTTL: An overview of general aviation propulsion research programs at NASA Lewis Research Center

AUTH: A/WILLIS, E. A.; B/STRACK, W. C.

MAJS: /*AIRCRAFT ENGINES/*CIVIL AVIATION/*COMBUSTION PHYSICS
/*ENGINE DESIGN/*NASA PROGRAMS

MINS: / COMBUSTION EFFICIENCY/ FUEL CONSUMPTION/ PISTON
ENGINES/ RESEARCH AND DEVELOPMENT/ TURBINE ENGINES

ABS: The review covers near-term improvements for current-type piston engines, as well as studies and limited corroborative research on several advanced g/a engine concepts, including diesels, small turboprops and both piston and rotary stratified-charge engines. Also described is basic combustion research, cycle modeling and diagnostic instrumentation work that is required to make new engines a reality.

RPT#: NASA-TM-81892 L-13960
81N12012

UTTL: Flight evaluation of the effect of winglets on performance and handling qualities of a single-engine general aviation airplane

AUTH: A/HOLMES, B. J.; B/VANDAM, C. P.; C/BROWN, P. W.;
D/DEAL, P. L.

MAJS: /*AERODYNAMIC CONFIGURATIONS/*AIRCRAFT PERFORMANCE/*
CIVIL AVIATION/*FLIGHT TESTS/*WINGLETS

MINS: / AERODYNAMIC STALLING/ CONTROLLABILITY/ DRAG
REDUCTION/ FINS/ FLIGHT CHARACTERISTICS/ MINIMUM DRAG/
PROTUBERANCES

ABS: A flight evaluation was conducted to determine the effects of winglets on the performance and handling qualities of a light, single-engine general aviation airplane. The performance measurements were made with a pace airplane to provide calibrated airspeeds; uncalibrated panel instruments in the test airplane were used to provide additional quantitative performance data. These tests were conducted with winglets on and off during the same day to measure relative performance effects. Handling qualities were evaluated by means of pilot comments. Winglets increased cruise speed 8 knots (5.6 percent) at 3962 m (13,000 ft) density altitude and 51 percent maximum continuous power setting. Maximum speed at 3962 m was virtually unchanged. Rate of climb increased approximately 6 percent, or 0.25 m/sec (50 ft/min), at 1524 m (5000 ft). Stall speed was virtually unchanged. Handling qualities were favorably affected.

TECHNICAL NOTES (TN)

Scientific and technical information considered important, complete and of importance as a contribution to existing knowledge. The designation Technical Notes (TN) was discontinued in 1977 and superseded by Technical Papers (TP).



RPT#: NASA-TN-D-7712 L-9411
75N17368

UTTL: Monte Carlo analysis of inaccuracies in estimated aircraft parameters caused by unmodeled flight instrumentation errors

AUTH: A/HODGE, W. F.; B/BRYANT, W. H.

MAJS: /*ERROR ANALYSIS/*FLIGHT INSTRUMENTS/*INSTRUMENT ERRORS/*MONTE CARLO METHOD

MINS: / AIRCRAFT STABILITY/ COMMERCIAL AIRCRAFT/ GENERAL AVIATION AIRCRAFT/ MILITARY AIRCRAFT

ABS: An output error estimation algorithm was used to evaluate the effects of both static and dynamic instrumentation errors on the estimation of aircraft stability and control parameters. A Monte Carlo error analysis, using simulated cruise flight data, was performed for a high-performance military aircraft, a large commercial transport, and a small general aviation aircraft. The results indicate that unmodeled instrumentation errors can cause inaccuracies in the estimated parameters which are comparable to their nominal values. However, the corresponding perturbations to the estimated output response trajectories and characteristics equation pole locations appear to be relatively small. Control input errors and dynamic lags were found to be in the most significant of the error sources evaluated.

RPT#: NASA-TN-D-7928
75N18169

UTTL: Pilot preference and procedures at uncontrolled airports

AUTH: A/PARKER, L. C.

MAJS: /*AIRCRAFT LANDING/*APPROACH CONTROL/*FLIGHT PATHS/* HUMAN FACTORS' ENGINEERING/*PILOT PERFORMANCE

MINS: / AIRPORTS/ FLIGHT SAFETY/ GENERAL AVIATION AIRCRAFT/ STATISTICAL ANALYSIS/ TERMINAL FACILITIES

ABS: The report presents the results of a pilot questionnaire utilized at the 1974 Reading, Pennsylvania Air Show to obtain data on pilot procedures and preference in the terminal airspace of uncontrolled airports.

RPT#: NASA-TN-D-8058 L-10355
76N15083

UTTL: A review of the NASA V-G/VGH general aviation program
AUTH: A/JEWEL, J. W., JR.; B/MORRIS, G. J.
MAJS: /*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS
MINS: / AIRCRAFT MANEUVERS/ GUST LOADS/ OPERATIONS RESEARCH
ABS: The V-G and VGH data collected from a wide variety of general aviation airplanes since the inception of the NASA V-G/VGH General Aviation Program in 1962 are presented. These data were analyzed to obtain information on the gust and maneuver loads, on the operating practices, and on the effects of different types of operations on these parameters.

RPT#: NASA-TN-D-8179 L-10514
76N21173

UTTL: Impact dynamics research facility for full-scale aircraft crash testing
AUTH: A/VAUGHAN, V. L. J.; B/ALFARO-BOU, E.
MAJS: /*AIRCRAFT SURVIVABILITY/*CRASHES/*GENERAL AVIATION AIRCRAFT/*IMPACT DAMAGE
MINS: / DATA ACQUISITION/ FLIGHT TESTS/ FREE FLIGHT/ ONBOARD EQUIPMENT
ABS: An impact dynamics research facility (IDRF) was developed to crash test full-scale general aviation aircraft under free-flight test conditions. The aircraft are crashed into the impact surface as free bodies; a pendulum swing method is used to obtain desired flight paths and velocities. Flight paths up to -60 deg and aircraft velocities along the flight paths up to about 27.0 m/s can be obtained with a combination of swing-cable lengths and release heights made available by a large gantry. Seven twin engine, 2721-kg aircraft were successfully crash tested at the facility, and all systems functioned properly. Acquisition of data from signals generated by accelerometers on board the aircraft and from external and onboard camera coverage was successful in spite of the amount of damage which occurred during each crash. Test parameters at the IDRF are controllable with flight path angles accurate within 8 percent, aircraft velocity accurate within 6 percent, pitch angles accurate to 4.25 deg, and roll and yaw angles acceptable under wind velocities up to 4.5 m/s.

RPT#: NASA-TN-D-8206 L-10735
76N26165

UTTL: Review of drag cleanup tests in Langley full-scale tunnel (from 1935 to 1945) applicable to current general aviation airplanes
AUTH: A/COE, P. L., JR.

MAJS: /*DRAG REDUCTION/*GENERAL AVIATION AIRCRAFT/*PROPELLER DRIVE

MINS: / AERODYNAMIC CHARACTERISTICS/ AIRCRAFT DESIGN/ WIND TUNNEL TESTS

ABS: Results of drag cleanup tests conducted in the Langley full-scale tunnel during the period from 1935 to 1945 are summarized for potential application to current propeller-driven general aviation airplanes. Data from tests on 23 airplanes indicate that the drag increments produced by many individual configuration features - such as, power plant installation, air leakage, cockpit canopies, control surface gaps, and antenna installations - are not large; however, when the increments are summed, the resulting total drag increase is significant. On the basis of results of the investigation, it appears that considerable reduction in drag can be obtained by proper attention to details in aerodynamic design and by adherence to the guidelines discussed.

RPT#: NASA-TN-D-8234 L-10635
76N31134

UTTL: An analytical study and wind tunnel tests of an aeromechanical gust-alleviation system for a light airplane
AUTH: A/STEWART, E. C.
MAJS: /*GUST ALLEVIATORS/*LIGHT AIRCRAFT/*WIND TUNNEL TESTS
MINS: / AERODYNAMIC COEFFICIENTS/ GRAPHS (CHARTS)/ TABLES (DATA)
ABS: The results of an analytical study of a system using stability derivatives determined in static wind tunnel tests of a 1/6 scale model of a popular, high wing, light airplane equipped with the gust alleviation system are reported. The longitudinal short period mode dynamics of the system are analyzed, and include the following: (1) root loci, (2) airplane frequency responses to vertical gusts, (3) power spectra of the airplane responses in a gust spectrum, (4) time history responses to vertical gusts, and (5) handling characteristics. The system reduces the airplane's normal acceleration response to vertical gusts while simultaneously increasing the pitching response and reducing the damping of the longitudinal short period mode. The normal acceleration response can be minimized by using the proper amount of static alleviation and a fast response system with a moderate amount of damping. The addition of a flap elevator interconnect or a pitch damper system further increases the alleviation while moderating the simultaneous increase in pitching response. The system provides direct lift control and may reduce the stick fixed longitudinal static stability.

RPT#: NASA-TN-D-8236 L-10736

76N26218

UTTL: Wind-tunnel investigation of a Fowler flap and spoiler for an advanced general aviation wing

AUTH: A/PAULSON, J. W., JR.

MAJS: /*ANGLE OF ATTACK/*FLAPS (CONTROL SURFACES)/*LATERAL CONTROL/*WIND TUNNEL STABILITY TESTS

MINS: / GENERAL AVIATION AIRCRAFT/ GRAPHS (CHARTS)/ JET BOUNDARIES/ SPOILERS

ABS: The wing was tested without fuselage or empennage and was fitted with approximately three-quarter span Fowler flaps and half span spoilers. The spoilers were hinged at the 70 percent chord point and vented when the flaps were deflected. Static longitudinal and lateral aerodynamic data were obtained over an angle of attack range of -8 deg to 22 deg for various flap deflections and positions, spoiler geometries, and vent lip geometries. Lateral characteristics indicate that the spoilers are generally adequate for lateral control. In general, the spoiler effectiveness increases with increasing angle of attack, increases with increasing flap deflections, and is influenced by vent lip geometry. In addition, the data show that some two-dimensional effects on spoiler effectiveness are reduced in the three-dimensional case. Results also indicate significant increase in lift coefficient as the Fowler flaps are deflected; when the flap was fully deflected, the maximum wing lift coefficient was increased about 96 percent.

RPT#: NASA-TN-D-8283 L-10878
77N11033

UTTL: Landing practices of general aviation pilots in single-engine light airplanes

AUTH: A/GOODE, M. W.; B/OBRYAN, T. C.; C/YENNI, K. R.; D/CANNADAY, R. L.; E/MAYO, M. H.

MAJS: /*AIRCRAFT LANDING/*GENERAL AVIATION AIRCRAFT/*PILOT PERFORMANCE

MINS: / APPROACH CONTROL/ CIVIL AVIATION/ FLIGHT CHARACTERISTICS

ABS: The methods and techniques used by a group of general aviation pilots during the landing phase of light airplane operations are documented. The results of 616 landings made by 22 pilots in 2 modern, four-place, single-engine, flight airplanes (one having a low wing and the other, a high wing) are presented. The landings were made on both a long runway (1524 m (5000 ft)) and a short runway (762 m (2500 ft)); both runways were considered typical of those used in general aviation. The results generally show that most of the approaches were fast with considerable floating during the flares and with touchdowns that were relatively flat or nose-low.

RPT#: NASA-TN-D-8521 L-11352
77N31072

UTTL: A comparison of the results of dynamic wind-tunnel tests with theoretical predictions for an aeromechanical gust-alleviation system for light airplanes

AUTH: A/STEWART, E. C.; B/REDD, L. T.
MAJS: /*GENERAL AVIATION AIRCRAFT/*GUST ALLEVIATORS/*SCALE MODELS/*WIND TUNNEL TESTS

MINS: / AERODYNAMIC LOADS/ FLAPS (CONTROL SURFACES)/ MATHEMATICAL MODELS/ PREDICTION ANALYSIS TECHNIQUES

ABS: Dynamic wind tunnel tests have been conducted on a 1/6-scale model of a general aviation airplane equipped with an all-mechanical gust alleviation system which uses auxiliary aerodynamic surfaces to drive the flaps. The longitudinal short period motions were studied under simulated gust conditions in order to verify the mathematical model used in a previous study to predict the performance of the full scale system and determine the amount of normal acceleration alleviation which could be attained. The model responses were measured for different configurations with the system active and without the system active for comparison. The tests confirmed the general relationships between the experimental variables and the model responses predicted by the mathematical model, but there were significant differences in the magnitudes of the responses. The experimental results

for the model were used to estimate a reduction of 30 percent in the rms normal acceleration response of a similar full scale airplane in atmospheric turbulence.

RPT#: NASA-TN-D-8524 L-11305
77N28094

UTTL: Aerodynamic characteristics of wing-body configuration with two advanced general aviation airfoil sections and simple flap systems

AUTH: A/MORGAN, H. L., JR.; B/PAULSON, J. W., JR.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*BODY-WING CONFIGURATIONS/*GENERAL AVIATION AIRCRAFT

MINS: / DRAG/ FLAPS (CONTROL SURFACES)/ LIFT/ WIND TUNNEL TESTS

ABS: Aerodynamic characteristics of a general aviation wing equipped with NACA 65 sub 2-415, NASA GA(W)-1, and NASA GA(PC)-1 airfoil sections were examined. The NASA GA(W)-1 wing was equipped with plain, split, and slotted partial- and full-span flaps and ailerons. The NASA GA(PC)-1 wing was equipped with plain, partial- and full-span flaps. Experimental chordwise static-pressure distribution and wake drag measurements were obtained for the NASA GA(PC)-1 wing at the 22.5-percent spanwise station. Comparisons were made between the three wing configurations to evaluate the wing performance, stall, and maximum lift capabilities. The results of this investigation indicated that the NASA GA(W)-1 wing had a higher maximum lift capability and almost equivalent drag values compared with both the NACA 65 sub 2-415 and NASA GA(PC)-1 wings. The NASA GA(W)-1 had a maximum lift coefficient of 1.32 with 0 deg flap deflection, and 1.78 with 41.6 deg deflection of the partial-span slotted flap. The effectiveness of the NASA GA(W)-1 plain and slotted ailerons with differential deflections were equivalent. The NASA GA(PC)-1 wing with full-span flaps deflected 0 deg for the design climb configuration showed improved lift and drag performance over the cruise flap setting of -10 deg.

TECHNICAL PAPERS (TP)

These documents record the findings of significant work conducted by NASA scientific and technical personnel. Technical Papers are the Agency's counterpart to professional papers and, therefore, are released only after a professional review controlled by the originating Headquarters or installation office. For documentation purposes Technical Papers are preferred over professional journal articles because they have less stringent limitations on manuscript length or number of figures.



there is a large surface area, but the airflow is restricted.

RPT#: NASA-TP-1009 L-11227
77N33111

UTTL: Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 1. Low-wing model A: Effects of tail configurations

AUTH: A/BURK, S. M., JR.; B/BOWMAN, J. S., JR.; C/WHITE, W. L.

MAJS: /*AERODYNAMIC CONFIGURATIONS/*AIRCRAFT DESIGN/*LOW WING AIRCRAFT/*SPIN TESTS/*TAIL ASSEMBLIES

MINS: / DYNAMIC STABILITY/ LIGHT AIRCRAFT/ SCALE MODELS/ SPIN DYNAMICS

ABS: The effects of tail design on spin and recovery were investigated in a spin tunnel. A 1/11-scale model of a research airplane which represents a typical low-wing, single engine, light general aviation airplane was used. A tail design criterion for satisfactory spin recovery for light airplanes was evaluated. The effects of other geometric design features on the spin and recovery characteristics were also determined. Results indicate that the existing tail design criterion for light airplanes, which uses the tail damping power factor as a parameter, cannot be used to predict spin-recovery characteristics.

RPT#: NASA-TP-1054 E-9098
77N32432

UTTL: Effect of fin passage length on optimization of cylinder head cooling fins

AUTH: A/SIEGEL, R.; B/GRAHAM, R. W.

MAJS: /*AIRCRAFT ENGINES/*COOLING FINS/*ENGINE DESIGN

MINS: / AIR FLOW/ HEAT TRANSFER/ OPTIMIZATION/ WALL TEMPERATURE

ABS: The heat transfer performance of baffled cooling fins on cylinder heads of small, air-cooled, general-aviation aircraft engines was analyzed to determine the potential for improving cooling fin design. Flow baffles were assumed to be installed tightly against the fin end edges, an ideal baffle configuration for guiding all flow between the fins. A rectangular flow passage is thereby formed between each set of two adjacent fins, the fin base surface, and the baffle. These passages extend around each side of the cylinder head, and the cooling air absorbs heat as it flows within them. For each flow passage length, the analysis was concerned with optimizing fin spacing and thickness to achieve the best heat transfer for each fin width. Previous literature has been concerned mainly with maximizing the local fin conductance and has not considered the heating of the gas in the flow direction, which leads to higher wall temperatures at the fin passage exits. If the fins are close together,

RPT#: NASA-TP-1043 L-11355
78N13071

UTTL: Effects of control inputs on the estimation of stability and control parameters of a light airplane
AUTH: A/CANNADAY, R. L.; B/SUIT, W. T.
MAJS: /*AERODYNAMIC STABILITY/*CONTROLLABILITY/*ESTIMATING/*
INPUT/OUTPUT ROUTINES/*LIGHT AIRCRAFT/*
PARAMETERIZATION
MINS: / COMPUTER PROGRAMMING/ DERIVATION/ FLIGHT TESTS/
MAXIMUM LIKELIHOOD ESTIMATES
ABS: The maximum likelihood parameter estimation technique was used to determine the values of stability and control derivatives from flight test data for a low-wing, single-engine, light airplane. Several input forms were used during the tests to investigate the consistency of parameter estimates as it relates to inputs. These consistencies were compared by using the ensemble variance and estimated Cramer-Rao lower bound. In addition, the relationship between inputs and parameter correlations was investigated. Results from the stabilator inputs are inconclusive but the sequence of rudder input followed by aileron input or aileron followed by rudder gave more consistent estimates than did rudder or ailerons individually. Also, square-wave inputs appeared to provide slightly improved consistency in the parameter estimates when compared to sine-wave inputs.

RPT#: NASA-TP-1076 L-11804
78N12040

UTTL: Spin-tunnel investigation of the spinning characteristics of typical single-engine general aviation airplane designs. 2: Low-wing model A; tail parachute diameter and canopy distance for emergency spin recovery
AUTH: A/BURK, S. M., JR.; B/BOWMAN, J. S., JR.; C/WHITE, W. L.
MAJS: /*LIGHT AIRCRAFT/*RECOVERY PARACHUTES/*SPIN STABILIZATION/*TAIL ASSEMBLIES
MINS: / GYROSCOPIC STABILITY/ SCALE MODELS/ SPIN TESTS/ WIND TUNNEL STABILITY TESTS
ABS: A spin tunnel study is reported on a scale model of a research airplane typical of low-wing, single-engine, light general aviation airplanes to determine the tail parachute diameter and canopy distance (riser length plus suspension-line length) required for emergency spin recovery. Nine tail configurations were tested, resulting in a wide range of developed spin conditions, including steep spins and flat spins. The results indicate that the full-scale parachute diameter required for satisfactory recovery from the most critical conditions investigated is about 3.2 m

and that the canopy distance, which was found to be critical for flat spins, should be between 4.6 and 6.1 m.

RPT#: NASA-TP-1157 L-12008
78N20115

UTTL: Ground distance covered during airborne horizontal deceleration of an airplane
AUTH: A/PHILLIPS, W. H.
MAJS: /*AIRCRAFT LANDING/*DECELERATION/*GENERAL AVIATION AIRCRAFT/*LANDING LOADS/*LANDING SPEED
MINS: / DRAG REDUCTION/ FLOATING/ GROUND EFFECT/ GROUND WIND / LIFT
ABS: The distance an airplane floats with respect to the ground during deceleration at constant altitude is analyzed taking into account the effects of a constant wind. By use of suitable nondimensionalizing parameters, data applicable to all airplanes are presented by means of a single family of curves.

RPT#: NASA-TP-1276 L-12157
78N31101

UTTL: Simulation and flight evaluation of a head-up landing aid for general aviation
AUTH: A/HARRIS, R. L., SR.; B/GOODE, M. W.; C/YENNI, K. R.
MAJS: /*FLIGHT SIMULATION/*GENERAL AVIATION AIRCRAFT/*
HEAD-UP DISPLAYS/*LANDING AIDS
MINS: / AILERONS/ CONTROL SURFACES/ DISPLAY DEVICES/
ELEVATORS (CONTROL SURFACES)/ FLIGHT TESTS/
INDEPENDENT VARIABLES/ INDICATING INSTRUMENTS/ LANDING SITES/ LANDING SPEED/ PILOT PERFORMANCE/ RUDDERS/
STANDARD DEVIATION/ VISUAL AIDS
ABS: A head-up general aviation landing aid called a landing site indicator (LASI) was tested in a fixed-base, visual simulator and in an airplane to determine the effectiveness of the LASI. The display, which had a simplified format and method of implementation, presented to the pilot in his line of sight through the windshield a graphic representation of the airplane's velocity vector. In each testing model (simulation of flight), each of 4 pilots made 20 landing approaches with the LASI and 20 approaches without it. The standard deviations of approach and touchdown parameters were considered an indication of pilot consistency. Use of the LASI improved consistency and also reduced elevator, aileron, and rudder control activity. Pilots' comments indicated that the LASI reduced work load. An appendix is included with a discussion of the simulator effectiveness for visual flight tasks.

RPT#: NASA-TP-1306 L-12291
79N20071

UTTL: Determination of stability and control parameters of a light airplane from flight data using two estimation methods

AUTH: A/KLEIN, V.

MAJS: /*AERODYNAMIC STABILITY/*AIRCRAFT CONTROL/*IN-FLIGHT MONITORING/*LIGHT AIRCRAFT/*MAXIMUM LIKELIHOOD ESTIMATES/*REGRESSION ANALYSIS

MINS: / CONTROL SURFACES/ EQUATIONS OF MOTION/ FLIGHT CHARACTERISTICS/ LEAST SQUARES METHOD/ PARAMETERIZATION

ABS: Two identification methods, the equation error method and the output error method, are used to estimate stability and control parameter values from flight data for a low-wing, single-engine, general aviation airplane. The estimated parameters from both methods are in very good agreement primarily because of sufficient accuracy of measured data. The estimated static parameters also agree with the results from steady flights. The effect of power different input forms are demonstrated. Examination of all results available gives the best values of estimated parameters and specifies their accuracies.

RPT#: NASA-TP-1321 L-12439
79N14874

UTTL: Noise transmission through flat rectangular panels into a closed cavity

AUTH: A/BARTON, C. K.; B/DANIELS, E. F.

MAJS: /*AIRCRAFT NOISE/*CAVITIES/*FLAT SURFACES/*LIGHT AIRCRAFT/*NOISE PROPAGATION/*RECTANGULAR PANELS

MINS: / ACOUSTIC ATTENUATION/ GLASS FIBERS/ LOW FREQUENCIES/ NOISE REDUCTION/ SINE WAVES/ STIFFNESS

ABS: Five panels backed by a closed cavity were studied experimentally and analytically to determine the noise transmission characteristics of the coupled panel-cavity system. The closed cavity was studied both with and without fiber-glass lining to provide either an absorbent or a reverberant acoustic space. The effects on noise reduction of cavity absorption, measurement location within the cavity, panel mass, and panel stiffness were examined. Results indicated that both measurement location and absorption in the cavity have significant effects on the noise reduction. Increasing panel mass improves the noise reduction at almost all frequencies, and increasing panel stiffness improves noise reduction below the fundamental resonance frequency. A simple, one dimensional analytical model was developed which provided good agreement with the experimental results.

RPT#: NASA-TP-1324 AVRADCOM-TR-78-45
79N14018

UTTL: Low-speed aerodynamic characteristics of a 16-percent-thick variable-geometry airfoil designed for general aviation applications

AUTH: A/BARNWELL, R. W.; B/NOONAN, K. W.; C/MCGHEE, R. J.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRFOIL PROFILES/* GENERAL AVIATION AIRCRAFT/*LOW SPEED

MINS: / AERODYNAMIC CONFIGURATIONS/ AERODYNAMIC STALLING/ ANGLE OF ATTACK/ BOUNDARY LAYERS/ DRAG/ LAND/ LEADING EDGES/ LIFT/ PRESSURE CHAMBERS/ REYNOLDS NUMBER/ TRAILING EDGES

ABS: Tests were conducted in the Langley low-turbulence pressure tunnel to determine the aerodynamic characteristics of climb, cruise, and landing configurations. These tests were conducted over a Mach number range from 0.10 to 0.35, a chord Reynolds number range from 2.0 x 1 million to 20.0 x 1 million, and an angle-of-attack range from -8 deg to 20 deg. Results show that the maximum section lift coefficients increased in the Reynolds number range from 2.0 x 1 million to 9.0 x 1 million and reached values of approximately 2.1, 1.8, and 1.5 for the landing, climb, and cruise configurations, respectively. Stall characteristics, although of the trailing-edge type, were abrupt. The section lift-drag ratio of the climb configuration with fixed transition near the leading edge was about 78 at a lift coefficient of 0.9, a Mach number of 0.15, and a Reynolds number of 4.0 x 1 million. Design lift coefficients of 0.9 and 0.4 for the climb and cruise configurations were obtained at the same angle of attack, about 6 deg, as intended. Good agreement was obtained between experimental results and the predictions of a viscous, attached-flow theoretical method.

RPT#: NASA-TP-1477 L-12778

80N10512

UTTL: Light airplane crash tests at three roll angles
AUTH: A/CASTLE, C. B.; B/ALFARO-BOU, E.
MAJS: /*CRASHES/*GENERAL AVIATION AIRCRAFT/*IMPACT TESTS/*
ROLL

MINS: / ACCELEROMETERS/ AIRCRAFT COMPARTMENTS/ AIRCRAFT
SURVIVABILITY/ IMPACT DAMAGE/ TRANSVERSE ACCELERATION

ABS: Three similar twin engine general aviation airplanes
were crash tested at the Langley impact dynamics
research facility at 27 m/sec and at nominal roll
angles of 0 deg, -15 deg, and -30 deg. Other flight
parameters were held constant. The test facility,
instrumentation, test specimens, and test method are
briefly described. Structural damage and accelerometer
data for each of the three impact conditions are
presented and discussed.

RPT#: NASA-TP-1481

80N11505

UTTL: Light airplane crash tests at three pitch angles
AUTH: A/VAUGHAN, V. L., JR.; B/ALFARO-BOU, E.
MAJS: /*CRASH LANDING/*GENERAL AVIATION AIRCRAFT/*IMPACT
TESTS/*LIGHT AIRCRAFT

MINS: / ACCELEROMETERS/ HUMAN FACTORS ENGINEERING/ IMPACT
DAMAGE/ PITCH (INCLINATION)/ STRUCTURAL STRAIN

ABS: Three similar twin-engine general aviation airplane
specimens were crash tested at an impact dynamics
research facility at 27 m/sec, a flight path angle of
-15 deg, and pitch angles of -15 deg, 0 deg, and 15
deg. Other crash parameters were held constant. The
test facility, instrumentation, test specimens, and
test method are briefly described. Structural damage
and accelerometer data for each of the three impact
conditions are presented and discussed.

RPT#: NASA-TP-1589 L-13143

80N13026

UTTL: Exploratory study of the effects of wing-leading-edge
modifications on the stall/spin behavior of a light
general aviation airplane

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT SPIN/*GENERAL
AVIATION AIRCRAFT/*LEADING EDGES/*LIGHT AIRCRAFT/*WING
PROFILES

MINS: / AERODYNAMIC STABILITY/ FLIGHT TESTS/ LATERAL
STABILITY/ LEADING EDGE SLATS

ABS: Configurations with full-span and segmented
leading-edge flaps and full-span and segmented
leading-edge droop were tested. Studies were conducted
with wind-tunnel models, with an outdoor
radio-controlled model, and with a full-scale

airplane. Results show that wing-leading-edge
modifications can produce large effects on stall/spin
characteristics, particularly on spin resistance. One
outboard wing-leading-edge modification tested
significantly improved lateral stability at stall,
spin resistance, and developed spin characteristics.

RPT#: NASA-TP-1591 L-13135

80N22266

UTTL: Full-scale wind tunnel investigation of the Advanced
Technology Light Twin-Engine airplane (ATLIT)

AUTH: A/HASSELL, J. L., JR.; B/NEWSOM, W. A., JR.; C/YIP,
L. P.

MAJS: /*AERODYNAMIC STABILITY/*AIRCRAFT CONTROL/*AIRCRAFT
PERFORMANCE/*ATLIT PROJECT/*FULL SCALE TESTS/*WIND
TUNNEL TESTS

MINS: / ANGLE OF ATTACK/ DRAG REDUCTION/ PROPELLER
EFFICIENCY/ SIDESLIP/ WINGLETS

ABS: An investigation was conducted to evaluate the
aerodynamic performance, stability, and control
characteristics of the Advanced Technology Light Twin
Engine airplane (ATLIT). Data were measured over an
angle of attack range from -4 deg to 20 deg for
various angles of sideslip between -5 deg and 15 deg
at Reynolds numbers of 0.000023 and 0.000035 for
various settings of power and flap deflection.
Measurements were also made by means of special thrust
torque balances to determine the installed propeller
characteristics. Part of the investigation was devoted
to drag cleanup of the basic airplane and to the
evaluation of the effect of winglets on drag and
stability.

RPT#: NASA-TP-1636 L-13054

80N25345

UTTL: Measurement of the handling characteristics of two
light airplanes

MAJS: /*CONTROLLABILITY/*FLIGHT TESTS/*GENERAL AVIATION
AIRCRAFT

MINS: / AERODYNAMIC STALLING/ AIRCRAFT CONTROL/ AIRCRAFT
PERFORMANCE/ LATERAL CONTROL/ LONGITUDINAL CONTROL

ABS: A flight investigation of the handling characteristics
of two single engine general aviation airplanes, one a
high wing and the other a low wing, included a variety
of measurements of different characteristics of the
airplanes. The characteristics included those of the
control systems, performance, longitudinal and lateral
responses, and stall motions.

RPT#: NASA-TP-1647 L-12494
80N22358

UTTL: Description of an experimental (hydrogen peroxide) rocket system and its use in measuring aileron and rudder effectiveness of a light airplane

AUTH: A/OBRYAN, T. C.; B/GOODE, M. W.; C/GREGORY, F. D.; D/MAYO, M. H.

MAJS: /*AILERONS/*HYDROGEN PEROXIDE/*LIGHT AIRCRAFT/*ROCKET ENGINES/*RUDDERS/*SYSTEM EFFECTIVENESS

MINS: / CONTROLLABILITY/ ROCKET THRUST/ ROLLING MOMENTS/ YAWING MOMENTS

ABS: A hydrogen peroxide fueled rocket system, which is to be used as a research tool in flight studies of stall and spin maneuvers, was installed on a light, four place general aviation airplane. The pilot controlled rocket system produces moments about either the roll or the yaw body axis to augment or oppose the aerodynamic forces and inertial moments acting on the airplane during various flight maneuvers, including the spin. These controlled moments of a known magnitude can be used in various ways to help analyze and interpret the importance of the various factors which influence airplane maneuvers. The rocket system and its installation in the airplane are described, and the results of flight tests used to measure rudder and aileron effectiveness at airspeeds above the stall are presented. These tests also serve to demonstrate the operational readiness of the rocket system for future research operations.

RPT#: NASA-TP-1498 L-12976
81N12015

UTTL: Low-speed aerodynamic characteristics of a 13 percent thick medium speed airfoil designed for general aviation applications

AUTH: A/MCGHEE, R. J.; B/BEASLEY, W. D.

MAJS: /*AIRCRAFT DESIGN/*ANGLE OF ATTACK/*GENERAL AVIATION AIRCRAFT/*WIND TUNNEL TESTS

MINS: / AERODYNAMIC CHARACTERISTICS/ MACH NUMBER/ REYNOLDS NUMBER

ABS: Wind tunnel tests were conducted to determine the low speed, two dimensional aerodynamic characteristics of a 13percent thick medium speed airfoil designed for general aviation applications. The results were compared with data for the 13 percent thick low speed airfoil. The tests were conducted over a Mach number range from 0.10 to 0.32, a chord Reynolds number range from 2.0×10^6 to the 6th power to 12.0×10^6 to the 6th power, and an angle of attack frange from about -8 deg to 10 deg. The objective of retaining good high-lift low speed characteristics for an airfoil designed to have good medium speed cruise performance was achieved.

RPT#: NASA-TP-1762 L-13946
81N16039

UTTL: Use of constrained optimization in the conceptual design of a medium-range subsonic transport

AUTH: A/SLIWA, S. M.

MAJS: /*COST ANALYSIS/*DESIGN ANALYSIS/*NONLINEAR PROGRAMMING/*OPTIMIZATION/*TRANSPORT AIRCRAFT

MINS: / AERODYNAMIC CONFIGURATIONS/ AIRCRAFT PERFORMANCE/ GENERAL AVIATION AIRCRAFT

ABS: Constrained parameter optimization was used to perform the optimal conceptual design of a medium range transport configuration. The impact of choosing a given performance index was studied, and the required income for a 15 percent return on investment was proposed as a figure of merit. A number of design constants and constraint functions were systematically varied to document the sensitivities of the optimal design to a variety of economic and technological assumptions. A comparison was made for each of the parameter variations between the baseline configuration and the optimally redesigned configuration.



CONTRACTOR REPORTS (CR)

These documents record scientific and technical findings generated by NASA-sponsored R&D and related efforts that are considered desirable for release by NASA. They are subdivided into low-numbered and high-numbered subseries contractor reports. The low-numbered subseries are similar in quality to NASA Technical Papers and are produced and disseminated in the same manner as NASA Technical Papers.

The high-numbered subseries do not meet the same criteria as the low-numbered subseries although they contain new technical information. They are produced and disseminated in the manner of NASA Technical Memorandums.



RPT#: NASA-CR-132531
75N10933

UTTL: Statistical analysis of general aviation VG-VGH data
AUTH: A/CLAY, L. E.; B/DICKEY, R. L.; C/MORAN, M. S.;
D/PAYAUYS, K. W.; E/SEVERYN, T. P.
MAJS: /*FLIGHT RECORDERS/*GENERAL AVIATION AIRCRAFT/*
STATISTICAL ANALYSIS
MINS: / ACCELERATION/ AERODYNAMIC LOADS/ AIRSPEED/ DATA
SAMPLING/ GUST LOADS/ IMPACT LOADS
ABS: To represent the loads spectra of general aviation
aircraft operating in the Continental United States,
VG and VGH data collected since 1963 in eight
operational categories were processed and analyzed.
Adequacy of data sample and current operational
categories, and parameter distributions required for
valid data extrapolation were studied along with
envelopes of equal probability of exceeding the normal
load factor ($n_{sub z}$) versus airspeed for gust and
maneuver loads and the probability of exceeding
current design maneuver, gust, and landing impact $n_{sub z}$
limits. The significant findings are included.

RPT#: NASA-CR-132677
75N25901

UTTL: Flight test and evaluation of Omega navigation for
general aviation
AUTH: A/HWOSCHINSKY, P. V.
MAJS: /*FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT/*OMEGA
NAVIGATION SYSTEM
MINS: / GROUND BASED CONTROL/ HYPERBOLIC NAVIGATION/
POSITION (LOCATION)/ RADIO RECEIVERS/ RADIO WAVES/
SYSTEMS ANALYSIS
ABS: A seventy hour flight test program was performed to
determine the suitability and accuracy of a low cost
Omega navigation receiver in a general aviation
aircraft. An analysis was made of signal availability
in two widely separated geographic areas. Comparison
is made of the results of these flights with other
navigation systems. Conclusions drawn from the test
experience indicate that developmental system
improvement is necessary before a competent fail safe
or fail soft area navigation system is offered to
general aviation.

RPT#: NASA-CR-137604 MDC-J4484-VOL-2
75N22301

UTTL: Analysis of operational requirements for medium
density air transportation, volume 2
MAJS: /*AIR TRANSPORTATION/*AIRCRAFT DESIGN/*COMMERCIAL
AIRCRAFT/*SHORT TAKEOFF AIRCRAFT
MINS: / ECONOMIC FACTORS/ GENERAL AVIATION AIRCRAFT/ MARKET

RESEARCH

ABS: The medium density air travel market is examined and
defined in terms of numbers of people transported per
route per day and frequency of service. The
operational characteristics for aircraft to serve this
market are determined and a basepoint aircraft is
designed from which tradeoff studies and parametric
variations can be conducted. The impact of the
operational characteristics on the air travel system
is evaluated along with the economic viability of the
study aircraft. Research and technology programs for
future study consideration are identified.

RPT#: NASA-CR-137605 MDC-J4484-VOL-3
75N22302

UTTL: Analysis of operational requirements for medium
density air transportation. Volume 3: Appendix
MAJS: /*AIR TRANSPORTATION/*AIRCRAFT DESIGN/*COMMERCIAL
AIRCRAFT/*SHORT TAKEOFF AIRCRAFT
MINS: / ECONOMIC FACTORS/ GENERAL AVIATION AIRCRAFT/ MARKET
RESEARCH
ABS: For abstract, see N75-22301.

RPT#: NASA-CR-137628
75N16554

UTTL: Analysis of technology requirements and potential
demand for general aviation avionics systems for
operation in the 1980's
AUTH: A/COHN, D. M.; B/KAYSER, J. H.; C/SENKO, G. M.;
D/GLENN, D. R.
MAJS: /*AVIONICS/*COST EFFECTIVENESS/*GENERAL AVIATION
AIRCRAFT/*TECHNOLOGICAL FORECASTING
MINS: / DEMAND (ECONOMICS)/ ECONOMIC ANALYSIS/ LOW COST/
NASA PROGRAMS/ TECHNOLOGY ASSESSMENT/ TECHNOLOGY
TRANSFER
ABS: Avionics systems are identified which promise to
reduce economic constraints and provide significant
improvements in performance, operational capability
and utility for general aviation aircraft in the
1980's.

RPT#: NASA-CR-143237 TM-17
75N28278

UTTL: Common antenna preamplifier-isolator for VLF-LF
receivers
AUTH: A/BURHANS, R. W.
MAJS: /*GENERAL AVIATION AIRCRAFT/*LOW FREQUENCIES/*
PREAMPLIFIERS/*RECEIVERS/*VERY LOW FREQUENCIES
MINS: / AIRCRAFT ANTENNAS/ OMEGA NAVIGATION SYSTEM/
PERFORMANCE TESTS
ABS: A modified high impedance preamplifier circuit which

provides outputs to drive an Omega-VLF receiver and an ADF-LF receiver from a common antenna on general aviation aircraft is reported. The preamplifier was evaluated with fixed ground station receivers and results show the burn out problem of the first stage MOSFET during very close lightning discharges was eliminated.

RPT#: NASA-CR-2443
75N12943

UTTL: Development of a Fowler flap system for a high performance general aviation airfoil
AUTH: A/WENTZ, W. H., JR.; B/SEETHARAM, H. C.
MAJS: /*FLOW VISUALIZATION/*GAW-1 AIRFOIL/*GENERAL AVIATION AIRCRAFT/*TRAILING-EDGE FLAPS/*WIND TUNNEL TESTS / AERODYNAMIC COEFFICIENTS/ COMPUTERIZED DESIGN/ PRESSURE DISTRIBUTION/ SUBSONIC SPEED
ABS: A two-dimensional wind-tunnel evaluation of two Fowler flap configurations on the new GA(W)-1 airfoil was conducted. One configuration used a computer-designed 29-percent chord Fowler flap. The second configuration was modified to have increased Fowler action with a 30-percent chord flap. Force, pressure, and flow-visualization data were obtained at Reynolds numbers of 2.2 million to 2.9 million. Optimum slot geometry and performance were found to be close to computer predictions. A C sub L max of 3.8 was achieved. Optimum flap deflection, slot gap, and flap overlap are presented as functions of C sub L. Tests were made with the lower surface cusp filled in to show the performance penalties that result. Some data on the effects of adding vortex generators and hinged-plate spoilers were obtained.

RPT#: NASA-CR-2523
75N24677

UTTL: Light aircraft lift, drag, and moment prediction: A review and analysis
AUTH: A/SMETANA, F. O.; B/SUMMEY, D. C.; C/SMITH, N. S.; D/CARDEN, R. K.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*COMPUTER PROGRAMS/* LIGHT AIRCRAFT/*PREDICTION ANALYSIS TECHNIQUES
MINS: / AERODYNAMIC COEFFICIENTS/ AERODYNAMIC DRAG/ AIRCRAFT CONFIGURATIONS/ FLOW CHARACTERISTICS/ LIFT
ABS: The historical development of analytical methods for predicting the lift, drag, and pitching moment of complete light aircraft configurations in cruising flight is reviewed. Theoretical methods, based in part on techniques described in the literature and in part on original work, are developed. These methods form the basis for understanding the computer programs given to: (1) compute the lift, drag, and moment of

conventional airfoils, (2) extend these two-dimensional characteristics to three dimensions for moderate-to-high aspect ratio unswept wings, (3) plot complete configurations, (4) convert the fuselage geometric data to the correct input format, (5) compute the fuselage lift and drag, (6) compute the lift and moment of symmetrical airfoils to $M = 1.0$ by a simplified semi-empirical procedure, and (7) compute, in closed form, the pressure distribution over a prolate spheroid at $\alpha = 0$. Comparisons of the predictions with experiment indicate excellent lift and drag agreement for conventional airfoils and wings. Limited comparisons of body-alone drag characteristics yield reasonable agreement. Also included are discussions for interference effects and techniques for summing the results above to obtain predictions for complete configurations.

RPT#: NASA-CR-132720 ASI-TR-75-22-VOL-1
76N18094

UTTL: Flight test and evaluation of Omega navigation in a general aviation aircraft. Volume 1: Technical

AUTH: A/HOWELL, J. D.; B/HOFFMAN, W. C.; C/HWOSCHINSKY, P. V.; D/WISCHMEYER, C. E.

MAJS: /*AIR NAVIGATION/*OMEGA NAVIGATION SYSTEM

MINS: / AIRCRAFT MANEUVERS/ ALTITUDE/ DATA PROCESSING/ FLIGHT TESTS/ PIPER AIRCRAFT/ PRECIPITATION (METEOROLOGY)/ SIGNAL TO NOISE RATIOS/ TERRAIN/ VERTICAL TAKEOFF AIRCRAFT

ABS: A low cost flight research program was conducted to evaluate the performance of differential Omega navigation in a general aviation aircraft. The flight program consisted of two distinct parts corresponding to the two major objectives of the study. The Wallops Flight Program was conducted to obtain Omega signal and phase data in the Wallops Flight Center vicinity to provide preliminary technical information and experience in preparation for a comprehensive NASA/FAA flight test program of an experimental differential Omega system. The Northeast Corridor Flight Program was conducted to examine Omega operational suitability and performance on low altitude area navigation (RNAV) routes for city-center to city-center VTOL commercial operations in the Boston-New York-Washington corridor. The development, execution and conclusions of the flight research program are described. The results of the study provide both quantitative and qualitative data on the Omega Navigation System under actual operating conditions.

RPT#: NASA-CR-132721 ASI-TR-75-22-VOL-2
76N18095

UTTL: Flight test and evaluation of Omega navigation in a general aviation aircraft. Volume 2: Appendices

AUTH: A/HOWELL, J. D.; B/HOFFMAN, W. C.; C/HWOSCHINSKY, P. V.; D/WISCHMEYER, C. E.

MAJS: /*AIR NAVIGATION/*OMEGA NAVIGATION SYSTEM

MINS: / COMPUTER PROGRAMS/ DATA PROCESSING/ FLIGHT PLANS/ FLIGHT TESTS/ GRAPHS (CHARTS)/ PIPER AIRCRAFT/ SIGNAL TO NOISE RATIOS/ VERTICAL TAKEOFF AIRCRAFT

ABS: Detailed documentation for each flight of the Omega Flight Evaluation study is presented, including flight test description sheets and actual flight data plots. Computer programs used for data processing and flight planning are explained and the data formats utilized by the Custom Interface Unit are summarized.

RPT#: NASA-CR-134854 NAPTC-PE-61
76N11099

UTTL: Rotor burst protection program: Statistics on aircraft gas turbine engine rotor failures that occurred in US commercial aviation during 1973

AUTH: A/DELUCIA, R. A.; B/MANGANO, G. J.

MAJS: /*ACCELERATION PROTECTION/*CIVIL AVIATION/*FRAGMENTATION/*GAS TURBINE ENGINES/*ROTORS/*RUPTURING /*STATISTICAL ANALYSIS

MINS: / ENGINE FAILURE/ ROTATING DISKS/ STRUCTURAL FAILURE/ TURBOMACHINE BLADES

ABS: Statistical data on gas turbine rotor failures that have occurred in U.S. commercial aviation during 1973 was presented. Analysis of the data led to the following conclusions: (1) the incidence of rotor failure and uncontained burst is significantly high enough to warrant continuation of the efforts of the Rotor Burst Protection Program (RBPP). (2) of all the types of fragments generated, disk fragments, because of their size, high energy content and high rate of uncontainment (100 %), continue to be a major threat to the welfare and safety of commercial aircraft passengers. (3) the number of uncontained blade failures is surprisingly high since rotor blade containment is required for engine certification under FAA regulations. (4) it appears that causes beyond the control or scope of present technology are still primarily responsible for most of the rotor failures that occur.

RPT#: NASA-CR-137671
76N10089

UTTL: Multivariate Analysis, Retrieval, and Storage system (MARS). Volume 1: MARS system and analysis techniques

AUTH: A/HAGUE, D. S.; B/VANDERBERG, J. D.; C/WOODBURY, N. W.

MAJS: /*AIRCRAFT DESIGN/*COMPUTER PROGRAMS/*DATA BASES/*DATA STORAGE/*INFORMATION RETRIEVAL/*MULTIVARIATE STATISTICAL ANALYSIS/*PREDICTION ANALYSIS TECHNIQUES

MINS: / ENGINE DESIGN/ GENERAL AVIATION AIRCRAFT/ REGRESSION ANALYSIS/ TURBOFAN AIRCRAFT/ WEIGHT ANALYSIS

ABS: A method for rapidly examining the probable applicability of weight estimating formulae to a specific aerospace vehicle design is presented. The Multivariate Analysis Retrieval and Storage System (MARS) is comprised of three computer programs which sequentially operate on the weight and geometry characteristics of past aerospace vehicles designs. Weight and geometric characteristics are stored in a set of data bases which are fully computerized. Additional data bases are readily added to the MARS system and/or the existing data bases may be easily

expanded to include additional vehicles or vehicle characteristics.

RPT#: NASA-CR-137859
76N31215

UTTL: Flight simulation study to determine MLS lateral course width requirements on final approach for general aviation

AUTH: A/CRUMRINE, R. J.

MAJS: /*FLIGHT SIMULATION/*GENERAL AVIATION AIRCRAFT/*
MICROWAVE LANDING SYSTEMS/*RUNWAY CONDITIONS

MINS: / AIR TRAFFIC CONTROL/ AIRCRAFT LANDING/ AIRCRAFT
PILOTS/ INSTRUMENT LANDING SYSTEMS/ TAKEOFF

ABS: An investigation of the effects of various lateral course widths and runway lengths for manual CAT I Microwave Landing System instrument approaches was carried out with instrument rated pilots in a General Aviation simulator. Data are presented on the lateral dispersion at the touchdown zone, and the middle and outer markers, for approaches to 3,000, 8,000 (and trial 12,000 foot) runway lengths with full scale angular lateral course widths of + or - 1.19 deg, + or - 2.35 deg, and + or - 3.63 deg. The distance from touchdown where the localizer deviation went to full scale was also recorded. Pilot acceptance was measured according to the Cooper-Harper rating system.

RPT#: NASA-CR-137861
76N28233

UTTL: Transcription of the Workshop on General Aviation Advanced Avionics Systems

AUTH: A/TASHKER, M.

MAJS: /*AVIONICS/*CONFERENCES/*GENERAL AVIATION AIRCRAFT

MINS: / DISPLAY DEVICES/ INTEGRATED CIRCUITS/
MICROPROCESSORS/ MINICOMPUTERS

ABS: Papers are presented dealing with the design of reliable, low cost, advanced avionics systems applicable to general aviation in the 1980's and beyond. Sensors, displays, integrated circuits, microprocessors, and minicomputers are among the topics discussed.

RPT#: NASA-CR-137889
76N30214

UTTL: Computer technology forecast study for general aviation

AUTH: A/SEACORD, C. L.; B/VAUGHN, D.

MAJS: /*AERONAUTICAL ENGINEERING/*AIRFRAMES/*COMPUTER
STORAGE DEVICES/*COMPUTER SYSTEMS DESIGN/*GENERAL
AVIATION AIRCRAFT

MINS: / AIRBORNE/SPACEBORNE COMPUTERS/ ENGINE DESIGN/

TECHNOLOGICAL FORECASTING/ TECHNOLOGY ASSESSMENT
ABS: A multi-year, multi-faceted program is underway to investigate and develop potential improvements in airframes, engines, and avionics for general aviation aircraft. The objective of this study was to assemble information that will allow the government to assess the trends in computer and computer/operator interface technology that may have application to general aviation in the 1980's and beyond. The current state of the art of computer hardware is assessed, technical developments in computer hardware are predicted, and nonaviation large volume users of computer hardware are identified.

RPT#: NASA-CR-137909 ASI-TR-76-35
76N33179

UTTL: Forecast of the general aviation air traffic control environment for the 1980's

AUTH: A/HOFFMAN, W. C.; B/HOLLISTER, W. M.

MAJS: /*AIR TRAFFIC CONTROL/*AIRBORNE SURVEILLANCE RADAR/*
AIRCRAFT COMMUNICATION/*INSTRUMENT LANDING SYSTEMS

MINS: / AERONAUTICAL SATELLITES/ AIRCRAFT DESIGN/ AVIONICS/
FLIGHT CONTROL/ GENERAL AVIATION AIRCRAFT

ABS: The critical information required for the design of a reliable, low cost, advanced avionics system which would enhance the safety and utility of general aviation is stipulated. Sufficient data is accumulated upon which industry can base the design of a reasonably priced system having the capability required by general aviation in and beyond the 1980's. The key features of the Air Traffic Control (ATC) system are: a discrete address beacon system, a separation assurance system, area navigation, a microwave landing system, upgraded ATC automation, airport surface traffic control, a wake vortex avoidance system, flight service stations, and aeronautical satellites. The critical parameters that are necessary for component design are identified. The four primary functions of ATC (control, surveillance, navigation, and communication) and their impact on the onboard avionics system design are assessed.

RPT#: NASA-CR-145627
76N10997

UTTL: Proceedings of the NASA, Industry, University, General Aviation Drag Reduction Workshop

AUTH: A/ROSKAM, J.

MAJS: /*AIRCRAFT CONFIGURATIONS/*CONFERENCES/*DRAG REDUCTION
/*GENERAL AVIATION AIRCRAFT

MINS: / AERODYNAMIC DRAG/ AIRCRAFT DESIGN/ BODY-WING AND
TAIL CONFIGURATIONS/ GOVERNMENT/INDUSTRY RELATIONS/
PREDICTION ANALYSIS TECHNIQUES/ WIND TUNNEL TESTS

RPT#: NASA-CR-145776
76N11994

UTTL: General aviation and community development
AUTH: A/SINCOFF, M. Z.; B/DAJANI, J. S.
MAJS: /*AIRPORT PLANNING/*GENERAL AVIATION AIRCRAFT
MINS: / AIR TRAFFIC CONTROL/ AIR TRANSPORTATION/ AIRCRAFT
PERFORMANCE/ ENVIRONMENT PROTECTION/ NATIONAL AVIATION
SYSTEM

RPT#: NASA-CR-145936
76N17091

UTTL: New potentials for conventional aircraft when powered
by hydrogen-enriched gasoline
AUTH: A/MENARD, W. A.; B/MOYNIHAN, P. I.; C/RUPE, J. H.
MAJS: /*FUEL INJECTION/*GAS MIXTURES/*GENERAL AVIATION
AIRCRAFT/*HYDROGEN FUELS
MINS: / COMBUSTION EFFICIENCY/ EXHAUST GASES/ FUEL
CONSUMPTION/ FUEL-AIR RATIO
ABS: Hydrogen enrichment for aircraft piston engines is
studied. The feasibility is examined of inflight
injection of hydrogen in general aviation aircraft
engines to reduce fuel consumption and to lower
emission levels. Results are summarized.

RPT#: NASA-CR-145979 ESS-4039-103-75 TR-403905
76N14089

UTTL: General aviation technology assessment
AUTH: A/JACOBSON, I. D.
MAJS: /*GENERAL AVIATION AIRCRAFT/*TECHNOLOGY ASSESSMENT
MINS: / AERODYNAMIC CHARACTERISTICS/ AIRCRAFT PERFORMANCE/
AIRCRAFT SAFETY/ DATA ACQUISITION/ SURVEYS
ABS: The existing problem areas in general aviation were
investigated in order to identify those which can
benefit from technological payoffs. The emphasis was
placed on acceptance by the pilot/passenger in areas
such as performance, safety, handling qualities, ride
quality, etc. Inputs were obtained from three sectors:
industry; government; and user, although slanted
toward the user group. The results should only be
considered preliminary due to the small sample sizes
of the data. Trends are evident however and a general
methodology for allocating effort in future programs
is proposed.

RPT#: NASA-CR-146324
76N18115

UTTL: Flight test of a stall sensor and evaluation of its
application to an aircraft stall deterrent system
using the NASA LRC general aviation simulator
AUTH: A/BENNETT, G.
MAJS: /*AERODYNAMIC STALLING/*FLIGHT SIMULATORS/*FLIGHT

TESTS/*SENSORS

MINS: / AIRCRAFT CONTROL/ COMPUTERIZED SIMULATION/ FORTRAN
ABS: A series of flight maneuvers were developed to cover
the range of flight conditions and to define the
repeatability and hysteresis of the sensors. Initial
flights were made with two sensors at the + or - 68
percent span and 60 percent and 70 percent chord
stations. The primary effort in simulation program
development was to modify the LRC General Aviation
Simulator (GAS) Fortran programs to allow execution on
the MSU UNIVAC 1106. A simple model of the
sensor-servo stall deterrent system was developed. A
one degree of freedom model of pitch dynamics of the
airplane and stall deterrent system was developed to
make initial estimates of the control system gains. A
position error plus rate damping control algorithm was
found to have acceptable characteristics.

RPT#: NASA-CR-147159
76N22216

UTTL: Technology and politics: The regional airport
experience
AUTH: A/STARLING, J. D.; B/BROWN, J.; C/GERHARDT, J. M.;
D/DOMINUS, M. I.
MAJS: /*AIRPORTS/*POLITICS/*REGIONAL PLANNING/*TECHNOLOGIES
/*URBAN DEVELOPMENT
MINS: / AIRPORT PLANNING/ CIVIL AVIATION/ ECONOMIC
DEVELOPMENT/ ECONOMIC FACTORS/ LAND MANAGEMENT/ LAND
USE
ABS: The findings of a comparative study of the following
six regional airports were presented: Dallas/Fort
Worth, Kansas City, Washington, D.C., Montreal, Tampa,
and St. Louis. Each case was approached as a unique
historical entity, in order to investigate common
elements such as: the use of predictive models in
planning, the role of symbolism to heighten dramatic
effects, the roles of community and professional
elites, and design flexibility. Some of the factors
considered were: site selection, consolidation of
airline service, accessibility, land availability and
cost, safety, nuisance, and pollution constraints,
economic growth, expectation of regional growth, the
demand forecasting conundrum, and design decisions.
The hypotheses developed include the following: the
effect of political, social, and economic conflicts,
the stress on large capacity and dramatic,
high-technology design, projections of rapid growth to
explain the need for large capital outlays.

RPT#: NASA-CR-147979
76N32177

UTTL: Development of criteria for the design of a low noise level general aviation propeller

AUTH: A/ORMSBEE, A. I.

MAJS: /*DESIGN ANALYSIS/*GENERAL AVIATION AIRCRAFT/*NOISE (SOUND)/*PROPELLERS

MINS: / AIRCRAFT NOISE/ AIRCRAFT PERFORMANCE/ NOISE REDUCTION

ABS: The theoretical and experimental investigation of general aviation propellers is considered. The objective is to improve noise generation characteristics without loss of performance.

RPT#: NASA-CR-147985 ESS-4035-105-76
76N24282

UTTL: Development and application of an atmospheric turbulence model for use in flight simulators in flight simulators

AUTH: A/JACOBSON, I. D.; B/JOSHI, D. S.

MAJS: /*ATMOSPHERIC TURBULENCE/*FLIGHT SIMULATORS

MINS: / AIRCRAFT CONTROL/ ATMOSPHERIC MODELS

ABS: The influence of simulated turbulence on aircraft handling qualities was investigated. Pilot opinion of the handling qualities of a light general aviation aircraft were evaluated in a motion-base simulator using a simulated turbulence environment. A realistic representation of turbulence disturbances is described in terms of rms intensity and scale length and their random variations with time. The time histories generated by the proposed turbulence models showed characteristics which appear to be more similar to real turbulence than the frequently-used Gaussian turbulence model. In addition, the proposed turbulence models can flexibly accommodate changes in atmospheric conditions and be easily implemented in flight simulator studies. Six turbulence time histories, including the conventional Gaussian model, were used in an IFR-tracking task. The realism of each of the turbulence models and the handling qualities of the simulated airplane were evaluated. Analysis of pilot opinions shows that at approximately the same rms intensities of turbulence, the handling quality ratings transit from the satisfactory level, for the simple Gaussian model, to an unacceptable level for more realistic and compositely structured turbulence models.

RPT#: NASA-CR-148147 TM-28
76N26176

UTTL: Small-aircraft flight evaluation of Rustrak chart recorder

AUTH: A/SALTER, R. J., JR.; B/LILLEY, R. W.

MAJS: /*LIGHT AIRCRAFT/*RECORDING INSTRUMENTS/*VIBRATION EFFECTS

MINS: / AIRCRAFT ENGINES/ AIRCRAFT MANEUVERS/ FLIGHT TESTS/ INSTRUMENT ERRORS/ OMEGA NAVIGATION SYSTEM/ VIBRATION DAMPING/ WIND (METEOROLOGY)

ABS: It was found that the RUSTRAK recorder was only slightly hampered by aircraft vibration while in level cruising flight or while taxiing, regardless of light turbulence or particular mounting configuration. No one mounting configuration was better than the other. There is some (approximately 1/4 inch) vibration error during climbs, descents, and touchdowns in choppy weather. However, it was found that improved performance resulted from setting the recorder on carpet rather than the metal floor plate. This suggests that padding the recorder with some cushioning, shock-damping material might reduce the engine vibration and wind chop effects.

RPT#: NASA-CR-148148 REPT-75-163-1
76N23249

UTTL: An assessment of the benefits of the use of NASA developed fuel conservative technology in the US commercial aircraft fleet

MAJS: /*CIVIL AVIATION/*ENERGY POLICY/*FUEL CONSUMPTION/* NASA PROGRAMS

MINS: / BOUNDARY LAYER CONTROL/ COMMERCIAL AIRCRAFT/ COMPOSITE MATERIALS/ COST REDUCTION/ ENGINE PARTS/ FUEL CONTROL/ LAMINAR BOUNDARY LAYER/ TECHNOLOGY ASSESSMENT/ TURBOPROP AIRCRAFT

ABS: Cost and benefits of a fuel conservative aircraft technology program proposed by NASA are estimated. NASA defined six separate technology elements for the proposed program: (a) engine component improvement (b) composite structures (c) turboprops (d) laminar flow control (e) fuel conservative engine and (f) fuel conservative transport. There were two levels postulated: The baseline program was estimated to cost \$490 million over 10 years with peak funding in 1980. The level two program was estimated to cost an additional \$180 million also over 10 years. Discussions with NASA and with representatives of the major commercial airframe manufacturers were held to estimate the combinations of the technology elements most likely to be implemented, the potential fuel savings from each combination, and reasonable dates for incorporation of these new aircraft into the fleet.

RPT#: NASA-CR-148287
76N26221

UTTL: Development of capabilities for stall/spin research
AUTH: A/CRAIG, A.
MAJS: /*AERODYNAMIC STALLING/*GENERAL AVIATION AIRCRAFT/*
RESEARCH MANAGEMENT
MINS: / AERODYNAMIC BALANCE/ LOW SPEED WIND TUNNELS/ ROTARY
STABILITY/ STATIC AERODYNAMIC CHARACTERISTICS/ WIND
TUNNEL TESTS
ABS: Apparatus and techniques were developed for measuring
in a low-speed wind tunnel the static and dynamic
(rotary balance) aerodynamic data pertinent to spin
behavior of a general aviation aircraft. The main
results were: (1) collection of static force and
moment data for several airplane configurations at
angles of attack from 0 to 90 degrees and angles of
sideslip from 0 to 40 degrees; and (2) difficulties,
shortcomings, and unsuitability of some aspects of the
rotary balance mount as constructed were discovered
and identified for avoidance in a new design for a
mount.

RPT#: NASA-CR-2605 RE-90
76N10002

UTTL: A passive gust alleviation system for a light aircraft
AUTH: A/ROESCH, P.; B/HARLAN, R. B.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRCRAFT CONTROL/*
GENERAL AVIATION AIRCRAFT/*GUST ALLEVIATORS
MINS: / AIRCRAFT DESIGN/ AIRCRAFT STABILITY/ ATMOSPHERIC
TURBULENCE
ABS: A passive aeromechanical gust alleviation system was
examined for application to a Cessna 172. The system
employs small auxiliary wings to sense changes in
angle of attack and to drive the wing flaps to
compensate the resulting incremental lift. The flaps
also can be spring loaded to neutralize the effects of
variations in dynamic pressure. Conditions for gust
alleviation are developed and shown to introduce
marginal stability if both vertical and horizontal
gusts are compensated. Satisfactory behavior is
realized if only vertical gusts are absorbed; however,
elevator control is effectively negated by the system.
Techniques to couple the elevator and flaps are
demonstrated to restore full controllability without
sacrifice of gust alleviation.

RPT#: NASA-CR-2625 REPT-126
76N12077

UTTL: An in-flight simulation of lateral control
nonlinearities
AUTH: A/ELLIS, D. R.; B/TILAK, N. W.
MAJS: /*FLIGHT SIMULATORS/*GENERAL AVIATION AIRCRAFT/*

LATERAL CONTROL/*SPOILERS

MINS: / NONLINEARITY/ SYSTEM EFFECTIVENESS
ABS: An in-flight simulation program was conducted to
explore, in a generalized way, the influence of
spoiler-type roll-control nonlinearities on handling
qualities. The roll responses studied typically
featured a dead zone or very small effectiveness for
small control inputs, a very high effectiveness for
mid-range deflections, and low effectiveness again for
large inputs. A linear force gradient with no
detectable breakout force was provided. Given
otherwise good handling characteristics, it was found
that moderate nonlinearities of the types tested might
yield acceptable roll control, but the best level of
handling qualities is obtained with linear,
aileron-like control.

RPT#: NASA-CR-2739 CG-D-1-76
76N33472

UTTL: Development and field testing of a Light Aircraft Oil
Surveillance System (LAOSS)
AUTH: A/BURNS, W.; B/HERZ, M. J.
MAJS: /*AIRBORNE EQUIPMENT/*FLIGHT TESTS/*LIGHT AIRCRAFT/*
OIL SLICKS/*RESEARCH AND DEVELOPMENT/*SURVEILLANCE
MINS: / OIL POLLUTION/ POLARIZED LIGHT/ REMOTE SENSORS/
TELEVISION CAMERAS
ABS: An experimental device consisting of a conventional TV
camera with a low light level photo image tube and
motor driven polarized filter arrangement was
constructed to provide a remote means of
discriminating the presence of oil on water surfaces.
This polarized light filtering system permitted a
series of successive, rapid changes between the
vertical and horizontal components of reflected
polarized skylight and caused the oil based substances
to be more easily observed and identified as a
flashing image against a relatively static water
surface background. This instrument was flight tested,
and the results, with targets of opportunity and more
systematic test site data, indicate the potential
usefulness of this airborne remote sensing instrument.

RPT#: NASA-CR-137679
77N24133

UTTL: Civil mini-RPA's for the 1980's: Avionics design considerations
AUTH: A/KARMARKAR, J. S.
MAJS: /*AVIONICS/ *CIVIL AVIATION/ *REMOTELY PILOTED VEHICLES
/*TECHNOLOGY UTILIZATION
MINS: / AERIAL RECONNAISSANCE/ COST EFFECTIVENESS/ FIRE
FIGHTING/ MICROPROGRAMMING/ REMOTE SENSORS
ABS: A number of remote sensing or surveillance tasks (e.g., fire fighting, crop monitoring) in the civilian sector of our society may be performed in a cost effective manner by use of small remotely piloted aircraft (RPA). This study was conducted to determine equipment (and the associated technology) that is available, and that could be applied to the mini-RPA and to examine the potential applications of the mini-RPA with special emphasis on the wild fire surveillance mission. The operational considerations of using the mini-RPA as affected by government regulatory agencies were investigated. These led to equipment requirements (e.g., infra-red sensors) over and above those for the performance of the mission. A computer technology survey and forecast was performed. Key subsystems were identified, and a distributed microcomputer configuration, that was functionally modular, was recommended. Areas for further NASA research and development activity were also identified.

RPT#: NASA-CR-137894 LMSC-D057323
77N10047

UTTL: Civil uses of remotely piloted aircraft
AUTH: A/ADERHOLD, J. R.; B/GORDON, G.; C/SCOTT, G. W.
MAJS: /*CIVIL AVIATION/ *COST EFFECTIVENESS/ *MISSION PLANNING
/*REMOTELY PILOTED VEHICLES/ *TECHNOLOGY ASSESSMENT
MINS: / AIRCRAFT SAFETY/ AIRLINE OPERATIONS/ TECHNOLOGICAL
FORECASTING
ABS: The technology effort is identified and assessed that is required to bring the civil uses of RPVs to fruition and to determine whether or not the potential market is real and economically practical, the technologies are within reach, the operational problems are manageable, and the benefits are worth the cost. To do so, the economic, technical, and environmental implications are examined. The time frame is 1980-85. Representative uses are selected; detailed functional and performance requirements are derived for RPV systems; and conceptual system designs are devised. Total system cost comparisons are made with non-RPV alternatives. The potential market demand for RPV systems is estimated. Environmental and safety

requirements are examined, and legal and regulatory concerns are identified. A potential demand for 2,000-11,000 RPV systems is estimated. Typical cost savings of 25-35% compared to non-RPV alternatives are determined. There appear to be no environmental problems, and the safety issue appears manageable.

RPT#: NASA-CR-137895 LMSC-D057322
77N10048

UTTL: Civil uses of remotely piloted aircraft
AUTH: A/ADERHOLD, J. R.; B/GORDON, G.; C/SCOTT, G. W.
MAJS: /*CIVIL AVIATION/ *ECONOMIC ANALYSIS/ *REMOTELY PILOTED
VEHICLES/ *TECHNOLOGY ASSESSMENT
MINS: / ENVIRONMENTAL ENGINEERING/ HUMAN FACTORS ENGINEERING
/ PILOTLESS AIRCRAFT
ABS: The economic, technical, and environmental implications of remotely piloted vehicles (RPV) are examined. The time frame is 1980-85. Representative uses are selected; detailed functional and performance requirements are derived for RPV systems; and conceptual system designs are devised. Total system cost comparisons are made with non-RPV alternatives. The potential market demand for RPV systems is estimated. Environmental and safety requirements are examined, and legal and regulatory concerns are identified. A potential demand for 2,000-11,000 RPV systems is estimated. Typical cost savings of 25 to 35% compared to non-RPV alternatives are determined. There appear to be no environmental problems, and the safety issue appears manageable.

RPT#: NASA-CR-137944 AIRESEARCH-76-211893
77N11054

UTTL: Study of small turbofan engines applicable to single-engine light airplanes
AUTH: A/MERRILL, G. L.
MAJS: /*LIGHT AIRCRAFT/ *TURBOFAN ENGINES
MINS: / COST ANALYSIS/ FUEL CONSUMPTION/ GENERAL AVIATION
AIRCRAFT/ NOISE REDUCTION
ABS: The design, efficiency and cost factors are investigated for application of turbofan propulsion engines to single engine, general aviation light airplanes. A companion study of a hypothetical engine family of a thrust range suitable to such aircraft and having a high degree of commonality of design features and parts is presented. Future turbofan powered light airplanes can have a lower fuel consumption, lower weight, reduced airframe maintenance requirements and improved engine overhaul periods as compared to current piston engine powered airplanes. Achievement of compliance with noise and chemical emission regulations is expected without impairing performance.

operating cost or safety.

RPT#: NASA-CR-137950
77N17033

UTTL: Study of industry information requirements for flight control and navigation systems of STOL aircraft
AUTH: A/GORHAM, J. A.
MAJS: /*AIR NAVIGATION/*AIRCRAFT INDUSTRY/*AVIONICS/*FLIGHT CONTROL/*OPERATIONS RESEARCH/*SHORT TAKEOFF AIRCRAFT
MINS: / CIVIL AVIATION/ DATA ACQUISITION/ GUIDANCE (MOTION)/ USER REQUIREMENTS
ABS: Answers to specific study questions are used to ascertain the data requirements associated with a guidance, navigation and control system for a future civil STOL airplane. Results of the study were used to recommend changes for improving the outputs of the STOLAND flight experiments program.

RPT#: NASA-CR-145059 REPT-43U-1228
77N13038

UTTL: Preliminary study of NAVSTAR/GPS for general aviation
AUTH: A/ALBERTS, R. D.; B/RUEDGER, W. H.
MAJS: /*GENERAL AVIATION AIRCRAFT/*NAVSTAR SATELLITES/* POSITIONING/*SATELLITE NAVIGATION SYSTEMS
MINS: / ECONOMIC ANALYSIS/ FUNCTIONAL ANALYSIS/ TECHNOLOGY TRANSFER
ABS: The activities conducted as a planning effort to focus attention on the applicability of the global positioning system for general aviation are described. The description of GPS, its impact on economic and functional aspects of general aviation avionics, as well as a declaration of potential extensions of the basic concept have been studied in detail.

RPT#: NASA-CR-145090
77N13043

UTTL: Improvements in aircraft extraction programs
AUTH: A/BALAKRISHNAN, A. V.; B/MAINE, R. E.
MAJS: /*CESSNA 172 AIRCRAFT/*COMPUTER PROGRAMS/*EXTRACTION/* F-8 AIRCRAFT
MINS: / CONVERGENCE/ ESTIMATING/ GRAPHS (CHARTS)/ LINEAR EQUATIONS/ RLC CIRCUITS
ABS: Flight data from an F-8 Corsair and a Cessna 172 was analyzed to demonstrate specific improvements in the LRC parameter extraction computer program. The Cramer-Rao bounds were shown to provide a satisfactory relative measure of goodness of parameter estimates. It was not used as an absolute measure due to an inherent uncertainty within a multiplicative factor, traced in turn to the uncertainty in the noise bandwidth in the statistical theory of parameter

estimation. The measure was also derived on an entirely nonstatistical basis, yielding thereby also an interpretation of the significance of off-diagonal terms in the dispersion matrix. The distinction between coefficients as linear and non-linear was shown to be important in its implication to a recommended order of parameter iteration. Techniques of improving convergence generally, were developed, and tested out on flight data. In particular, an easily implemented modification incorporating a gradient search was shown to improve initial estimates and thus remove a common cause for lack of convergence.

RPT#: NASA-CR-149247
77N13044

UTTL: Research on the exploitation of advanced composite materials to lightly loaded structures
AUTH: A/MAR, J. W.
MAJS: /*COMPOSITE MATERIALS/*GLIDERS/*LIGHT AIRCRAFT
MINS: / COMPRESSIVE STRENGTH/ EPOXY RESINS/ GRAPHITE/ STABILIZERS (FLUID DYNAMICS)/ TENSILE STRENGTH
ABS: The objective was to create a sailplane which could fly in weaker thermals than present day sailplanes (by being lighter) and to fly in stronger thermals than present sailplanes (by carrying more water ballast). The research was to tackle the interaction of advanced composites and the aerodynamic performance, the interaction of fabrication procedures and the advanced composites, and the interaction of advanced composites and the design process. Many pieces of the overall system were investigated but none were carried to the resolution required for engineering application. Nonetheless, interesting and useful results were obtained and are here reported.

RPT#: NASA-CR-151973 AD-200
77N23096

UTTL: Conceptual design of a single turbofan engine powered light aircraft
AUTH: A/NEWMAN, M.; B/HUGGINS, G. L.
MAJS: /*EXPERIMENTAL DESIGN/*GENERAL AVIATION AIRCRAFT/* LIGHT AIRCRAFT/*TURBOFAN ENGINES
MINS: / CESSNA AIRCRAFT/ ENGINE DESIGN/ PRODUCT DEVELOPMENT/ SIZING (SHAPING)
ABS: The NASA developed General Aviation Synthesis Program (GASP) was evaluated as to its usefulness as a design tool. This evaluation was accomplished by: conducting a conceptual study of a Cessna designed turbofan aircraft using Cessna's sizing routines and the GASP, and comparing the GASP methodology to the design procedures now in use by Cessna. This evaluation

concluded that the GASP needs extensive modifications to fulfill its purpose; but once these are made the program could be a useful new tool for general aviation.

RPT#: NASA-CR-152621 UVA/528066/ESS77/106
77N20115

UTTL: Effects of simulated turbulence on aircraft handling qualities
AUTH: A/JACOBSON, I. D.; B/JOSHI, D. S.
MAJS: /*AIRCRAFT MANEUVERS/*ALTITUDE SIMULATION/*FLIGHT SIMULATION/*TURBULENCE EFFECTS
MINS: / AERODYNAMIC STABILITY/ FLIGHT CHARACTERISTICS/ LIGHT AIRCRAFT/ NORMAL DENSITY FUNCTIONS
ABS: The influence of simulated turbulence on aircraft handling qualities is presented. Pilot opinions of the handling qualities of a light general aviation aircraft were evaluated in a motion-base simulator using a simulated turbulence environment. A realistic representation of turbulence disturbances is described in terms of rms intensity and scale length and their random variations with time. The time histories generated by the proposed turbulence models showed characteristics which are more similar to real turbulence than the frequently-used Gaussian turbulence model. The proposed turbulence models flexibly accommodate changes in atmospheric conditions and are easily implemented in flight simulator studies.

RPT#: NASA-CR-153268 KU-FRL-317-2
77N27871

UTTL: A research program to reduce interior noise in general aviation airplanes
AUTH: A/PESCHIER, T. D.; B/ANDREWS, D.; C/HENDERSON, T.
MAJS: /*AIRCRAFT NOISE/*AVIONICS/*GENERAL AVIATION AIRCRAFT /*NOISE REDUCTION
MINS: / INSULATION/ NOISE SPECTRA/ SUPERHIGH FREQUENCIES
ABS: The relevance of KU-FRL test results in predicting (theoretically or semi-empirically) interior noise levels in general aviation aircraft was studied. As a result of this study, it was decided to make a few additions to the program. These additions are: (1) to use three (instead of two) noise sources in the plane wave tube to evaluate the influence of excitation spectrum on panel response, (2) to use theoretical and experimental data obtained in the course of the project to develop more efficient noise reduction materials (or procedures to apply these), or to develop guidelines for the design of such materials for procedures, and (3) to use nonstructural materials in the collection of specimens to be tested in the

KU-FRL plane wave tube.

RPT#: NASA-CR-153291 REPT-770441
77N26122

UTTL: Flight test data for light aircraft spoiler roll control systems
AUTH: A/KOHLMAN, D. L.
MAJS: /*FLIGHT TESTS/*LATERAL CONTROL/*LIGHT AIRCRAFT/* SPOILERS
MINS: / FLAPS (CONTROL SURFACES)/ ROLLING MOMENTS/ WIND TUNNEL TESTS/ YAW
ABS: The results of flight tests to determine the characteristics of spoiler roll control systems on three different light aircraft are summarized. Comparisons are made with wind tunnel data where available. Flight tests indicate that excellent roll characteristics can be achieved with spoilers. Yaw coupling with roll control inputs is virtually eliminated. Roll rates remain high when flaps are deployed at low speed. Very mild nonlinearities in control effectiveness exist, and there was no deadband or lag detected.

RPT#: NASA-CR-153914 UILU-ENG-77-0511 AAE-77-11
77N27074

UTTL: Low speed airfoil study
AUTH: A/ORMSBEE, A. I.
MAJS: /*AIRFOILS/*LOW SPEED
MINS: / BOUNDARY LAYER SEPARATION/ DESIGN ANALYSIS/ GENERAL AVIATION AIRCRAFT/ LIFT AUGMENTATION/ TURBULENT BOUNDARY LAYER
ABS: Airfoil geometries were developed for low speed high lift applications, such as general aviation aircraft, propellers and helicopter rotors. The primary effort was to determine the extent to which the application of turbulent boundary layer separation criteria, plus manipulation of other input parameters, specifically trailing edging velocity ratio, could be utilized to achieve high C sub Lmax airfoils with relatively low drag at C sub Lmax. Both single-element and double-element airfoils were considered. Wind tunnel testing of some airfoils was included.

RPT#: NASA-CR-153985 TM-52
77N30101

UTTL: Interactive LORAN-C to geographic and geographic-to-LORAN-C computation
AUTH: A/PIECUCH, L. M.; B/LILLEY, R. W.
MAJS: /*COMPUTER PROGRAMS/*LORAN C/*NAVIGATION AIDS
MINS: / AIR NAVIGATION/ DATA CONVERSION ROUTINES/ FILE MAINTENANCE (COMPUTERS)/ GENERAL AVIATION AIRCRAFT/

USER REQUIREMENTS

ABS: The LORAN program is stored in CMS disk files for use by Avionics Engineering Center terminal users. A CMS EXEC file named LORAN controls program operation. The user types LORAN and the program then prompts for data input and produces output on the terminal. The FORTRAN program refers to a disk file of LORAN master data giving station locations, coding delays, repetition rate and station pair identification letters. For Geographic-to-LORAN conversion, no iterative computations are required; the program is a straightforward coordinate conversion based upon the techniques described by the Navy. For LORAN-to-Geographic conversion, the original Navy program required a dead-reckoned position, near the actual unknown fix, to begin computations. No iteration was performed to obtain the LORAN fix, but internal program errors occurred at execution time if the dead-reckoned fix were displaced from the actual fix by more than a few minutes of latitude or longitude. In order to enhance usefulness of the program for the terminal user, an iterative routine was added which allows a single dead-reckoned position to be entered from the master data file for each LORAN chain. The results compare exactly with the LORAN-C navigation chart, and provide adequate benchmark data for general aviation flight planning and data analysis.

RPT#: NASA-CR-154619
77N27021

UTTL: Analysis of flight equipment purchasing practices of representative air carriers
MAJS: /*AIRCRAFT EQUIPMENT/*AIRLINE OPERATIONS/*CIVIL AVIATION/*INVESTMENTS/*PROCUREMENT POLICY/*REPLACING
MINS: / DECISION MAKING/ INVENTORY MANAGEMENT/ MANAGEMENT METHODS/ PASSENGER AIRCRAFT/ SERVICE LIFE
ABS: The process through which representative air carriers decide whether or not to purchase flight equipment was investigated as well as their practices and policies in retiring surplus aircraft. An analysis of the flight equipment investment decision process in ten airlines shows that for the airline industry as a whole, the flight equipment investment decision is in a state of transition from a wholly informal process in earliest years to a much more organized and structured process in the future. Individual air carriers are in different stages with respect to the formality and sophistication associated with the flight equipment investment decision.

RPT#: NASA-CR-154620
77N28101

UTTL: Evaluation of NASA-sponsored research on capital investment decision making in the civil aviation industry
AUTH: A/DONOVAN, D. J.
MAJS: /*CIVIL AVIATION/*DECISION MAKING/*INVESTMENTS/*NASA PROGRAMS/*OPERATIONS RESEARCH
MINS: / AIRCRAFT INDUSTRY/ AIRLINE OPERATIONS/ ECONOMIC FACTORS/ MANAGEMENT METHODS/ PROCUREMENT POLICY
ABS: Significant findings of three studies undertaken to provide the NASA Aircraft Energy Efficiency (ACEE) Office with information regarding how aircraft manufacturers and commercial airlines make investment decisions concerning the acquisition of new and derivative technology are analyzed and their general implications explored. Topics discussed include: the market for airline aircraft, factors affecting the corporate decision making process of air transport manufacturers, and flight equipment purchasing practices of representative air carriers.

RPT#: NASA-CR-155002 AAE-77-12-PT-1
UILU-ENG-77-0512-PT-1
77N31156

UTTL: Propeller study. Part 1: Introduction and overview
AUTH: A/ORMSBEE, A. I.
MAJS: /*AERONAUTICAL ENGINEERING/*DESIGN ANALYSIS/*DYNAMIC TESTS/*PROPELLER EFFICIENCY/*PROPELLERS/*STRUCTURAL DESIGN CRITERIA
MINS: / ACOUSTIC PROPERTIES/ AERODYNAMIC CONFIGURATIONS/ GENERAL AVIATION AIRCRAFT/ PROPELLER BLADES/ SHAFTS (MACHINE ELEMENTS)
ABS: A general aerodynamic-acoustic theory was developed for determining the acoustical design of propellers used on general aviation aircraft. Data from the theoretical investigation were applied in the design of a propeller whose thrust and torque were measured during a series of YO-3A aircraft flight tests.

RPT#: NASA-CR-155152 KU-FRL-317-3
77N33957

UTTL: A research program to reduce interior noise in general aviation airplanes. Design of an acoustic panel test facility
AUTH: A/ROSKAM, J.; B/MUIRHEAD, V. U.; C/SMITH, H. W.; D/HENDERSON, T. D.
MAJS: /*ACOUSTIC ATTENUATION/*GENERAL AVIATION AIRCRAFT/* NOISE REDUCTION/*PANELS/*STRUCTURAL DESIGN/*TEST FACILITIES
MINS: / AIRCRAFT NOISE/ DATA PROCESSING/ NOISE MEASUREMENT/ PLANE WAVES/ PREDICTION ANALYSIS TECHNIQUES

ABS: The design, construction, and costs of a test facility for determining the sound transmission loss characteristics of various panels and panel treatments are described. The pressurization system and electronic equipment used in experimental testing are discussed as well as the reliability of the facility and the data gathered. Tests results are compared to pertinent acoustical theories for panel behavior and minor anomalies in the data are examined. A method for predicting panel behavior in the stiffness region is also presented.

RPT#: NASA-CR-155153 KU-FRL-317-4
77N33958

UTTL: A research to reduce interior noise in general aviation airplanes. General aviation interior noise study

AUTH: A/ROSKAM, J.; B/MUIRHEAD, V. U.; C/SMITH, H. W.; D/PESCHIER, T. D.

MAJS: /*ACOUSTIC ATTENUATION/*GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION/*PANELS/*PRESSURIZED CABINS

MINS: / ACOUSTIC PROPERTIES/ AIRCRAFT NOISE/ DIFFERENTIAL PRESSURE/ SOUND GENERATORS/ STIFFNESS

ABS: The construction, calibration, and properties of a facility for measuring sound transmission through aircraft type panels are described along with the theoretical and empirical methods used. Topics discussed include typical noise source, sound transmission path, and acoustic cabin properties and their effect on interior noise. Experimental results show an average sound transmission loss in the mass controlled frequency region comparable to theoretical predictions. The results also verify that transmission losses in the stiffness controlled region directly depend on the fundamental frequency of the panel. Experimental and theoretical results indicate that increases in this frequency, and consequently in transmission loss, can be achieved by applying pressure differentials across the specimen.

RPT#: NASA-CR-155154 KU-FRL-317-5
77N33959

UTTL: A research program to reduce interior noise in general aviation airplanes

AUTH: A/ROSKAM, J.; B/MUIRHEAD, V. U.; C/SMITH, H. W.; D/PESCHIER, T. D.; E/DURENBERGER, D.; F/VANDAM, K.; G/SHU, T. C.

MAJS: /*ACOUSTIC ATTENUATION/*AIRCRAFT COMPARTMENTS/*GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION/*PANELS

MINS: / DAMPING/ FLAT PLATES/ GRAPHS (CHARTS)/ MASS DISTRIBUTION/ PRESSURE EFFECTS/ PRESSURIZED CABINS/ STIFFNESS

ABS: Analytical and semi-empirical methods for determining the transmission of sound through isolated panels and predicting panel transmission loss are described. Test results presented include the influence of plate stiffness and mass and the effects of pressurization and vibration damping materials on sound transmission characteristics. Measured and predicted results are presented in tables and graphs.

RPT#: NASA-CR-2699 D6-75775
77N10033

UTTL: An exploratory study to determine the integrated technological air transportation system ground requirements of liquid-hydrogen-fueled subsonic, long-haul civil air transports

MAJS: /*AIRLINE OPERATIONS/*CRYOGENIC FLUID STORAGE/*HYDROGEN FUELS/*JET ENGINE FUELS/*LIQUID HYDROGEN

MINS: / AIRPORTS/ CIVIL AVIATION/ COST ANALYSIS/ TECHNOLOGY ASSESSMENT

ABS: A baseline air terminal concept was developed which permitted airlines and the airport to operate JP- or LH2-fueled aircraft at common terminal gates. The concept included installation of a hydrogen liquefaction and storage facility on airport property, as well as the fuel distribution system. The capital investment and hydrogen-related operating costs to the airlines were estimated.

RPT#: NASA-CR-2773 UTEC-ME-75-159
77N14615

UTTL: The subjective evaluation of noise from light aircraft

AUTH: A/SHEPHERD, K. P.

MAJS: /*AIRCRAFT NOISE/*LIGHT AIRCRAFT/*NOISE MEASUREMENT/*PSYCHOACOUSTICS

MINS: / HUMAN BEINGS/ NOISE TOLERANCE/ TIME MEASUREMENT

ABS: A study was conducted in which subjects evaluated the sounds of a light aircraft and a motorcycle. Particular emphasis was placed on examining the duration of the sounds. Thirty subjects gave annoyance ratings to a total of 50 sounds, with peak levels between 65 and 85dB(A). It was found that aircraft and motorcycles have differing optimum duration corrections. The conventional duration correction used in the calculation of EPNL is far from being the optimum for light aircraft.

RPT#: NASA-CR-2774
77N20027

UTTL: Prediction of light aircraft horizontal tail onset flows: A review and analysis

AUTH: A/SUMMEY, D. C.; B/SMETANA, F. O.

MAJS: /*AIRCRAFT WAKES/*FLOW VELOCITY/*HORIZONTAL TAIL SURFACES/*LIGHT AIRCRAFT

MINS: / COMPUTER PROGRAMS/ DOWNWASH/ TRAILING-EDGE FLAPS/ VELOCITY DISTRIBUTION

ABS: The theoretical basis of the two computer programs (WASH and WAKE) are developed. WASH calculates the location of wake-sheet streamlines behind the wing, and upwash and downwash angles ahead of and behind the wing, respectively. WAKE computes two-dimensional velocity profiles along the wake streamlines given the upper and lower surface velocity profiles at the wing trailing edge. Comparisons with experiment indicate good agreement for wake location, downwash angles, and two-dimensional velocity profiles at low to moderate angles of attack. The adaptation of the results of the two programs to predict the total onset flow at the tail is discussed.

RPT#: NASA-CR-2832
77N33104

UTTL: Flight evaluation of an advanced technology light twin-engine airplane (ATLIT)

AUTH: A/HOLMES, B. J.

MAJS: /*AIRCRAFT PERFORMANCE/*AIRFOILS/*ATLIT PROJECT/* FLIGHT TESTS

MINS: / LIFT DRAG RATIO/ PERFORMANCE PREDICTION/ PERFORMANCE TESTS/ SEPARATED FLOW

ABS: Project organization and execution, airplane description and performance predictions, and the results of the flight evaluation of an advanced technology light twin engine airplane (ATLIT) are presented. The ATLIT is a Piper PA-34-200 Seneca I modified by the installation of new wings incorporating the GA(W)-1 (Whitcomb) airfoil, reduced wing area, roll control spoilers, and full span Fowler flaps. The conclusions for the ATLIT evaluation are based on complete stall and roll flight test results and partial performance test results. The Stalling and rolling characteristics met design expectations. Climb performance was penalized by extensive flow separation in the region of the wing body juncture. Cruise performance was found to be penalized by a large value of zero lift drag. Calculations showed that, with proper attention to construction details, the improvements in span efficiency and zero lift drag would permit the realization of the predicted increases in cruising and maximum rate of climb performance.

RPT#: E78-10184 NASA-CR-157374 INPE-1289-NTE/124
78N31483

UTTL: INPE's crop survey program using combined LANDSAT and aircraft data
AUTH: A/DEJESUSPARADA, N.; B/BATISTA, G. T.; C/TARDIN, A. T.; D/NOVAES, R. A.; E/MENDONCA, F. J.; F/LEE, D. C. L.; G/CHEN, S. C.
MAJS: /*BRAZIL/*CROP IDENTIFICATION/*CROP INVENTORIES/*GRASSLANDS/*SOILS/*SUGAR CANE/*VEGETATION
MINS: / ALGORITHMS/ EARTH RESOURCES PROGRAM/ PHOTOINTERPRETATION
ABS: There are no author-identified significant results in this report.

RPT#: NASA-CR-132333 REPT-2558
78N13851

UTTL: Investigation of acoustic properties of a rigid foam with application to noise reduction in light aircraft
AUTH: A/HOLMER, C. I.
MAJS: /*ACOUSTIC PROPERTIES/*ENGINE NOISE/*LIGHT AIRCRAFT/*MATHEMATICAL MODELS/*NOISE REDUCTION/*POLYURETHANE FOAM
MINS: / ABSORPTIVITY/ AIRCRAFT COMPARTMENTS/ RIGID STRUCTURES/ SOUND TRANSMISSION
ABS: A analytic model of sound transmission into an aircraft cabin was developed as well as test procedures which appropriately rank order properties which affect sound transmission. The proposed model agrees well with available data, and reveals that the pertinent properties of an aircraft cabin for sound transmission include: stiffness of cabin walls at low frequencies (as this reflects on impedance of the walls) and cabin wall transmission loss and interior absorption at mid and high frequencies. Below 315 Hz the foam contributes substantially to wall stiffness and sound transmission loss of typical light aircraft cabin construction, and could potentially reduce cabin noise levels by 3-5 db in this frequency range at a cost of about 0.2 lb/sq. ft. of treated cabin area. The foam was found not to have significant sound absorbing properties.

RPT#: NASA-CR-135265 AIRESEARCH-21-2391 RADC-TR-77-216
78N12083

UTTL: Cost/benefit analysis of advanced material technologies for small aircraft turbine engines
AUTH: A/COMNEY, D. H.
MAJS: /*AIRCRAFT ENGINES/*COST EFFECTIVENESS/*ENGINE PARTS/*FABRICATION/*LIGHT AIRCRAFT/*TECHNOLOGY ASSESSMENT/*TURBINE ENGINES
MINS: / GENERAL AVIATION AIRCRAFT/ LAMINATES/ ROTOR BLADES

(TURBOMACHINERY)/ SERVICE LIFE/ STATORS

ABS: Cost/benefit studies were conducted on ten advanced material technologies applicable to small aircraft gas turbine engines to be produced in the 1985 time frame. The cost/benefit studies were applied to a two engine, business-type jet aircraft in the 6800- to 9100-Kg (15,000- to 20,000-lb) gross weight class. The new material technologies are intended to provide improvements in the areas of high-pressure turbine rotor components, high-pressure turbine rotor components, high-pressure turbine stator airfoils, and static structural components. The cost/benefit of each technology is presented in terms of relative value, which is defined as a change in life cycle cost times probability of success divided by development cost. Technologies showing the most promising cost/benefits based on relative value are uncooled single crystal MAR-M 247 turbine blades, cooled DS MAR-M 247 turbine blades, and cooled ODS 'M'CrAl laminate turbine stator vanes.

RPT#: NASA-CR-141433
78N22491

UTTL: Laser Doppler velocimeter aerial spray measurements
AUTH: A/ZALAY, A. D.; B/EBERLE, W. R.; C/HOWLE, R. E.; D/SHRIDER, K. R.
MAJS: /*DOPPLER EFFECT/*INFRARED LASERS/*SPRAYING/*VELOCITY MEASUREMENT
MINS: / AGRICULTURE/ FLIGHT TESTS/ LIGHT AIRCRAFT/ TRANSPORT PROPERTIES
ABS: An experimental research program for measuring the location, spatial extent, and relative concentration of airborne spray clouds generated by agricultural aircraft is described. The measurements were conducted with a ground-based laser Doppler velocimeter. The remote sensing instrumentation, experimental tests, and the results of the flight tests are discussed. The cross section of the aerial spray cloud and the observed location, extent, and relative concentration of the airborne particulates are presented. It is feasible to use a mobile laser Doppler velocimeter to track and monitor the transport and dispersion of aerial spray generated by an agricultural aircraft.

RPT#: NASA-CR-143849
78N15692

UTTL: An analysis of flight data from aircraft landings with and without the aid of a painted diamond on the same runway
AUTH: A/SWAROOP, R.; B/ASHWORTH, G. R.
MAJS: /*LANDING AIDS/*MARKERS/*RUNWAYS/*STATISTICAL ANALYSIS
MINS: / DATA REDUCTION/ FLIGHT TESTS/ PATTERN RECOGNITION/

SHAPES/ VISUAL AIDS

ABS: The usefulness of a painted diamond on a runway as a visual aid to perform safe landings of aircraft was studied. Flight data on glideslope intercepts, flight path elevation angles, and touchdown distances were collected and analyzed. It is concluded that an appropriately painted diamond on a runway has the potential of providing glideslope information for the light weight class of general aviation aircraft. This conclusion holds irrespective of the differences in landing techniques used by the pilots.

RPT#: NASA-CR-145307 RTI-4378-1009-F
78N18028

UTTL: Continued investigation of potential application of Omega navigation to civil aviation

AUTH: A/BAXA, E. G., JR.

MAJS: /*CIVIL AVIATION/*OMEGA NAVIGATION SYSTEM/*TECHNOLOGY UTILIZATION

MINS: / DATA ACQUISITION/ ERROR ANALYSIS/ GRAPHS (CHARTS)/ WEIGHTING FUNCTIONS

ABS: Major attention is given to an analysis of receiver repeatability in measuring OMEGA phase data. Repeatability is defined as the ability of two like receivers which are co-located to achieve the same LOP phase readings. Specific data analysis is presented. A propagation model is described which has been used in the analysis of propagation anomalies. Composite OMEGA analysis is presented in terms of carrier phase correlation analysis and the determination of carrier phase weighting coefficients for minimizing composite phase variation. Differential OMEGA error analysis is presented for receiver separations. Three frequency analysis includes LOP error and position error based on three and four OMEGA transmissions. Results of phase amplitude correlation studies are presented.

RPT#: NASA-CR-145342 RTI-1464-00-00F
78N24132

UTTL: General aviation avionics equipment maintenance

AUTH: A/PARKER, C. D.; B/TOMMERDAHL, J. B.

MAJS: /*AIRCRAFT MAINTENANCE/*AVIONICS/*GENERAL AVIATION AIRCRAFT

MINS: / COST ANALYSIS/ PERFORMANCE/ RELIABILITY

ABS: Maintenance of general aviation avionics equipment was investigated with emphasis on single engine and light twin engine general aviation aircraft. Factors considered include the regulatory agencies, avionics manufacturers, avionics repair stations, the statistical character of the general aviation community, and owners and operators. The maintenance, environment, and performance, repair costs, and

reliability of avionics were defined. It is concluded that a significant economic stratification is reflected in the maintenance problems encountered, that careful attention to installations and use practices can have a very positive impact on maintenance problems, and that new technologies and a general growth in general aviation will impact maintenance.

RPT#: NASA-CR-145378
78N32094

UTTL: Avionics performance analysis: A historical review and a current assessment of flight instrumentation and control systems in civil aviation

MAJS: /*AVIONICS/*CIVIL AVIATION/*FLIGHT CONTROL/*FLIGHT INSTRUMENTS/*PERFORMANCE PREDICTION

MINS: / AIR TRANSPORTATION/ COST REDUCTION/ FLIGHT SAFETY/ TECHNOLOGY ASSESSMENT/ VALUE ENGINEERING

ABS: The role of flight instrumentation and control systems in the advancement of civil aviation to the safest form of commercial transportation is discussed. Safety, cost reduction, and increased capabilities provided by recent developments are emphasized. Cost/performance considerations are considered in terms of determining the relative values of comparable systems or the absolute worth of a system.

RPT#: NASA-CR-151972
78N16045

UTTL: Conceptual design of single turbofan engine powered light aircraft

AUTH: A/SNYDER, F. S.; B/VOORHEES, C. G.; C/HEINRICH, A. M.; D/BAISDEN, D. N.

MAJS: /*AIRCRAFT DESIGN/*LIGHT AIRCRAFT/*MONOPLANES/*NASA PROGRAMS/*TURBOFAN ENGINES

MINS: / EVALUATION/ METHODOLOGY/ PRODUCTION ENGINEERING/ PROJECT MANAGEMENT

ABS: The conceptual design of a four place single turbofan engine powered light aircraft was accomplished utilizing contemporary light aircraft conventional design techniques as a means of evaluating the NASA-Ames General Aviation Synthesis Program (GASP) as a preliminary design tool. In certain areas, disagreement or exclusion were found to exist between the results of the conventional design and GASP processes. Detail discussion of these points along with the associated contemporary design methodology are presented.

RPT#: NASA-CR-152025
78N10060

UTTL: Preliminary candidate advanced avionics system for general aviation
AUTH: A/MCCALLA, T. M.; B/GRISMORE, F. L.; C/GREATLINE, S. E.; D/BIRKHEAD, L. M.
MAJS: /*AIRCRAFT SAFETY/*AVIONICS/*CIVIL AVIATION/*GENERAL AVIATION AIRCRAFT/*MICROELECTRONICS/*SYSTEMS ENGINEERING
MINS: / COST EFFECTIVENESS/ MICROPROCESSORS/ RELIABILITY ENGINEERING
ABS: An integrated avionics system design was carried out to the level which indicates subsystem function, and the methods of overall system integration. Sufficient detail was included to allow identification of possible system component technologies, and to perform reliability, modularity, maintainability, cost, and risk analysis upon the system design. Retrofit to older aircraft, availability of this system to the single engine two place aircraft, was considered.

RPT#: NASA-CR-152069
78N17931

UTTL: Determination of the flight equipment maintenance costs of commuter airlines
MAJS: /*AIRCRAFT EQUIPMENT/*AIRCRAFT MAINTENANCE/*AIRLINE OPERATIONS/*COST ANALYSIS/*PASSENGER AIRCRAFT
MINS: / AVIONICS/ GENERAL AVIATION AIRCRAFT/ INVENTORY MANAGEMENT/ OPERATIONS RESEARCH
ABS: Labor and materials costs associated with maintaining and operating 12 commuter airlines carrying an average of from 42 to 1,100 passengers daily in a variety of aircraft types were studied to determine the total direct maintenance cost per flight hour for the airframe, engine, and avionics and other instruments. The distribution of maintenance costs are analyzed for two carriers, one using turboprop aircraft and the other using piston engine aircraft.

RPT#: NASA-CR-156067 TM-56
78N20100

UTTL: Stand-alone development system using a KIM-1 microcomputer module
AUTH: A/NICKUM, J. D.
MAJS: /*AIRBORNE/SPACEBORNE COMPUTERS/*ELECTRONIC MODULES/* MICROPROCESSORS
MINS: / AIRCRAFT EQUIPMENT/ AVIONICS/ GUIDANCE SENSORS/ HARDWARE/ INTERFACES/ LORAN C
ABS: A small microprocessor-based system designed to: contain all or most of the interface hardware, designed to be easy to access and modify the hardware, to be capable of being strapped to the seat of a small

general aviation aircraft, and to be independent of the aircraft power system is described. The system is used to develop a low cost Loran C sensor processor, but is designed such that the Loran interface boards may be removed and other hardware interfaces inserted into the same connectors. This flexibility is achieved through memory-mapping techniques into the microprocessor.

RPT#: NASA-CR-156142
78N20110

UTTL: A study of low-cost reliable actuators for light aircraft. Part A: Chapters 1-8
AUTH: A/EIJSINK, H.; B/RICE, M.
MAJS: /*ACTUATORS/*CONTROL SURFACES/*CONTROLLERS/*FLIGHT CONTROL/*LIGHT AIRCRAFT
MINS: / DYNAMIC RESPONSE/ LOW COST/ PERFORMANCE PREDICTION/ POSITIONING/ RELIABILITY ANALYSIS
ABS: An analysis involving electro-mechanical, electro-pneumatic, and electro-hydraulic actuators was performed to study which are compatible for use in the primary and secondary flight controls of a single engine light aircraft. Actuator characteristics under investigation include cost, reliability, weight, force, volumetric requirements, power requirements, response characteristics and heat accumulation characteristics. The basic types of actuators were compared for performance characteristics in positioning a control surface model and then were mathematically evaluated in an aircraft to get the closed loop dynamic response characteristics. Conclusions were made as to the suitability of each actuator type for use in an aircraft.

RPT#: NASA-CR-156143 KU-FRL-351-PT-B
78N20111

UTTL: A study of low-cost reliable actuators for light aircraft. Part B: Appendices
AUTH: A/EIJSINK, H.; B/RICE, M.
MAJS: /*ACTUATORS/*CONTROL SURFACES/*CONTROLLERS/*FLIGHT CONTROL/*LIGHT AIRCRAFT
MINS: / COMPUTER PROGRAMS/ DYNAMIC RESPONSE/ LOW COST/ PERFORMANCE PREDICTION/ POSITIONING/ RELIABILITY ANALYSIS
ABS: Computer programs written in FORTRAN are given for time response calculations on pneumatic and linear hydraulic actuators. The programs are self-explanatory with comment statements. Program output is also included.

RPT#: NASA-CR-156170 KU-FRL-317-6
78N21889

UTTL: Experimental and theoretical sound transmission
AUTH: A/ROSKAM, J.; B/MUIRHEAD, V. U.; C/SMITH, H. W.;
D/DURENBERGER, D. W.

MAJS: /*AIRCRAFT COMPARTMENTS/*AIRCRAFT NOISE/*AIRCRAFT
STRUCTURES/-NOISE REDUCTION/*PANELS/*SOUND
TRANSMISSION

MINS: / ACOUSTIC PROPERTIES/ HONEYCOMB STRUCTURES/ NOISE
MEASUREMENT/ TEST FACILITIES/ UNIVERSITY PROGRAM

ABS: The capabilities of the Kansas University- Flight
Research Center for investigating panel sound
transmission as a step toward the reduction of
interior noise in general aviation aircraft were
discussed. Data obtained on panels with holes, on
honeycomb panels, and on various panel treatments at
normal incidence were documented. The design of
equipment for panel transmission loss tests at
nonnormal (slanted) sound incidence was described. A
comprehensive theory-based prediction method was
developed and shows good agreement with experimental
observations of the stiffness controlled, the region,
the resonance controlled region, and the mass-law
region of panel vibration.

RPT#: NASA-CR-156714
78N20990

UTTL: Identification and promulgation of objectives for OAST
R and T programs, Task 2

MAJS: /*MANAGEMENT METHODS/*NASA PROGRAMS/*OPERATIONS
RESEARCH/*PROJECT PLANNING/*RESEARCH AND DEVELOPMENT

MINS: / AERONAUTICS/ AEROSPACE ENGINEERING/ DECISION MAKING/
GENERAL AVIATION AIRCRAFT/ PROJECT MANAGEMENT

ABS: Overall perspectives and guidelines are discussed for
defining and promulgating NASA's Office of Aeronautics
and Space Technology (OAST) objectives to meet
national needs and goals in aeronautical, space, and
nuclear technology. Emphasis is placed on the
practicality of ultimately instituting
objective-setting processes within the normal OAST
operation, and of establishing quantitative measures
to be used as a working management tool in determining
the degree to which the objectives have been or are
being met.

RPT#: NASA-CR-156715
78N20051

UTTL: Aviation system modeling study and alternatives

MAJS: /*AERONAUTICAL ENGINEERING/*DATA BASES/*TECHNOLOGY
ASSESSMENT

MINS: / CIVIL AVIATION/ MODELS/ NASA PROGRAMS/ RESEARCH AND
DEVELOPMENT

ABS: The Aviation System Modeling Study was directed toward
two primary goals: an improved understanding of the
U.S. aviation system, and technology. There are three
major categories into which the individual study
efforts may be subdivided. These three categories are:
special issue studies, task studies, and data base
development.

RPT#: NASA-CR-156838
78N11890

UTTL: The benefits of improved technologies in agricultural
aviation

AUTH: A/LIETZKE, K.; B/ABRAM, P.; C/BRAEN, C.; D/GIVENS,
S.; E/HAZELRIGG, G. A., JR.; F/FISH, R.; G/CLYNE,
F.; H/SAND, F.

MAJS: /*AGRICULTURE/*ECONOMIC ANALYSIS/*PESTICIDES

MINS: / BIBLIOGRAPHIES/ CIVIL AVIATION/ COST REDUCTION/ CROP
GROWTH/ INSECTICIDES

ABS: The results are present for a study of the economic
benefits attributed to a variety of potential
technological improvements in agricultural aviation.
Part 1 gives a general description of the ag-air
industry and discusses the information used in the
data base to estimate the potential benefits from
technological improvements. Part 2 presents the
benefit estimates and provides a quantitative basis
for the estimates in each area study. Part 3 is a
bibliography of references relating to this study.

RPT#: NASA-CR-157051
78N27045

UTTL: The benefits of improved technologies in agricultural
aviation

MAJS: /*AGRICULTURE/*AIRCRAFT CONFIGURATIONS/*CROP GROWTH/*
ECONOMIC IMPACT/*LIGHT AIRCRAFT/*TECHNOLOGY ASSESSMENT

MINS: / AIRCRAFT INDUSTRY/ CIVIL AVIATION/ COST REDUCTION/
FERTILIZERS/ PESTICIDES/ SPRAYING

ABS: The economic benefits attributable to a variety of
potential technological improvements in agricultural
aviation are discussed. Topics covered include: the
ag-air industry, the data base used to estimate the
potential benefits and a summary of the potential
benefits from technological improvements; ag-air
activities in the United States; foreign ag-air
activities; major ag-air aircraft in use and
manufacturers' sales and distribution networks; and
estimates of the benefits to the United States of
proposed technological improvements to the aircraft
and dispersal equipment. A bibliography of references
is appended.

RPT#: NASA-CR-157210 KU-FRL-313-5 SR-4
78N25078

UTTL: A study of commuter airplane design optimization
AUTH: A/KEPPEL, B. V.; B/EYSINK, H.; C/HAMMER, J.;
D/HAWLEY, K.; E/MEREDITH, P.; F/ROSKAM, J.
MAJS: /*AIRCRAFT DESIGN/*COMPUTERIZED DESIGN/*GENERAL
AVIATION AIRCRAFT/*OPTIMIZATION/*PASSENGER AIRCRAFT/*
SHORT HAUL AIRCRAFT
MINS: / CURVE FITTING/ DYNAMIC PROGRAMMING/ DYNAMIC
STABILITY/ STABILITY DERIVATIVES/ SUBROUTINES
ABS: The usability of the general aviation synthesis
program (GASP) was enhanced by the development of
separate computer subroutines which can be added as a
package to this assembly of computerized design
methods or used as a separate subroutine program to
compute the dynamic longitudinal, lateral-directional
stability characteristics for a given airplane.
Currently available analysis methods were evaluated to
ascertain those most appropriate for the design
functions which the GASP computerized design program
performs. Methods for providing proper constraint
and/or analysis functions for GASP were developed as
well as the appropriate subroutines.

RPT#: NASA-CR-157582 TM-60
78N31068

UTTL: Phase-locked tracking loops for LORAN-C
AUTH: A/BURHANS, R. W.
MAJS: /*GENERAL AVIATION AIRCRAFT/*LORAN C/*PHASE LOCKED
SYSTEMS/*RADAR RECEIVERS/*SIGNAL DETECTORS
MINS: / NAVIGATION AIDS/ SIGNAL DETECTION/ SWITCHING
CIRCUITS/ TRACKING FILTERS/ VOLTAGE REGULATORS
ABS: Portable battery operated LORAN-C receivers were
fabricated to evaluate simple envelope detector
methods with hybrid analog to digital phase locked
loop sensor processors. The receivers are used to
evaluate LORAN-C in general aviation applications.
Complete circuit details are given for the
experimental sensor and readout system.

RPT#: NASA-CR-157587 KU-FRL-317-9
78N31874

UTTL: A research program to reduce interior noise in general
aviation airplanes: Investigation of the
characteristics of an acoustic panel test facility
AUTH: A/GROSVELD, F.; B/VANAKEN, J.
MAJS: /*GENERAL AVIATION AIRCRAFT/*MEASURING INSTRUMENTS/*
NOISE REDUCTION/*SOUND INTENSITY/*TEST FACILITIES
MINS: / ACOUSTIC MEASUREMENTS/ AIRCRAFT COMPARTMENTS/ PANEL
FLUTTER/ SOUND PRESSURE
ABS: Sound pressure levels in the test facility were
studied that are caused by varying: (1) microphone

positions; (2) equalizer setting; and (3) panel
clamping forces. Measurements were done by using a
Beranek tube or this Beranek tube in combinations with
an extension tube and a special test section. In all
configurations tests were executed with and without a
test panel installed. The influence of the speaker
back panel and the back panel of the Beranek tube on
the sound pressure levels inside the test tube were
also investigated. It is shown that the definition of
noise reduction is more useful in relation to this
test facility than transmission loss.

RPT#: NASA-CR-157588 KU-FRL-317-8
78N31873

UTTL: A research program to reduce interior noise in general
aviation airplanes: Noise reduction through a
cavity-backed flexible plate
AUTH: A/ROSKAM, J.; B/VANDAM, C. P. G.
MAJS: /*CAVITIES/*GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION
/*PLATES (STRUCTURAL MEMBERS)
MINS: / AIRCRAFT COMPARTMENTS/ MODULUS OF ELASTICITY/ PANEL
FLUTTER/ PREDICTION ANALYSIS TECHNIQUES/ TRANSMISSION
LOSS/ VIBRATION DAMPING
ABS: A prediction method is reported for noise reduction
through a cavity-backed panel. The analysis takes into
account only cavity modes in one direction. The
results of this analysis were to find the effect of
acoustic stiffness of a backing cavity on the panel
behavior. The resulting changes in the noise reduction
through the panel are significant.

RPT#: NASA-CR-157745 AAE-TR-78-5 UILU-ENG-78-0505
78N33048

UTTL: A distribution model for the aerial application of
granular agricultural particles
AUTH: A/FERNANDES, S. T.; B/ORMSBEE, A. I.
MAJS: /*AGRICULTURE/*DISPERSING/*DISTRIBUTION FUNCTIONS/*
GRANULAR MATERIALS/*MATHEMATICAL MODELS/*PARTICLE SIZE
DISTRIBUTION
MINS: / AERODYNAMIC DRAG/ COMPUTER PROGRAMS/ LIGHT AIRCRAFT/
PROBABILITY THEORY/ SCALING LAWS
ABS: A model is developed to predict the shape of the
distribution of granular agricultural particles
applied by aircraft. The particle is assumed to have a
random size and shape and the model includes the
effect of air resistance, distributor geometry and
aircraft wake. General requirements for the
maintenance of similarity of the distribution for
scale model tests are derived and are addressed to the
problem of a nongeneral drag law. It is shown that if
the mean and variance of the particle diameter and
density are scaled according to the scaling laws

governing the system, the shape of the distribution will be preserved. Distributions are calculated numerically and show the effect of a random initial lateral position, particle size and drag coefficient. A listing of the computer code is included.

RPT#: NASA-CR-2935 KU-FRL-203
78N15055

UTTL: Flight evaluation of a spoiler roll control system on a light twin-engine airplane

AUTH: A/KOHLMAN, D. L.

MAJS: /*FLIGHT TESTS/*JET AIRCRAFT/*LATERAL CONTROL/*LIGHT AIRCRAFT/*SPOILERS

MINS: / AERODYNAMIC COEFFICIENTS/ DYNAMIC PRESSURE/ FLAPS (CONTROL SURFACES)/ LIFT

ABS: A flight test program was conducted to evaluate the characteristics of a spoiler roll control system on a light twin-engine airplane. The spoilers provided excellent roll control with no deadband or reduced sensitivity for small deflections. Roll power increased significantly with the flaps deployed. Cable stretch limited spoiler authority at high dynamic pressure. Data were presented on roll rates, sideslip, wheel deflections, and wheel forces.

RPT#: NASA-CR-156840
79N25665

UTTL: A review of the meteorological parameters which affect aerial application

AUTH: A/CHRISTENSEN, L. S.; B/FROST, W.
MAJS: /*AGRICULTURAL AIRCRAFT/*CHEMICAL COMPOUNDS/*
DISPERSING/*METEOROLOGICAL PARAMETERS

MINS: / MATHEMATICAL MODELS/ TEMPERATURE GRADIENTS/ WIND
(METEOROLOGY)

ABS: The ambient wind field and temperature gradient were found to be the most important parameters. Investigation results indicated that the majority of meteorological parameters affecting dispersion were interdependent and the exact mechanism by which these factors influence the particle dispersion was largely unknown. The types and approximately ranges of instrumented capabilities for a systematic study of the significant meteorological parameters influencing aerial applications were defined. Current mathematical dispersion models were also briefly reviewed. Unfortunately, a rigorous dispersion model which could be applied to aerial application was not available.

RPT#: NASA-CR-157452 KU-FRL-417-10
79N29958

UTTL: The effect of oblique angle of sound incidence, realistic edge conditions, curvature and in-plane panel stresses on the noise reduction characteristics of general aviation type panels

AUTH: A/GROSVELD, F.; B/LAMERIS, J.; C/DUNN, D.
MAJS: /*ACOUSTIC PROPERTIES/*AIRCRAFT NOISE/*CURVED PANELS/*
GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION/*STRESSES
MINS: / AIRCRAFT COMPARTMENTS/ ALUMINUM/ INCIDENCE/ LOADS
(FORCES)/ PLANE WAVES

ABS: Experiments and a theoretical analysis were conducted to predict the noise reduction of inclined and curved panels. These predictions are compared to the experimental results with reasonable agreement between theory and experiment for panels under an oblique angle of sound incidence. Theoretical as well as experimental results indicate a big increase in noise reduction when a flat test panel is curved. Further curving the panel slightly decreases the noise reduction. Riveted flat panels are shown to give a higher noise reduction in the stiffness-controlled frequency region, while bonded panels are superior in this region when the test panel is curved. Experimentally measured noise reduction characteristics of flat aluminum panels with uniaxial in-plane stresses are presented and discussed. These test results indicate an important improvement in the noise reduction of these panels in the frequency range

below the fundamental panel/cavity frequency.

RPT#: NASA-CR-157629 TM-64
79N13018

UTTL: Initial flight test of a Loran-C receiver/data collection system

AUTH: A/FISCHER, J. P.; B/NICKUM, J. D.
MAJS: /*DATA ACQUISITION/*FLIGHT TESTS/*LORAN C/*RADAR
RECEIVERS

MINS: / GENERAL AVIATION AIRCRAFT/ NAVIGATION AIDS/ PHASE
LOCKED SYSTEMS/ TRACKING (POSITION)

ABS: Development of a low cost Loran C receiver for general aviation use is discussed. The preparation and procedure of a flight test conducted with a receiver design which utilizes a phase locked loop oscillator to track the Loran C signals is described. It is indicated that such a receiver is a viable alternative for future work in developing a low cost Loran-C navigator.

RPT#: NASA-CR-158076
79N15943

UTTL: Flight test evaluation of predicted light aircraft drag, performance, and stability

AUTH: A/SMETANA, F. O.; B/FOX, S. R.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*FLIGHT TESTS/*LIGHT
AIRCRAFT/*PERFORMANCE PREDICTION

MINS: / ACCURACY/ DATA PROCESSING/ FLOW CHARTS/ INPUT/OUTPUT
ROUTINES/ LEAST SQUARES METHOD/ NONLINEAR EQUATIONS

ABS: A technique was developed which permits simultaneous extraction of complete lift, drag, and thrust power curves from time histories of a single aircraft maneuver such as a pullup (from V sub max to V sub stall) and pushover (to sub V max for level flight.) The technique is an extension to non-linear equations of motion of the parameter identification method of Iliff and Taylor and includes provisions for internal data compatibility improvement as well. The technique was shown to be capable of correcting random errors in the most sensitive data channel and yielding highly accurate results. This technique was applied to flight data taken on the ATLIT aircraft. The drag and power values obtained from the initial least squares estimate are about 15% less than the 'true' values. If one takes into account the rather dirty wing and fuselage existing at the time of the tests, however, the predictions are reasonably accurate. The steady state lift measurements agree well with the extracted values only for small values of alpha. The predicted value of the lift at alpha = 0 is about 33% below that found in steady state tests while the predicted lift slope is 13% below the steady state value.

RPT#: NASA-CR-158753 KU-FRL-399-1
79N26018

UTTL: Comparison of theoretical predicted longitudinal aerodynamic characteristics with full-scale wind tunnel data on the ATLIT airplane

AUTH: A/VAHDAM, C. P. G.; B/GRISWOLD, M.; C/ROSKAM, J.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*ATLIT PROJECT/* PREDICTION ANALYSIS TECHNIQUES

MINS: / AERODYNAMIC COEFFICIENTS/ PITCHING MOMENTS/ WIND TUNNEL TESTS

ABS: An analytical method is presented for predicting the lift coefficient, the pitching moment coefficient, and the drag coefficient of light, twin-engine, propeller-driven airplanes. The method was applied to the Advanced Technology Light Twin-Engine airplane. The calculated characteristics were then correlated against full scale wind tunnel data. The analytical method was found to predict the drag and pitching moment fairly well. However, the lift prediction was extremely poor.

RPT#: NASA-CR-158787 ARL-79-1
79N27092

UTTL: The development of methods for predicting and measuring distribution patterns of aerial sprays

AUTH: A/ORMSBEE, A. I.; B/BRAGG, M. B.; C/MAUGHMER, M. D.

MAJS: /*AIRCRAFT WAKES/*DISPERSING/*PREDICTION ANALYSIS TECHNIQUES/*SCALE MODELS/*SPRAYING/*WIND TUNNEL TESTS

MINS: / AGRICULTURAL AIRCRAFT/ PARTICLE TRAJECTORIES/ SCALING LAWS/ SLIPSTREAMS/ VORTICES

ABS: The capability of conducting scale model experiments which involve the ejection of small particles into the wake of an aircraft close to the ground is developed. A set of relationships used to scale small-sized dispersion studies to full-size results are experimentally verified and, with some qualifications, basic deposition patterns are presented. In the process of validating these scaling laws, the basic experimental techniques used in conducting such studies, both with and without an operational propeller, were developed. The procedures that evolved are outlined. The envelope of test conditions that can be accommodated in the Langley Vortex Research Facility, which were developed theoretically, are verified using a series of vortex trajectory experiments that help to define the limitations due to wall interference effects for models of different sizes.

RPT#: NASA-CR-158919
79N12857

UTTL: Evaluation of aero Commander Propeller acoustic data: Static operations

AUTH: A/PIERSOL, A. G.; B/WILBY, E. G.; C/WILBY, J. F.

MAJS: /*AEROACOUSTICS/*DATA PROCESSING/*LIGHT AIRCRAFT/* PROPELLER DRIVE

MINS: / ACOUSTIC MEASUREMENTS/ AIRCRAFT NOISE/ PRESSURE DISTRIBUTION/ PROPELLER BLADES/ STATIC TESTS

ABS: Acoustic data are analyzed from a series of ground tests performed on an Aero Commander propeller-driven aircraft with an array of microphones flush-mounted on one side of the fuselage. The analyses were concerned with the propeller blade passage noise during static operation at several different engine speeds and included calculations of the magnitude and phase of the blade passage tones, the amplitude stability of the tones, and the spatial phase and coherence of the tones. The results indicate that the pressure field impinging on the fuselage represents primarily aerodynamic (near field) effects in the plane of the propeller at all frequencies. Forward and aft of the propeller plane aerodynamic effects still dominate the pressure field at frequencies below 200 Hz; but at higher frequencies, the pressure field is due to acoustic propagation from an equivalent center located about 0.15 to 0.30 blade diameters inboard from the propeller hub.

RPT#: NASA-CR-158937 R79-912839-24
79N21000

UTTL: Study of future world markets for agricultural aircraft

AUTH: A/GOBETZ, F. W.; B/ASSARABOWSKI, R. J.

MAJS: /*AGRICULTURE/*FARM CROPS/*GENERAL AVIATION AIRCRAFT/* MARKET RESEARCH

MINS: / COLOMBIA/ CROP GROWTH/ DEVELOPING NATIONS/ ECONOMIC DEVELOPMENT/ FERTILIZERS/ PESTICIDES

ABS: The future world market for US-manufactured agricultural aircraft was studied and the technology needs for foreign markets were identified. Special emphasis was placed on the developing country market, but the developed countries and the communist group were also included in the forecasts. Aircraft needs were projected to the year 2000 by a method which accounted for field size, crop production, treated area, productivity, and attrition of the fleet. A special scenario involving a significant shift toward aerial fertilization was also considered. An operations analysis was conducted to compare the relative application costs of various existing and hypothetical future aircraft. A case study was made of Colombia as an example of a developing country in

which aviation is emerging as an important industry.

RPT#: NASA-CR-158938
79N26046

UTTL: System design requirements for advanced rotary-wing agricultural aircraft.
AUTH: A/LEMONT, H. E.
MAJS: /*AGRICULTURAL AIRCRAFT/*CROP DUSTING/*ROTARY WINGS/* SYSTEMS ENGINEERING
MINS: / BOOMS (EQUIPMENT)/ DISPERSIONS/ ECONOMIC ANALYSIS/ HELICOPTER PERFORMANCE/ LIFT DEVICES/ OPERATIONAL PROBLEMS/ REQUIREMENTS/ WEIGHT ANALYSIS
ABS: Helicopter aerial dispersal systems were studied to ascertain constraints to the system, the effects of removal of limitations (technical and FAA regulations), and subsystem improvements. Productivity indices for the aircraft and swath effects were examined. Typical missions were formulated through conversations with operators, and differing gross weight aircraft were synthesized to perform these missions. Economic analysis of missions and aircraft indicated a general correlation of small aircraft (3000 lb gross weight) suitability for small fields (25 acres), and low dispersion rates (less than 32 lb/acre), with larger aircraft (12,000 lb gross weight) being more favorable for bigger fields (200 acres) and heavier dispersal rates (100 lb/acre). Operator problems, possible aircraft and system improvements, and selected removal of operating limitations were reviewed into recommendations for future NASA research items.

RPT#: NASA-CR-158953
79N12081

UTTL: Basic avionics module design for general aviation aircraft
AUTH: A/SMYTH, R. K.; B/SMYTH, D. E.
MAJS: /*AVIONICS/*GENERAL AVIATION AIRCRAFT
MINS: / DIGITAL SYSTEMS/ MICROPROCESSORS/ SYSTEMS ENGINEERING
ABS: The design of an advanced digital avionics system (basic avionics module) for general aviation aircraft operated with a single pilot under IFR conditions is described. The microprocessor based system provided all avionic functions, including flight management, navigation, and lateral flight control. The mode selection was interactive with the pilot. The system used a navigation map data base to provide operation in the current and planned air traffic control environment. The system design included software design listings for some of the required modules. The distributed microcomputer uses the IEEE 488 bus for

interconnecting the microcomputer and sensors.

RPT#: NASA-CR-158974 F-C4705
79N13055

UTTL: Design and test of the 172K fluidic rudder
AUTH: A/BELSTERLING, C. A.
MAJS: /*CESSNA 172 AIRCRAFT/*FLIGHT CONTROL/*FLIGHT TESTS/* FLUIDICS/*RUDDERS
MINS: / AIRCRAFT DESIGN/ AIRCRAFT STABILITY/ AIRFOILS/ FLIGHT CONDITIONS/ WIND TUNNEL TESTS
ABS: Progress in the development of concepts for control of aircraft without moving parts or a separate source of power is described. The design and wind tunnel tests of a full scale fluidic rudder for a Cessna 172K aircraft, intended for subsequent flight tests were documented. The 172K fluidic rudder was designed to provide a control force equivalent to 3.3 degrees of deflection of the conventional rudder. In spite of an extremely thin airfoil, cascaded fluidic amplifiers were built to fit, with the capacity for generating the required level of control force. Wind tunnel tests demonstrated that the principles of lift control using ram air power are sound and reliable under all flight conditions. The tests also demonstrated that the performance of the 172K fluidic rudder is not acceptable for flight tests until the design of the scoop is modified to prevent interference with the lift control phenomenon.

RPT#: NASA-CR-158989
79N18074

UTTL: An assessment of the risks presented by the use of carbon fiber composites in commercial aviation. Volume 1: Final report. Volume 2: Supporting appendices
AUTH: A/KALELKAR, A. S.; B/FIKSEL, J.; C/RAJ, P. P. K.; D/ROSENFELD, D. B.
MAJS: /*AIRCRAFT STRUCTURES/*CARBON FIBERS/*CIVIL AVIATION/* COMMERCIAL AIRCRAFT/*COMPOSITE MATERIALS/*RISK
MINS: / AIRCRAFT ACCIDENTS/ AIRPORTS/ DATA PROCESSING/ ECONOMIC ANALYSIS/ MARKETING/ MATHEMATICAL MODELS/ PENETRATION/ PROBABILITY THEORY/ RELIABILITY ANALYSIS/ VULNERABILITY

RPT#: NASA-CR-159022
79N22068

UTTL: General aviation IFR operational problems
AUTH: A/BOLZ, E. H.; B/EISELE, J. E.
MAJS: /*CIVIL AVIATION/*GENERAL AVIATION AIRCRAFT/* INSTRUMENT FLIGHT RULES/*OPERATIONAL PROBLEMS
MINS: / AIR TRAFFIC CONTROL/ AIRCRAFT PILOTS/ AVIONICS/ STATISTICAL ANALYSIS

ABS: Operational problems of general aviation IFR operators (particularly single pilot operators) were studied. Several statistical bases were assembled and utilized to identify the more serious problems and to demonstrate their magnitude. These bases include official activity projections, historical accident data and delay data, among others. The GA operating environment and cockpit environment were analyzed in detail. Solutions proposed for each of the problem areas identified are based on direct consideration of currently planned enhancements to the ATC system, and on a realistic assessment of the present and future limitations of general aviation avionics. A coordinated set of research program is suggested which would provide the developments necessary to implement the proposed solutions.

RPT#: NASA-CR-159099
79N29957

UTTL: Engine-induced structural-borne noise in a general aviation aircraft

AUTH: A/UNRUH, J. F.; B/SCHIEDT, D. C.; C/POMERENING, D. J.

MAJS: /*AIRCRAFT NOISE/*ENGINE NOISE/*NOISE INTENSITY/*NOISE MEASUREMENT/*NOISE REDUCTION

MINS: / AIRCRAFT COMPARTMENTS/ AIRCRAFT STRUCTURES/ CESSNA 172 AIRCRAFT/ ENGINE MONITORING INSTRUMENTS/ ENGINE TESTS

ABS: Structural borne interior noise in a single engine general aviation aircraft was studied to determine the importance of engine induced structural borne noise and to determine the necessary modeling requirements for the prediction of structural borne interior noise. Engine attached/detached ground test data show that engine induced structural borne noise is a primary interior noise source for the single engine test aircraft. Cabin noise is highly influenced by responses at the propeller tone, and cabin acoustic resonances can influence overall noise levels. Results from structural and acoustic finite element coupled models of the test aircraft show that wall flexibility has a strong influence on fundamental cabin acoustic resonances. The lightweight fuselage structure has a high modal density, and finite element analysis procedures are appropriate for the prediction of structural borne noise.

RPT#: NASA-CR-159100 D210-11336-1
79N31164

UTTL: Development of crashworthy passenger seats for general-aviation aircraft

AUTH: A/REILLY, M. J.; B/TANNER, A. E.

MAJS: /*GENERAL AVIATION AIRCRAFT/*LIGHT AIRCRAFT/*SAFETY MANAGEMENT/*SEATS

MINS: / CRASHES/ DESIGN ANALYSIS/ ENERGY ABSORPTION/ IMPACT LOADS

ABS: Two types of energy absorbing passenger seat concepts suitable for installation in light twin-engine fixed wing aircraft were developed. An existing passenger seat for such an aircraft was used to obtain the envelope constraints. Ceiling suspended and floor supported seat concept designs were developed. A restraint system suitable for both concepts was designed. Energy absorbing hardware for both concepts was fabricated and tension and compression tests were conducted to demonstrate the stroking capability and the force deflection characteristics. Crash impact analysis was made and seat loads developed. The basic seat structures were analyzed to determine the adequacy of their strength under impact loading.

RPT#: NASA-CR-159558 DDA-EDR-9528
79N21073

UTTL: Study of an advanced General Aviation Turbine Engine (GATE)

AUTH: A/GILL, J. C.; B/SHORT, F. R.; C/STATON, D. V.; D/ZOLEZZI, B. A.; E/CURRY, C. E.; F/ORELUP, M. J.; G/VAUGHT, J. M.; H/HUMPHREY, J. M.

MAJS: /*GAS TURBINE ENGINES/*GENERAL AVIATION AIRCRAFT/* TECHNOLOGY ASSESSMENT

MINS: / AIRCRAFT INDUSTRY/ AIRCRAFT PERFORMANCE/ COST ANALYSIS/ ENGINE DESIGN/ FUEL CONSUMPTION/ HELICOPTERS / ROTARY WINGS/ TURBOFAN ENGINES/ TURBOPROP ENGINES/ TURBOSHAFTS/ WEIGHT ANALYSIS

ABS: The best technology program for a small, economically viable gas turbine engine applicable to the general aviation helicopter and aircraft market for 1985-1990 was studied. Turboshaft and turboprop engines in the 112 to 746 kw (150 to 1000 hp) range and turboprop engines up to 6672 N (1500 lbf) thrust were considered. A good market for new turbine engines was predicted for 1988 providing aircraft are designed to capitalize on the advantages of the turbine engine. Parametric engine families were defined in terms of design and off-design performance, mass, and cost. These were evaluated in aircraft design missions selected to represent important market segments for fixed and rotary-wing applications. Payoff parameters influenced by engine cycle and configuration changes were aircraft gross mass, acquisition cost, total cost

of ownership, and cash flow. Significant advantage over a current technology, small gas turbine engines was found especially in cost of ownership and fuel economy for airframes incorporating an air-cooled high-pressure ratio engine. A power class of 373 kw (500 hp) was recommended as the next frontier for technology advance where large improvements in fuel economy and engine mass appear possible through component research and development.

RPT#: NASA-CR-159603 WRC-78-113-15
79N25017

UTTL: Advanced General Aviation Turbine Engine (GATE) concepts

AUTH: A/LAYS, E. J.; B/MURRAY, G. L.

MAJS: /*ENGINES/*GENERAL AVIATION AIRCRAFT/*LIFE CYCLE COSTS
/*PROPULSION/*TURBINE ENGINES

MINS: / COMPONENT RELIABILITY/ FUEL CONSUMPTION/ TURBOFANS/
TURBOPROP ENGINES/ TURBOSHAFTS

ABS: Concepts are discussed that project turbine engine cost savings through use of geometrically constrained components designed for low rotational speeds and low stress to permit manufacturing economies. Aerodynamic development of geometrically constrained components is recommended to maximize component efficiency. Conceptual engines, airplane applications, airplane performance, engine cost, and engine-related life cycle costs are presented. The powerplants proposed offer encouragement with respect to fuel efficiency and life cycle costs, and make possible remarkable airplane performance gains.

RPT#: NASA-CR-159624 TELEDYNE-CAE-1600
79N29189

UTTL: Advanced General Aviation Turbine Engine (GATE) study

AUTH: A/SMITH, R.; B/BENSTEIN, E. H.

MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*GAS TURBINE ENGINES
/*GENERAL AVIATION AIRCRAFT

MINS: / AIRCRAFT CONFIGURATIONS/ COST REDUCTION/ FIXED WINGS
/ MARKET RESEARCH/ PERFORMANCE PREDICTION/ POLLUTION
CONTROL/ PROPULSION SYSTEM CONFIGURATIONS/ ROTARY
WINGS/ TECHNOLOGICAL FORECASTING

ABS: The small engine technology requirements suitable for general aviation service in the 1987 to 1988 time frame were defined. The market analysis showed potential United States engines sales of 31,500 per year providing that the turbine engine sales price approaches current reciprocating engine prices. An optimum engine design was prepared for four categories of fixed wing aircraft and for rotary wing applications. A common core approach was derived from the optimum engines that maximizes engine commonality

over the power spectrum with a projected price competitive with reciprocating piston engines. The advanced technology features reduced engine cost, approximately 50 percent compared with current technology.

RPT#: NASA-CR-3097
79N30145

UTTL: Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 1: High-wing model B

AUTH: A/BIHRLE, W., JR.; B/HULTBERG, R. S.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*FLUID FLOW/*GENERAL
AVIATION AIRCRAFT/*VORTICES

MINS: / AERODYNAMIC CONFIGURATIONS/ ANGLE OF ATTACK/ GRAPHS
(CHARTS)/ SPIN TESTS/ WIND TUNNEL TESTS

ABS: Aerodynamic characteristics obtained in a rotational flow environment utilizing a rotary balance located in a spin tunnel are presented in plotted form for a 1/6.5 scale, single engine, high wing, general aviation airplane model. The configurations tested included the basic airplane, various wing leading-edge devices, tail designs, and rudder control settings as well as airplane components. Data are presented without analysis for an angle of attack range of 8 deg to 90 deg and clockwise and counter-clockwise rotations covering an $(\omega)/2V$ range from 0 to 0.85.

RPT#: NASA-CR-3098
79N33163

UTTL: Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 2: Low-wing model B

AUTH: A/BIHRLE, W., JR.; B/HULTBERG, R. S.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AERODYNAMIC
CONFIGURATIONS/*GENERAL AVIATION AIRCRAFT

MINS: / ANGLE OF ATTACK/ GRAPHS (CHARTS)/ SPIN/ WIND TUNNEL
TESTS

ABS: Aerodynamic characteristics obtained in a rotational flow environment utilizing a rotary balance located in the spin tunnel are presented in plotted form for a 1/6.5 scale, single engine, low wing, general aviation airplane model. The configurations tested included the basic airplane, various wing leading-edge devices, tail designs, and rudder control settings as well as airplane components. Data are presented without analysis for an angle-of-attack range of 8 deg to 90 deg and clockwise and counter-clockwise rotations covering an $(\omega)/2V$ range from 0 to 0.85.

RPT#: NASA-CR-3099
79N31152

UTTL: Rotary balance data for a single-engine trainer design for an angle-of-attack range of 8 deg to 90 deg

AUTH: A/PANTASON, P.; B/DICKENS, W.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*ANGLE OF ATTACK/*LEADING EDGES/*SPIN TESTS/*TRAINING AIRCRAFT/*VORTICES

MINS: / AERIAL RUDDERS/ AILERONS/ AIRCRAFT MODELS/ AIRCRAFT PERFORMANCE/ ELEVATORS (CONTROL SURFACES)/ FLIGHT CHARACTERISTICS/ GENERAL AVIATION AIRCRAFT/ WING PROFILES

ABS: Aerodynamic characteristics obtained in a rotational flow environment utilizing a rotary balance located in the Langley spin tunnel are presented in plotted form for a 1/6 scale, single engine trainer airplane model. The configurations tested included the basic airplane, various wing leading edge devices, elevator, aileron and rudder control settings as well as airplane components. Data are presented without analysis for an angle of attack range of 8 to 90 degrees and clockwise and counter-clockwise rotations.

RPT#: NASA-CR-3101
79N31149

UTTL: Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 2: High-wing model A

AUTH: A/MULCAY, W.; B/ROSE, R.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*GENERAL AVIATION AIRCRAFT/*ROTARY STABILITY/*SPIN TESTS

MINS: / ANGLE OF ATTACK/ BODY-WING AND TAIL CONFIGURATIONS/ WIND TUNNEL TESTS

ABS: Aerodynamic characteristics obtained in a rotational flow environment utilizing a rotary balance located in the Langley spin tunnel are presented in plotted form for a 1/5-scale, single-engine, high-wing, general aviation airplane model. The configurations tested included various tail designs and fuselage shapes. Data are presented without analysis for an angle of attack range of 8 to 90 degrees and clockwise and counter-clockwise rotations covering an Omega b/2 v range from 0 to 0.85.

RPT#: NASA-CR-159035
BON11079

UTTL: AVIONICS: Projections for civil aviation, 1995-2000
AUTH: A/MCREE, G. J.; B/LUEG, R. E.; C/CARLSON, P. A.;
D/CHOI, Y. H.; E/CRITTENDEN, J. B.; F/DOZIER, J. C.;
G/EASTMAN, R. M.; H/GRAVANDER, J. W.; I/HARGROVE, A.
; J/KEATON, A. E.
MAJS: /*AIR TRANSPORTATION/*AVIONICS/*CIVIL AVIATION
MINS: / AIR TRAFFIC CONTROL/ SYSTEMS ENGINEERING/
TECHNOLOGICAL FORECASTING
ABS: A view of the 1995-2000 civil aviation avionics system
is summarized. Descriptions of the scenarios
considered, the avionics technologies, the 1995-2000
avionics system, and an evaluation of the impacts are
presented. Recommendations are also presented.

RPT#: NASA-CR-159090
BON10962

UTTL: A study of the cost-effective markets for new
technology agricultural aircraft
AUTH: A/HAZELRIGG, G. A., JR.; B/CLYNE, F.
MAJS: /*AGRICULTURAL AIRCRAFT/*AIRCRAFT DESIGN/*COST
EFFECTIVENESS/*MARKET RESEARCH/*TECHNOLOGY UTILIZATION
MINS: / DATA BASES/ DECISION MAKING/ INDUSTRIES/ NASA
PROGRAMS/ OPERATIONS RESEARCH/ USER REQUIREMENTS
ABS: A previously developed data base was used to estimate
the regional and total U.S. cost-effective markets for
a new technology agricultural aircraft as
incorporating features which could result from
NASA-sponsored aerial applications research. The
results show that the long-term market penetration of
a new technology aircraft would be near 3,000
aircraft. This market penetration would be attained in
approximately 20 years. Annual sales would be about
200 aircraft after 5 to 6 years of introduction. The
net present value of cost savings benefit which this
aircraft would yield (measured on an infinite horizon
basis) would be about \$35 million counted at a 10
percent discount rate and \$120 million at a 5 percent
discount rate. At both discount rates the present
value of cost savings exceeds the present value of
research and development (R&D) costs estimated for the
development of the technology base needed for the
proposed aircraft. These results are quite
conservative as they have been derived neglecting
future growth in the agricultural aviation industry,
which has been averaging about 12 percent per year
over the past several years.

RPT#: NASA-CR-159145 RT1/1404/00-01F
BON18020

UTTL: Continued study of NAVSTAR/GPS for general aviation
AUTH: A/ALBERTS, R. D.; B/RUEDGER, W. H.
MAJS: /*CIVIL AVIATION/*GLOBAL POSITIONING SYSTEM/*NAVSTAR
SATELLITES/*TECHNOLOGY ASSESSMENT
MINS: / AIRCRAFT GUIDANCE/ AIRCRAFT SAFETY/ COLLISION
AVOIDANCE/ DATA LINKS/ TECHNOLOGY UTILIZATION
ABS: A conceptual approach for examining the full potential
of Global Positioning Systems (GPS) for the general
aviation community is presented. Aspects of an
experimental program to demonstrate these concepts are
discussed. The report concludes with the observation
that the true potential of GPS can only be exploited
by utilization in concert with a data link. The
capability afforded by the combination of position
location and reporting stimulates the concept of GPS
providing the auxiliary functions of collision
avoidance, and approach and landing guidance. A series
of general recommendations for future NASA and civil
community efforts in order to continue to support GPS
for general aviation are included.

RPT#: NASA-CR-159176 R-6132
BON15062

UTTL: Design study of a low cost civil aviation GPS receiver
system
AUTH: A/CNOSSEN, R.; B/GILBERT, G. A.
MAJS: /*CIVIL AVIATION/*DISPLAY DEVICES/*GENERAL AVIATION
AIRCRAFT/*GLOBAL POSITIONING SYSTEM/*RADAR RECEIVERS/*
SYSTEMS ENGINEERING
MINS: / AVIONICS/ COMPUTER SYSTEMS PROGRAMS/ MICROCOMPUTERS/
NAVIGATION AIDS/ NAVSTAR SATELLITES
ABS: A low cost Navstar receiver system for civil aviation
applications was defined. User objectives and
constraints were established. Alternative navigation
processing design trades were evaluated. Receiver
hardware was synthesized by comparing technology
projections with various candidate system designs. A
control display unit design was recommended as the
result of field test experience with Phase I GPS sets
and a review of special human factors for general
aviation users. Areas requiring technology development
to ensure a low cost Navstar Set in the 1985 timeframe
were identified.

RPT#: NASA-CR-159206
BON26391

UTTL: An assessment of the risk arising from electrical
effects associated with the release of carbon fibers
from general aviation aircraft fires
AUTH: A/ROSENFELD, D.; B/FIKSEL, J.

MAJS: /*CARBON FIBERS/*COMBUSTION PRODUCTS/*COST ESTIMATES/*
ELECTRICAL FAULTS/*GENERAL AVIATION AIRCRAFT/*RISK
MINS: / AIRCRAFT EQUIPMENT/ AIRCRAFT SAFETY/ GRAPHITE-EPOXY
COMPOSITE MATERIALS/ POISSON DENSITY FUNCTIONS
ABS: A Poisson type model was developed and exercised to
estimate the risk of economic losses through 1993 due
to potential electric effects of carbon fibers
released from United States general aviation aircraft
in the aftermath of a fire. Of the expected 354 annual
general aviation aircraft accidents with fire
projected for 1993, approximately 88 could involve
carbon fibers. The average annual loss was estimated
to be about \$250 (1977 dollars) and the likelihood of
exceeding \$107,000 (1977 dollars) in annual loss in
any one year was estimated to be at most one in ten
thousand.

RPT#: NASA-CR-159237
80N21100

UTTL: Development and evaluation of a general aviation real
world noise simulator
AUTH: A/GALANTER, E.; B/POPPER, R.
MAJS: /*AIRCRAFT NOISE/*COCKPIT SIMULATORS/*GENERAL AVIATION
AIRCRAFT
MINS: / AIRCRAFT PILOTS/ NOISE MEASUREMENT/ NOISE SPECTRA/
PSYCHOACOUSTICS
ABS: An acoustic playback system is described which
realistically simulates the sounds experienced by the
pilot of a general aviation aircraft during engine
idle, take-off, climb, cruise, descent, and landing.
The physical parameters of the signal as they appear
in the simulator environment are compared to analogous
parameters derived from signals recorded during actual
flight operations. The acoustic parameters of the
simulated and real signals during cruise conditions
are within plus or minus two dB in third octave bands
from 0.04 to 4 kHz. The overall A-weighted levels of
the signals are within one dB of signals generated in
the actual aircraft during equivalent maneuvers.
Psychoacoustic evaluations of the simulator signal are
compared with similar measurements based on
transcriptions of actual aircraft signals. The
subjective judgments made by human observers support
the conclusion that the simulated sound closely
approximates transcribed sounds of real aircraft.

RPT#: NASA-CR-159329
80N31353

UTTL: Computation of spanwise distribution of circulation
and lift coefficient for flapped wings of arbitrary
planform
AUTH: A/RAZAK, K.

MAJS: /*AERODYNAMIC COEFFICIENTS/*AGRICULTURAL AIRCRAFT/*
CROP DUSTING/*LIFT/*WING LOADING
MINS: / COMPUTER PROGRAMS/ FLAPS (CONTROL SURFACES)/
VORTICITY
ABS: The question of the effect of distribution and
magnitude of spanwise circulation and shed vorticity
from an airplane wing on the distribution pattern of
agricultural products distributed from an airplane was
studied. The first step in an analysis of this
question is the determination of the actual
distribution of lift along an airplane wing, from
which the pattern of shed vorticity can be determined.
A procedure is developed to calculate the span loading
for flapped and unflapped wings of arbitrary aspect
ratio and taper ratio. The procedure was programmed on
a small programmable calculator, the Hewlett Packard
HP-97, and also was programmed in BASIC language. They
could be used to explore the variations in span
loading that can be secured by variable flap
deflections or the effect of flying at varying air
speeds at different airplane gross weights. Either an
absolute evaluation of span loading can be secured or
comparative span loading can be evaluated to determine
their effect on swath width and swath distribution
pattern. The programs are intended to assist the user
in evaluating the effect of a given spanload
distribution.

RPT#: NASA-CR-159702
80N10460

UTTL: Spray nozzle designs for agricultural aviation
applications
AUTH: A/LEE, K. W.; B/PUTNAM, A. A.; C/GIESEKE, J. A.;
D/GOLOVIN, M. N.; E/HALE, J. A.
MAJS: /*AGRICULTURAL AIRCRAFT/*DROP SIZE/*NOZZLE DESIGN/*
NOZZLE EFFICIENCY/*SPRAY CHARACTERISTICS/*SPRAY
NOZZLES
MINS: / AIR JETS/ DROPS (LIQUIDS)/ LIQUID ATOMIZATION/
NOZZLE FLOW/ PESTICIDES/ SPRAYERS/ ULTRASONICS
ABS: Techniques of generating monodisperse sprays and
information concerning chemical liquids used in
agricultural aviation are surveyed. The periodic
dispersion of liquid jet, the spinning disk method,
and ultrasonic atomization are the techniques
discussed. Conceptually designed spray nozzles for
generating monodisperse sprays are assessed. These are
based on the classification of the drops using
centrifugal force, on using two opposing liquid laden
air jets, and on operating a spinning disk at an
overloaded flow. Performance requirements for the
designs are described and estimates of the operational
characteristics are presented.

RPT#: NASA-CR-159758 AIRESEARCH-21-3071
80N21331

UTTL: Airesearch OCGAT program
AUTH: A/HELDENBRAND, R. W.; B/NORGREN, W. M.
MAJS: /*ENGINE DESIGN/*GENERAL AVIATION AIRCRAFT/*NOISE
REDUCTION/*QUIET ENGINE PROGRAM/*TURBOFAN ENGINES
MINS: / AIRCRAFT ENGINES/ EXHAUST EMISSION/ FUEL CONSUMPTION
/ GEARS/ JET AIRCRAFT NOISE/ NACELLES
ABS: A model TFE731-1 engine was used as a baseline for the
NASA quiet clean general aviation turbofan engine and
engine/nacelle program designed to demonstrate the
applicability of large turbofan engine technology to
small general aviation turbofan engines, and to obtain
significant reductions in noise and pollutant
emissions while reducing or maintaining fuel
consumption levels. All new technology design for
rotating parts and all items in the engine and nacelle
that contributed to the acoustic and pollution
characteristics of the engine system were of flight
design, weight, and construction. The major noise,
emissions, and performance goals were met. Noise
levels estimated for the three FAR Part 36 conditions,
are 10 to 15 ENPD below FAA requirements; emission
values are considerably reduced below that of current
technology engines; and the engine performance
represents a TSFC improvement of approximately 9
percent over other turbofan engines.

RPT#: NASA-CR-159777
80N19450

UTTL: Monodisperse atomizers for agricultural aviation
applications
AUTH: A/CHRISTENSEN, L. S.; B/STEELY, S. L.
MAJS: /*AGRICULTURAL AIRCRAFT/*ATOMIZERS/*ATOMIZING/*SPRAY
NOZZLES
MINS: / CAPILLARY FLOW/ DROP SIZE/ DROPS (LIQUIDS)/ NOZZLE
DESIGN
ABS: Conceptual designs of two monodisperse spray nozzles
are described and the rationale used in each design is
discussed. The nozzles were designed to eliminate
present problems in agricultural aviation
applications, such as ineffective plant coverage,
drift due to small droplets present in the spray being
dispersed, and nonuniform swath coverages.
Monodisperse atomization techniques are reviewed and a
synopsis of the information obtained concerning
agricultural aviation spray applications is presented.

RPT#: NASA-CR-159781 ORI-TR-1686
80N18586

UTTL: Aerial applications dispersal systems control
requirements study
AUTH: A/BAUCHSPIES, J. S.; B/CLEARY, W. L.; C/ROGERS, W.
F.; D/SIMPSON, W.; E/SANDERS, G. S.
MAJS: /*AGRICULTURAL AIRCRAFT/*CONTROL EQUIPMENT/*CROP
DUSTING/*DISPERSING/*ENVIRONMENT PROTECTION
MINS: / AUTOMATIC CONTROL/ ECONOMIC FACTORS/ FLOW REGULATORS
/ HERBICIDES/ PESTICIDES
ABS: Performance deficiencies in aerial liquid and dry
dispersal systems are identified. Five control system
concepts are explored: (1) end of field on/off
control; (2) manual control of particle size and
application rate from the aircraft; (3) manual control
of deposit rate on the field; (4) automatic alarm and
shut-off control; and (5) fully automatic control.
Operational aspects of the concepts and specifications
for improved control configurations are discussed in
detail. A research plan to provide the technology
needed to develop the proposed improvements is
presented along with a flight program to verify the
benefits achieved.

RPT#: NASA-CR-159796 ADL-83381-2
80N18040

UTTL: Study of research and development requirements of
small gas-turbine combustors
AUTH: A/DEMETRI, E. P.; B/TOPPING, R. F.; C/WILSON, R. P.,
JR.
MAJS: /*COMBUSTION CHAMBERS/*GAS TURBINE ENGINES/*GENERAL
AVIATION AIRCRAFT/*RESEARCH AND DEVELOPMENT
MINS: / FUEL INJECTION/ LININGS/ OPTIMIZATION/ SIZE
(DIMENSIONS)
ABS: A survey is presented of the major small-engine
manufacturers and governmental users. A consensus was
undertaken regarding small-combustor requirements. The
results presented are based on an evaluation of the
information obtained in the course of the study. The
current status of small-combustor technology is
reviewed. The principal problems lie in liner cooling,
fuel injection, part-power performance, and ignition.
Projections of future engine requirements and their
effect on the combustor are discussed. The major
changes anticipated are significant increases in
operating pressure and temperature levels and greater
capability of using heavier alternative fuels. All
aspects of combustor design are affected, but the
principal impact is on liner durability. An R&D plan
which addresses the critical combustor needs is
described. The plan consists of 15 recommended
programs for achieving necessary advances in the areas
of liner thermal design, primary-zone performance.

fuel injection, dilution, analytical modeling, and alternative-fuel utilization.

RPT#: NASA-CR-162796 MSSU-EIRS-ASE-80-2
BON17992

UTTL: Full scale visualization of the wing tip vortices generated by a typical agricultural aircraft
AUTH: A/CROSS, E. J., JR.; B/BRIDGES, P. D.; C/BROWNLEE, J. A.; D/LIVINGSTON, W. W.
MAJS: /*AGRICULTURAL AIRCRAFT/*CESSNA AIRCRAFT/*FLOW VISUALIZATION/*TRAJECTORY ANALYSIS/*WING TIP VORTICES
MINS: / FLIGHT TESTS/ GROUND EFFECT/ GROUND WIND/ PRESSURE MEASUREMENTS/ SCALE MODELS
ABS: The trajectories of the wing tip vortices of a typical agricultural aircraft were experimentally determined by flight test. A flow visualization method, similar to the vapor screen method used in wind tunnels, was used to obtain trajectory data for a range of flight speeds, airplane configurations, and wing loadings. Detailed measurements of the spanwise surface pressure distribution were made for all test points. Further, a powered 1/8 scale model of the aircraft was designed, built, and used to obtain tip vortex trajectory data under conditions similar to that of the full scale test. The effects of light wind on the vortices were demonstrated, and the interaction of the flap vortex and the tip vortex was clearly shown in photographs and plotted trajectory data.

RPT#: NASA-CR-163001 JPL-PUB-79-75
BON22430

UTTL: Ultralean combustion in general aviation piston engines
AUTH: A/CHIRIVELLA, J. E.
MAJS: /*COMBUSTION EFFICIENCY/*GENERAL AVIATION AIRCRAFT/* PISTON ENGINES
MINS: / ENGINE TESTS/ IGNITION/ INTERNAL COMBUSTION ENGINES/ THERMODYNAMICS
ABS: The role of ultralean combustion in achieving fuel economy in general aviation piston engines was investigated. The aircraft internal combustion engine was reviewed with regard to general aviation requirements, engine thermodynamics and systems. Factors affecting fuel economy such as those connected with an ideal leanout to near the gasoline lean flammability limit (ultralean operation) were analyzed. A Lycoming T10-541E engine was tested in that program (both in the test cell and in flight). Test results indicate that hydrogen addition is not necessary to operate the engine ultralean. A 17 percent improvement in fuel economy was demonstrated in flight with the Beechcraft Duke B60 by simply

leaning the engine at constant cruiser power and adjusting the ignition for best timing. No detonation was encountered, and a 25,000 ft ceiling was available. Engine roughness was shown to be the limiting factor in the leanout.

RPT#: NASA-CR-163189 KU-FRL-399-2
BON24295

UTTL: Comparison of theoretically predicted lateral-directional aerodynamic characteristics with full-scale wind tunnel data on the ATLIT airplane
AUTH: A/GRISWOLD, M.; B/ROSKAM, J.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*ATLIT PROJECT/* PREDICTION ANALYSIS TECHNIQUES/*WIND TUNNEL TESTS
MINS: / ANGLE OF ATTACK/ PERFORMANCE PREDICTION/ SIDESLIP/ SPOILERS/ STABILITY DERIVATIVES
ABS: An analytical method is presented for predicting lateral-directional aerodynamic characteristics of light twin engine propeller-driven airplanes. This method is applied to the Advanced Technology Light Twin Engine airplane. The calculated characteristics are correlated against full-scale wind tunnel data. The method predicts the sideslip derivatives fairly well, although angle of attack variations are not well predicted. Spoiler performance was predicted somewhat high but was still reasonable. The rudder derivatives were not well predicted, in particular the effect of angle of attack. The predicted dynamic derivatives could not be correlated due to lack of experimental data..

RPT#: NASA-CR-3100
BON19030

UTTL: Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 1: Low-wing model A
AUTH: A/HULTBERG, R. S.; B/MULCAY, W.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRCRAFT DESIGN/*FLUID FLOW/*GENERAL AVIATION AIRCRAFT/*VORTICES
MINS: / AIRCRAFT MODELS/ GRAPHS (CHARTS)/ LEADING EDGES/ SPIN TESTS/ WIND TUNNEL TESTS
ABS: Aerodynamic characteristics obtained in a rotational flow environment utilizing a rotary balance are presented in plotted form for a 1/5 scale, single engine, low-wing, general aviation airplane model. The configuration tested included the basic airplane, various control deflections, tail designs, fuselage shapes, and wing leading edges. Data are presented without analysis for an angle of attack range of 8 to 90 deg and clockwise and counterclockwise rotations covering a range from 0 to 0.85.

RPT#: NASA-CR-3102
80N12060

UTTL: Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 degrees to 35 degrees. 3. Effect of wing leading-edge modifications, model A

AUTH: A/BIHRLE, W. JR.; B/MULCAY, W.

MAJS: /*GENERAL AVIATION AIRCRAFT/*LIGHT AIRCRAFT/*ROTARY STABILITY/*WIND TUNNEL TESTS

MINS: / AERODYNAMIC CONFIGURATIONS/ ANGLE OF ATTACK/ LEADING EDGES/ SPIN TESTS

ABS: Aerodynamic characteristics obtained in a rotational flow environment utilizing a rotary balance located in the Langley spin tunnel are presented in plotted form for a 1/5 scale, single-engine, low-wing, general aviation airplane model. The configurations tested included the basic airplane, sixteen wing leading-edge modifications and lateral-directional control settings. Data are presented for all configurations without analysis for an angle of attack range of 8 deg to 35 deg and clockwise and counter-clockwise rotations covering an $\Omega b/2v$ range from 0 to 0.85. Also, data are presented above 35 deg of attack for some configurations.

RPT#: NASA-CR-3199 D6-32872
80N19791

UTTL: NASA TLA workload analysis support. Volume 1: Detailed task scenarios for general aviation and metering and spacing studies

AUTH: A/SUNDSTROM, J. L.

MAJS: /*AIRCRAFT EQUIPMENT/*AUTOMATIC PILOTS/*WORKLOADS (PSYCHOPHYSIOLOGY)

MINS: / AIR TRAFFIC CONTROL/ FLIGHT CONTROL/ GENERAL AVIATION AIRCRAFT

ABS: The techniques required to produce and validate six detailed task timeline scenarios for crew workload studies are described. Specific emphasis is given to: general aviation single pilot instrument flight rules operations in a high density traffic area; fixed path metering and spacing operations; and comparative workload operation between the forward and aft-flight decks of the NASA terminal control vehicle. The validation efforts also provide a cursory examination of the resultant demand workload based on the operating procedures depicted in the detailed task scenarios.

RPT#: NASA-CR-3200
80N33355

UTTL: Rotary balance data for a typical single-engine general aviation design for an angle of attack range of 8 deg to 90 deg. 1: Low wing model C

AUTH: A/MULCAY, W. J.; B/ROSE, R. A.

MAJS: /*AERODYNAMIC BALANCE/*AIRCRAFT SPIN/*ANGLE OF ATTACK /*GENERAL AVIATION AIRCRAFT/*WIND TUNNEL TESTS

MINS: / CENTER OF GRAVITY/ GRAPHS (CHARTS)/ HELICAL FLOW/ LEADING EDGES/ STABILITY DERIVATIVES/ STRAIN GAGES

ABS: Aerodynamic characteristics obtained in a helical flow environment utilizing a rotary balance located in the Langley spin tunnel are presented in plotted form for a 1/6 scale, single engine, low wing, general aviation model (model C). The configurations tested included the basic airplane and control deflections, wing leading edge and fuselage modification devices, tail designs and airplane components. Data are presented without analysis for an angle of attack range of 8 deg to 90 deg and clockwise and counter clockwise rotations covering an $\Omega b/2v$ range from 0 to .9.

RPT#: NASA-CR-3201
80N32335

UTTL: Rotary balance data for a typical single-engine general aviation design for an angle-of-attack range of 8 deg to 90 deg. 2: High-wing model C

AUTH: A/HULTBERG, R. S.; B/CHU, J.

MAJS: /*GENERAL AVIATION AIRCRAFT/*ROTARY STABILITY/*SPIN TESTS/*TABLES (DATA)/*WIND TUNNEL TESTS

MINS: / ANGLE OF ATTACK/ LEADING EDGES

ABS: Aerodynamic characteristics obtained in a helical flow environment utilizing a rotary balance located in the Langley spin g tunnel are presented in plotted form for a 1/6 scale, single engine, high wing, general aviation model. The configurations tested included the basic airplane and control deflections, wing leading edge devices, tail designs, and airplane components. Data are presented without analysis for an angle of attack range of 8 deg to 90 deg and clockwise and counter clockwise rotations covering a spin coefficient range from 0 to 0.9.

RPT#: NASA-CR-3239
80N27091

UTTL: NASA TLA workload analysis support. Volume 2: Metering and spacing studies validation data

AUTH: A/SUNDSTROM, J. L.

MAJS: /*AIR TRAFFIC CONTROL/*GENERAL AVIATION AIRCRAFT/*MAN MACHINE SYSTEMS/*TERMINAL CONFIGURED VEHICLE PROGRAM/* WORKLOADS (PSYCHOPHYSIOLOGY)

MINS: / FLIGHT OPERATIONS/ GRAPHS (CHARTS)/ PILOT

airplanes. The performance data show a vast improvement over current gasoline-powered aircraft.

PERFORMANCE/ TASKS/ TIME SERIES ANALYSIS
ABS: Four sets of graphic reports--one for each of the metering and spacing scenarios--are presented. The complete data file from which the reports were generated is also given. The data was used to validate the detail task of both the pilot and copilot for four metering and spacing scenarios. The output presents two measures of demand workload and a report showing task length and task interaction.

RPT#: NASA-CR-3240
80N27093

UTTL: NASA TLA workload analysis support. Volume 3: FFD autopilot scenario validation data

AUTH: A/SUNDSTROM, J. L.

MAJS: /*AIR TRAFFIC CONTROL/*AUTOMATIC PILOTS/*MAN MACHINE SYSTEMS/*TERMINAL CONFIGURED VEHICLE PROGRAM/* WORKLOADS (PSYCHOPHYSIOLOGY)

MINS: / FLIGHT OPERATIONS/ GENERAL AVIATION AIRCRAFT/ GRAPHS (CHARTS)/ PILOT PERFORMANCE/ TASKS/ TIME SERIES ANALYSIS

ABS: The data used to validate a seven time line analysis of forward flight deck autopilot mode for the pilot and copilot for NASA B737 terminal configured vehicle are presented. Demand workloads are given in two forms: workload histograms and workload summaries (bar graphs). A report showing task length and task interaction is also presented.

RPT#: NASA-CR-3260 REPT-756
80N20271

UTTL: A 150 and 300 kW lightweight diesel aircraft engine design study

AUTH: A/BROUWERS, A. P.

MAJS: /*AIRCRAFT ENGINES/*DIESEL ENGINES/*ENGINE DESIGN/* GENERAL AVIATION AIRCRAFT

MINS: / AIRCRAFT PERFORMANCE/ CONFIGURATIONS/ COST ANALYSIS/ ENGINE TESTS/ ENGINEERING DRAWINGS

ABS: The diesel engine was reinvestigated as an aircraft powerplant through design study conducted to arrive at engine configurations and applicable advanced technologies. Two engines are discussed, a 300 kW six-cylinder engine for twin engine general aviation aircraft and a 150 kW four-cylinder engine for single engine aircraft. Descriptions of each engine include concept drawings, a performance analysis, stress and weight data, and a cost study. This information was used to develop two airplane concepts, a six-place twin and a four-place single engine aircraft. The aircraft study consists of installation drawings, computer generated performance data, aircraft operating costs, and drawings of the resulting

RPT#: NASA-CR-1E2390 FR-MTRD(CA)-80-13-VOL-2
81N10019

UTTL: Civil helicopter wire strike assessment study. Volume 2: Accident analysis briefs

AUTH: A/TUOMELA, C. H.; B/BRENNAN, M. F.

MAJS: /*AIRCRAFT HAZARDS/*COLLISIONS/*HELICOPTERS/*PILOT ERROR/*ROTARY WINGS/*WIRE

MINS: / AIRCRAFT ACCIDENTS/ FLIGHT HAZARDS/ GENERAL AVIATION AIRCRAFT

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

RPT#: NASA-CR-159328
81N13941

UTTL: An assessment of General Aviation utilization of advanced avionics technology

AUTH: A/QUINBY, G. F.

MAJS: /*AIRCRAFT INDUSTRY/*AVIONICS/*CIVIL AVIATION/*GOVERNMENT/INDUSTRY RELATIONS/*METEOROLOGICAL SERVICES/*TECHNOLOGY TRANSFER

MINS: / AIRLINE OPERATIONS/ FLIGHT CONDITIONS/ GENERAL AVIATION AIRCRAFT/ NASA PROGRAMS/ WEATHER FORECASTING

ABS: Needs of the general aviation industry for services and facilities which might be supplied by NASA were examined. In the data collection phase, twenty-one individuals from nine manufacturing companies in general aviation were interviewed against a carefully prepared meeting format. General aviation avionics manufacturers were credited with a high degree of technology transfer from the forcing industries such as television, automotive, and computers and a demonstrated ability to apply advanced technology such as large scale integration and microprocessors to avionics functions in an innovative and cost effective manner. The industry's traditional resistance to any unnecessary regimentation or standardization was confirmed. Industry's self sufficiency in applying advanced technology to avionics product development was amply demonstrated. NASA research capability could be supportive in areas of basic mechanics of turbulence in weather and alternative means for its sensing.

RPT#: NASA-CR-159361
81N11013

UTTL: Preliminary design characteristics of a subsonic business jet concept employing an aspect ratio 25 strut braced wing

AUTH: A/TURRIZIANI, R. V.; B/LOVELL, W. A.; C/MARTIN, G. L.; D/PRICE, J. E.; E/SWANSON, E. E.; F/WASHBURN, G. F.

MAJS: /*AIRCRAFT DESIGN/*HIGH ASPECT RATIO/*JET AIRCRAFT/*LIGHT AIRCRAFT/*SLENDER WINGS/*STRUTS

MINS: / AIRCRAFT PRODUCTION COSTS/ DRAG REDUCTION/ LIFT DRAG RATIO/ SUBSONIC SPEED/ WEIGHT REDUCTION

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

RPT#: NASA-CR-159371
81N16066

UTTL: The state of the art of general aviation autopilots

AUTH: A/SEE, M. J.; B/LEVY, D.

MAJS: /*AIRCRAFT EQUIPMENT/*AUTOMATIC PILOTS/*CIVIL AVIATION/*RESEARCH AND DEVELOPMENT/*TECHNOLOGY ASSESSMENT

MINS: / AIRCRAFT INDUSTRY/ AVIONICS/ FLIGHT CONTROL/ LANDING AIDS/ NAVIGATION AIDS

ABS: The study is based on the information obtained from a general literature search, product literature, and visitations and interviews with manufacturers, users, and service centers. State of the art autopilots are documented with respect to total systems, components, and functions. Recommendations concerning potential areas of further research are also presented.

RPT#: NASA-CR-159381 KU-FRL-414-1
81N15974

UTTL: A feasibility study for advanced technology integration for general aviation

AUTH: A/KOHLMAN, D. L.; B/MATSUYAMA, G. T.; C/HAWLEY, K. E.; D/MEREDITH, P. T.

MAJS: /*AERODYNAMICS/*AERONAUTICAL ENGINEERING/*AIRCRAFT DESIGN/*AVIONICS/*CIVIL AVIATION/*FEASIBILITY ANALYSIS/*FUEL CONSUMPTION/*SAFETY MANAGEMENT/*TECHNOLOGY UTILIZATION

MINS: / AERODYNAMIC CONFIGURATIONS/ AIRCRAFT INDUSTRY/

**AIRFOILS/ COMPOSITE MATERIALS/ ENGINE DESIGN/
STRUCTURAL ENGINEERING/ TECHNOLOGY TRANSFER**

ABS: An investigation was conducted to identify candidate technologies and specific developments which offer greatest promise for improving safety, fuel efficiency, performance, and utility of general aviation airplanes. Interviews were conducted with general aviation airframe and systems manufacturers and NASA research centers. The following technologies were evaluated for use in airplane design tradeoff studies conducted during the study: avionics, aerodynamics, configurations, structures, flight controls, and propulsion. Based on industry interviews and design tradeoff studies, several recommendations were made for further high payoff research. The most attractive technologies for use by the general aviation industry appear to be advanced engines, composite materials, natural laminar flow airfoils, and advanced integrated avionics systems. The integration of these technologies in airplane design can yield significant increases in speeds, ranges, and payloads over present aircraft with 40 percent to 50 percent reductions in fuel used.

RPT#: NASA-CR-159382
81N12019

UTTL: Full scale visualization of the wing tip vortices generated by a typical agricultural aircraft

AUTH: A/CROSS, E. J., JR.; B/BRIDGES, P. D.; C/BROWLEE, J. A.; D/LININGSTON, W. W.

MAJS: /*AGRICULTURAL AIRCRAFT/*AIRCRAFT WAKES/*FLOW VISUALIZATION/*VORTICES/*WING TIPS

MINS: / FLIGHT TESTS/ FULL SCALE TESTS/ GENERAL AVIATION AIRCRAFT/ TRAJECTORY ANALYSIS

ABS: The trajectories of the wing tip vortices of a typical agricultural aircraft were experimentally determined by flight test. A flow visualization method, similar to the vapor screen method used in wind tunnels, was used to obtain trajectory data for a range of flight speeds, airplane configurations, and wing loadings. Detailed measurements of the spanwise surface pressure distribution were made for all test points. Further, a powered 1/8 scale model of the aircraft was designed, built, and used to obtain tip vortex trajectory data under conditions similar to that of the full-scale test. The effects of light wind on the vortices were demonstrated, and the interaction of the flap vortex and the tip vortex was clearly shown in photographs and plotted trajectory data.

RPT#: NASA-CR-160036 CRI-7846-14
81N10020

UTTL: Systems analysis of the installation, mounting, and activation of emergency locator transmitters in general aviation aircraft

AUTH: A/HALL, D. S.

MAJS: /*AIRCRAFT DETECTION/*CIVIL AVIATION/*CRASHES/* INDICATING INSTRUMENTS/*RESCUE OPERATIONS/*SEARCHING/* SIGNAL DETECTORS

MINS: / AIRCRAFT ACCIDENTS/ DITCHING (LANDING)/ MALFUNCTIONS / RADIO TRANSMITTERS/ SAFETY DEVICES

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

RPT#: NASA-CR-163920 MSSU-EIRS-ASE-81-3
81N15986

UTTL: An application of wake survey rakes to the experimental determination of thrust for a propeller driven aircraft

AUTH: A/HALL, K. R.; B/MILEY, S. J.; C/TSAI, H. J.

MAJS: /*AERODYNAMIC DRAG/*AIRCRAFT WAKES/*FLIGHT TESTS/* GENERAL AVIATION AIRCRAFT/*PROPELLER SLIPSTREAMS/* THRUST

MINS: / CAVITATION FLOW/ DRAG MEASUREMENT/ FLOW CHARACTERISTICS/ GROUND EFFECT

ABS: The lack of slipstream static pressure distribution seriously affected the results but recommendations for removing the deficiency are discussed. The wake survey rake is shown to be a valuable tool in aircraft flight testing. Flow characteristics in the wake of the propeller were examined.

RPT#: NASA-CR-165185 LYC-80-27
81N16057

UTTL: Design and evaluation of an integrated Quiet Clean General Aviation Turbofan (OCGAT) engine and aircraft propulsion system

AUTH: A/GERMAN, J.; B/FOGEL, P.; C/WILSON, C.

MAJS: /*COMMERCIAL AIRCRAFT/*ENGINE DESIGN/*ENGINE NOISE/* GENERAL AVIATION AIRCRAFT/*JET AIRCRAFT/*POLLUTION

CONTROL/*TURBOFAN ENGINES

MINS: / CIVIL AVIATION/ EXHAUST EMISSION/ FUEL CONSUMPTION/
JET AIRCRAFT NOISE/ NOISE REDUCTION

ABS: The engine and nacelle system design was to demonstrate the applicability of large turbofan engine technology to small turbofans suitable for the general aviation market. The design was based on the LTS-101 engine family for the core engine. A high bypass fan design (BPR=9.4) was incorporated to provide reduced fuel consumption for the design mission. All acoustic and pollutant emissions goals were achieved. A discussion of the preliminary design of a business jet suitable for the developed propulsion system is also included. Large engine technology can be successfully applied to small turbofans, and noise or pollutant levels need not be constraints for the design of future small general aviation turbofan engines.

RPT#: NASA-CR-165649 D6-44815-9 QTPR-9
BIN16139

UTTL: Environmental exposure effects on composite materials for commercial aircraft

AUTH: A/HOFFMAN, D. J.

MAJS: /*AIRFRAME MATERIALS/*COMMERCIAL AIRCRAFT/*COMPOSITE MATERIALS/*FATIGUE LIFE/*LONG TERM EFFECTS/*MECHANICAL PROPERTIES

MINS: / ACCELERATED LIFE TESTS/ AIRCRAFT SURVIVABILITY/
CIVIL AVIATION/ HUMIDITY/ STRUCTURAL FAILURE

ABS: The test program concentrates on three major areas: flight exposure; ground based exposure; and accelerated environmental effects and data correlation. Among the parameters investigated were: geographic location, flight profiles, solar heating effects, ultraviolet degradation, retrieval times, and test temperatures. Data from the tests can be used to effectively plan the cost of production and viable alternatives in materials selection.

ARTICLES AND MEETING PRESENTATIONS
(AIAA, SAE, ETC.)

These are journal articles and papers from technical presentations made at Society and professional meetings.



RPT#: AIAA PAPER 75-271
75A22494

UTTL: Simulation of aircraft crash and its validation
AUTH: A/HAYDUK, R. J.; B/THOMSON, R. G.
MAJS: /*AIRCRAFT SAFETY/*AIRFRAME MATERIALS/*CRASH LANDING/*
DESTRUCTIVE TESTS/*FULL SCALE TESTS/*LANDING
SIMULATION
MINS: / DYNAMIC TESTS/ GENERAL AVIATION AIRCRAFT/ LOAD TESTS
/ STRUCTURAL DESIGN
ABS: NASA Langley Research Center is engaged in an
extensive research and development task aimed at
providing the general aviation industry with reliable
crashworthy airframe design technology. This paper
describes the full-scale crash tests of general
aviation airplanes being conducted to generate data on
simulated crashes and to study the nonlinear dynamic
behavior of aircraft structures. Analytical techniques
under development for predicting nonlinear behavior of
general airframe structures under crash-loading
conditions are also described. Data are presented from
the full-scale crash tests as well as comparison of
analytical predictions with experimental results on
some simplified structures.

RPT#: AIAA PAPER 75-290
75A25007

UTTL: NASA general aviation technology programs
AUTH: A/WINBLADE, R. L.
MAJS: /*AIRCRAFT DESIGN/*GENERAL AVIATION AIRCRAFT/*NASA
PROGRAMS/*TECHNOLOGY ASSESSMENT
MINS: / AIRCRAFT NOISE/ AIRCRAFT SAFETY/ AVIONICS/ CRASH
LANDING/ ENVIRONMENT EFFECTS/ FULL SCALE TESTS/
HYDROGEN FUELS/ PROPELLER EFFICIENCY
ABS: This paper describes the status of the current NASA
programs that are aimed at providing new technology
for aircraft designs that will improve both safety and
utility while reducing the environmental impact of
general aviation to acceptable levels. Safety related
areas that are discussed include the full scale crash
test program and the stall/spin research effort. Among
the programs addressing increased utility and
performance, advanced airfoil developments and engine
cooling drag reduction are discussed. Noise and
emission reduction is a subject that is receiving
significant emphasis within the NASA programs. Also
included is a description of the current status of the
hydrogen injection concept as a means of both lowering
emissions and increasing fuel economy.

RPT#: AIAA PAPER 75-319
75A22515

UTTL: Air transportation energy consumption - Yesterday,
today, and tomorrow
AUTH: A/MASCY, A. C.; B/WILLIAMS, L. J.
MAJS: /*AIR TRANSPORTATION/*ENERGY CONSUMPTION/*FUEL
CONSUMPTION/*TECHNOLOGY ASSESSMENT
MINS: / AIRLINE OPERATIONS/ CIVIL AVIATION/ PASSENGER
AIRCRAFT/ PROPULSIVE EFFICIENCY/ SURFACE VEHICLES/
TECHNOLOGICAL FORECASTING
ABS: The energy consumption by aviation is reviewed and
projections of its growth are discussed. Forecasts of
domestic passenger demand are presented, and the
effect of restricted fuel supply and increased fuel
prices is considered. The most promising sources for
aircraft fuels, their availability and cost, and
possible alternative fuels are reviewed. The energy
consumption by various air and surface transportation
modes is identified and compared on typical
portal-to-portal trips. A measure of the indirect
energy consumed by ground and air modes is defined.
Historical trends in aircraft energy intensities are
presented and the potential fuel savings with new
technologies are discussed.

RPT#: AIAA PAPER 75-584
75A26737

UTTL: Advanced computer technology - An aspect of the
Terminal Configured Vehicle program
AUTH: A/BERKSTRESSER, B. K.
MAJS: /*AIR TRANSPORTATION/*AIRBORNE/SPACEBORNE COMPUTERS/*
COMPUTER SYSTEMS DESIGN/*TERMINAL FACILITIES
MINS: / AIRCRAFT NOISE/ AUTOMATIC CONTROL/ CIVIL AVIATION/
COMPUTER TECHNIQUES/ NOISE REDUCTION/ REDUNDANT
COMPONENTS/ RELIABILITY ANALYSIS/ RESEARCH AND
DEVELOPMENT/ TECHNOLOGY ASSESSMENT
ABS: NASA is conducting a Terminal Configured Vehicle
program to provide improvements in the air
transportation system such as increased system
capacity and productivity, increased all-weather
reliability, and reduced noise. A typical jet
transport has been equipped with highly flexible
digital display and automatic control equipment to
study operational techniques for conventional takeoff
and landing aircraft. The present airborne computer
capability of this aircraft employs a multiple
computer simple redundancy concept. The next step is
to proceed from this concept to a reconfigurable
computer system which can degrade gracefully in the
event of a failure, adjust critical computations to
remaining capacity, and reorder itself, in the case of
transients, to the highest order of redundancy and
reliability.

RPT#: SAE PAPER 750500
75A36678

UTTL: NASA General Aviation Research overview - 1975
AUTH: A/WINBLADE, R. L.; B/WESTFALL, J. A.
MAJS: /*AIRCRAFT DESIGN/*BIBLIOGRAPHIES/*GENERAL AVIATION
AIRCRAFT/*NASA PROGRAMS/*RESEARCH AND DEVELOPMENT/*
TECHNOLOGY ASSESSMENT
MINS: / AIR TRANSPORTATION/ AIRCRAFT PRODUCTION/ AIRCRAFT
SAFETY/ CIVIL AVIATION/ ENVIRONMENTAL CONTROL
ABS: An overview of the 1975 NASA Research and Technology
efforts directly focused on general aviation is
presented. Current status and accomplishments during
of the past year are described. An updated bibliography
of technical reports generated by the NASA program,
including seven recently declassified reports on
airplane noise reduction, is included as an Appendix
to this report.

RPT#: SAE PAPER 750523
75A36663

UTTL: Wind tunnel and flight development of spoilers for
general aviation aircraft
AUTH: A/WENTZ, W. H., JR.; B/SEETHARAM, H. C.; C/CALHOUN,
J. T.
MAJS: /*AIRCRAFT CONTROL/*AIRFOIL PROFILES/*GENERAL AVIATION
AIRCRAFT/*LATERAL CONTROL/*SPOILERS/*WIND TUNNEL TESTS
MINS: / AERODYNAMIC INTERFERENCE/ AIR FLOW/ AIRCRAFT DESIGN/
AIRCRAFT PERFORMANCE/ FLAPS (CONTROL SURFACES)/ MANUAL
CONTROL/ VENTILATION
ABS: Wind tunnel tests have been carried out to develop a
spoiler lateral control system for use with the
GA(W)-1 airfoil with a 30% Fowler flap. Tests show
that unfavorable aerodynamic interactions can occur
between spoiler and flap for large flap deflections.
Providing venting of lower surface air through the
spoiler opening substantially improves performance.
Results of tests with a number of spoiler and cavity
shapes are presented and discussed. Applications of
two-dimensional wind tunnel results to the design of
satisfactory manual lateral control systems are
discussed.

RPT#: SAE PAPER 750528
75A36666

UTTL: An in-flight investigation of nonlinear roll control
AUTH: A/ELLIS, D. R.; B/TILAK, N. W.
MAJS: /*AIRCRAFT CONTROL/*CONTROL SIMULATION/*IN-FLIGHT
MONITORING/*LATERAL CONTROL/*ROLLING MOMENTS
MINS: / FLIGHT STABILITY TESTS/ INSTRUMENT LANDING SYSTEMS/
LIGHT AIRCRAFT/ NONLINEAR SYSTEMS/ PILOT PERFORMANCE/
SPOILER SLOT AILERONS/ TOUCHDOWN
ABS: An in-flight simulation was undertaken to study the

piloting problems associated with a type of nonlinear
control effectiveness which is characteristic of
spoiler roll control systems. Typically, the initial
response is small or even zero, followed by a narrow
region of highly effective control, and a final one of
moderate effectiveness. Results for the landing flare
and touchdown, which turned out to be the critical
flight phase, indicate that a substantial amount of
dead zone and changing effectiveness can be tolerated,
but the best level of handling is obtained with
linear, aileron-like control.

RPT#: SAE PAPER 750544
75A36675

UTTL: Discussion of an aeromechanical gust alleviation
system to improve the ride comfort of light airplanes
AUTH: A/STEWART, E. C.
MAJS: /*AERODYNAMIC STABILITY/*AIRCRAFT STABILITY/*COMFORT/*
GUST ALLEVIATORS/*LIGHT AIRCRAFT
MINS: / AIRCRAFT MODELS/ NASA PROGRAMS/ WIND TUNNEL TESTS/
WING FLAPS
ABS: A discussion of an on-going NASA research project of a
gust alleviation system to improve the ride comfort of a
light airplane is presented. The discussion includes
a description of the proposed system which uses
auxiliary aerodynamic surfaces to drive the
trailing-edge flaps. The results of analytical work on
the effects of the system on stability and
effectiveness of the system are presented. Static
wind-tunnel tests of the system installed in a
1/6-scale model of a popular light airplane are also
described. Problem areas which may need future
investigation are discussed.

RPT#: SAE PAPER 750592
75A40507

UTTL: NASA refan program status
AUTH: A/ABDALLA, K. L.; B/YUSKA, J. A.
MAJS: /*AIRCRAFT DESIGN/*ENGINE NOISE/*JET AIRCRAFT NOISE/*
NASA PROGRAMS/*NOISE REDUCTION/*TURBOFAN ENGINES
MINS: / AIRFRAMES/ CIVIL AVIATION/ NOISE POLLUTION/
POLLUTION CONTROL/ TECHNOLOGY ASSESSMENT
ABS: The objective of the refan program is to demonstrate
the technical feasibility of substantially reducing
the noise levels of existing JT8D powered aircraft.
The program consists of the design, manufacturing and
testing of the refan engines and modified nacelles and
airplanes. Experimental testing has been completed for
the refan engine both at sea level and at altitude
conditions. Ground testing for the B727 side- and
center-engine installations and flight testing of the
DC-9 with refan engines and acoustic nacelles have
been performed. Analyses of the test results are in
progress. Preliminary results presented in this paper
show that substantial noise reductions were achieved.

RPT#: AIAA PAPER 76-572
76A38085

UTTL: Noise comparisons of single and two stage demonstrator fans for advanced technology aircraft

AUTH: A/HEIDMANN, M. F.

MAJS: /*AERODYNAMIC CONFIGURATIONS/*AERODYNAMIC NOISE/*AIRCRAFT CONFIGURATIONS/*ATLIT PROJECT/*NOISE REDUCTION/*TURBOFANS

MINS: / ACOUSTIC PROPERTIES/ DIRECTIVITY/ GRAPHS (CHARTS)/ NOISE INTENSITY/ NOISE SPECTRA/ TIP SPEED

ABS: A high-speed single-stage and a low-speed two-stage fan were designed, fabricated and tested to demonstrate their predicted low noise performance for an advanced 0.85-0.90 cruise Mach number aircraft requiring a 1.8-1.9 pressure ratio fan. Acoustic tests were made with both unsuppressed and suppressed configurations. The two-stage fan demonstrated that quiet fan technology developed for low-speed single-stage fan is applicable to two-stage designs. The unsuppressed two-stage fan was 3-5 dB quieter than the high-speed single-stage fan at the same pressure ratio. The unsuppressed high-speed single-stage fan demonstrated that significant reductions in inlet noise can be achieved from the sonic blockage caused by supersonic flow in the rotor blading. Both fans demonstrated suppressed inlet noise levels with treated sonic inlets that met advanced technology goals. Suppressed aft noise levels did not meet expectations for either fan. The aft noise problem is attributed to both excessive source noise and ineffective treatment performance.

RPT#: AIAA PAPER 76-939
76A45414

UTTL: Prospective markets and design concepts for civilian remotely piloted aircraft

AUTH: A/NELMS, W. P., JR.; B/GREGORY, T. J.; C/ADERHOLD, J. R.

MAJS: /*AIRCRAFT DESIGN/*CIVIL AVIATION/*REMOTELY PILOTED VEHICLES/*USER REQUIREMENTS/*UTILITY AIRCRAFT

MINS: / COST EFFECTIVENESS/ ENVIRONMENT EFFECTS/ FOREST FIRES/ METEOROLOGICAL RESEARCH AIRCRAFT/ OBSERVATION AIRCRAFT/ PATROLS/ SAFETY FACTORS/ TECHNOLOGY ASSESSMENT

ABS: This paper summarizes a study that examines the technical, economic, and environmental aspects of remotely piloted vehicles (RPVs) in the civil environment. A market survey was conducted in which 35 civil applications of RPVs were identified. For a number of these uses, vehicle and system concepts were defined, benefit and cost comparisons were made with present methods, and the influence of safety and environmental implications was assessed. The results suggest a sizable potential demand for the use of RPVs in the civil sector, and some of the applications show promising cost savings over established methods. A focussed technology effort could provide the safety assurances needed for routine civilian operation of RPVs.

RPT#: AIAA PAPER 76-1720
76A33650

UTTL: A visual motion simulator for general aviation compensated within the nonlinear adaptive washout for actuator lag

AUTH: A/ASHWORTH, B. R.; B/PARRISH, R. V.

MAJS: /*ACTUATORS/*ADAPTIVE CONTROL/*GENERAL AVIATION AIRCRAFT/*MOTION SIMULATORS/*TIME LAG/*VISUAL AIDS

MINS: / AIRCRAFT INSTRUMENTS/ COCKPITS/ COMPUTER TECHNIQUES/ DEGREES OF FREEDOM/ DYNAMIC RESPONSE/ FREQUENCY RESPONSE/ MAN MACHINE SYSTEMS/ STEEPEST DESCENT METHOD

ABS: A description is presented of the general aviation aircraft simulator recently acquired by the Langley Research Center, summarizing the complement of instruments, radio/navigation equipment, control loading, and other features. Emphasis is placed mainly on the two-degree-of-freedom motion drives developed for this simulator and the presentation of the dynamic response of the motion system (without washout) in terms of amplitude ratio and phase lag as a function of frequency. The nonlinear adaptive washout based on continuous steepest descent optimization presents cues in pitch rate, surge, roll rate, and sway, and allows for actuator lag compensation.

RPT#: AIAA 76-1987
76A41486

UTTL: Omega navigation for general aviation

AUTH: A/HOLLISTER, W. M.

MAJS: /*AIR NAVIGATION/*FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT/*INSTRUMENT ERRORS/*OMEGA NAVIGATION SYSTEM/*RADIO NAVIGATION

MINS: / CIVIL AVIATION/ FEASIBILITY ANALYSIS/ NOISE GENERATORS/ POSITION ERRORS/ SIGNAL TO NOISE RATIOS

ABS: A 70-hour flight test evaluation of an Omega navigation system was performed using a Piper Cherokee 180, to determine the feasibility of Omega for worldwide general aviation navigation. Measurements were made of position accuracy, noise phenomena, and signal to noise ratio. It was found that Omega accuracy is essentially insensitive to local geography, but that there are isolated local interference phenomena associated with radio transmitters, although the strongest noise source observed was due to the onboard power source for the

VHF comm/nav radio. An occurrence of lane jumps was observed when attempting to navigate with one weak station.

RPT#: AIAA 76-1991
76A41489

UTTL: Flight test evaluation of a separate surface attitude command control system on a Beech 99 airplane
AUTH: A/GEE, S. W.; B/JENKS, G. E.; C/ROSKAM, J.; D/STONE, R. L.
MAJS: /*AIRCRAFT CONTROL/*ATTITUDE CONTROL/*BEECHCRAFT AIRCRAFT/*COMMAND AND CONTROL/*CONTROL SURFACES/* FLIGHT TESTS
MINS: /AILERONS/ BLOCK DIAGRAMS/ FLY BY WIRE CONTROL/ GENERAL AVIATION AIRCRAFT/ LOW COST/ RIDING QUALITY
ABS: A joint NASA/university/industry program was conducted to flight evaluate a potentially low cost separate surface implementation of attitude command in a Beech 99 airplane. Saturation of the separate surfaces was the primary cause of many problems during development. Six experienced professional pilots made simulated instrument flight evaluations in light-to-moderate turbulence. They were favorably impressed with the system, particularly with the elimination of control force transients that accompanied configuration changes. For ride quality, quantitative data showed that the attitude command control system resulted in all cases of airplane motion being removed from the uncomfortable ride region.

RPT#: SAE PAPER 751086
76A22305

UTTL: Variable cycle engines for advanced supersonic transports
AUTH: A/HOWLETT, R. A.; B/KOZLOWSKI, H.
MAJS: /*AIRCRAFT ENGINES/*CIVIL AVIATION/*ENGINE DESIGN/* SUPERSONIC TRANSPORTS
MINS: / FUEL CONSUMPTION/ FUEL CONTROL/ JET AIRCRAFT NOISE/ NOISE REDUCTION/ TURBOFAN ENGINES
ABS: Variable Cycle Engines being studied for advanced commercial supersonic transports show potential for significant environmental and economic improvements relative to 1st generation SST engines. The two most promising concepts are: a Variable Stream Control Engine and a Variable Cycle Engine with a rear flow-control valve. Each concept utilizes variable components and separate burners to provide independent temperature and velocity control for two coannular flow streams. Unique fuel control techniques are combined with cycle characteristics that provide low fuel consumption, similar to a turbojet engine, for supersonic operation. This is accomplished while

retaining the good subsonic performance features of a turbofan engine. A two-stream coannular nozzle shows potential to reduce jet noise to below FAR Part 36 without suppressors. Advanced burner concepts have the potential for significant reductions in exhaust emissions. In total, these unique engine concepts have the potential for significant overall improvements to the environmental and economic characteristics of advanced supersonic transports.

RPT#: SAE PAPER 760454
76A31954

UTTL: Progress report on propeller aircraft flyover noise research
AUTH: A/METZGER, F. B.; B/MAGLIOZZI, B.; C/PEGG, R. J.
MAJS: /*ACOUSTIC MEASUREMENTS/*AIRCRAFT NOISE/*FLIGHT CHARACTERISTICS/*PROPELLER BLADES
MINS: / FAR FIELDS/ FLIGHT TESTS/ LIGHT AIRCRAFT/ NOISE GENERATORS/ NOISE SPECTRA/ PRESSURE DISTRIBUTION/ TURBULENCE EFFECTS
ABS: Initial results of a program to investigate the sources of noise in unshrouded propellers under forward flight conditions are reported. Tests were conducted using a three-blade full-scale instrumented propeller mounted on a twin-engine aircraft. Measurements included (1) far-field noise at fixed ground stations and at two aircraft wing tip locations, (2) blade surface pressures at seven locations on one of the propeller blades, (3) atmospheric turbulence encountered by the aircraft in flight, and (4) aircraft operating conditions. The results confirm that significantly lower levels of propeller noise are produced in forward flight than at static conditions. It is tentatively concluded that propeller noise generation in flight may be dominated by steady loading at blade passage frequency, but at higher frequencies unsteady loading due to interaction with natural atmospheric turbulence may be the dominant mechanism of noise generation. Under static conditions the total noise signature appears to be the result of interaction of the propeller with persistent turbulent eddies passing through the propeller disk.

RPT#: SAE PAPER 760458
76A31957

UTTL: NASA general aviation research overview - 1976
AUTH: A/WINBLADE, R. L.; B/WESTFALL, J. A.
MAJS: /*AIRCRAFT DESIGN/*BIBLIOGRAPHIES/*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS
MINS: / AERODYNAMIC STALLING/ AIRCRAFT CONFIGURATIONS/ AIRCRAFT DESIGN/ AVIONICS/ ENVIRONMENT EFFECTS/ TECHNOLOGY ASSESSMENT

ABS: Recent accomplishments in the field of general aviation are reviewed which resulted from NASA's steadily improving communication with the industry and user community, both on a formal level and through more direct involvement in the research activities. Several NASA programs are examined whose aim is to provide new technologies across the board for improvements in safety, efficiency, and reduction of the impact of general aviation on the environment. The use of the results of some NASA programs in designing new aircraft is demonstrated. A list of technical reports generated by the NASA program is given in an appendix.

RPT#: SAE PAPER 760460
76A31958

UTTL: NASA study of an automated Pilot Advisory System
AUTH: A/PARKER, L. C.
MAJS: /*ACCIDENT PREVENTION/*AIRCRAFT COMMUNICATION/*AIRCRAFT PILOTS/*AUTOMATION/*GROUND-AIR-GROUND COMMUNICATIONS/*NASA PROGRAMS/*SYSTEMS ANALYSIS/*VOICE COMMUNICATION

MINS: / AIR TRAFFIC CONTROL/ AIRCRAFT ACCIDENTS/ AIRPORTS/ GENERAL AVIATION AIRCRAFT/ MIDAIR COLLISIONS/ NASA PROGRAMS/ WARNING SYSTEMS

ABS: A Pilot Advisory System (PAS) concept for high-density uncontrolled airports is discussed where the general aviation pilots will be provided with automatic audio voice airport and air traffic advisories within two minute intervals and with mid-air collision warnings whenever such situations arise. Free of manual inputs, the PAS includes the options of fixed-base operator runway select, automatic restart and self-test, and remote inquiry of system status and messages.

RPT#: SAE PAPER 760463
76A31961

UTTL: Business jet approach noise abatement techniques - Flight test results

AUTH: A/PUTNAM, T. W.; B/BURCHAM, F. W.
MAJS: /*FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT/*JET AIRCRAFT NOISE/*NOISE REDUCTION

MINS: / ACOUSTIC MEASUREMENTS/ APPROACH/ GLIDE PATHS/ JET ENGINES

ABS: Operational techniques for reducing approach noise from business jet aircraft were evaluated in flight by measuring the noise generated by five such aircraft during modified approaches. Approaches with 4-deg glide slopes were approximately 4.0 EPNdB quieter than approaches with standard 3-deg glide slopes. Noise reductions for low-drag 3-deg approaches varied widely among the airplanes tested; the fleet-weighted

reduction was 8.5 EPNdB. Two-segment approaches resulted in noise reductions of 7.0 EPNdB to 8.5 EPNdB 3 nautical miles and 5 nautical miles from touchdown. Pilot workload increased progressively for the 4-deg, low-drag 3-deg, and two-segment approach.

RPT#: SAE PAPER 760466
76A31962

UTTL: The impact of interior cabin noise on passenger acceptance

AUTH: A/RUDRAPATNA, A. N.; B/JACOBSON, I. D.
MAJS: /*AIRCRAFT COMPARTMENTS/*AIRCRAFT NOISE/*GENERAL AVIATION AIRCRAFT/*HUMAN REACTIONS/*NOISE TOLERANCE/*PASSENGER AIRCRAFT

MINS: / COMFORT/ FLIGHT TESTS/ GRAPHS (CHARTS)/ HUMAN FACTORS ENGINEERING/ NOISE SPECTRA

ABS: Based on flight test data gathered in general aviation aircraft, a composite motion-noise passenger comfort model has been developed which enables the assessment of cabin interior noise impact on passenger acceptance. Relationships between special subject responses and passenger responses are given, as well as the effect of comfort on passenger acceptance. The importance of comfort and noise on the overall passenger reaction is discussed.

RPT#: SAE PAPER 760469
76A31964

UTTL: New potentials for conventional aircraft when powered by hydrogen-enriched gasoline

AUTH: A/MENARD, W. A.; B/MOYNIHAN, P. I.; C/RUPE, J. H.
MAJS: /*AIRCRAFT FUELS/*ENGINE TESTS/*EXHAUST GASES/*FUEL CONSUMPTION/*GASOLINE/*HYDROGEN FUELS/*PISTON ENGINES
MINS: / AIRCRAFT PERFORMANCE/ BEECHCRAFT AIRCRAFT/ GENERAL AVIATION AIRCRAFT/ HORSEPOWER/ NASA PROGRAMS/ POLLUTION CONTROL/ SYSTEMS ANALYSIS/ THERMODYNAMIC EFFICIENCY

ABS: Hydrogen enrichment for aircraft piston engines is under study in a new NASA program. The objective of the program is to determine the feasibility of inflight injection of hydrogen in general aviation aircraft engines to reduce fuel consumption and to lower emission levels. A catalytic hydrogen generator will be incorporated as part of the air induction system of a Lycoming turbocharged engine and will generate hydrogen by breaking down small amounts of the aviation gasoline used in the normal propulsion system. This hydrogen will then be mixed with gasoline and compressed air from the turbocharger before entering the engine combustion chamber. The special properties of the hydrogen-enriched gasoline allow the engine to operate at ultralean fuel/air ratios.

resulting in higher efficiencies and hence less fuel consumption. This paper summarizes the results of a systems analysis study. Calculations assuming a Beech Duke aircraft indicate that fuel savings on the order of 20% are possible. An estimate of the potential for the utilization of hydrogen enrichment to control exhaust emissions indicates that it may be possible to meet the 1979 Federal emission standards.

produce roll helix angles in excess of 0.11 rad. Flight testing is planned to document climb and cruise performance, and supercritical propeller performance and noise characteristics. The airplane is scheduled for testing in the NASA-Langley Research Center Full-Scale Tunnel.

RPT#: SAE PAPER 760476
76A31968

UTTL: General aviation design synthesis utilizing interactive computer graphics
AUTH: A/GALLOWAY, T. L.; B/SMITH, M. R.
MAJS: /*AIRCRAFT DESIGN/*COMPUTER GRAPHICS/*COMPUTERIZED DESIGN/*GENERAL AVIATION AIRCRAFT/*MAN MACHINE SYSTEMS
MINS: / AIRCRAFT CONFIGURATIONS/ COMPUTER PROGRAMS/ DESIGN ANALYSIS/ INPUT/OUTPUT ROUTINES/ NASA PROGRAMS
ABS: Interactive computer graphics is a fast growing area of computer application, due to such factors as substantial cost reductions in hardware, general availability of software, and expanded data communication networks. In addition to allowing faster and more meaningful input/output, computer graphics permits the use of data in graphic form to carry out parametric studies for configuration selection and for assessing the impact of advanced technologies on general aviation designs. The incorporation of interactive computer graphics into a NASA developed general aviation synthesis program is described, and the potential uses of the synthesis program in preliminary design are demonstrated.

RPT#: SAE PAPER 760497
76A31976

UTTL: Preliminary flight-test results of an advanced technology light twin-engine airplane /ATLIT/
AUTH: A/HOLMES, B. J.; B/KOHLMAN, D. L.; C/CRANE, H. L.
MAJS: /*AIRCRAFT PERFORMANCE/*ATLIT PROJECT/*FLIGHT TESTS/* LIGHT AIRCRAFT/*PIPER AIRCRAFT
MINS: / AERODYNAMIC STALLING/ AIRCRAFT CONFIGURATIONS/ LATERAL CONTROL/ PA-34 SENECA AIRCRAFT/ ROLL/ SPOILERS
ABS: The present status and flight-test results are presented for the ATLIT airplane. The ATLIT is a Piper PA-34 Seneca I modified by the installation of new wings incorporating the GA(W)-1 (Whitcomb) airfoil, reduced wing area, roll-control spoilers, and full-span Fowler flaps. Flight-test results on stall and spoiler roll characteristics show good agreement with wind-tunnel data. Maximum power-off lift coefficients are greater than 3.0 with flaps deflected 37 deg. With flaps down, spoiler deflections can

RPT#: AIAA PAPER 77-258
77A18206

UTTL: The technical challenge of air transportation - A Government view

AUTH: A/ROBERTS, L.

MAJS: /*AIR TRANSPORTATION/*CIVIL AVIATION/*
GOVERNMENT/INDUSTRY RELATIONS/*RESEARCH AND
DEVELOPMENT/*TECHNOLOGICAL FORECASTING

MINS: / ECONOMIC ANALYSIS/ FLIGHT SIMULATORS/ SUPERSONIC
TRANSPORTS/ URBAN DEVELOPMENT

ABS: This paper reviews the research and technology that must be conducted, and the facility investments that must be made, in order to assure that the United States is adequately prepared to meet the challenges that air transportation will provide in the future. The technical focal points for the next decade are reviewed in the context of the emerging pattern of air transportation needs for the remainder of the Century and the prospects for satisfying these needs are discussed. Particular attention is given to the responsibility that the Government must assume in aviation R&T and to the relationship that must be encouraged between the Government, the Industry and the University Community.

RPT#: AIAA PAPER 77-312
77A18237

UTTL: Technical highlights in general aviation

AUTH: A/STICKLE, J. W.

MAJS: /*AIRCRAFT DESIGN/*GENERAL AVIATION AIRCRAFT/*
PROPULSION SYSTEM PERFORMANCE/*RESEARCH AND
DEVELOPMENT

MINS: / AIR POLLUTION/ AIRCRAFT PERFORMANCE/ AIRCRAFT SAFETY
/ AIRCRAFT STRUCTURES/ AIRFOIL PROFILES/ AVIONICS/
DRAG REDUCTION/ NOISE REDUCTION/ POLLUTION CONTROL/
PROPULSIVE EFFICIENCY/ TECHNOLOGY ASSESSMENT

ABS: Improvements in performance, safety, efficiency, and emissions control in general aviation craft are reviewed. While change is slow, the U.S. industries still account for the bulk (90%) of the world's general aviation fleet. Advances in general aviation aerodynamics, structures and materials, acoustics, avionics, and propulsion are described. Supercritical airfoils, drag reduction design, stall/spin studies, crashworthiness and passenger safety, fiberglass materials, flight noise abatement, interior noise and vibration reduction, navigation systems, quieter and cleaner (reciprocating, turboprop, turbofan) engines, and possible benefits of the Global Position Satellite System to general aviation navigation are covered in the discussion. Some of the developments are illustrated.

RPT#: AIAA 77-444
77A25802

UTTL: Methods of reducing low frequency cabin noise and sonically induced stresses, based on the intrinsic structural tuning concept

AUTH: A/SENGUPTA, G.

MAJS: /*ACOUSTIC ATTENUATION/*AIRCRAFT NOISE/*AIRCRAFT
STRUCTURES/*LOW FREQUENCIES/*NOISE REDUCTION/*TUNING

MINS: / AIRCRAFT COMPARTMENTS/ DAMPING TESTS/ DYNAMIC
STRUCTURAL ANALYSIS/ FREQUENCY RESPONSE/ FUSELAGES/
POWER SPECTRA/ STRINGERS/ STRUCTURAL STRAIN

ABS: Control of low frequency interior noise has been difficult in all commercial and general aviation aircraft, since the existing sound attenuation techniques are less effective at these frequencies. Therefore low frequency cabin noise and sonically induced stresses can be reduced mainly by a proper design of the fuselage structure. For this purpose, a concept based on intrinsic tuning and damping of fuselage structural elements has been under development at Boeing for the past three years. This paper describes the results of some laboratory and field tests that were conducted for evaluation of the concept.

RPT#: AIAA 77-1102
77A42805

UTTL: Application of microelectronic technology to general aviation flight control

AUTH: A/SORENSEN, J. A.; B/TASHKER, M. G.; C/DEBRA, D. B.

MAJS: /*AVIONICS/*FEEDBACK CONTROL/*FLIGHT CONTROL/*GENERAL
AVIATION AIRCRAFT/*MICROELECTRONICS/*TECHNOLOGY
UTILIZATION

MINS: / ACCELEROMETERS/ AIRCRAFT CONTROL/ ATTITUDE CONTROL/
ELECTRONIC CONTROL/ INSTRUMENT ERRORS/ MAGNETOMETERS/
PRESSURE SENSORS/ SOLID STATE DEVICES

ABS: This paper presents several different methods that can be used to determine the aircraft orientation (attitude) without direct measurement. The methods combine state estimation techniques with measurements from solid state pressure sensors, accelerometers, and magnetometers to determine the aircraft state. The paper demonstrates how the estimation algorithms were validated and compared using flight test data, and it presents results of performance sensitivity analyses of sensor error, modeling inaccuracies, and wind disturbance effects on the attitude estimation errors. If implemented, the methods presented could make it possible to eliminate directional and vertical gyros and to change from many isolated sensors to an integrated, small, reliable sensing package for determining the aircraft state.

RPT#: AIAA PAPER 77-1217
77A44319

UTTL: Flight test results for an advanced technology light airplane
AUTH: A/KOHLMAN, D. L.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRCRAFT DESIGN/*FLIGHT TESTS/*LIGHT AIRCRAFT
MINS: / CESSNA AIRCRAFT/ DRAG REDUCTION/ DYNAMIC STABILITY/ FLAPS (CONTROL SURFACES)/ GUST LOADS/ WING LOADING/ WING PLANFORMS
ABS: A single-engine light airplane was modified by the installation of a wing with reduced area, Fowler flaps, Kruger flaps, and spoilers. Flight test results show that zero-lift drag was reduced 13.8% and a trimmed maximum lift coefficient of 2.73 was achieved. Gust response was significantly reduced and excellent roll control was achieved with spoilers. Several design features employed in the new wings have excellent potential for incorporation in future light airplanes.

RPT#: AIAA PAPER 77-1248
77A44337

UTTL: Optimum acoustic design of free-running low speed propellers
AUTH: A/ORMSBEE, A. I.; B/WOAN, C. J.
MAJS: /*AERODYNAMIC LOADS/*NOISE REDUCTION/*PROPELLER BLADES /*SOUND PRESSURE/*STRUCTURAL DESIGN
MINS: / AIRCRAFT WAKES/ GENERAL AVIATION AIRCRAFT/ NONLINEAR PROGRAMMING/ OPTIMIZATION/ THRUST/ TORQUE
ABS: A theoretical analysis is conducted concerning the effect of blade loading on the noise output of a free-running propeller in axial motion. The minimization of the mean square sound pressure at a point in space is considered, taking into account constraints on propeller thrust and torque. Attention is given to aerodynamic equations, acoustic equations, the expansion of the aerodynamic variables, and the nonlinear programming formulation.

RPT#: AIAA 77-1494
78A12243

UTTL: Advanced Digital Avionics System for general aviation
AUTH: A/SMYTH, R. K.; B/HOH, R. H.; C/TEPER, G. L.
MAJS: /*AVIONICS/*DIGITAL SYSTEMS/*GENERAL AVIATION AIRCRAFT /*SYSTEMS ENGINEERING
MINS: / AIR NAVIGATION/ AIR TRAFFIC CONTROL/ AUTOMATIC FLIGHT CONTROL/ BLOCK DIAGRAMS/ CHANNELS (DATA TRANSMISSION)/ COMPUTER SYSTEMS PROGRAMS/ INSTRUMENT FLIGHT RULES/ MICROPROCESSORS
ABS: Objectives and functions of the Advanced Digital Avionics System (ADAS) for general aviation are outlined with particular reference to navigation, flight control, engine management, ATC surveillance, flight management, communications, and the pilot controls and displays. The resulting ADAS design comprises the selection of off-the-shelf avionics to be integrated with ADAS-unique elements including new pilot displays and controls along with a microcomputer control complex (MCC). Reasons for which the ADAS achieves increased avionics capability are mentioned, including overall system integration through the MCC and pilot orientation from navigation map display.

RPT#: ASME PAPER 77-GT-36
77A28551

UTTL: A study of commuter aircraft design
AUTH: A/GALLOWAY, T. L.
MAJS: /*AIRCRAFT CONFIGURATIONS/*AIRCRAFT DESIGN/*PASSENGER
AIRCRAFT/*TURBOFAN AIRCRAFT/*TURBOPROP AIRCRAFT
MINS: / AIRCRAFT COMPARTMENTS/ AIRCRAFT NOISE/ AIRCRAFT
PERFORMANCE/ AIRSPEED/ CIVIL AVIATION/ SIZING
(SHAPING)/ WING PLANFORMS
ABS: This paper investigates the impact of configuration
considerations, mission requirements, and performance
constraints on conceptual commuter aircraft designs.
Emphasis is placed on direct comparisons between
turbofan and turboprop powered aircraft in the 10-30
passenger class. The analysis is accomplished using a
computerized aircraft synthesis model that simulates
the aircraft design and mission. The resulting
conceptual aircraft are similar in size and
performance regardless of engine type but the
turboprop offers more mission flexibility

RPT#: ASME PAPER 77-GT-70
77A28581

UTTL: Some measured and calculated effects of forward
velocity on propeller noise
AUTH: A/PEGG, R. J.; B/FARASSAT, F.; C/MAGLIOZZI, B.
MAJS: /*AIRCRAFT NOISE/*AIRSPEED/*NOISE MEASUREMENT/*
PROPELLERS/*SHORT TAKEOFF AIRCRAFT
MINS: / FLIGHT TESTS/ GENERAL AVIATION AIRCRAFT/ NOISE
INTENSITY/ NOISE SPECTRA/ PREDICTION ANALYSIS
TECHNIQUES/ STATIC TESTS/ TURBULENCE EFFECTS
ABS: Test flights using a twin-engine, high-wing, light
STOL transport plane powered by free turbine engines
driving three-bladed propellers, were conducted at the
NASA Wallops Flight Center. A ground-based acoustic
measuring range was set up, and aircraft tracking
information was supplied by a radar system. The noise
of the unshrouded propeller was measured under static
and forward flight conditions, and the measurements
were compared with theory. Under static conditions,
the principal noise is related to the unsteady loading
associated with the interaction of the propeller with
persistent turbulent eddies passing through the
propeller disk. Through the use of existing prediction
techniques, it was shown that changes in the geometry
such as different airfoil thickness distribution can
affect the radiated acoustic pressure signatures. This
test program confirmed that lower propeller noise
levels are produced in forward flight than under
static conditions and that the most significant
reductions occur at the midfrequencies which dominate
perceived and A-weighted noise levels.

RPT#: ASME PAPER 77-GT-77
77A28588

UTTL: NASA Quiet, Clean General Aviation Turbofan /QCGAT/
program status
AUTH: A/BRESNAHAN, D. L.; B/SIEVERS, G. K.
MAJS: /*ENGINE NOISE/*GENERAL AVIATION AIRCRAFT/*QUIET
ENGINE PROGRAM/*TURBOFAN ENGINES
MINS: / AIR POLLUTION/ ENGINE DESIGN/ FUEL CONSUMPTION/
NOISE POLLUTION/ POLLUTION CONTROL
ABS: Emissions pollution studies, noise studies, and engine
performance studies and their place in QCGAT
developmental program status are reported. The
Lycoming TFE 731 turbofan engine, the GE T700-GE-700
high bypass ratio turbofan, and the AVCO-Lycoming LTS
101 turboshaft engine are prominent candidates in the
tests for urban quiet turbofan service. Two phases in
the program are characterized. Engine quieting,
polluting emissions abatement, and fuel economies are
particularly important for the anticipated rise in
number of jet propulsion craft using smaller airports
adjacent to communities accustomed to low
noise/pollution backgrounds.

RPT#: SAE PAPER 760928
77A28233

UTTL: Technology outlook for aviation
AUTH: A/ROBERTS, L.
MAJS: /*AIR TRANSPORTATION/*AIRCRAFT DESIGN/*CIVIL AVIATION
/*TECHNOLOGICAL FORECASTING
MINS: / AIRCRAFT CONFIGURATIONS/ HELICOPTER DESIGN/ ROTARY
WINGS/ V/STOL AIRCRAFT
ABS: Growth projections for aviation technology are put
forth for a quarter-century ahead. Three main trends
envisaged are towards: great efficiency and economy
and longer range and endurance for subsonic aircraft;
new generations of short-range fixed-wing craft and
rotorcraft with versatile applicability; supersonic
and hypersonic speeds. Improvements in lift/drag
ratio, specific fuel consumption, structural weight
factor, aerodynamic improvements (laminar flow
control, increased wing aspect ratio, drag reduction
for specified lift, propulsion efficiency, higher
bypass ratios, composite structures) are discussed
along with V/STOL, controllable twist rotors,
circulation control rotors, variable-cycle engines,
and higher structural efficiencies.

RPT#: SAE PAPER 770441
77A37062

UTTL: Flight test data for light aircraft spoiler roll
control systems
AUTH: A/KOHLMAN, D. L.
MAJS: /*AIRCRAFT CONTROL/*FLIGHT TESTS/*LATERAL CONTROL/*
LIGHT AIRCRAFT/*SPOILERS
MINS: / AIRCRAFT DESIGN/ FLAPS (CONTROL SURFACES)/ ROLLING
MOMENTS/ WIND TUNNEL TESTS/ YAW
ABS: The results of flight tests to determine the
characteristics of spoiler roll control systems on
three different light aircraft are summarized.
Comparisons are made with wind tunnel data where
available. Flight tests indicate that excellent roll
characteristics can be achieved with spoilers. Yaw
coupling with roll control inputs is virtually
eliminated. Roll rates remain high when flaps are
deployed at low speed. Very mild nonlinearities in
control effectiveness exist and there was no deadband
or lag detected.

RPT#: SAE PAPER 770445
77A37066

UTTL: Interior noise analysis and control for light aircraft
AUTH: A/MIXSON, J. S.; B/BARTON, C. K.; C/VAICAITIS, R.
MAJS: /*AIRCRAFT NOISE/*ENGINE NOISE/*LIGHT AIRCRAFT/*NOISE
REDUCTION/*NOISE SPECTRA
MINS: / AIRCRAFT DESIGN/ NOISE MEASUREMENT/ NOISE

PROPAGATION/ PRESSURE DISTRIBUTION/ PROPELLER DRIVE/
SOUND PRESSURE/ STRINGERS

ABS: This paper describes experimental and analytical
studies of the interior noise of twin-engine,
propeller-driven, light aircraft. Experimental results
indicate that interior noise levels due to propeller
noise can be reduced by reduction of engine rpm at
constant airspeed (about 3 dB), by synchronization of
the twin engines/propellers (up to 12 dB), and by
increasing the distances from propeller tip to
fuselage. The analytical model described uses modal
methods and incorporates the flat-sided geometrical
and skin-stringer structural features of light
aircraft. Initial results show good agreement with
measured noise transmitted into a rectangular box
through a flat panel.

RPT#: SAE PAPER 770446
77A37067

UTTL: Noise effects on passenger communication in light
aircraft
AUTH: A/RUPF, J. A.
MAJS: /*AIRCRAFT NOISE/*CONVERSION/*HUMAN REACTIONS/*LIGHT
AIRCRAFT/*NOISE POLLUTION/*VERBAL COMMUNICATION
MINS: / GENERAL AVIATION AIRCRAFT/ LOW FREQUENCIES/ NOISE
INTENSITY/ NOISE MEASUREMENT/ NOISE SPECTRA/
PASSENGERS
ABS: This paper considers the effect of noise on
conversation between two persons seated in a close,
side-by-side position such as in a small aircraft.
Twelve pairs of subjects were required to converse
while being exposed to noises of various levels and
spectra similar to those currently found in general
aviation aircraft. After a period of noise exposure,
subjects rated the disruptive effect of the noise on
conversation and judged the acceptability of the
noise. Subjective estimates of the maximum times for
pleasant conversation in the noises were also
obtained.

RPT#: SAE PAPER 770471
77A37089

UTTL: Utilization of separate surface control systems on
general aviation aircraft
AUTH: A/ROSKAM, J.
MAJS: /*AIRCRAFT CONTROL/*CONTROL SURFACES/*GENERAL AVIATION
AIRCRAFT/*SERVOCONTROL/*SYSTEMS ANALYSIS
MINS: / ACTUATORS/ AERODYNAMIC STABILITY/ AUTOMATIC FLIGHT
CONTROL/ AUTOMATIC PILOTS/ BLOCK DIAGRAMS/ FEEDBACK
CONTROL/ GRAPHS (CHARTS)/ STABILITY AUGMENTATION
ABS: The application of separate surface control systems to
general aviation aircraft is discussed. Block diagrams

of a conventional control system with autopilot tie-in and of a separate surface control system are presented, and the advantages and disadvantages of the two systems are compared. Theoretical descriptions of pilot-in-the-loop operation and operation in the autopilot mode are presented. The application of separate surface stability augmentation in yaw dampers, wing levelers, and static longitudinal stability augmentation is examined. The state-of-the-art of separate control surface technology is summarized.

RPT#: SAE PAPER 770473
77A37091

UTTL: Investigation of a stall deterrent system utilizing an acoustic stall sensor

AUTH: A/BENNETT, A. G.; B/OWENS, J. K.; C/HARRIS, R. L.

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT CONTROL/*GENERAL

AVIATION AIRCRAFT/*WARNING SYSTEMS

MINS: / AIRCRAFT INSTRUMENTS/ ANGLE OF ATTACK/ CESSNA
AIRCRAFT/ FLIGHT TESTS/ TIME RESPONSE

ABS: A simple rugged acoustic stall sensor which has an output proportional to angle of attack near wing stall has been evaluated on a Cessna 319 aircraft. A sensor position has been found on the wing where the sensor output is only slightly affected by engine power level, yaw angle, flap position and wing roughness. The NASA LRC General Aviation Simulator has been used to evaluate the acoustic sensor output as a control signal for active stall deterrent systems. It has been found that a simple control algorithm is sufficient for stall deterrence.

RPT#: SAE PAPER 770481
77A37097

UTTL: Use of simplified flow separation criteria for slotted flap preliminary design

AUTH: A/WENTZ, W. H., JR.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*FLAPS (CONTROL SURFACES)/*GENERAL AVIATION AIRCRAFT/*SEPARATED FLOW

MINS: / ANGLE OF ATTACK/ DESIGN ANALYSIS/ INVISCID FLOW/
PRESSURE DISTRIBUTION/ PRESSURE RECOVERY

ABS: From experimental correlations of airfoil and flap pressure distributions, it is observed that flow separation is likely to occur when the canonical pressure recovery coefficient ($C_{sub pr}$) exceeds a critical value. A procedure is described for obtaining the $C_{sub pr}$ parameter from modified inviscid analysis. The procedure has been applied to preliminary design studies of a new slotted flap to determine the influence of shape and location. Experiments are planned to evaluate the flap designed

by this procedure.

RPT#: SAE PAPER 1124
77A12192

UTTL: Air transportation energy efficiency - Alternatives and implications

AUTH: A/WILLIAMS, L. J.

MAJS: /*AIR TRANSPORTATION/*AIRCRAFT FUELS/*ENERGY
CONSERVATION/*TRANSPORTATION ENERGY

MINS: / AIRCRAFT DESIGN/ AIRLINE OPERATIONS/ CIVIL AVIATION/
ENERGY REQUIREMENTS/ FUEL CONSUMPTION/ TECHNOLOGICAL
FORECASTING

ABS: Results from recent studies of air transportation energy efficiency alternatives are discussed, along with some of the implications of these alternatives. The fuel-saving alternatives considered include aircraft operation, aircraft modification, derivative aircraft, and new aircraft. In the near-term, energy efficiency improvements should be possible through small improvements in fuel-saving flight procedures, higher density seating, and higher load factors. Additional small near-term improvements could be obtained through aircraft modifications, such as the relatively inexpensive drag reduction modifications. Derivatives of existing aircraft could meet the requirements for new aircraft and provide energy improvements until advanced technology is available to justify the cost of a completely new design. In order to obtain significant improvements in energy efficiency, new aircraft must truly exploit advanced technology in such areas as aerodynamics, composite structures, active controls, and advanced propulsion.

RPT#: AIAA PAPER 78-43
78A20651

UTTL: A review of NASA's propulsion programs for civil aviation

AUTH: A/STEWART, W. L.; B/JOHNSON, H. W.; C/WEBER, R. J.

MAJS: /*AIRCRAFT ENGINES/*CIVIL AVIATION/*ENGINE DESIGN/*NASA PROGRAMS/*PROPULSION SYSTEM PERFORMANCE

MINS: / AIRCRAFT DESIGN/ ENERGY CONSERVATION/ POWERED LIFT AIRCRAFT/ RESEARCH AND DEVELOPMENT/ SUBSONIC AIRCRAFT/ SUPERSONIC AIRCRAFT/ TURBOFAN AIRCRAFT

ABS: Five NASA engine-oriented propulsion programs of major importance to civil aviation are presented and discussed. Included are programs directed at exploring propulsion-system concepts for (1) energy-conservative subsonic aircraft (improved current turbofans, advanced turbofans, and advanced turboprops), (2) supersonic cruise aircraft (variable-cycle engines), (3) general aviation aircraft (improved reciprocating engines and small gas turbines), (4) powered-lift aircraft (advanced turbofans), and (5) advanced rotorcraft. These programs reflect the opportunities still existing for significant improvements in civil aviation through the application of advanced propulsion concepts

RPT#: AIAA PAPER 78-197
78A20739

UTTL: Noise transmission into a light aircraft

AUTH: A/VAICAITIS, R.; B/MCDONALD, W.

MAJS: /*ACOUSTIC PROPAGATION/*AIRCRAFT NOISE/*LIGHT AIRCRAFT /*NOISE PROPAGATION/*NOISE REDUCTION

MINS: / AIRCRAFT COMPARTMENTS/ GRAPHS (CHARTS)/ SOUND PRESSURE/ WAVE EQUATIONS

ABS: An analytical study on noise transmission into a cabin of a twin engine G/A aircraft is presented. The solution of the governing acoustic-structural equations of motion is developed utilizing modal expansions and a Galerkin type procedure. The exterior noise pressure inputs are taken from available experimental data. A direct comparison between theory and experiments on cabin noise levels is given. Interior noise reduction by stiffening, mass addition, and damping treatments is investigated. It is shown that a combination of added mass and damping could significantly reduce interior noise levels for this aircraft.

RPT#: AIAA 78-553
78A32895

UTTL: Search and rescue by satellite

AUTH: A/EHRLICH, E.; B/WILDER, F. N.

MAJS: /*COMMUNICATION SATELLITES/*GROUND STATIONS/*RESCUE OPERATIONS/*SATELLITE OBSERVATION/*SEARCHING

MINS: / AIRCRAFT DETECTION/ GENERAL AVIATION AIRCRAFT/ INTERNATIONAL COOPERATION/ MARINE ENVIRONMENTS/ RADIO BEACONS/ TRANSPONDERS

ABS: A system of satellites, ground stations and user equipments is proposed to provide an operational demonstration, using existing technology, for the timely detection and position location of general aviation aircraft and marine distress incidents so that rescue efforts can be started as soon as possible. The spaceborne equipment will consist of a transponder capable of receiving signals from existing and planned distress beacons at 121.5, 243.0 and 406.0 MHz, and transmitting at 1543 MHz. The program has generated international interest with Canada, France and the USSR presently planning to participate jointly with the U.S. in the development of the space and ground hardware.

RPT#: AIAA 78-835
78A32386

UTTL: New rotation-balance apparatus for measuring airplane spin aerodynamics in the wind tunnel

AUTH: A/MALCOLM, G. N.

MAJS: /*AERODYNAMIC BALANCE/*AIRCRAFT CONTROL/*ROTARY STABILITY/*SPIN DYNAMICS/*WIND TUNNEL APPARATUS

MINS: / AERODYNAMIC CHARACTERISTICS/ ANGLE OF ATTACK/ ANGULAR VELOCITY/ FIGHTER AIRCRAFT/ GRAPHS (CHARTS)/ REYNOLDS NUMBER/ SPIN STABILIZATION

ABS: An advanced rotation-balance apparatus has been developed for the Ames 12-ft pressure tunnel to study the effects of spin rate, angles of attack and sideslip, and, particularly, Reynolds number on the aerodynamics of fighter and general aviation aircraft in a steady spin. Angles of attack to 100 deg and angles of sideslip to 30 deg are possible with spin rates to 42 rad/sec (400 rpm) and Reynolds numbers to 30 million/m on fighter models with wing spans that are typically 0.7 m. A complete description of the new rotation-balance apparatus, the sting/balance/model assembly, and the operational capabilities is given.

RPT#: AIAA PAPER 78-1476
78A49787

UTTL: A method for localizing wing flow separation at stall to alleviate spin entry tendencies
AUTH: A/FEISTEL, T. W.; B/ANDERSON, S. B.; C/KROEGER, R. A.
MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT DESIGN/*LEADING EDGES /*LIGHT AIRCRAFT/*SEPARATED FLOW/*WING FLOW METHOD TESTS
MINS: / FULL SCALE TESTS/ LIFT/ SPIN STABILIZATION/ VORTICES / WIND TUNNEL TESTS
ABS: A wing leading-edge modification has been developed, applicable at present to single-engine light aircraft, which produces stabilizing vortices at stall and beyond. These vortices have the effect of fixing the stall pattern of the wing such that the various portions of the wing upper surface stall nearly symmetrically. The lift coefficient produced is essentially constant to very high angles of attack above the stall angle of the unmodified wing. It is hypothesized that these characteristics will help prevent inadvertent spin entry after a stall. Results are presented from recent large-scale wind-tunnel tests of a complete light aircraft, both with and without the modification.

RPT#: AIAA PAPER 78-1477
78A47922

UTTL: Correlation of model and airplane spin characteristics for a low-wing general aviation research airplane
AUTH: A/BOWMAN, J. S., JR.; B/STOUGH, H. P.; C/BURK, S. M., JR.; D/PATTON, J. M., JR.
MAJS: /*AERODYNAMIC CONFIGURATIONS/*GENERAL AVIATION AIRCRAFT/*LOW WING AIRCRAFT/*SPIN TESTS/*TAIL ASSEMBLIES
MINS: / AERODYNAMIC COEFFICIENTS/ CIVIL AVIATION/ MILITARY AVIATION/ RADIO CONTROL/ REMOTELY PILOTED VEHICLES/ TABLES (DATA)/ WIND TUNNEL TESTS

RPT#: AIAA PAPER 78-1480
78A47925

UTTL: Some sound transmission loss characteristics of typical general aviation structural materials
AUTH: A/ROSKAM, J.; B/VAN DAM, C.; C/GROSVELD, F.; D/DURENBERGER, D.
MAJS: /*AIRCRAFT CONSTRUCTION MATERIALS/*ALUMINUM/*FLAT PLATES/*GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION/* SOUND TRANSMISSION/*TRANSMISSION LOSS
MINS: / ACOUSTIC MEASUREMENTS/ ACOUSTIC PROPAGATION/ GRAPHS (CHARTS)/ PANELS/ PLANE WAVES/ PRESSURE EFFECTS/ STIFFNESS/ TEST FACILITIES/ VIBRATION DAMPING
ABS: Experimentally measured sound transmission loss characteristics of flat aluminum panels with and without damping and stiffness treatment are presented and discussed. The effect of pressurization on sound transmission loss of flat aluminum panels is shown to be significant.

RPT#: AIAA PAPER 78-1482
78A47927

UTTL: Integrated avionics for future general aviation aircraft
AUTH: A/DENERY, D. G.; B/JACKSON, C. T., JR.; C/CALLAS, G. P.; D/BERKSTRESSER, B. K.; E/HARDY, G. H.
MAJS: /*AIR TRAFFIC CONTROL/*AIRCRAFT RELIABILITY/*AVIONICS /*GENERAL AVIATION AIRCRAFT/*SYSTEMS ENGINEERING
MINS: / AIRCRAFT DESIGN/ AIRCRAFT MAINTENANCE/ CHANNELS (DATA TRANSMISSION)/ COST EFFECTIVENESS/ DISPLAY DEVICES/ ELECTRONIC MODULES/ MICROPROCESSORS
ABS: The program described was initiated in 1975 to provide the critical information for the design of an advanced avionics system suitable for general aviation. Emphasis is on the use of data busing, distributed microsensors, shared electronic displays and pilot entry devices, innovative low-cost sensors, and improved functional characteristics. Design considerations include cost, reliability, maintainability, and modularity.

RPT#: AIAA PAPER 78-1551
78A46514

UTTL: A historical overview of stall/spin characteristics of
general aviation aircraft

AUTH: A/ANDERSON, S. B.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AERODYNAMIC STALLING/*
AIRCRAFT STABILITY/*GENERAL AVIATION AIRCRAFT/*SPIN
STABILIZATION

MINS: / AERODYNAMIC COEFFICIENTS/ AERODYNAMIC STABILITY/
AIRSPEED/ ANGLE OF ATTACK/ LIFT/ LONGITUDINAL
STABILITY/ LOW SPEED STABILITY/ PITCH (INCLINATION)/
STATIC STABILITY/ TURBULENCE EFFECTS

ABS: Even today, stall/spin accidents involving general
aviation aircraft account for more fatal and serious
injuries than any other kind of accident. The classic
stall/spin accident is one in which the pilot stalls
the aircraft at too low an altitude to affect
recovery. The primary attention in the investigation
is given to aerodynamic considerations, although it is
recognized that human factors and pilot training are
also very important aspects of the total problem. A
review of some 70 years of flight indicates that
incorporation of the proper combination of aerodynamic
parameters to provide good stall/spin avoidance has
persistently remained an elusive goal for designers of
general aviation aircraft.

RPT#: AIAA PAPER 79-0561
79A25870

UTTL: NASA research on general aviation power plants
AUTH: A/STEWART, W. L.; B/WEBER, R. J.; C/WILLIS, E. A.;
D/SIEVERS, G. K.
MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*GENERAL AVIATION
AIRCRAFT/*NASA PROGRAMS/*RESEARCH AND DEVELOPMENT
MINS: / DIESEL ENGINES/ FUEL CONSUMPTION/ PISTON ENGINES/
PROPELLER EFFICIENCY/ PROPELLER FANS/ PROPULSION
SYSTEM CONFIGURATIONS/ TURBOFAN ENGINES/ TURBOPROP
ENGINES/ WANKEL ENGINES
ABS: Research activities within NASA to support general
aviation industry in improving propulsion engines are
described. Near-term objectives include improvements
of gasoline piston engines to achieve fuel savings and
reduce emissions well below EPA levels. To meet the
longer term goals, advanced combustion research has
been considered as essential in obtaining further
improvements in BSFC (break-specific fuel
consumption). Modifications of an aircraft rotary
engine were tested and it was found that by increasing
the compression ratio and other refinements the BSFC
was improved by 15%. The applicability of available
large turbofan engine technology to small engines in
order to obtain significant reductions in noise and
pollutant emissions is being tested. Studies have been
conducted at exploring the possibility of achieving
high improvements in cost and performance for
turboprop engines of less than 1000 horsepower.

RPT#: AIAA PAPER 79-0646
79A26932

UTTL: Characteristics of propeller noise on an aircraft
fuselage related to interior noise transmission
AUTH: A/MIXSON, J. S.; B/BARTON, C. K.; C/PIERSOL, A. G.;
D/WILBY, J. F.
MAJS: /*AIRCRAFT NOISE/*FUSELAGES/*LIGHT AIRCRAFT/*NOISE
PROPAGATION/*NOISE SPECTRA/*PROPELLERS
MINS: / CORRELATION/ HARMONIC OSCILLATION/ NOISE INTENSITY/
NOISE REDUCTION/ PROPELLER BLADES/ STATIC TESTS
ABS: Exterior noise was measured on the fuselage of a
twin-engine, light aircraft at four values of engine
rpm in ground static tests and at forward speeds up to
36 m/s in taxi tests. Propeller noise levels, spectra,
and correlations were determined using a horizontal
array of seven flush-mounted microphones and a
vertical array of four flush-mounted microphones in
the propeller plane. The measured levels and spectra
are compared with predictions based on empirical and
analytical methods for static and taxi conditions.
Trace wavelengths of the propeller noise field,
obtained from point-to-point correlations, are
compared with the aircraft sidewall structural
dimensions, and some analytical results are presented
that suggest the sensitivity of interior noise
transmission to variations of the propeller noise
characteristics.

RPT#: AIAA 79-0780
79A29024

UTTL: NASA/FAA general aviation crash dynamics program - A status report
AUTH: A/THOMSON, R. G.; B/GOETZ, R. C.
MAJS: /*AIRCRAFT SAFETY/*CRASHES/*FULL SCALE TESTS/*GENERAL AVIATION AIRCRAFT/*IMPACT TESTS/*NASA PROGRAMS/* STRUCTURAL ANALYSIS
MINS: / AIRCRAFT SURVIVABILITY/ DYNAMIC RESPONSE/ ELASTOPLASTICITY/ IMPACT LOADS/ LIGHT AIRCRAFT/ NASA PROGRAMS/ NONLINEAR SYSTEMS/ SAFETY DEVICES/ SEATS
ABS: The objective of the Langley Research Center general aviation crash dynamics program is to develop technology for improved crash safety and occupant survivability in general aviation aircraft. The program involves three basic areas of research: controlled full-scale crash testing, nonlinear structural analyses to predict large deflection elasto-plastic response, and load attenuating concepts for use in improved seat and subfloor structure. Both analytical and experimental methods are used to develop expertise in these areas. Analyses include simplified procedures for estimating energy dissipating capabilities and complex computerized procedures for predicting airframe response. These analyses are being developed to provide designers with methods for predicting accelerations, loads, and displacements of collapsing structure. Tests on typical full-scale aircraft and on full- and sub-scale structural components are being performed to verify the analyses and to demonstrate load attenuating concepts.

RPT#: AIAA PAPER 79-1157
79A38964

UTTL: General aviation turbine engine /GATE/ concepts
AUTH: A/LAYS, E. J.; B/MURRAY, D. L.
MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*GENERAL AVIATION AIRCRAFT/*PRODUCT DEVELOPMENT/*TURBINE ENGINES
MINS: / AIRCRAFT CONFIGURATIONS/ FUEL CONSUMPTION/ GRAPHS (CHARTS)/ LIFE CYCLE COSTS/ MARKET RESEARCH/ PISTON ENGINES/ TECHNOLOGY UTILIZATION
ABS: The paper deals with only a portion of the work done by Williams Research Corporation for NASA. It provides a look at possible new-generation powerplants that offer the potential for remarkable airplane performance gains with attendant safety, utility, productivity and life cycle cost benefits. Attention is given to a turboprop engine concept and applications. A turbofan engine having core components in common with the turboprop is also discussed and an airplane application shown. Some of the more important findings are presented.

RPT#: AIAA 79-1625
79A45307

UTTL: Application of the equilibrium spin technique to a typical low-wing general aviation design
AUTH: A/TISCHLER, M. B.; B/BARLOW, J. B.
MAJS: /*AIRCRAFT DESIGN/*EQUILIBRIUM METHODS/*FULL SCALE TESTS/*GENERAL AVIATION AIRCRAFT/*LOW WING AIRCRAFT/* SPIN REDUCTION
MINS: / AERODYNAMIC FORCES/ ANGULAR MOMENTUM/ CENTER OF GRAVITY/ DATA REDUCTION/ DYNAMIC CHARACTERISTICS
ABS: A graphical implementation of the equilibrium technique for obtaining spin modes from rotary balance data is presented. Using this technique, spin modes were computed for the NASA Low-Wing General Aviation Aircraft. The computed angles of attack are within 10 degrees of the NASA spin tunnel results. The method also provides information on the dynamic nature of spin modes. This technique offers the capability of providing a great deal of information on spin modes and recovery, using data from a single experimental installation. Such a technique could be utilized in the preliminary design phase in order to provide basic information on aircraft spin and recovery characteristics. Results, advantages and limitations of the application of this technique are discussed.

RPT#: AIAA 79-1775
79A45403

UTTL: Preliminary study of pilot lateral control of two light airplanes near the stall
AUTH: A/MOUL, M. T.; B/BROWN, L. W.
MAJS: /*AIRCRAFT PILOTS/*FLIGHT CONDITIONS/*LATERAL CONTROL /*LATERAL STABILITY/*LIGHT AIRCRAFT
MINS: / AERIAL RUDDERS/ AERODYNAMIC CHARACTERISTICS/ AERODYNAMIC STALLING/ ANGLE OF ATTACK/ APPROACH CONTROL/ DIVERGENCE/ EQUATIONS OF MOTION/ TRANSFER FUNCTIONS/ TURNING FLIGHT
ABS: For two representative light, single-engine airplanes the single-axis piloting task of controlling bank angle with combined aileron and rudder, and a two-axis task of controlling bank angle with aileron and sideslip with rudder have been studied. For these tasks existing divergence criteria have been applied to determine conditions for closed-loop stability for selected flight conditions near the stall; in addition closed-loop stability characteristics and airplane response to bank angle command were calculated. Results obtained from applying the divergence criterion and from calculations of airplane responses

to bank angle command indicate that aileron-alone bank angle control is marginally acceptable at high angle of attack. Of the two rudder control techniques considered, rudder used with the aileron in controlling bank angle increased stability and produced satisfactory responses; the combined bank angle and sideslip control task does not warrant further consideration because of the task difficulty and the small improvement indicated in airplane closed-loop response with this technique.

RPT#: AIAA PAPER 79-1786
79A47876

UTTL: The effects of configuration changes on spin and recovery characteristics of a low-wing general aviation research airplane

AUTH: A/STOUGH, H. P., III; B/PATTON, J. M., JR.

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT CONFIGURATIONS/*AIRCRAFT SPIN/*GENERAL AVIATION AIRCRAFT/*RESEARCH AIRCRAFT/*SPIN TESTS

MINS: / AIRCRAFT ACCIDENTS/ AIRFOIL PROFILES/ CONFIGURATION MANAGEMENT/ CONTROL SURFACES/ FLIGHT TESTS/ GRAPHS (CHARTS)/ NASA PROGRAMS/ REYNOLDS NUMBER/ TABLES (DATA)

ABS: A fully instrumented, low-wing, single-engine general aviation airplane has been spin tested. Several tail configurations, wing leading-edge modifications, fuselage modifications, moment-of-inertia variations, center-of-gravity positions, and control inputs have been tested to determine their effect on spinning and spin recovery. Results indicate that wing airfoil design can significantly influence airplane spin and recovery characteristics and can overpower the effects of tail design. Results also point out a need to determine limitations of such factors as Reynolds number in model spin test techniques and high angle-of-attack aerodynamics.

RPT#: AIAA PAPER 79-1790
79A47879

UTTL: Some results from the use of a control augmentation system to study the developed spin of a light plane

AUTH: A/OBRYAN, I. C.; B/GLOVER, K. E.; C/EDWARDS, T. E.

MAJS: /*AIRCRAFT CONTROL/*LIGHT AIRCRAFT/*ROCKET THRUST/*SPIN DYNAMICS/*SPIN TESTS/*THRUST CONTROL

MINS: / AERODYNAMIC STALLING/ ANGLE OF ATTACK/ HYDROGEN PEROXIDE/ WING TIPS

ABS: A control augmentation system consisting of hydrogen peroxide rockets mounted on the wing tips of a light airplane has been developed and used to study spin recovery characteristics. Recovery from spins that were unrecoverable with aerodynamic controls was accomplished in less than one turn at maximum thrust in about three turns at minimum thrust. The rocket system at maximum thrust produced spin recovery characteristics similar to those obtained using a parachute. An advantage of using the control augmentation system on any airplane being used in a spin test program is its capability to demonstrate configuration effects on stall/spin characteristics at very high angles of attack and clearly determine the existence of all possible spin modes.

RPT#: AIAA PAPER 79-1802
79A47887

UTTL: Some flight data extraction techniques used on a general aviation spin research aircraft

AUTH: A/SLIWA, S. M.

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT SPIN/*DATA ACQUISITION/*FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT/*IN-FLIGHT MONITORING/*RESEARCH AIRCRAFT/*SPIN TESTS

MINS: / AERODYNAMIC LOADS/ AIRCRAFT CONTROL/ DATA COLLECTION PLATFORMS/ DATA REDUCTION/ DYNAMIC STRUCTURAL ANALYSIS / LOAD DISTRIBUTION (FORCES)/ NASA PROGRAMS/ STRUCTURAL DESIGN CRITERIA

ABS: Some methods for obtaining flight data from a highly instrumented general aviation spin research aircraft are developed and illustrated. The required correction terms for the measurement of body accelerations, body velocities, and aircraft orientation are presented. In addition, the equations of motion are utilized to derive total aerodynamic coefficients for comparison with model tests and for analysis. Flight test experience is used to evaluate the utility of various instruments and calculation techniques for spin research.

RPT#: AIAA PAPER 79-1820
79A47900

UTTL: Full-scale wind tunnel study of nacelle shape on cooling drag
AUTH: A/CORSIGLIA, V. R.; B/KATZ, J.; C/KROEGER, R. A.
MAJS: /*AIR COOLING/*DRAG REDUCTION/*EXHAUST SYSTEMS/*GENERAL AVIATION AIRCRAFT/*NACELLES/*WIND TUNNEL TESTS
MINS: / AERODYNAMIC DRAG/ AIRCRAFT DESIGN/ GRAPHS (CHARTS)/ PISTON ENGINES/ PLENUM CHAMBERS/ PRESSURE DISTRIBUTION / TEST EQUIPMENT
ABS: Tests were made in the NASA-Ares 40- by 80 Foot Wind Tunnel of a wing semispan with a nacelle (no propeller) from a typical, general aviation twin-engine aircraft. Measurements were made of the effect on drag of the cooling air flow through the nacelle. Internal and external nacelle pressures were measured. It was found that the cooling flow accounts for about 13% of the estimated airplane drag and about 42% of the cooling flow drag is associated with the internal flow. It was concluded that improvements could be made by relocating both the inlet and the outlet of the cooling air.

RPT#: AIAA PAPER 79-1824
79A53750

UTTL: An overview of NASA research on positive displacement type general aviation engines
AUTH: A/KEMPKE, E. E.; B/WILLIS, E. A.
MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS/*RESEARCH AND DEVELOPMENT
MINS: / AIRCRAFT DESIGN/ COMBUSTION EFFICIENCY/ DIESEL ENGINES/ FUEL INJECTION/ SPARK IGNITION/ TURBINE ENGINES/ WEIGHT REDUCTION
ABS: The paper surveys the current status of the aviation positive displacement engine programs underway at the NASA Lewis Research Center. The program encompasses conventional, lightweight diesel, and rotary combustion engines. Attention is given to topics such as current production type engine improvement, cooling drag reduction, fuel injection, and experimental and theoretical combustion studies. It is shown that the program's two major technical thrusts are directed toward lean operation of current production type spark ignition engines and advanced alternative engine concepts. Finally, an Otto cycle computer model is also covered.

RPT#: AIAA PAPER 79-1837
79A47908

UTTL: Exploratory study of the influence of wing leading-edge modifications on the spin characteristics of a low-wing single-engine general aviation airplane
AUTH: A/DICARLO, D. J.; B/JOHNSON, J. L., JR.
MAJS: /*AIRCRAFT DESIGN/*GENERAL AVIATION AIRCRAFT/*LEADING EDGES/*SPIN/*WINGS
MINS: / AERODYNAMIC STALLING/ AIRCRAFT CONFIGURATIONS/ RESEARCH AIRCRAFT/ TIME RESPONSE/ WIND TUNNEL MODELS
ABS: A wide variety of model and airplane tests were conducted to explore the effects of wing leading-edge modifications on the stalling and spinning characteristics of a low-wing general aviation research airplane configuration. The results presented herein discuss the effects of leading-edge airfoil modifications applied to the full wing span and to partial-span locations. The results obtained in the study indicate that the wing modifications can produce large effects (both favorable or unfavorable) on spin resistance, developed spin characteristics, and spin recovery.

RPT#: ASAE PAPER 78-1506
79A16723

UTTL: Analytical prediction of agricultural aircraft wakes

AUTH: A/MORRIS, D. J.

MAJS: /*AIRCRAFT WAKES/*COMPUTERIZED SIMULATION/*GROUND
EFFECT (AERODYNAMICS)/*PREDICTION ANALYSIS TECHNIQUES
/*UTILITY AIRCRAFT/*VORTICES

MINS: / AGRICULTURE/ AIRCRAFT GUIDANCE/ FLIGHT TESTS/
MONOPLANES/ WIND TUNNEL TESTS

ABS: An analytical technique has been developed to understand the formation, interaction, and decay of lift-generated vortices. It is possible, by use of a computer code, to give a complete description of the viscous rollup of individual vortices from a wing. That the interaction of the vortex wake with the ground is a viscous interaction is demonstrated. Comparisons are given of experimental model data and predictions of vortex location for agricultural aircraft. The future of these codes in guiding wind-tunnel and flight research and in providing operational mission guidance is discussed.

RPT#: ASAE PAPER 78-1507
79A16724

UTTL: NASA Agricultural Aircraft Research Program in the Langley Vortex Research Facility and the Langley Full Scale Wind Tunnel

AUTH: A/JORDAN, F. L., JR.; B/MCLEMORE, H. C.; C/BRAGG, M. B.

MAJS: /*AGRICULTURE/*AIRCRAFT WAKES/*COMPUTERIZED SIMULATION
/*UTILITY AIRCRAFT/*WIND TUNNEL TESTS

MINS: / AIRCRAFT MODELS/ DISPERSIONS/ DRIFT RATE/ FULL SCALE
TESTS/ NASA PROGRAMS/ PARTICLES

ABS: The current status of aerial applications technology research at the Langley's Vortex Research Facility and Full-Scale Wind Tunnel is reviewed. Efforts have been directed mainly toward developing and validating the required experimental and theoretical research tools. A capability to simulate aerial dispersal of materials from agricultural airplanes with small-scale airplane models, numerical methods, and dynamically scaled test

particles was demonstrated. Tests on wake modification concepts have proved the feasibility of tailoring wake properties aerodynamically to produce favorable changes in deposition and to provide drift control. An aerodynamic evaluation of the Trush Commander 800 agricultural airplane with various dispersal systems installed is described. A number of modifications intended to provide system improvement to both airplane and dispersal system are examined, and a technique for documenting near-field spray characteristics is evaluated.

RPT#: SAE PAPER 790565
79A36706

UTTL: Spin flight research summary

AUTH: A/PATTON, J. M., JR.; B/STOUGH, H. P., III;
C/DICARLO, D. J.

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT CONFIGURATIONS/*
AIRCRAFT CONTROL/*BODY-WING AND TAIL CONFIGURATIONS/*
FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT/*SPIN
STABILIZATION

MINS: / AIRFOIL PROFILES/ HORIZONTAL TAIL SURFACES/ LEADING
EDGES/ LIGHT AIRCRAFT/ MASS DISTRIBUTION

ABS: An extensive general aviation stall/spin research program is underway at the NASA Langley Research Center. Flight tests have examined the effects of tail design, wing leading edge design, mass distribution, and minor airframe modifications on spin and recovery characteristics. Results and observations on test techniques are presented for the first airplane in the program. Configuration changes produced spins varying from easily recoverable slow, steep spins to unrecoverable, fast flat spins.

RPT#: SAE PAPER 790569
79A36709

UTTL: A Demonstration Advanced Avionics System for general aviation

AUTH: A/DENERY, D. G.; B/CALLAS, G. P.; C/JACKSON, C. T.;
D/BERKSTRESSER, B. K.; E/HARDY, G. H.

MAJS: /*AVIONICS/*GENERAL AVIATION AIRCRAFT/*SYSTEMS
ENGINEERING

MINS: / AIRFRAMES/ ARCHITECTURE (COMPUTERS)/ DISPLAY DEVICES
/ LOW COST/ MICROPROCESSORS/ TECHNOLOGICAL FORECASTING

ABS: A program initiated within NASA has emphasized the use of a data bus, microprocessors, electronic displays and data entry devices for general aviation. A Demonstration Advanced Avionics System (DAAS) capable of evaluating critical and promising elements of an integrating system that will perform the functions of (1) automated guidance and navigation; (2) flight planning; (3) weight and balance performance

computations; (4) monitoring and warning; and (5) storage of normal and emergency check lists and operational limitations is described. Consideration is given to two major parts of the DAAS instrument panel: the integrated data control center and an electronic horizontal situation indicator, and to the system architecture. The system is to be installed in the Ames Research Center's Cessna 402B in the latter part of 1980; engineering flight testing will begin in the first part of 1981.

RPT#: SAE PAPER 790576
79A36712

UTTL: The analysis of propellers including interaction effects

AUTH: A/MCCORMICK, B. W.; B/ALJABRI, A. S.; C/JUMPER, S. J.;
D/MARTINOVIC, Z. N.

MAJS: /*AERODYNAMIC LOADS/*DYNAMIC RESPONSE/*GENERAL
AVIATION AIRCRAFT/*PERFORMANCE PREDICTION/*PROPELLER
BLADES/*UNSTEADY FLOW

MINS: / AERODYNAMIC INTERFERENCE/ AERODYNAMIC STABILITY/
AIRCRAFT CONFIGURATIONS/ GRAPHS (CHARTS)/ THRUST/
TORQUE/ VELOCITY DISTRIBUTION

ABS: Analytical and experimental studies have been undertaken on propellers operating in the unsteady flow field produced by interaction effects due to the fuselage, wing, and nacelles. Methods have been developed and verified experimentally for determining the velocity field in which a propeller operates as well as its aerodynamic and dynamic response to this unsteady environment. Methods are presented for predicting the net thrust of a propeller-wing-body combination as well as the unsteady thrust and torque acting on the propeller. Sample calculations as well as wind tunnel and flight test results are presented which illustrates the sensitivity of a propeller to flow field in which it is operating.

RPT#: SAE PAPER 790584
79A36719

UTTL: Design of quiet efficient propellers

AUTH: A/SUCCI, G. P.

MAJS: /*AERODYNAMIC NOISE/*DESIGN ANALYSIS/*GENERAL AVIATION
AIRCRAFT/*MATHEMATICAL MODELS/*NOISE REDUCTION/*
PROPELLERS

MINS: / CESSNA 172 AIRCRAFT/ FLIGHT TESTS/ GRAPHS (CHARTS)/
LOAD DISTRIBUTION (FORCES)/ NOISE SPECTRA/ PROPELLER
EFFICIENCY/ RADIAL DISTRIBUTION/ SOUND PROPAGATION

ABS: A numerical computation scheme has been developed to determine the sound generated by propellers. A comparison of these calculations to the noise data taken in the flight test of a propeller driven

aircraft shows good agreement. The method is then applied in a parametric study of fixed pitch propellers designed to reduce noise. All these techniques reduce noise while maintaining shaft speed so that the method presented here may be used in a retrofit option for the general aviation fleet.

RPT#: SAE PAPER 790588
79A36722

UTTL: Nonlinear structural crash dynamics analyses
AUTH: A/HAYDUK, R. J.; B/THOMSON, R. G.; C/WITTLIN, G.;
D/KAMAT, M. P.

MAJS: /*AIRCRAFT STRUCTURES/*COMPUTERIZED SIMULATION/*
CRASHES/*DROP TESTS/*DYNAMIC RESPONSE/*DYNAMIC
STRUCTURAL ANALYSIS/*FINITE ELEMENT METHOD/*LIGHT
AIRCRAFT

MINS: / ACCELEROMETERS/ AIRCRAFT ACCIDENTS/ COMPUTERIZED
SIMULATION/ DESTRUCTIVE TESTS/ FUSELAGES/ GENERAL
AVIATION AIRCRAFT/ GRAPHS (CHARTS)/ IMPACT DAMAGE/
IMPACT LOADS/ LANDING SPEED/ MATHEMATICAL MODELS

ABS: Presented in this paper are the results of three nonlinear computer programs, KRASH, ACTION and DYCAST used to analyze the dynamic response of a twin-engine, low-wing airplane section subjected to a 8.38 m/s (27.5 ft/s) vertical impact velocity crash condition. This impact condition simulates the vertical sink rate in a shallow aircraft landing or takeoff accident. The three distinct analysis techniques for nonlinear dynamic response of aircraft structures are briefly examined and compared versus each other and the experimental data. The report contains brief descriptions of the three computer programs, the respective aircraft section mathematical models, pertinent data from the experimental test performed at NASA Langley, and a comparison of the analyses versus test results. Cost and accuracy comparisons between the three analyses are made to illustrate the possible uses of the different nonlinear programs and their future potential.

RPT#: SAE PAPER 790591
79A36725

UTTL: NASA general aviation crashworthiness seat development
AUTH: A/FASANELLA, E. L.; B/ALFARO-BOU, E.

MAJS: /*ACCELERATION PROTECTION/*GENERAL AVIATION AIRCRAFT/*
HUMAN FACTORS ENGINEERING/*IMPACT TESTS/*NASA PROGRAMS
/*SEATS

MINS: / ACCELERATION STRESSES (PHYSIOLOGY)/ ACCELERATION
TOLERANCE/ COMPUTER GRAPHICS/ COMPUTERIZED SIMULATION/
FULL SCALE TESTS/ HARNESSSES/ LIGHT AIRCRAFT/ SAFETY
DEVICES

ABS: Three load limiting seat concepts for general aviation

aircraft designed to lower the deceleration of the occupant in the event of a crash were sled tested and evaluated with reference to a standard seat. Dummy pelvis accelerations were reduced up to 50 percent with one of the concepts. Computer program MSOMLA (Modified Seat Occupant Model for Light Aircraft) was used to simulate the behavior of a dummy passenger in a NASA full-scale crash test of a twin engine light aircraft. A computer graphics package MANPLOT was developed to pictorially represent the occupant and seat motion.

RPT#: SAE PAPER 790596
79A36729

UTTL: Preliminary QCGAT program test results
AUTH: A/KOENIG, R. W.; B/SIEVERS, G. K.

MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*GENERAL AVIATION
AIRCRAFT/*NOISE REDUCTION/*QUIET ENGINE PROGRAM/*
TURBOFAN ENGINES

MINS: / AIR POLLUTION/ AIRCRAFT DESIGN/ COMBUSTION CHAMBERS/
EXHAUST GASES/ POLLUTION CONTROL

ABS: The paper presents the NASA Lewis program to demonstrate that large engine technology can be applied to general aviation engines to reduce noise, emissions, and fuel consumption. After a Phase I study, two Contractors, Garrett AiResearch and AVCO-Lycoming, were selected to design, manufacture, assemble, test, and deliver their Quiet, Clean, General Aviation Turbofan (QCGAT) engines to NASA. Noise, emission, and performance goals and how well they were met are discussed. Noise goals involve take off noise 3.5 n. mi. from runway threshold, sideline noise at .25 n mi. and approach noise 1 n mi. from the runway at an altitude of 370 ft. The AiResearch engines power a stretched Learjet 35 and the Lycoming a specially conceived Beech executive jet, resulting in differing power goals. Thus the thrust goal for the Lycoming was 1622 lb. while the AiResearch goal was 3937 lb. Cruise thrust goals were 485 lb. at Mach 0.6 at 25,000 ft. and 903 lb. at Mach 0.8 at 40,000 ft. respectively. The design of both engines, based on existing cores, is studied, noting such special QCGAT features as new reduction gears, combustor and power turbine. Test results are given, indicating that while the goals for noise and thrust were met those for emissions were only partially met.

RPT#: SAE PAPER 790605
79A36737

UTTL: Concepts for reducing exhaust emissions and fuel consumption of the aircraft piston engine

AUTH: A/REZY, B. J.; B/STUCKAS, K. J.; C/TUCKER, J. R.; D/MEYERS, J. E.

MAJS: /*AIRCRAFT ENGINES/*EXHAUST GASES/*FUEL CONSUMPTION/*GENERAL AVIATION AIRCRAFT/*PISTON ENGINES/*POLLUTION CONTROL

MINS: / CARBON MONOXIDE/ COMBUSTION CHAMBERS/ COOLING SYSTEMS/ COST EFFECTIVENESS/ FUEL INJECTION/ HYDROCARBONS/ IGNITION SYSTEMS/ LININGS/ NITROGEN OXIDES/ TEMPERATURE EFFECTS

ABS: A study was made to reduce exhaust emissions and fuel consumption of a general aviation aircraft piston engine by applying known technology. Fourteen promising concepts such as stratified charge combustion chambers, cooling cylinder head improvements, and ignition system changes were evaluated for emission reduction and cost effectiveness. A combination of three concepts, improved fuel injection system, improved cylinder head with exhaust port liners and exhaust air injection was projected as the most cost effective and safe means of meeting the EPA standards for CO, HC and NO. The fuel economy improvement of 4.6% over a typical single engine aircraft flight profile does not though justify the added cost of the three concepts, and significant reductions in fuel consumption must be applied to the cruise mode where most of the fuel is used. The use of exhaust air injection in combination with exhaust port liners reduces exhaust valve stem temperatures which can result in longer valve guide life. The use of exhaust port liners alone can reduce engine cooling air requirements by 11% which is the equivalent of a 1.5% increase in propulsive power. The EPA standards for CO, HC and NO can be met in the IO-520 engine using air injection alone or the Simmonds improved fuel injection system.

RPT#: SAE PAPER 790607
79A36760

UTTL: Effects of air injection on a turbocharged Teledyne Continental Motors TS10-360-C engine

AUTH: A/COSGROVE, D. V.; B/KEMPKE, E. E.

MAJS: /*AIRCRAFT ENGINES/*GAS INJECTION/*GAS TURBINE ENGINES /*SUPERCHARGERS/*TURBOCOMPRESSORS

MINS: / AIR FLOW/ COMBUSTION EFFICIENCY/ ENGINE DESIGN/ FUEL-AIR RATIO/ GENERAL AVIATION AIRCRAFT/ HYDROCARBON COMBUSTION

ABS: Results are presented for tests performed to assess the effects of exhaust manifold injection air flow rate on emissions and on exhaust gas temperature and

turbine inlet temperature for a range of engine operating conditions (speed, torque, and fuel-air ratios) of a fuel-injected turbocharged six-cylinder air-cooled Teledyne Continental Motors TS10-360-C engine. Air injection into the exhaust gas at 80 F resulted in a decrease in hydrocarbons and carbon monoxide while exceeding the maximum recommended turbine inlet temperature of 1650 F at the full rich mixture of the engine. The EPA standards could be met within present turbine inlet temperature limits using commercially available air pumps, provided that the fuel-air ratios were leaned in the taxi, climb, and approach modes.

RPT#: SAE PAPER 790618
79A36746

UTTL: Full-scale wind-tunnel investigation of an Ayres S2R-800 Thrush Agricultural Airplane

AUTH: A/JOHNSON, J. L., JR.; B/MCLEMORE, H. C.; C/WHITE, R.; D/JORDAN, F. L., JR.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AGRICULTURAL AIRCRAFT/* FULL SCALE TESTS/*WIND TUNNEL TESTS

MINS: / AERODYNAMIC INTERFERENCE/ AIRCRAFT PERFORMANCE/ AIRCRAFT STABILITY/ AIRCRAFT WAKES/ BUFFETING/ DISPERSING/ DRAG REDUCTION/ GRAPHS (CHARTS)/ PERFORMANCE PREDICTION/ SLIPSTREAMS/ THRUST LOADS/ WING TIP VORTICES

ABS: This paper summarizes the significant results of recent full-scale wind tunnel tests at the NASA-Langley Research Center of the Ayres S2R-800 Thrush Agricultural Aircraft. The purpose of the tests was to provide fundamental aerodynamic, performance, and stability and control information of the airplane and dispersal equipment; and to study near-field wake interaction characteristics behind the aircraft. The aerodynamic tests included the use of a propeller thrust-torque balance to measure the efficiency of the propeller in the presence of the engine and to provide data for determining slipstream interference effects and slip-stream drag.

RPT#: SAE PAPER 790619
79A36747

UTTL: New opportunities for future small civil turbine engines - Overiewing the GATE studies

AUTH: A/STRACK, W. C.

MAJS: /*ECONOMIC FACTORS/*GENERAL AVIATION AIRCRAFT/* TECHNOLOGY ASSESSMENT/*TURBINE ENGINES

MINS: / COST REDUCTION/ FUEL CONSUMPTION/ GRAPHS (CHARTS)/ LOW COST/ PISTON ENGINES/ THERMODYNAMIC CYCLES/ TURBOFAN ENGINES/ TURBOMACHINE BLADES/ TURBOMACHINERY/ TURBOPROP ENGINES/ TURBOSHAFTS

ABS: This paper presents an overview of four independent studies that explore the opportunities for future General Aviation Turbine Engines (GATE) in the 150-1000 SHP class. Detroit Diesel Allison, Garrett/AiResearch, Teledyne CAE, and Williams Research participated along with several airframers. These studies forecasted the potential impact of advanced technology turbine engines in the post-1988 market, identified important aircraft and missions, desirable engine sizes, engine performance and cost goals. Parametric evaluations of various engine cycles, configurations, design features, and advanced technology elements defined baseline conceptual engines for each of the important missions identified by the market analysis. Both fixed-wing and helicopter aircraft, and turboshaft, turboprop, and turboprop engines were considered. All four companies predicted sizable performance gains (e.g., 20% SFC decrease), and three predicted large engine cost reductions of sufficient magnitude to challenge the reciprocating engine in the 300-500 SHP class. Key technology areas were recommended for NASA support in order to realize these improvements.

RPT#: SAE PAPER 790621
79A36749

UTTL: A review of Curtiss-Wright rotary engine developments with respect to general aviation potential

AUTH: A/JONES, C.

MAJS: /*AIRCRAFT ENGINES/*ENGINE TESTS/*GENERAL AVIATION AIRCRAFT/*RESEARCH AND DEVELOPMENT/*WANKEL ENGINES
MINS: / AIR COOLING/ AUTOMOBILE FUELS/ COMBUSTION CHAMBERS/ CURTISS-WRIGHT AIRCRAFT/ DIESEL ENGINES/ EXHAUST GASES / FUEL CONSUMPTION/ HIGH SPEED/ HYDROCARBONS/ SPARK IGNITION/ TURBOSHAFTS

ABS: Aviation related rotary (Wankel-type) engine tests, possible growth directions and relevant developments at Curtiss-Wright have been reviewed. Automotive rotary engines including stratified charge are described and flight test results of rotary aircraft engines are presented. The current 300 HP engine prototype shows basic durability and competitive performance potential. Related parallel developments have separately confirmed the geometric advantages of the rotary engine for direct injected unthrottled stratified charge. Specific fuel consumption equal to or better than pre- or swirl-chamber diesels, low emission and multi-fuel capability have been shown by rig tests of similar rotary engine.

RPT#: SAE PAPER 790623
79A36751

UTTL: A comparison of hydraulic, pneumatic, and electro-mechanical actuators for general aviation flight controls

AUTH: A/ROSKAM, J.; B/RICE, M.; C/EYSINK, H.

MAJS: /*ACTUATORS/*ELECTROMECHANICAL DEVICES/*FLIGHT CONTROL /*GENERAL AVIATION AIRCRAFT/*MATHEMATICAL MODELS/* PNEUMATIC CONTROL

MINS: / AIRCRAFT HYDRAULIC SYSTEMS/ ELECTRIC POWER SUPPLIES/ GRAPHS (CHARTS)/ MAGNETIC MATERIALS/ PNEUMATIC EQUIPMENT

ABS: Mathematical models for electromechanical (EM), pneumatic and hydraulic actuators are discussed. It is shown that EM and hydraulic actuators provide better and faster time responses than pneumatic actuators but EM actuators utilizing the recently developed samarium-cobalt technology have significant advantages in terms of size, weight and power requirements. In terms of ease and flexibility of installation EM actuators apparently have several advantages over hydraulic actuators, and cost is a primary reason for the popularity of EM actuation for secondary control function since no additional systems need to be added to the aircraft. While new rare earth magnets are currently in developmental stage, costs are relatively high; but continued research should bring prices down.

RPT#: SAE PAPER 790625
79A36753

UTTL: An experimental study of propeller-induced structural vibration and interior noise

AUTH: A/HOWLETT, J. T.; B/SCHOENSTER, J. A.

MAJS: /*AIRCRAFT COMPARTMENTS/*AIRCRAFT NOISE/*LIGHT AIRCRAFT/*NOISE PROPAGATION/*PERFORMANCE TESTS/* PROPELLER BLADES/*STRUCTURAL VIBRATION

MINS: / DYNAMIC RESPONSE/ FREQUENCY SCANNING/ GRAPHS (CHARTS)/ GROUND TESTS/ HARMONIC EXCITATION/ NOISE REDUCTION/ NOISE SPECTRA/ SOUND TRANSMISSION/ SPECTRUM ANALYSIS

ABS: This paper presents results of tests conducted to study fuselage sidewall dynamics and their effects on the cabin interior noise of a twin-engine, propeller-driven, light aircraft. Data on the dynamic behavior were obtained by slowly sweeping the RPM of one of the engines while the aircraft was stationary on the ground. This technique allowed frequency response plots of the sidewall structural accelerations to be obtained. These accelerations are compared to similar results from a test using a mechanical shaker in order to evaluate the structural dynamic response caused by the harmonics of the

propeller blade passage tone. The dynamic response of the fuselage sidewall is also discussed as a noise transmission mechanism. A second mechanism for noise transmission through the fuselage sidewall was investigated by opening the copilot's window. The results illustrate the complex nature of the noise transmission mechanisms and the importance of correctly assessing noise paths.

discussed based on the results.

RPT#: SAE PAPER 790626
79A36754

UTTL: Engine induced structural-borne noise in a general aviation aircraft
AUTH: A/UNRUH, J. F.; B/SCHEIDT, D. C.
MAJS: /*AIRCRAFT ENGINES/*AIRCRAFT NOISE/*ENGINE TESTS/*GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION/*VIBRATION EFFECTS
MINS: / CABINS/ FUSELAGES/ GROUND TESTS/ LIGHT AIRCRAFT/ NOISE MEASUREMENT/ NOISE SPECTRA/ STRUCTURAL VIBRATION / VIBRATIONAL SPECTRA
ABS: This paper describes a study of engine induced structural-borne noise in a single engine light aircraft. Cabin noise and fuselage vibration levels were recorded during ground tests for engine-attached, engine-detached, interior-installed, and interior-removed configurations. By comparisons of the data, engine induced structure-borne noise is shown to be a primary source of cabin noise. Corresponding fuselage vibration levels were quite high with energy concentrated mainly in the lower frequencies. A measure of the noise control effectiveness of the interior trim was also obtained.

RPT#: SAE PAPER 790627
79A36755

UTTL: Summary of noise reduction characteristics of typical general aviation materials
AUTH: A/ROSKAM, J.; B/GROSVELD, F.; C/VAN AKEN, J.
MAJS: /*AIRCRAFT NOISE/*GENERAL AVIATION AIRCRAFT/*HONEYCOMB STRUCTURES/*LIGHT AIRCRAFT/*NOISE MEASUREMENT/*NOISE REDUCTION
MINS: / ACOUSTIC ATTENUATION/ CABINS/ ENERGY ABSORPTION/ PRESSURE EFFECTS/ RESONANT FREQUENCIES/ SOUND PRESSURE / TEST FACILITIES/ VIBRATION DAMPING
ABS: The paper presents the results of a large number of systematic tests to determine noise reduction characteristics of general aviation materials. Effects of material type (metallic and composite), thickness, panel stiffening, vibration damping materials, sound absorption materials and pressurization on noise reduction are included. Several promising methods for reducing cabin interior noise in light airplanes are

RPT#: AIAA PAPER 80-0169
80A18351

UTTL: Determination of the spin and recovery characteristics of a typical low-wing general aviation design

AUTH: A/TISCHLER, M. B.; B/BARLOW, J. B.

MAJS: /*AERODYNAMIC STABILITY/*AERODYNAMIC STALLING/*
AIRCRAFT SPIN/*GENERAL AVIATION AIRCRAFT/*PERFORMANCE
PREDICTION

MINS: / AIRCRAFT CONTROL/ AIRCRAFT PERFORMANCE/ AIRCRAFT
STABILITY

ABS: The equilibrium spin technique implemented in a graphical form for obtaining spin and recovery characteristics from rotary balance data is outlined. Results of its application to recent rotary balance tests of the NASA Low-Wing General Aviation Aircraft are discussed. The present results, which are an extension of previously published findings, indicate the ability of the equilibrium method to accurately evaluate spin modes and recovery control effectiveness. A comparison of the calculated results with available spin tunnel and full scale findings is presented. The technique is suitable for preliminary design applications as determined from the available results and data base requirements. A full discussion of implementation considerations and a summary of the results obtained from this method to date are presented.

RPT#: AIAA 80-0427
80A26939

UTTL: Development of test methods for scale model simulation of aerial applications in the NASA Langley Vortex Facility

AUTH: A/JORDAN, F. L., JR.

MAJS: /*AGRICULTURAL AIRCRAFT/*AIRCRAFT MODELS/*FLOW
VISUALIZATION/*SCALE MODELS/*VORTICES/*WING FLOW
METHOD TESTS

MINS: / CROP DUSTING/ GRANULAR MATERIALS/ PARTICLE SIZE
DISTRIBUTION/ PARTICLE TRAJECTORIES/ SPRAYING

ABS: Methods have been developed at the Langley Vortex Research Facility to simulate and measure the deposition patterns of aerially applied sprays and granular materials by means of tests with small-scale models of agricultural and dynamically scaled test particles. Interactions between the aircraft wake and the dispersed particles are studied with the aim of modifying wake characteristics and dispersal techniques in order to increase swath width, improve deposition pattern uniformity, and minimize drift. This paper examines the particle sizing analysis, test methods for particle dispersal from the model aircraft, and measurement and computer analysis of test deposition patterns. Results that indicate improved control of chemical drift by winglets are presented to demonstrate test methods.

RPT#: AIAA 80-0455
80A26955

UTTL: The influence of wing, fuselage and tail design on rotational flow aerodynamics data obtained beyond maximum lift with general aviation configurations

AUTH: A/BIHRLE, W., JR.; B/BOWMAN, J. S., JR.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRCRAFT DESIGN/*
FUSELAGES/*GENERAL AVIATION AIRCRAFT/*HORIZONTAL TAIL
SURFACES/*WING PROFILES

MINS: / AERODYNAMIC CONFIGURATIONS/ ANGLE OF ATTACK/
FEEDBACK CONTROL/ FLUID FLOW/ ROTARY WINGS/ TEST
EQUIPMENT/ VORTICES/ YAWING MOMENTS

ABS: The NASA Langley Research Center has initiated a broad general aviation stall/spin research program. A rotary balance system was developed to support this effort. Located in the Langley spin tunnel, this system makes it possible to identify an airplane's aerodynamic characteristics in a rotational flow environment, and thereby permits prediction of spins. This paper presents a brief description of the experimental set-up, testing technique, five model programs conducted to date, and an overview of the rotary balance results and their correlation with spin tunnel free-spinning model results. It is shown, for example, that there is a large, nonlinear dependency of the aerodynamic moments on rotational rate and that these moments are pronouncedly configuration-dependent. Fuselage shape, horizontal tail and, in some instances, wing location are shown to appreciably influence the yawing moment characteristics above an angle of attack of 45 deg.

RPT#: AIAA PAPER 80-0914
80A32887

UTTL: Aeropropulsion in year 2000
AUTH: A/WEBER, R. J.
MAJS: /*AIRCRAFT INDUSTRY/*PROPULSION SYSTEM CONFIGURATIONS
/*RESEARCH AND DEVELOPMENT/*TECHNOLOGY ASSESSMENT
MINS: / ELECTRONIC CONTROL/ ENGINE DESIGN/ GENERAL AVIATION
AIRCRAFT/ HELICOPTER ENGINES/ NOISE REDUCTION/
PROPELLERS/ SUPERSONIC AIRCRAFT/ TURBOPROP ENGINES
ABS: The paper demonstrates that many advances can be
anticipated in propulsion systems for aircraft in the
next 20 years. A survey is presented of probable
future engine types, including convertible engines for
helicopters, turboprops for fuel efficient airliners,
and variable cycle engines for supersonic transports.
Also examined is the use of rotary engines in general
aviation aircraft. Finally, a review is given of
related technology improvements in propellers,
materials, noise suppression, and digital electronic
controls.

RPT#: AIAA PAPER 80-0932
80A32895

UTTL: Vehicle expectations in air transportation for the
year 2000
AUTH: A/HEARTH, D. P.
MAJS: /*AIR TRANSPORTATION/*AIRLINE OPERATIONS/*CIVIL
AVIATION/*PERFORMANCE PREDICTION/*TECHNOLOGICAL
FORECASTING/*TECHNOLOGY ASSESSMENT
MINS: / AEROSPACE INDUSTRY/ AIR TRAFFIC CONTROL/ ECONOMIC
FACTORS/ EXPECTATION/ FUEL CONSUMPTION/ SKIN FRICTION
ABS: This paper is intended to provide an overview of the
air transportation system for the year 2000 in terms
of vehicle expectations. Emphasis is placed on civil
air transportation with the time period approached
from the standpoint of evolutionary changes for the
near term and also with the assumption of more
revolutionary changes for the far term. The view along
the evolutionary path begins with a historical review
of airline market growth and the impact that
technologies have had on airplane designs. Projections
of the life expectancy of existing, derivative, and
new airplanes are examined in terms of their
productivity and fuel efficiency in view of the
present and projected fuel usage and availability. The
factors influencing airline growth are outlined and
some views on whether another new generation of
subsonic airplanes are in the offing are given along
with an assessment of the economic viability of an
advanced commercial supersonic transport in terms of

its higher speed, higher productivity, and higher fuel
usage. With regard to revolutionary changes, major
technology breakthroughs are assumed to occur at a
specified date. As an example, the impact of a
dramatic reduction in skin friction drag is examined
in terms of its effect on the airplane configuration,
its propulsion systems, its projected fuel usage, and
the air transportation system in which it must
operate.

RPT#: AIAA PAPER 80-1036
80A35984

UTTL: Noise transmission and control for a light,
twin-engine aircraft
AUTH: A/BARTON, C. K.; B/MIXSON, J. S.
MAJS: /*AIRCRAFT NOISE/*FUSELAGES/*LIGHT AIRCRAFT/*NOISE
REDUCTION/*SOUND TRANSMISSION
MINS: / AIRCRAFT COMPARTMENTS/ ENGINE NOISE/ HONEYCOMB
STRUCTURES/ SKIN (STRUCTURAL MEMBER)/ STATIC TESTS/
STIFFNESS/ STRUCTURAL WEIGHT
ABS: One of the dominant source-path combinations for cabin
noise in light, twin-engine aircraft is propeller
noise being transmitted through the fuselage sidewall.
This source-path was investigated and candidate
sidewall add-on treatment were installed and tested
using both an external sound source and the propeller
in a ground static runup. Results indicate that adding
either mass or stiffness to the fuselage skin would
improve sidewall attenuation and that the honeycomb
stiffness treatment used generally provided more
improvement than an equal amount of added mass. It is
proposed that double-wall construction in conjunction
with skin stiffening should provide a good weight
efficient combination for the aircraft studied.

RPT#: AIAA PAPER 80-1240
80A43283

UTTL: A theoretical and experimental investigation of
propeller performance methodologies
AUTH: A/KORKAN, K. D.; B/GREGOREK, G. M.; C/MIKKELSON, D.
C.
MAJS: /*AIRCRAFT PERFORMANCE/*GENERAL AVIATION AIRCRAFT/*
PERFORMANCE PREDICTION/*PROPELLERS/*WIND TUNNEL TESTS
MINS: / AERODYNAMIC DRAG/ AIRCRAFT DESIGN/ AIRFOIL PROFILES/
FLIGHT TESTS/ METHODOLOGY/ RADIAL DISTRIBUTION/
SYSTEMS ANALYSIS
ABS: This paper briefly covers aspects related to propeller
performance by means of a review of propeller
methodologies; presentation of wind tunnel propeller
performance data taken in the NASA Lewis Research
Center 10 x 10 wind tunnel; discussion of the
predominant limitations of existing propeller
performance methodologies; and a brief review of
airfoil developments appropriate for propeller
applications.

RPT#: AIAA 80-1562
80A45861

UTTL: A study of stall deterrent systems for general aviation aircraft

AUTH: A/BENNETT, A. G.; B/OWENS, J. K.; C/BULL, G.

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT CONTROL/*FLIGHT SIMULATION/*FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT

MINS: / ACCIDENT PREVENTION/ ACOUSTIC PROPERTIES/ AIRCRAFT CONFIGURATIONS/ AIRCRAFT LANDING/ AIRCRAFT PILOTS/ SYSTEM EFFECTIVENESS

ABS: Stall deterrent concepts for general aviation aircraft have been investigated using simulation studies and flight test experiments. It was found that the simulator was suitable for the development of deterrent system concepts, but the simulator was unacceptable for pilot evaluation of system effectiveness under typical stall/spin accident conditions. A Cessna 319 was outfitted with sensors, servoactuators, and analog control logic necessary to investigate a wide range of stall deterrent systems. It was found that an acoustic stall sensor and an error control law were sufficient for stall deterrence. The pitch intervention control system prevented aircraft stall for all aircraft configurations and pilot inputs. The variable up elevator stop concept was found to be effective for slow decelerations to aircraft stall. The stall deterrent systems were evaluated by four professional pilots and three low time pilots.

RPT#: AIAA 80-1565
80A45864

UTTL: A dynamic analysis of the motion of a low-wing general aviation aircraft about its calculated equilibrium flat spin mode

AUTH: A/TISCHLER, M. B.; B/BARLOW, J. B.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT/*ROTARY STABILITY/*SPIN STABILIZATION

MINS: / AIRCRAFT MODELS/ DEGREES OF FREEDOM/ DYNAMIC STABILITY/ MATHEMATICAL MODELS/ PERTURBATION THEORY/ PREDICTION ANALYSIS TECHNIQUES/ YAWING MOMENTS

ABS: The properties of the flat spin mode of a general aviation configuration have been studied through analysis of rotary balance data, numerical simulation, and analytical study of the equilibrium state. The equilibrium state is predicted well from rotary balance data. The variations of yawing moment and pitching moment as functions of sideslip have been shown to be of great importance in obtaining accurate modeling. These dependencies are not presently available with sufficient accuracy from previous tests or theories. The stability of the flat spin mode has been examined extensively using numerical linearization, classical perturbation methods, and reduced order modeling. The stability exhibited by the time histories and the eigenvalue analyses is shown to be strongly dependent on certain static cross derivatives and more so on the dynamic derivatives. Explicit stability criteria are obtained from the reduced order models.

RPT#: AIAA PAPER 80-1580
BOA50099

UTTL: Overview of stall/spin technology
AUTH: A/CHAMBERS, J. R.
MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT MANEUVERS/*FLIGHT CONTROL/*GENERAL AVIATION AIRCRAFT/*MILITARY AIRCRAFT /*SPIN DYNAMICS
MINS: / AIRCRAFT DESIGN/ LIGHT AIRCRAFT/ PERFORMANCE PREDICTION/ TECHNOLOGY ASSESSMENT/ WIND TUNNEL TESTS
ABS: A general overview of the current state of the art in stall/spin technology for highly-maneuverable military configurations and light general aviation configurations is presented. The key areas of predictive methods, aerodynamics, and flight controls are discussed, using illustrations of results obtained during recent studies. In addition, some of the more-pertinent near-term and future challenges and opportunities in stall/spin technology are discussed. This survey of the existing technology shows that rapid progress has been achieved in each of the key technical areas during the last decade, especially for military airplanes. However, a significant amount of innovative research is urgently required in order to improve the productivity and capabilities of existing predictive techniques, and to provide the technology required for advanced, unconventional configurations.

RPT#: AIAA PAPER 80-1843
BOA43301

UTTL: Effects of discontinuous drooped wing leading-edge modifications on the spinning characteristics of a low-wing general aviation airplane
AUTH: A/DICARLO, D. J.; B/STOUGH, H. P., III; C/PATTON, J. M., JR.
MAJS: /*DROOPED AIRFOILS/*FLIGHT TESTS/*GENERAL AVIATION AIRCRAFT/*LEADING EDGES/*RESEARCH AIRCRAFT/*SPIN TESTS /*WIND TUNNEL TESTS
MINS: / AERODYNAMIC CHARACTERISTICS/ AERODYNAMIC STALLING/ AIRCRAFT CONFIGURATIONS/ AIRCRAFT DESIGN/ AIRCRAFT MODELS/ LIGHT AIRCRAFT/ STATIC TESTS/ WING SPAN/ WINGS
ABS: Wind tunnel and flight tests were conducted to determine the effects of several discontinuous drooped wing leading-edge configurations on the spinning characteristics of a light, single-engine, low-wing research airplane. Particular emphasis was placed on the identification of modifications which would improve the spinning characteristics. The spanwise length of a discontinuous outboard droop was varied

and several additional inboard segments were added to determine the influence of such leading-edge configurations on the spin behavior. Results of the study indicated that the use of only the discontinuous outboard droop, over a specific spanwise area, was most effective towards improving spin and spin recovery characteristics, whereas the segmented configurations having both inboard and outboard droop exhibited a tendency to enter a flat spin.

RPT#: AIAA PAPER 80-1844
BOA43302

UTTL: Full-scale wind-tunnel investigation of the effects of wing leading-edge modifications on the high angle-of-attack aerodynamic characteristics of a low-wing general aviation airplane
AUTH: A/JOHNSON, J. L., JR.; B/NEWSOM, W. A.; C/SATRAN, D. R.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*BODY-WING CONFIGURATIONS/*DROOPED AIRFOILS/*GENERAL AVIATION AIRCRAFT/*LEADING EDGE SLATS/*WIND TUNNEL TESTS
MINS: / AERODYNAMIC DRAG/ ANGLE OF ATTACK/ FLIGHT TESTS/ FLOW VISUALIZATION/ FULL SCALE TESTS/ LIFT
ABS: The paper presents the results of a recent investigation to determine the effects of wing leading-edge modifications on the high angle-of-attack aerodynamic characteristics of a low-wing general aviation airplane in the Langley Full-Scale Wind Tunnel. The investigation was conducted to provide aerodynamic information for correlation and analysis of flight-test results obtained for the configuration. The wind-tunnel investigation consisted of force and moment measurements, wing pressure measurements, flow surveys, and flow visualization studies utilizing a tuft grid. Smoke and nonintrusive mini-tufts which were illuminated by ultra-violet light. In addition to the tunnel scale system which measured overall forces and moments, the model was equipped with an auxiliary strain-gage balance within the left wing panel to measure lift and drag forces on the outer wing panel independent of the tunnel scale system. The leading-edge modifications studied included partial- and full-span leading-edge droop arrangements as well as leading-edge slats.

RPT#: AIAA PAPER 80-1845
BOA43303

UTTL: Determination of an angle of attack sensor correction for a general aviation airplane at large angles of attack as determined from wind tunnel and flight tests
AUTH: A/MOUL, T. M.; B/TAYLOR, L. W., JR.
MAJS: /*ANGLE OF ATTACK/*ERROR CORRECTING DEVICES/*FLIGHT

TESTS/*FLOW DIRECTION INDICATORS/*GENERAL AVIATION
AIRCRAFT/*WIND TUNNEL TESTS

MINS: /AILERONS/ AIRCRAFT CONFIGURATIONS/ FULL SCALE TESTS/
LEADING EDGES/ PARAMETER IDENTIFICATION/ RESEARCH
AIRCRAFT/ SCALE MODELS

ABS: A comprehensive investigation into the flow correction for an angle of attack sensor mounted ahead of the wing tip of a general aviation research airplane has been conducted at the Langley Research Center. This correction has been determined in wind tunnels using a full-scale model up to angles of attack of 45 deg and a 1/5-scale model up to 80 deg angle of attack. The flow correction has also been obtained in flight by using a standard technique at low angles of attack and in spinning flight at larger angles of attack, by using both a simple approximate technique and a parameter estimation technique. The results show the correction is significant, reaching 10 deg at a measured angle of attack of about 90 deg. The flow correction was sensitive to the angle of sideslip at measured angles of attack greater than 60 deg and was not influenced by wing leading-edge modifications or aileron deflections.

RPT#: AIAA PAPER 80-1846
80A43304

UTTL: Aerodynamic design optimization of a fuel efficient high-performance, single-engine, business airplane

AUTH: A/HOLMES, B. J.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRCRAFT DESIGN/*
AIRCRAFT PERFORMANCE/*FUEL CONSUMPTION/*GENERAL
AVIATION AIRCRAFT/*POWER EFFICIENCY

MINS: / AERODYNAMIC STALLING/ AIRCRAFT ENGINES/ AIRSPEED/
CRUISING FLIGHT/ ENGINE DESIGN/ FLIGHT ALTITUDE/
FLIGHT CHARACTERISTICS/ PASSENGERS/ PAYLOADS/ WINGS

ABS: A design study has been conducted to optimize a single-engine airplane for a high-performance cruise mission. The mission analyzed included a cruise speed of about 300 knots, a cruise range of about 1300 nautical miles, and a six-passenger payload (5340 N (1200 lb)). The purpose of the study is to investigate the combinations of wing design, engine, and operating altitude required for the mission. The results show that these mission performance characteristics can be achieved with fuel efficiencies competitive with present-day high-performance, single- and twin-engine, business airplanes. It is noted that relaxation of the present Federal Aviation Regulation, Part 23, stall-speed requirement for single-engine airplanes facilitates the optimization of the airplane for fuel efficiency.

RPT#: AIAA PAPER 80-1862
80A43309

UTTL: Preliminary design of a very advanced technology light twin for the mid-80's

AUTH: A/ROSKAM, J.; B/GROSVELD, F.; C/VAN KEPPEL, B.;
D/EIJUSINK, J.; E/HOEVEN, A. V. D.

MAJS: /*AIRCRAFT DESIGN/*AIRCRAFT ENGINES/*ATLIT PROJECT/*
DESIGN ANALYSIS/*RESEARCH AND DEVELOPMENT/*STRUCTURAL
WEIGHT

MINS: / AERODYNAMICS/ AIRCRAFT CONTROL/ AIRCRAFT PERFORMANCE
/ AIRCRAFT STABILITY/ AIRCRAFT STRUCTURES/ ALUMINUM/
FUEL CONSUMPTION/ GUST LOADS/ PROPELLER FANS/
TURBOPROP AIRCRAFT

ABS: A preliminary design analysis was performed on a specification that called for a twin-engine business aircraft with performance nearing that of a jet airplane, coupled with the fuel efficiency of a turboprop. Use was made of advanced technologies in the areas of aerodynamics, propulsion, construction and stability and control. Results are presented which indicate a significant improvement in performance compared to turboprop airplanes currently in use.

RPT#: AIAA PAPER 80-1870
80A43314

UTTL: Effect of winglets on performance and handling qualities of general aviation aircraft

AUTH: A/VAN DAM, C. P.; B/HOLMES, B. J.; C/PITTS, C.

MAJS: /*AIRCRAFT PERFORMANCE/*CLIMBING FLIGHT/*CRUISING
FLIGHT/*GENERAL AVIATION AIRCRAFT/*TURNING FLIGHT/*
WINGLETS

MINS: / AERODYNAMIC STALLING/ AILERONS/ AIRCRAFT
CONFIGURATIONS/ AIRCRAFT CONTROL/ AIRCRAFT STABILITY/
FLIGHT TESTS/ FUEL CONSUMPTION/ RETROFITTING/
STRUCTURAL WEIGHT/ WIND TUNNEL TESTS/ YAW

ABS: Recent flight and wind tunnel evaluations of winglets mounted on general aviation airplanes have shown improvements in cruise fuel efficiency, and climbing and turning performance. Some of these analyses have also uncovered various effects of winglets on airplane handling qualities. Retrofitting an airplane with winglets can result in reduced cross wind take-off and landing capabilities. Also, winglets can have a detrimental effect on the lateral directional response characteristics of aircraft which have a moderate to high level of adverse yaw due to aileron. Introduction of an aileron-rudder-interconnect, and reduction of the effective dihedral by canting-in of the winglets, or addition of a lower winglet can eliminate these flying quality problems.

RPT#: AIAA PAPER 80-1871
80A50191

UTTL: An acoustic sensitivity study of general aviation propellers

AUTH: A/KORKAN, K. D.; B/GREGOREK, G. M.; C/KEITER, I.
MAJS: /*ACOUSTIC PROPERTIES/*AIRCRAFT NOISE/*GENERAL

AVIATION AIRCRAFT/*NOISE REDUCTION/*PROPELLERS
MINS: / AIRFOILS/ PERFORMANCE TESTS/ PROPELLER BLADES/
SENSITIVITY

ABS: This paper describes the results of a study in which a systematic approach has been taken in studying the effect of selected propeller parameters on the character and magnitude of propeller noise. Four general aviation aircraft were chosen, i.e., a Cessna 172, Cessna 210, Cessna 441, and a 19 passenger commuter concept, to provide a range in flight velocity, engine horsepower, and gross weight. The propeller parameters selected for examination consisted of number of blades, rpm reduction, thickness/chord reduction, activity factor reduction, proplets, airfoil improvement, sweep, position of maximum blade loading, and diameter reduction.

RPT#: AIAA PAPER 80-1872
80A43315

UTTL: Effect of propeller slipstream on the drag and performance of the engine cooling system for a general aviation twin-engine aircraft

AUTH: A/KATZ, J.; B/CORSIGLIA, V. R.; C/BARLOW, P. R.
MAJS: /*AERODYNAMIC DRAG/*AIRCRAFT ENGINES/*COOLING SYSTEMS
/*GENERAL AVIATION AIRCRAFT/*PERFORMANCE TESTS/*
PROPELLER SLIPSTREAMS

MINS: / ANGLE OF ATTACK/ CLIMBING FLIGHT/ COLD FLOW TESTS/
CRUISING FLIGHT/ FUEL CONSUMPTION/ INLET PRESSURE/
NACELLES/ PRESSURE RECOVERY/ REATTACHED FLOW/ SEMISPAN
MODELS/ STRUCTURAL VIBRATION/ WIND TUNNEL TESTS

ABS: The pressure recovery of incoming cooling air and the drag associated with engine cooling of a typical general aviation twin-engine aircraft was investigated experimentally. The semispan model was mounted vertically in the 40- by 80-Foot Wind Tunnel at Ames Research Center. The propeller was driven by an electric motor to provide thrust with low vibration levels for the cold-flow configuration. It was found that the propeller slipstream reduces the frontal air spillage around the blunt nacelle shape. Consequently, this slipstream effect promotes flow reattachment at the rear section of the engine nacelle and improves inlet pressure recovery. These effects are most pronounced at high angles of attack, that is, climb condition. For the cruise condition those improvements were more moderate.

RPT#: AIAA PAPER 80-1874
80A43317

UTTL: Noise reduction characteristics of general aviation type dual-pane windows

AUTH: A/GROSVELD, F.; B/NAVANEETHAN, R.; C/ROSKAM, J.
MAJS: /*AIRCRAFT CONSTRUCTION MATERIALS/*GENERAL AVIATION
AIRCRAFT/*NOISE REDUCTION/*POLYMETHYL METHACRYLATE/*
WINDOWS (APERTURES)

MINS: / AIRCRAFT NOISE/ ATMOSPHERIC PRESSURE/ EDGES/
MECHANICAL PROPERTIES/ PRESSURE REDUCTION/ RESONANT
FREQUENCIES/ THICKNESS RATIO

ABS: The noise reduction characteristics of general-aviation-type, dual-pane windows in various configurations have been experimentally investigated. The effects of inner and outer pane thickness, spacing between the panes, edge conditions, inclination of the inner pane and depressurization of the air in between the panes are presented. The space in between the two window panes is sealed airtight in all cases. Results show that increasing the mass of a 'floating' window pane does not increase the noise reduction below the fundamental resonance frequency. It is concluded that the concept of depressurization of the air between thin (1/8 in) Plexiglas panes and application of multiple-freedom edge conditions for the inner pane are promising to reduce noise levels in general aviation airplanes.

RPT#: ASAE PAPER AA 79-001
80A15220

UTTL: Data and analysis procedures for improved aerial applications mission performance

AUTH: A/HOLMES, B. J.; B/MORRIS, D. K.; C/RAZAK, K.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*AGRICULTURAL AIRCRAFT/*
VORTICES/*WINGS

MINS: / AIRCRAFT DESIGN/ ASPECT RATIO/ CROP DUSTING/
PARTICLE MOTION/ WING FLAPS/ WING LOADING

ABS: An analysis procedure is given and cases analyzed for the effects of wing geometry on lateral transport of a variety of agricultural particles released in the wake of an agricultural airplane. The cases analyzed simulate the release of particles from a fuselage centerline-mounted dry material spreader; however, the procedure applies to particles released anywhere along the wing span. Consideration is given to the effects of taper ratio, aspect ratio, wing loading, and deflected flaps. It is noted that significant lateral transport of large particles can be achieved using high-lift devices positioned to create a strong vortex near the location of particle release.

RPT#: AIAA PAPER 81-0403
81A20810

UTTL: An analytical approach to airfoil icing
AUTH: A/BRAGG, M. B.; B/GREGOREK, G. M.; C/SHAW, R. J.
MAJS: /*AIRFOIL PROFILES/*FLIGHT HAZARDS/*GENERAL AVIATION
AIRCRAFT/*ICE FORMATION/*PERFORMANCE PREDICTION
MINS: / AERODYNAMIC DRAG/ FREEZING/ FULL SCALE TESTS/
MATHEMATICAL MODELS/ PARTICLE TRAJECTORIES
ABS: An analytical procedure has been developed to predict
rime ice growth on unprotected airfoil sections and to
evaluate the aerodynamic performance. A time stepping
method is used in which: (1) water droplet
trajectories are calculated, (2) a rime ice shape
determined, (3) the flowfield around the iced airfoil
is recalculated, and (4) the build-up process iterated
upon until the desired icing time is reached. The
performance of the iced airfoil shapes are then
determined from existing analytic methods. Rime ice
shapes determined in the NASA Lewis Icing Research
Tunnel on a modified NACA 64 series airfoil agree well
with the shapes predicted by the analytical method.
Measured and predicted increases in drag due to the
rime ice also agree favorably. A simplified scaling
analysis is also presented and verified which provides
the duplication of full scale results of rime ice
accretions in small scale model tests.

RPT#: AIAA PAPER 81-0404
81A20811

UTTL: Simulated aircraft takeoff performance with frosted
wings
AUTH: A/DIETENBERGER, M. A.
MAJS: /*AIRCRAFT HAZARDS/*AIRCRAFT PERFORMANCE/*COMPUTERIZED
SIMULATION/*ICE FORMATION/*TAKEOFF/*WING PANELS
MINS: / AERODYNAMIC DRAG/ AIRCRAFT PILOTS/ FREEZING/ GENERAL
AVIATION AIRCRAFT/ PENALTIES/ SAFETY FACTORS/
TRANSPORT AIRCRAFT
ABS: The absolute and relative safety of certain nocturnal
frost formations on general aviation and transport
type airfoils is evaluated by a computer simulation
program. The frost layer aerodynamic penalty and
takeoff program was used to calculate the frost
thickness distribution on an airfoil with time, as
well as the aerodynamic penalties associated with the
frost layer during takeoff. The program was validated
by nocturnal frost formation experiments on an
inclined flat plate and by comparisons with documented
aerodynamic penalties of an arbitrarily roughened
airfoil. For various meteorological conditions and
runway take-off velocities, a frost layer can be
determined that produces no aerodynamic penalty, thus
inferring the absolute safety of the airfoil with
respect to frost. The relative safety of a frosted
airfoil depends on the ability of the engine power
reserve to overcome both as much as doubling of
airfoil drag and an increased stall speed due to lift
penalties.

RPT#: AIAA PAPER 81-0405
81A20837

UTTL: Icing tunnel tests of a glycol-exuding porous leading
edge ice protection system on a general aviation
airfoil
AUTH: A/KOHLMAN, D. L.; B/SCHWEIKHARD, W. G.; C/EVANICH,
P.
MAJS: /*AIRFOIL PROFILES/*FLUID FLOW/*GENERAL AVIATION
AIRCRAFT/*GLYCOLS/*ICE PREVENTION/*LEADING EDGES
MINS: / AERODYNAMIC CHARACTERISTICS/ FLIGHT CONDITIONS/ WIND
TUNNEL TESTS/ WING PANELS
ABS: Tests were conducted in the Icing Research Tunnel at
the NASA Lewis Research Center to determine the
characteristics of an ice protection system that
distributes a glycol solution onto the leading edge of
an airfoil through a porous surface material. Minimum
fluid flow rates required to achieve anti-icing (no
ice formation) were determined for various flight
conditions and angles of attack. The ability of the
system to remove ice formed on the airfoil before
system activation was also investigated.



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75A25713

UTTL: NASA's role in aeronautics
AIAA Student Journal, vol. 12, Oct. 1974, p. 10-12.
AUTH: A/JONES, J. L.
MAJS: /*AIRCRAFT DESIGN/*NASA PROGRAMS/*RESEARCH PROJECTS
MINS: / CIVIL AVIATION/ FLY BY WIRE CONTROL/ GENERAL
AVIATION AIRCRAFT/ JET AIRCRAFT NOISE/ MILITARY
TECHNOLOGY/ NOISE REDUCTION/ REMOTELY PILOTED VEHICLES
/ SUPERCRITICAL WINGS
ABS: NASA civil aviation research efforts in regard to
noise reduction, development of very quiet engines,
fuel conservation, and aircraft efficiency and safety
are outlined. Specific projects discussed include the
supercritical wing program, the fly-by-wire control
system, the modified JT8D jet engine, the two-segment
noise abatement landing procedure, the general
aviation safety program, the GAW-1 low speed airfoil,
the Army/NASA tilt rotor flight research project, and
the remotely piloted research vehicle program.

75A26006

UTTL: A semibuoyant vehicle for general transportation
missions
In: Interagency Workshop on Lighter than Air Vehicles,
Monterey, Calif., September 9-13, 1974, Proceedings.
(A75-25969 10-05) Cambridge, Mass., MIT Flight
Transportation Laboratory, 1975, p. 431-439.
AUTH: A/HAVILL, C. D.; B/HARPER, M.
MAJS: /*AIR TRANSPORTATION/*AIRSHIPS/*GENERAL AVIATION
AIRCRAFT/*LIFTING BODIES
MINS: / BUOYANCY/ COST ANALYSIS/ DESIGN ANALYSIS/ FLIGHT
VEHICLES/ FUEL CONSUMPTION/ PAYLOADS/ PERFORMANCE
PREDICTION/ REENTRY VEHICLES/ WIND TUNNEL TESTS
ABS: The concept of small, semibuoyant, lifting-body
airships is discussed. Estimates of important
performance characteristics are made and compared with
other flight vehicle systems.

75A36960

UTTL: An evaluation of differential Omega for general
aviation area navigation
In: Omega Symposium, 2nd, Washington, D.C., November
5-7, 1974, Proceedings. (A75-36951 17-04) Washington,
D.C., Institute of Navigation, 1974, p. 85-95.
AUTH: A/HOLLISTER, W. M.; B/DODGE, S. M.
MAJS: /*AREA NAVIGATION/*COST EFFECTIVENESS/*GENERAL
AVIATION AIRCRAFT/*OMEGA NAVIGATION SYSTEM/*SYSTEM
EFFECTIVENESS/*TECHNOLOGY ASSESSMENT
MINS: / AIR NAVIGATION/ INSTRUMENT ERRORS/ LORAN C/ POSITION
ERRORS/ VHF OMNIRANGE NAVIGATION
ABS: This paper reports on a study which compared the

expected cost and performance of Differential Omega
with that of Loran-C and VORTAC for general aviation
area navigation. Analysis is directed toward a
comparison of the systems with respect to specified
performance parameters and the cost-effectiveness of
each system in relation to the specifications. Loran-C
offers the highest performance with respect to
accuracy. Differential Omega requires the least
expenditure. It was found cost ineffective to attempt
to obtain complete coverage by expanding the existing
VORTAC system.

75A36968

UTTL: Binary phase locked loops for Omega receivers
In: Omega Symposium, 2nd, Washington, D.C., November
5-7, 1974, Proceedings. (A75-36951 17-04) Washington,
D.C., Institute of Navigation, 1974, p. 154-159.
AUTH: A/CHAMBERLIN, K.
MAJS: /*BINARY DATA/*DIGITAL SYSTEMS/*OMEGA NAVIGATION
SYSTEM/*PHASE LOCKED SYSTEMS/*RADIO RECEIVERS
MINS: / ADAPTIVE FILTERS/ AIR NAVIGATION/ GENERAL AVIATION
AIRCRAFT/ PHASE DETECTORS/ PHASE ERROR/ VERY LOW
FREQUENCIES
ABS: An all-digital phase lock loop (PLL) is considered
because of a number of problems inherent in an
employment of analog PLL. The digital PLL design
presented solves these problems. A single loop
measures all eight Omega time slots. Memory-aiding
leads to the name of this design, the memory-aided
phase lock loop (MAPLL). Basic operating principles
are discussed and the superiority of MAPLL over the
conventional digital phase lock loop with regard to
the operational efficiency for Omega applications is
demonstrated.

75A46477

UTTL: Civil aircraft
In: Composite materials. Volume 3. (A75-46476 24-05)
New York, Academic Press, Inc., 1974, p. 23-68.
AUTH: A/MAYER, N. J.
MAJS: /*AIRCRAFT STRUCTURES/*AIRFRAME MATERIALS/*CIVIL
AVIATION/*COMPOSITE MATERIALS/*ENGINE DESIGN
MINS: / AIRCRAFT DESIGN/ COST EFFECTIVENESS/ DESIGN ANALYSIS
/ ECONOMIC ANALYSIS/ FATIGUE LIFE/ MECHANICAL
PROPERTIES/ STRUCTURAL WEIGHT
ABS: This study deals with aircraft material and structural
requirements, advantages of composites, airframe and
engine applications, design procedures, problem areas,
and future trends in civil aircraft. The selection of
materials and design of structure for any given
component or part must be made not only on the basis
of the mechanical and structural functions, but must

also consider the operational and cost parameters for civil aircraft. Composites have caused the orientation to shift from a metal-based philosophy for design, where only incremental improvements could be anticipated, to one where substantial changes in design approaches are possible. Future designs are likely to include a combination of new approaches and composite materials.

76A10095
UTTL: Interior noise levels of two propeller driven light aircraft
 In: NOISEXPO '75; National Noise and Vibration Control Conference, 3rd, Atlanta, Ga., April 30-May 2, 1975, Proceedings of the Technical Program. (A76-10091 01-45) Bay Village, Ohio, NOISEXPO, 1975, p. 335-338.
AUTH: A/CATHERINES, J. J.; B/MAYES, W. H.
MAJS: /*AIRCRAFT NOISE/*ENGINE NOISE/*LIGHT AIRCRAFT/*NOISE REDUCTION
MINS: / FLIGHT TESTS/ GROUND TESTS/ NOISE INTENSITY/ NOISE SPECTRA/ PROPELLER EFFICIENCY
ABS: A test program is described with the objective of determining the relationship between aircraft operating conditions and interior noise and of determining the degree to which ground testing can be used in lieu of flight testing for performing interior noise research. Measurements are presented for single and twin engine aircraft for 2 or 4 passengers. It was found that noise levels are strongly influenced by the rotational speed of the engine and propeller. Both the overall noise and low frequency spectra levels were observed to decrease with increasing high speed rpm operation during flight. Comparison of spectra obtained in flight with spectra obtained on the ground suggests that identification of frequency components and relative amplitude of propeller and engine noise sources may be evaluated on stationary aircraft.

76A10393
UTTL: Review of NASA short-haul studies
 In: International air transportation; Proceedings of the Conference, San Francisco, Calif., March 24-26, 1975. (A76-10389 01-03) San Francisco, American Society of Civil Engineers, 1975, p. 41-65.
AUTH: A/KENYON, G. C.
MAJS: /*AIR TRANSPORTATION/*AIRCRAFT DESIGN/*ECONOMIC ANALYSIS/*NASA PROGRAMS/*SHORT HAUL AIRCRAFT
MINS: / AIRPORT PLANNING/ COST EFFECTIVENESS/ ENGINE DESIGN/ NOISE REDUCTION/ TURBOFAN ENGINES
ABS: The paper summarizes the results of NASA-conducted technological and economic studies of low, medium, and high density short-haul transportation systems. Aircraft concepts considered included CTOL, RTOL, STOL, and general aviation aircraft. For low density systems, it was found that viable air service becomes possible if city pairs are at least 100 km apart and a two-way total travel demand of at least 200 daily passengers exists. Currently available aircraft were found suitable. The medium-density study showed that a 60-passenger twin engine turbofan was the best suited aircraft. For high density systems, STOL appears to be

an economically viable means of reducing noise and congestion at major hub airports. Adequate runways 914 m in length or greater either already exist or could be added to most existing major hub airports.

76A10603
UTTL: Evaluation of several navigation algorithms for application to general aviation
 In: National Aerospace Meeting, Alamogordo, N. Mex., May 12, 13, 1975, Proceedings. (A76-10601 01-04) Washington, D.C., Institute of Navigation, 1975, p. 7-12.
AUTH: A/CONRAD, B.; B/KORSACK, A. J.; C/JACKSON, C. T., JR.
MAJS: /*AIR NAVIGATION/*ALGORITHMS/*DISTANCE MEASURING EQUIPMENT/*GENERAL AVIATION AIRCRAFT/*NAVIGATION AIDS
MINS: / AIRCRAFT DETECTION/ COMPUTER PROGRAMS/ FLIGHT TESTS/ POSITION (LOCATION)
ABS: Using data obtained in flight, three position determining algorithms for use by general aviation aircraft were evaluated representing increasing software requirements. These were a DME only, DME/air data and blended DME/air data. Although each step represented additional software with resultant increase in position accuracy, all could be performed on a programmable electronic desk calculator. Results from the computation of aircraft position using the three algorithms are presented. The algorithms employed can be extended to accept VOR, TACAN bearing, ADF, or other NAVAID Data. To obtain the flight data an experimental system was configured and flown on a general aviation aircraft. Principal hardware elements (all with low-cost potential) were a programmable calculator, a single DME receiver (multiplexed for multiple DME use) and a low-cost air speed sensor (shed-vortex principle). The flight test demonstrated satisfactory performance of these principal elements.

76A15775
UTTL: General aviation and community development; Summer Faculty Fellowship Program in Engineering Systems Design, Hampton, Va., June 2-August 15, 1975, Report Program sponsored by NASA and American Society for Engineering Education; Norfolk, Va., Old Dominion University, 1975, 271 p.
AUTH: A/SINCOFF, M. Z.; B/DAJANI, J. S.
MAJS: /*AIRPORT PLANNING/*AVIONICS/*LAND USE/*RESEARCH AND DEVELOPMENT/*URBAN DEVELOPMENT
MINS: / AIR TRAFFIC CONTROL/ AIR TRANSPORTATION/ AIRCRAFT COMMUNICATION/ DECISION MAKING/ ECONOMIC ANALYSIS/ ENERGY TECHNOLOGY/ GENERAL AVIATION AIRCRAFT/ HUMAN FACTORS ENGINEERING/ NAVIGATION AIDS
ABS: The document summarizes the results of a faculty

program in engineering systems design whose primary aim was to provide a framework for communication and collaboration between academic personnel, research engineers, and scientists in government agencies and private industry. Other objectives were to provide a useful study of a broadly based societal problem, requiring the coordinated efforts of a multidisciplinary team, and to generate experience in the development of systems design and multidisciplinary activities. The success of the program is evidenced by the resulting study of general aviation and community development, characterized by thorough scrutiny of ideas, philosophies, and academic perspectives.

76A23156

UTTL: Optimizing airport runway improvement program - A dynamic programming approach
In: Modeling and simulation, Volume 6 - Proceedings of the Sixth Annual Pittsburgh Conference, Pittsburgh, Pa., April 24, 25, 1975. Part 2. (A76-23110 09-59) Pittsburgh, Pa., Instrument Society of America, 1975, p. 693-697.

AUTH: A/YU, J. C.; B/GIBSON, D. R.

MAJS: /*AIR TRAFFIC CONTROL/*AIRPORT PLANNING/*COMPUTERIZED SIMULATION/*DYNAMIC PROGRAMMING/*RUNWAYS

MINS: / AIRLINE OPERATIONS/ ALGORITHMS/ CIVIL AVIATION/ FLOW CHARTS/ MATHEMATICAL MODELS/ OPTIMIZATION

ABS: In order to reduce the air traffic delay in the terminal area, an immediate remedy is to increase airport capacity by an expansion of the existing runway system. The runway expansion program is often limited by budgetary constraints; the expensive facilities for a long-term improvement cannot be built at once. When a runway improvement strategy is being considered for a longer planning horizon, the investment decision depends upon the interrelations of its composite periods. The problem, therefore, is to determine how time factor and investment decisions interact to yield an optimal improvement scheme that meets demand at a minimum cost. With this objective in mind, a dynamic programming methodology is employed to determine the optimal planning scheme. Also, an example runway improvement problem is tested to illustrate how a dynamic programming model is practical in actual application.

76A34157

UTTL: Simulation of aircraft crash and its validation
In: Aircraft crashworthiness: Proceedings of the Symposium, Cincinnati, Ohio, October 6-8, 1975. (A76-34132 16-03) Charlottesville, University Press of Virginia, 1975, p. 485-497.

AUTH: A/ALFARO-BOU, E.; B/HAYDUK, R. J.; C/THOMSON, R. G.; D/VAUGHAN, V. L., JR.

MAJS: /*AIRCRAFT ACCIDENTS/*AIRCRAFT DESIGN/*AIRCRAFT SURVIVABILITY/*CRASH LANDING/*FLIGHT SIMULATION/*LIGHT AIRCRAFT

MINS: / AIRCRAFT RELIABILITY/ AIRFRAMES/ DYNAMIC STRUCTURAL ANALYSIS/ FREE FLIGHT TEST APPARATUS/ FULL SCALE TESTS / IMPACT ACCELERATION/ IMPACT LOADS/ MATHEMATICAL MODELS/ NASA PROGRAMS/ SAFETY DEVICES/ STRUCTURAL STABILITY

ABS: A joint FAA/NASA program is discussed which is aimed at developing a reliable technology for the design of crashworthy light aircraft. This program encompasses the development of analytical methods, the definition of a survivable crash envelope, and the design of improved seat and restraint systems. A facility for full-scale crash-simulation testing is described along with the test method and results of five full-scale crash tests of twin-engine light aircraft. The major goals of the analytical portion of the program are outlined, including the development and validation of the analytical technique using simplified structural specimens that approximate aircraft components, as well as the mathematical modeling of the complete airframe and its subsequent dynamic analysis by substructuring and matrix reduction techniques.

76A36924

UTTL: The effects of aircraft design and atmospheric turbulence on handling and ride qualities
In: Atmospheric Flight Mechanics Conference, 3rd, Arlington, Tex., June 7-9, 1976, Proceedings. (A76-36901 17-08) New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 210-219.

AUTH: A/JONES, C. R.; B/JACOBSON, I. D.

MAJS: /*AIRCRAFT DESIGN/*ATMOSPHERIC TURBULENCE/*COMMERCIAL AIRCRAFT/*CONTROLLABILITY/*RIDING QUALITY/*TURBULENCE EFFECTS

MINS: / FLIGHT SIMULATORS/ GENERAL AVIATION AIRCRAFT/ MATHEMATICAL MODELS/ ROLL/ SHORT TAKEOFF AIRCRAFT

ABS: The effects of aircraft dynamic characteristics on passenger ride quality were investigated to determine ride-quality isocontours similar to aircraft handling-quality contours. Measurements were made on a motion-base simulator while varying the aircraft short-period and Dutch Roll frequencies and dampings. Both pilot ratings and subjective ride-quality ratings

were obtained during simulator flight. Ride and handling qualities were found to be complimentary for the Dutch Roll mode, but not for the short-period mode. Regions of optimal ride and handling qualities were defined for the short-period mode, and the effects of changes in turbulence level studied using mathematical models.

76A45776

- UTTL:** The future of aeronautical transportation; Proceedings of the Princeton University Conference, Princeton, N.J., November 10, 11, 1975
Conference supported by the Boeing Co., Grumman Corp., McDonnell Douglas Corp., NASA, Northrop Corp., and United Technologies Corp. Princeton, N.J., Princeton University, 1976. 480 p
- MAJS:** /*AIR TRANSPORTATION/*AIRCRAFT DESIGN/*AIRLINE OPERATIONS/*TECHNOLOGICAL FORECASTING
- MINS:** / AIR POLLUTION/ AIRCRAFT ENGINES/ AIRCRAFT NOISE/ CIVIL AVIATION/ ECONOMIC FACTORS/ ENGINE DESIGN/ FINANCE/ GOVERNMENT/INDUSTRY RELATIONS/ NOISE REDUCTION/ SUPERSONIC TRANSPORTS
- ABS:** Papers are presented on first and second generation supersonic transports, the Supersonic Cruise Aircraft Research Program, wide-body subsonic transports and vertical and short takeoff and landing transports. Aspects of aircraft design are examined including the airframe, propulsion and electronics. Government regulation, cost/benefit analysis of research and development, airline economics and aircraft financing are also considered. The environmental impact of air transportation is discussed with emphasis on atmospheric emissions (including stratospheric pollution) and noise pollution. Individual items are announced in this issue.

77A17067

UTTL: Sources and characteristics of interior noise in general aviation aircraft
Acoustical Society of America, Annual Meeting, 91st, Washington, D.C., Apr. 5-9, 1976, Paper. 23 p.
NASA-sponsored research.

AUTH: A/CATHERINES, J. J.; B/JHA, S. K.

MAJS: /*AIRCRAFT NOISE/*ENGINE NOISE/*GENERAL AVIATION AIRCRAFT/*LIGHT AIRCRAFT/*NOISE GENERATORS/*PROPELLER BLADES

MINS: / AERODYNAMIC NOISE/ BROADBAND/ GROUND TESTS/ LOW FREQUENCIES/ NOISE MEASUREMENT/ NOISE REDUCTION/ SAFETY FACTORS/ STRUCTURAL VIBRATION

ABS: A field study has been conducted to examine the interior noise characteristics of a general aviation aircraft. The purposes of the study were to identify the major noise sources and their relative contribution and to establish the noise transmission paths and their relative importance. Tests were performed on an aircraft operating under stationary conditions on the ground. The results show that the interior noise level of light aircraft is dominated by broadband, low frequencies (below 1,000 Hz). Both the propeller and the engine are dominant sources; however, the contribution from the propeller is significantly more than the engine at its fundamental blade passage frequency. The data suggests that the airborne path is more dominant than the structure-borne path in the transmission of broadband, low-frequency noise which apparently results from the exhaust.

77A17069

UTTL: Prediction of light aircraft interior noise
Acoustical Society of America, Annual Meeting, 91st, Washington, D.C., Apr. 5-9, 1976, Paper. 20 p.
NASA-sponsored research.

AUTH: A/HOWLETT, J. T.; B/MORALES, D. A.

MAJS: /*AIRCRAFT DESIGN/*AIRCRAFT NOISE/*COMPUTERIZED DESIGN /*LIGHT AIRCRAFT/*NOISE REDUCTION/*PERFORMANCE PREDICTION

MINS: / ACOUSTICS/ COMPUTER PROGRAMS/ NOISE INTENSITY/ NOISE SPECTRA/ RESONANT FREQUENCIES/ STRUCTURAL DESIGN

ABS: At the present time, predictions of aircraft interior noise depend heavily on empirical correction factors derived from previous flight measurements. However, to design for acceptable interior noise levels and to optimize acoustic treatments, analytical techniques which do not depend on empirical data are needed. This paper describes a computerized interior noise prediction method for light aircraft. An existing analytical program (developed for commercial jets by

Cockburn and Jolly in 1968) forms the basis of some modal analysis work which is described. The accuracy of this modal analysis technique for predicting low-frequency coupled acoustic-structural natural frequencies is discussed along with trends indicating the effects of varying parameters such as fuselage length and diameter, structural stiffness, and interior acoustic absorption.

77A20721

UTTL: Air transportation beyond the 1980's
In: Air transportation for the 1980's. (A77-20712 07-01) College Park, Md., University of Maryland, 1976, p. 353-380.

AUTH: A/KAYTEN, G. G.

MAJS: /*AIR TRANSPORTATION/*AIRLINE OPERATIONS/*CIVIL AVIATION/*TECHNOLOGICAL FORECASTING

MINS: / AIR CARGO/ ECONOMIC FACTORS/ GENERAL AVIATION AIRCRAFT/ NOISE REDUCTION/ SHORT HAUL AIRCRAFT/ SUPERSONIC TRANSPORTS/ VERTICAL TAKEOFF AIRCRAFT

ABS: This work is a preview of the air transportation sections of the NASA 'Outlook for Aeronautics' study report (1976). Attention is given to future directions and opportunities for civil aviation taking account of economic and demographic factors, and resources. Technical objectives for the period 1976-1985 are summarized with consideration of research in the low-speed, high-speed, and long-range flight regimes.

77A21931

UTTL: Recollections from an earlier period in American aeronautics
In: Annual review of fluid mechanics, Volume 9, (A77-21930 08-34) Palo Alto, Calif., Annual Reviews, Inc., 1977, p. 1-11.

AUTH: A/JONES, R. T.

MAJS: /*AERONAUTICAL ENGINEERING/*AIRCRAFT INDUSTRY/* HISTORIES

MINS: / AERODYNAMICS/ CIVIL AVIATION/ RESEARCH AND DEVELOPMENT/ WIND TUNNELS

ABS: The situation of American aeronautics in the year 1929 is examined. In that year manufacturers all over the U.S. were bringing out new aircraft models to capture an assured market. Earlier developments in aviation in the U.S. after World War I are also considered along with the conditions of American aeronautics in the 1930s. Attention is given to the introduction of the Barling NB-3 with its all-metal construction, efforts of NACA to collect and disseminate in a uniform notation aerodynamic characteristics of airfoils from laboratories around the world, and the invention of the variable-density wind tunnel.

77A24936

UTTL: Investigation of the influence of simulated turbulence on handling qualities

Journal of Aircraft, vol. 14, Mar. 1977, p. 272-275.

AUTH: A/JACOBSON, I. D.; B/JOSHI, D. S.

MAJS: /*AIRCRAFT CONTROL/*CONTROLLABILITY/*ENVIRONMENT SIMULATION/*FLIGHT SIMULATION/*PILOT PERFORMANCE/*TURBULENCE EFFECTS

MINS: / ATMOSPHERIC MODELS/ ATMOSPHERIC TURBULENCE/ DEGREES OF FREEDOM/ LIGHT AIRCRAFT/ MOTION SIMULATORS/ VISUAL PERCEPTION

ABS: Pilot opinion of the handling quality of a light general aviation aircraft was evaluated in a simulated turbulence environment. The turbulence is described in terms of rms intensity and scale length and their variation with time. Significant changes in pilot opinion ratings were obtained with variation in turbulence models and these are discussed in terms of complexity and suitability for handling-quality studies.

77A30006

UTTL: Directions in civil aviation 1980-2000

Acta Astronautica, vol. 4, Jan.-Feb. 1977, p. 7-14.

AUTH: A/ROBERTS, L.

MAJS: /*AIR TRANSPORTATION/*AIRCRAFT DESIGN/*CIVIL AVIATION /*TECHNOLOGICAL FORECASTING

MINS: / COMMERCIAL AIRCRAFT/ GENERAL AVIATION AIRCRAFT/ HYPERSONIC AIRCRAFT/ PASSENGER AIRCRAFT/ RESEARCH AND DEVELOPMENT/ SUBSONIC AIRCRAFT/ SUPERSONIC AIRCRAFT

ABS: The following future directions in civil aviation are considered: (1) greater economy and efficiency in passenger and cargo air service at subsonic speeds, and improved utility and safety for general aviation, (2) greatly improved short haul air transportation using turbofan or turboprop aircraft, and subsequently, rotorcraft and V/STOL aircraft, and (3) supersonic, and ultimately hypersonic, air transportation for transoceanic long range flight. Attention is also given to new directions in research and technology.

77A31588

UTTL: Worth assessments of approach to landing

IEEE Transactions on Systems, Man, and Cybernetics, vol. SMC-7, May 1977, p. 395-398.

AUTH: A/CURRY, R. E.

MAJS: /*AIRCRAFT CARRIERS/*AIRCRAFT LANDING/*GENERAL AVIATION AIRCRAFT/*MAN MACHINE SYSTEMS/*PILOT PERFORMANCE

MINS: / HUMAN FACTORS ENGINEERING/ MARKET RESEARCH/ REGRESSION ANALYSIS/ VALUE ENGINEERING/ VARIANCE

(STATISTICS)

ABS: The objective of worth assessment is to determine a descriptive model of how attributes of a set of objects are combined into preferences for the objects. The technique is described and is applied to the assessment of worth functions in approach to landing for general aviation and air carrier pilots.

77A33392

UTTL: New potentials for conventional aircraft when powered by hydrogen-enriched gasoline

In: World Hydrogen Energy Conference, 1st, Miami Beach, Fla., March 1-3, 1976, Proceedings, Volume 3. (A77-33326 14-44) Coral Gables, Fla., University of Miami; New York, Pergamon Press, 1976, p. 5C-59 to 5C-86.

AUTH: A/MENARD, W. A.; B/MOYNIHAN, P. I.; C/RUPE, J. H.

MAJS: /*ADDITIVES/*AIRCRAFT FUELS/*FUEL CONSUMPTION/*GASOLINE/*HYDROGEN-BASED ENERGY/*POLLUTION CONTROL

MINS: / AIR POLLUTION/ AIRCRAFT ENGINES/ CATALYTIC ACTIVITY/ COST EFFECTIVENESS/ ENGINE DESIGN/ EXHAUST GASES/ GENERAL AVIATION AIRCRAFT/ LIQUID HYDROGEN/ SYSTEMS ANALYSIS

ABS: Hydrogen enrichment for aircraft piston engines is under study in a new NASA program. The objective of the program is to determine the feasibility of inflight injection of hydrogen in general aviation aircraft engines to reduce fuel consumption and to lower emission levels. A catalytic hydrogen generator will be incorporated as part of the air induction system of a Lycoming turbocharged engine and will generate hydrogen by breaking down small amounts of the aviation gasoline used in the normal propulsion system. This hydrogen will then be mixed with gasoline and compressed air from the turbocharger before entering the engine combustion chamber. The paper summarizes the results of a systems analysis study. Calculations assuming a Beech Duke aircraft indicate that fuel savings on the order of 20% are possible. An estimate of the potential for the utilization of hydrogen enrichment to control exhaust emissions indicates that it may be possible to meet the 1979 Federal emission standards.

78A13416
UTTL: Feasibility of modern airships - Preliminary assessment
 Journal of Aircraft, vol. 14, Nov. 1977, p. 1140-1148.
AUTH: A/ARDEMA, M. D.
MAJS: /*AIRSHIPS/*CIVIL AVIATION/*FEASIBILITY ANALYSIS/*NASA PROGRAMS
MINS: / AERODYNAMIC CHARACTERISTICS/ AIR CARGO/ AIRCRAFT CONFIGURATIONS/ ECONOMIC FACTORS/ MISSION PLANNING/ TECHNOLOGICAL FORECASTING
ABS: Attention is given to the NASA program, Feasibility Study of Modern Airships, initiated to investigate potential research and technology programs associated with airship development. A historical survey of the program is presented, including the development of past airship concepts, aerodynamical and design improvements, structure and material concepts, and research in controls, avionics, instrumentation, flight operations, and ground handling. A mission analysis was carried out which considered passenger and cargo transportation, heavy-lift, short-haul applications, surveillance missions, and the transportation of natural gas. A vehicle parametric analysis examined the entire range of airship concepts, discussing both conventional airships and hybrids. Various design options were evaluated, such as choice of structural materials, use of boundary-layer control, and choice of lifting gas.

78A16184
UTTL: Radiation safety in high-altitude air traffic
 Journal of Aircraft, vol. 14, Dec. 1977, p. 1226-1233.
AUTH: A/FOELSCH, T.
MAJS: /*AIR TRAFFIC/*FLIGHT HAZARDS/*HIGH ALTITUDE ENVIRONMENTS/*PASSENGER AIRCRAFT/*RADIATION HAZARDS
MINS: / CIVIL AVIATION/ COSMIC RAYS/ HEALTH PHYSICS/ PASSENGERS/ RADIATION DOSAGE/ SOLAR RADIATION/ SUPERSONIC TRANSPORTS
ABS: Results of an experimental and theoretical study on dose equivalent rates at high altitudes are presented. The flight personnel flying 500 hours per year at SST cruise altitude in high latitudes (maximum of radiation) would be exposed to less than 14% of the maximum permissible dose rate (MPD) for radiation workers (5 rem/yr), averaged over the solar cycle. One-half or more is due to energetic secondary neutrons that are penetrant and highly biologically effective. Passengers would, in general, be exposed only to the low-level galactic cosmic rays, except for a relative few who encounter rare, intense, and energetic solar-particle events. If the airplane descends to subsonic altitudes during events such as

that of Feb. 23, 1956 - the most intense and unique giant energy event of the last 35 years - passenger exposure even then remains at or below permissible levels (0.5 rem for the general population). Systems of radiation monitoring are briefly discussed which will prevent false alarms and which would be useful in disproving overexposure in potential malpractice suits against the airlines. In subsonic jet transports the exposure of the crews is lower by a factor 3 to 4; for passengers it is about the same for the same distance traveled. Solar events, except for giant energy events, will yield only a minor fraction of the MPD of the general population.

78A28218
UTTL: The year for shaping a digital operations R&D program
 Astronautics and Aeronautics, vol. 16, Mar. 1978, p. 41-46, 63.
AUTH: A/REID, H. J. E., JR.
MAJS: /*AIR TRAFFIC CONTROL/*AIRCRAFT COMMUNICATION/*CIVIL AVIATION/*DIGITAL SYSTEMS/*RESEARCH AND DEVELOPMENT
MINS: / AIR NAVIGATION/ GLOBAL POSITIONING SYSTEM/ NAVSTAR SATELLITES/ TIME DIVISION MULTIPLE ACCESS
ABS: Digital systems which deal with functions outside the aircraft in commercial aviation are discussed with attention to navigation and communication. New systems of air traffic control (ATC) are described, including time division multiple access (TDMA) to ground-based ATC units and to the Navstar/GPS (global positioning system). Such innovations are expected to come on-line before the mid-1980s, and greatly increase air safety, while at the same time making a pilot's work easier.

78A29330
UTTL: General aviation energy-conservation research programs at NASA-Lewis Research Center
 Western Michigan University, Conference on Energy Conservation in General Aviation, Kalamazoo, Mich., Oct. 10, 11, 1977, Paper, 23 p.
AUTH: A/WILLIS, E. A.
MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*FUEL CONSUMPTION/*GENERAL AVIATION AIRCRAFT/*TECHNOLOGICAL FORECASTING
MINS: / AIR POLLUTION/ AUTOMOBILE ENGINES/ COMBUSTION EFFICIENCY/ ENGINE TESTS/ POLLUTION CONTROL
ABS: A review is presented of non-turbine general aviation engine programs underway at the NASA-Lewis Research Center in Cleveland, Ohio. The program encompasses conventional, lightweight diesel and rotary engines. Its three major thrusts are, in order of priority: (1) reduced SFCs; (2) improved fuels tolerance; and (3) reducing emissions. Current and planned future programs in such areas as lean operation, improved

fuel management, advanced cooling techniques and advanced engine concepts, are described. These are expected to lay the technology base, by the mid to latter 1980s, for engines whose total fuel costs are as much as 30% lower than today's conventional engines.

78A29641

UTTL: Investigation of interior noise in a twin-engine light aircraft

Journal of Aircraft, vol. 15, Apr. 1978, p. 227-233.

AUTH: A/MIXSON, J. S.; B/BARTON, C. K.; C/VAICAITIS, R.

MAJS: /*AIRCRAFT NOISE/*AIRCRAFT STRUCTURES/*ENGINE NOISE/* LIGHT AIRCRAFT/*NOISE MEASUREMENT

MINS: / AIRCRAFT DESIGN/ AIRCRAFT ENGINES/ NOISE SPECTRA

ABS: This paper describes experimental studies of interior noise in a twin-engine, propeller-driven, light aircraft. An analytical model for this type of aircraft is also discussed. Results indicate that interior noise levels in this aircraft due to propeller noise can be reduced by reducing engine rpm at constant airspeed (about 3 dB), and by synchronizing the twin engines/propellers (perhaps up to 12 dB). Ground tests show that the exterior noise pressure imposed on the fuselage consists of a complex combination of narrow-band harmonics due to propeller and engine exhaust sources. This noise is reduced by about 20-40 dB (depending on the frequency) by transmission through the sidewall to the cabin interior. The analytical model described uses modal methods and incorporates the flat-side geometrical and skin-stringer structural features of this light aircraft.

78A30506

UTTL: Remotely piloted aircraft in the civil environment
Mechanism and Machine Theory, vol. 12, no. 5, 1977, p. 471-479.

AUTH: A/GREGORY, T. J.; B/NELMS, W. P.; C/KARMARKAR, J. S.

MAJS: /*AIRCRAFT DESIGN/*CIVIL AVIATION/*COST REDUCTION/* REMOTELY PILOTED VEHICLES/*TECHNOLOGY TRANSFER/*WEIGHT REDUCTION

MINS: / AIR TRANSPORTATION/ MATERIALS HANDLING/ MINIATURIZATION/ NASA PROGRAMS/ REMOTE CONTROL/ REMOTE SENSORS/ RESCUE OPERATIONS

ABS: Improved remotely piloted aircraft (RPAs), i.e., incorporating reductions in size, weight, and cost, are becoming available for civilian applications. Existing RPA programs are described and predicted into the future. Attention is given to the NASA Mini-Sniffer, which will fly to altitudes of more than 20,000 m, sample the atmosphere behind supersonic

cruise aircraft, and telemeter the data to ground stations. Design and operating parameters of the aircraft are given, especially the optical sensing systems, and civilian RPA uses are outlined, including airborne research, remote mapping, rescue, message relay, and transportation of need materials. Civil regulatory factors are also dealt with.

78A32396

UTTL: A spectroradiometer for airborne remote sensing
Photogrammetric Engineering and Remote Sensing, vol. 44, Apr. 1978, p. 507-517. NASA-supported research.

AUTH: A/CHIU, H.-Y.; B/COLLINS, W.

MAJS: /*AIRBORNE EQUIPMENT/*REMOTE SENSORS/* SPECTRORADIOMETERS

MINS: / DIGITAL SYSTEMS/ GEOLOGICAL SURVEYS/ HIGH RESOLUTION / HYDROLOGY/ LIGHT AIRCRAFT/ VEGETATION/ VIDICONS

ABS: A remote sensing system for use in light aircraft is discussed with attention to its applications in measuring geologic zones of alteration, vegetation canopies, and the spectral properties of water bodies. A parallel electro-optical input spectroradiometer configuration with 500 channels operating in the 400-1100 nm region is described. A resolution of 18 meters square from an altitude of 600 m at 200 kmh is obtained with 4-digit spectral radiance data at 2.5 spectra/sec on a 9-track tape in computer compatible format.

78A42721

UTTL: Interior noise studies for general aviation types of aircraft. I - Field studies. II - Laboratory studies
Journal of Sound and Vibration, vol. 58, June 8, 1978, p. 375-406.

AUTH: A/JHA, S. K.; B/CATHERINES, J. J.

MAJS: /*AIRCRAFT NOISE/*FREQUENCY ANALYZERS/*GENERAL AVIATION AIRCRAFT/*NOISE INTENSITY

MINS: / ACOUSTIC ATTENUATION/ FAR FIELDS/ FLIGHT TESTS/ FUSELAGES/ GROUND TESTS/ HARMONIC ANALYSIS/ NEAR FIELDS

ABS: Sources of the interior noise level of typical light aircraft are identified for stationary conditions on the ground and in flight. In addition, the relationship between the exterior near- and far-field noise around an aircraft and the interior noise field is examined. The sound transmission paths of a light aircraft fuselage are investigated, and the relative effectiveness of several components of the fuselage for sound attenuation is assessed. The fuselage furnishes an acoustic attenuation of about 20 dB; windows and metallic areas appear to transmit approximately equal amounts of sound energy.

78A46339

UTTL: Legal issues inherent in Space Shuttle operations
Journal of Space Law, vol. 6, Spring 1978, p. 47-76.

AUTH: A/MOSSINGHOFF, G. J.; B/SLOUP, G. P.

MAJS: /*INTERNATIONAL COOPERATION/*LEGAL LIABILITY/*NASA
PROGRAMS/*SPACE SHUTTLES/*SPACE TRANSPORTATION SYSTEM

MINS: / CIVIL AVIATION/ GOVERNMENT/INDUSTRY RELATIONS/
INTERNATIONAL RELATIONS/ OUTER SPACE TREATY

ABS: The National Aeronautics and Space Act of 1958
(NASAct) is discussed with reference to its relevance
to the operation of the Space Shuttle. The law is
interpreted as giving NASA authority to regulate
specific Shuttle missions, as well as authority to
decide how much space aboard the Shuttle gets rented
to whom. The Shuttle will not, however, be considered
a 'common carrier' either in terms of NASAct or FAA
regulations, because it will not be held available to
the public-at-large, as are the flag carriers of
various national airlines, e.g., Lufthansa, Air
France, Aeroflot, etc. It is noted that the Launch
Policy of 1972, which ensures satellite launch
assistance to other countries or international
organizations, shall not be interpreted as conferring
common carrier status on the Space Shuttle.

79A14136
UTTL: Technology for aircraft energy efficiency
 In: International Air Transportation Conference,
 Washington, D.C., April 4-6, 1977, Proceedings,
 (A79-14126 03-03) New York, American Society of Civil
 Engineers, 1977, p. 127-171.

AUTH: A/KLINEBERG, J. M.
MAJS: /*AIRCRAFT DESIGN/*CIVIL AVIATION/*COMMERCIAL AIRCRAFT
 /*ENERGY CONSERVATION/*FUEL CONSUMPTION/*NASA PROGRAMS
 /*TECHNOLOGY ASSESSMENT
MINS: / AERODYNAMIC CHARACTERISTICS/ AIRCRAFT CONSTRUCTION
 MATERIALS/ AIRCRAFT ENGINES/ AIRCRAFT STRUCTURES/
 LAMINAR FLOW/ TURBOPROP ENGINES
ABS: Six technology programs for reducing fuel use in U.S.
 commercial aviation are discussed. The six NASA
 programs are divided into three groups: Propulsion -
 engine component improvement, energy efficient engine,
 advanced turboprops; Aerodynamics - energy efficient
 transport, laminar flow control; and Structures -
 composite primary structures. Schedules, phases, and
 applications of these programs are considered, and it
 is suggested that program results will be applied to
 current transport derivatives in the early 1980s and
 to all-new aircraft of the late 1980s and early 1990s.

79A14138
UTTL: Alternate aircraft fuels prospects and operational
 implications
 In: International Air Transportation Conference,
 Washington, D.C., April 4-6, 1977, Proceedings,
 (A79-14126 03-03) New York, American Society of Civil
 Engineers, 1977, p. 197-241.

AUTH: A/WITCOFSKI, R. D.
MAJS: /*AIR TRANSPORTATION/*AIRCRAFT FUELS/*CIVIL AVIATION/*
 COMMERCIAL AIRCRAFT/*LIQUID HYDROGEN/*SYNTHETIC FUELS
MINS: / COAL GASIFICATION/ ENERGY CONSUMPTION/ ENERGY
 REQUIREMENTS/ FUEL CONSUMPTION/ HYDROCARBON FUEL
 PRODUCTION/ HYDROGEN FUELS/ HYDROGEN PRODUCTION/
 KEROSENE/ LIQUEFIED NATURAL GAS/ METHANE
ABS: The paper discusses NASA studies of the potentials of
 coal-derived aviation fuels, specifically synthetic
 aviation kerosene, liquid methane, and liquid
 hydrogen. Topics include areas of fuel production, air
 terminal requirements for aircraft fueling (for liquid
 hydrogen only), and the performance characteristics of
 aircraft designed to utilize alternate fuels. Energy
 requirements associated with the production of each of
 the three selected fuels are determined, and fuel
 prices are estimated. Subsonic commercial air
 transports using liquid hydrogen fuel have been
 analyzed, and their performance and the performance of

aircraft which use commercial aviation kerosene are
 compared. Environmental and safety issues are
 considered.

79A16123
UTTL: Free as a bird - A point of view
 (Canadian Aeronautics and Space Institute, Annual
 General Meeting, Winnipeg, Canada, May 15-17, 1978.)
 Canadian Aeronautics and Space Journal, vol. 24,
 Nov.-Dec. 1978, p. 339-346.

AUTH: A/BURKE, J. D.
MAJS: /*BALLOON FLIGHT/*GLIDING/*LIGHT AIRCRAFT/*MAN
 OPERATED PROPULSION SYSTEMS/*SOARING
MINS: / CIVIL AVIATION/ GENERAL AVIATION AIRCRAFT
ABS: A number of ways are discussed in which ingenious
 people can further increase their enjoyment of
 experimenting in air (balloons, man-powered flight,
 etc.). For the lowest cost forms of flight, private
 sponsorship has been modestly successful. Much more
 could be done if people would not take themselves so
 seriously and always demand that advanced technology
 should serve some nationalistic or economic goals. For
 the society, the next step forward will perhaps
 originate if it is demonstrated to the government,
 manufacturers, and customers that private flying has
 become too costly due to those factors which limit the
 acquisition and introduction of new knowledge.

79A30560
UTTL: The GATE studies - Assessing the potential of future
 small general aviation turbine engines
 American Society of Mechanical Engineers, Gas Turbine
 Conference and Exhibit and Solar Energy Conference,
 San Diego, Calif., Mar. 12-15, 1979, Paper, 22 p.

AUTH: A/STRACK, W. C.
MAJS: /*AIRCRAFT ENGINES/*GENERAL AVIATION AIRCRAFT/*
 PROPULSION SYSTEM CONFIGURATIONS/*TURBINE ENGINES
MINS: / JET ENGINES/ PROPULSION SYSTEM PERFORMANCE/ RESEARCH
 AND DEVELOPMENT/ TECHNOLOGICAL FORECASTING
ABS: Four studies have been completed that explore the
 opportunities for future General Aviation Turbine
 Engines (GATE) in the 150-1000 SHP class. These
 studies forecasted the potential impact of advanced
 technology turbine engines in the post-1988 market,
 identified important aircraft and missions, desirable
 engine sizes, engine performance and cost goals,
 Parametric evaluations of various engine cycles,
 configurations, design features, and advanced
 technology elements defined baseline conceptual
 engines for each of the important missions identified
 by the market analysis. Both fixed-wing and helicopter
 aircraft, and turboshaft, turboprop, and turbofan

engines were considered. Key technology areas were recommended for NASA support in order to realize proposed improvements.

79A36091

UTTL: The search and rescue satellite mission - A basis for international cooperation
In: PLANS 1978; Position Location and Navigation Symposium, San Diego, Calif., November 6-9, 1978, Record. (A79-36063 15-04) New York. Institute of Electrical and Electronics Engineers, Inc., 1978, p. 345-348.
AUTH: A/REDISCH, W. N.; B/TRUDELL, B. J.
MAJS: /*COMMUNICATION SATELLITES/*GROUND-AIR-GROUND COMMUNICATIONS/*RESCUE OPERATIONS/*SATELLITE NETWORKS
MINS: / AIRCRAFT ACCIDENTS/ SEARCHING/ SPACECRAFT COMMUNICATION/ SYSTEMS ANALYSIS
ABS: The use of geostationary and polar-orbiting satellites to monitor and locate signals of the Emergency Locator Transmitter (ELT) and Emergency Position Indicating Radio Beacon (EPIB) of general aviation aircraft and inspected marine vessels respectively is described. The joint U.S. Canada/France SRSAT demonstration program will require a minimum of four minutes of mutual visibility of distress transmitter, local user terminal and satellite to obtain a location by Doppler tracking. The program consisting of placing instrumentation on-board three of the Tiros-N series of NOAA operational satellites is attracting interest also from other countries including the USSR, Norway, Australia, and Japan.

79A38882

UTTL: Exploring team avionics systems by simulation
In: Annual Simulation Symposium, 11th, Tampa, Fla., March 15-17, 1978, Record of Proceedings. (A79-38876 16-59) Tampa, Fla., Annual Simulation Symposium; Long Beach, Calif., IEEE Computer Society, 1978, p. 155-170.
AUTH: A/BRENT, G. A.; B/MCCALLA, T. M., JR.
MAJS: /*AIRBORNE/SPACEBORNE COMPUTERS/*AVIONICS/*COMPUTERIZED DESIGN/*COMPUTERIZED SIMULATION/*MICROPROCESSORS/*PROGRAMMING LANGUAGES
MINS: / AIRCRAFT DESIGN/ ARCHITECTURE (COMPUTERS)/ COMPUTER PROGRAMS/ FLIGHT INSTRUMENTS/ HARDWARE/ IN-FLIGHT MONITORING
ABS: Configurations of software and hardware in a no-critical-element team architecture are under study for future general aviation aircraft avionics. The team integrated avionics system, based on microprocessors, can monitor and partially interpret all flight instrument data, engine parameters, and

navigation information faster than a human pilot. Simulation programs based on an event-oriented simulation language are being used to design team architectures.

79A42800

UTTL: Simulation study of the operational effects of fuel-conservative approaches
Journal of Aircraft, vol. 16, July 1979, p. 498-505.
AUTH: A/TOBIAS, L.; B/PALMER, E. A.; C/OBRIEN, P. J.
MAJS: /*AIR TRAFFIC CONTROL/*AIRLINE OPERATIONS/*ENERGY CONSERVATION/*FUEL CONSUMPTION
MINS: / AIRCRAFT LANDING/ APPROACH/ CIVIL AVIATION/ COMPUTERIZED SIMULATION/ FLIGHT PATHS/ WORKLOADS (PSYCHOPHYSIOLOGY)
ABS: Fuel-conservative procedures have been investigated using real-time air traffic control simulations linked to two piloted simulators. The fuel-conservative procedures studied were profile descents and two types of landing approaches, delayed flap and IATA. The investigation determined the effect of these procedures on the ATC system operation. It examined the mixing of aircraft executing fuel-conservative approaches with those executing conventional approaches. The most difficult approach type mix of traffic was found to be 50% conventional and 50% delayed flap. However, for the test scenario chosen, arrival rates of at least 30 aircraft per hour were feasible and resulted in a net average fuel saving, even for the most difficult mix. Also, there is a fuel savings and reduced controller workload for the profile descent procedures.

79A49344

UTTL: NASA/Princeton digital avionics flight test facility
Institute of Electrical and Electronics Engineers and American Institute of Aeronautics and Astronautics, Digital Avionics Systems Conference, 3rd, Fort Worth, Tex., Nov. 6-8, 1979, Paper, 7 p.
AUTH: A/DOWNING, D. R.; B/BRYANT, W. H.; C/STENGEL, R. F.
MAJS: /*AVIONICS/*DIGITAL SYSTEMS/*FLIGHT TESTS/*FLY BY WIRE CONTROL/*GENERAL AVIATION AIRCRAFT/*TEST FACILITIES
MINS: / AIRBORNE/SPACEBORNE COMPUTERS/ COMPUTER GRAPHICS/ DATA LINKS/ ELECTRONIC EQUIPMENT TESTS/ IN-FLIGHT MONITORING/ PRODUCT DEVELOPMENT/ RESEARCH AIRCRAFT/ TECHNOLOGY ASSESSMENT
ABS: This paper describes a general-aviation digital avionics flight-test facility being jointly developed by the Flight Dynamics Laboratory of Princeton University and NASA/Langley Research Center. This facility consists of the Princeton avionics research aircraft (ARA) and NASA/Langley's digital avionics

research (DARE) system. The ARA is a fully instrumented five-degree-of-freedom fly-by-wire aircraft. The DARE system contains a state-of-the-art flight computer system and receiving equipment that permits use of the NASA/Wallops Flight Center's position-tracking ground-based display-generation and ground-to-air digital-data-link equipment. The DARE/ARA system will be used for flight evaluation of advanced control, guidance, and display concepts developed as part of NASA/Langley Research Center's general aviation terminal area operations program.

79A51091

UTTL: Advanced crew station concepts, displays, and input/output technology for civil aircraft of the future

Institute of Electrical and Electronics Engineers and American Institute of Aeronautics and Astronautics, Digital Avionics Systems Conference, 3rd, Fort Worth, Tex., Nov. 6-8, 1979, Paper, 11 p.

AUTH: A/HATFIELD, J. J.; B/ROBERTSON, J. B.; C/BATSON, V. M.

MAJS: /*AIR TRANSPORTATION/*AIRCRAFT DESIGN/*AVIONICS/*CIVIL AVIATION/*CREW STATIONS

MINS: / AIR TRAFFIC CONTROL/ COCKPITS/ DISPLAY DEVICES/ ELECTRONIC EQUIPMENT/ INPUT/OUTPUT ROUTINES/ TECHNOLOGICAL FORECASTING

ABS: Current efforts on a new Cockpit Avionics Research program are described. The major thrusts of the program presented include: a comparative analysis of advanced display media and development of promising selected media, development of flight display generation techniques, and identification and development of promising I/O technology. In addition, the advanced integrated display concepts described include a 'tunnel in the sky' display and a traffic situation display with associated keyboard. Finally, the Cockpit Avionics Research program is summarized, future research plans are presented, and the need for an expanded program is discussed.

79A52694

UTTL: NASA/FAA general aviation crash dynamics program - An update

International Society of Air Safety Investigators, Annual Seminar, Montreal, Canada, Sept. 24-27, 1979, Paper, 12 p.

AUTH: A/HAYDUK, R. J.; B/THOMSON, R. G.; C/CARDEN, H. D.

MAJS: /*AIRCRAFT SAFETY/*CRASH LANDING/*GENERAL AVIATION AIRCRAFT/*IMPACT DAMAGE/*SEATS/*TEST FACILITIES

MINS: / AIRCRAFT COMPARTMENTS/ AIRCRAFT STRUCTURES/ COMPOSITE STRUCTURES/ COMPUTERIZED SIMULATION/ GRAPHS

(CHARTS)/ NASA PROGRAMS/ STRUCTURAL DESIGN CRITERIA
ABS: Work in progress in the NASA/FAA General Aviation Crash Dynamics Program for the development of technology for increased crash-worthiness and occupant survivability of general aviation aircraft is presented. Full-scale crash testing facilities and procedures are outlined, and a chronological summary of full-scale tests conducted and planned is presented. The Plastic and Large Deflection Analysis of Nonlinear Structures and Modified Seat Occupant Model for Light Aircraft computer programs which form part of the effort to predict nonlinear geometric and material behavior of sheet-stringer aircraft structures subjected to large deformations are described, and excellent agreement between simulations and experiments is noted. The development of structural concepts to attenuate the load transmitted to the passenger through the seats and subfloor structure is discussed, and an apparatus built to test emergency locator transmitters in a realistic environment is presented.

80A21122
UTTL: A spin-recovery parachute system for light general aviation airplanes
 NASA Langley Research Center, Aerospace Mechanisms Symposium, 14th, Hampton, Va., May 1, 2, 1980, Paper, 16 p.
AUTH: A/BRADSHAW, C. F.
MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT CONFIGURATIONS/*GENERAL AVIATION AIRCRAFT/*LIGHT AIRCRAFT/*PARACHUTES/*SPIN TESTS
MINS: / AERODYNAMIC STABILITY/ AIRCRAFT RELIABILITY/ FLIGHT TESTS/ NASA PROGRAMS
ABS: A tail-mounted spin-recovery parachute system has been designed and developed by the NASA Langley Research Center for use on light general aviation airplanes. The system was designed for use on typical airplane configurations, including low-wing, high-wing, single- and twin-engine designs. A mechanically triggered pyrotechnic slug gun is used to forcibly deploy a pilot parachute which extracts a bag that deploys a ring-slot spin-recovery parachute. The total system weighs 8.2 kg (18 lb). System design factors included airplane wake effects on parachute deployment, prevention of premature parachute deployment, positive parachute jettison, compact size, low weight, system reliability, and pilot and ground crew safety. Extensive ground tests were conducted to qualify the system. The recovery parachute has been used successfully in flight 17 times.

80A21224
UTTL: Toward new small transports for commuter airlines
 Astronautics and Aeronautics, vol. 18, Feb. 1980, p. 16-25.
AUTH: A/GIULIANETTI, D. J.; B/WILLIAMS, L. J.
MAJS: /*AIR TRANSPORTATION/*AIRLINE OPERATIONS/*ECONOMIC ANALYSIS/*LIGHT TRANSPORT AIRCRAFT/*PASSENGER AIRCRAFT
MINS: / AIR TRAFFIC CONTROL/ AIRCRAFT DESIGN/ AIRCRAFT SAFETY/ CARGO AIRCRAFT/ COST REDUCTION/ ECONOMIC FACTORS/ GENERAL AVIATION AIRCRAFT/ GROUND HANDLING/ PASSENGERS/ TECHNOLOGY ASSESSMENT
ABS: The article discusses the results of a survey of commuter airline operators and large and small airframe manufacturers conducted by the Small Transport Aircraft Technology Office of the NASA Ames Research Center. Attention is given to economic concerns of the operator and manufacturer, as well as social concerns of the passenger, community, and system. Discussion also covers research and technology opportunities for improving commuter aircraft, and provides a background of information on the commuter and short-haul local-service air carriers, regulations

pertaining to their aircraft, and operations, overall airline interfaces, and facility requirements.

80A32064
UTTL: Hybrid composites that retain graphite fibers on burning
 In: Rising to the challenge of the '80s: Annual Conference and Exhibit, 35th, New Orleans, La., February 4-8, 1980, Preprints, (ABO-32058 12-24) New York, Society of the Plastics Industry, Inc., 1980, p. 11-D 1 to 11-D 8.
AUTH: A/HOUSE, E. E.
MAJS: /*AIRCRAFT CONSTRUCTION MATERIALS/*CARBON FIBER REINFORCED PLASTICS/*FIRE PREVENTION/*GRAPHITE-EPOXY COMPOSITE MATERIALS
MINS: / AIRCRAFT HAZARDS/ CIVIL AVIATION/ ELECTRIC EQUIPMENT / REINFORCING FIBERS/ THERMAL DECOMPOSITION
ABS: A laboratory scale program was conducted to determine fiber release tendencies of graphite reinforced/resinous matrix composites currently used or projected for use in civil aircraft. In the event of an aircraft crash and burn situation, there is concern that graphite fibers will be released from the composites once the resin matrix is thermally decomposed. Hybridizing concepts aimed at preventing fiber release on burning were postulated and their effectiveness evaluated under fire, impact, and air flow during an aircraft crash.

80A34840
UTTL: Current and projected use of carbon composites in United States aircraft
 NATO, AGARD, Specialists Meeting on Electromagnetic Effects of Carbon Composite Materials upon Avionics Systems, Lisbon, Portugal, June 16-19, 1980, Paper, 31 p.
AUTH: A/LEONARD, R. W.; B/MULVILLE, D. R.
MAJS: /*AIRCRAFT CONSTRUCTION MATERIALS/*AIRCRAFT STRUCTURES /*CARBON FIBERS/*COMMERCIAL AIRCRAFT/*FIBER COMPOSITES /*WINGS
MINS: / AIRFRAME MATERIALS/ AVIONICS/ FIGHTER AIRCRAFT/ GENERAL AVIATION AIRCRAFT/ HELICOPTERS/ STRUCTURAL WEIGHT/ SYSTEMS ENGINEERING/ UNITED STATES OF AMERICA
ABS: It is noted that carbon composite materials are beginning to be used in commercial transports, general aviation aircraft, military fighter aircraft and helicopters due to demonstrated weight savings and potential manufacturing cost savings. Attention is given to current production applications of carbon composites which range from the secondary structures of new commercial transports to wing primary structures of fighters. Current development efforts

are discussed that will lead to their future application to fuselages, as well as whole airframes. Finally, laminate constructions which vary widely, and may be relevant to avionics system design, are examined.

80A40340

UTTL: Analysis of eighty-four commercial aviation incidents - Implications for a resource management approach to crew training

In: Annual Reliability and Maintainability Symposium, San Francisco, Calif., January 22-24, 1980. Proceedings. (A80-40301 16-38) New York, Institute of Electrical and Electronics Engineers, Inc., 1980, p. 298-306.

AUTH: A/MURPHY, M. R.

MAJS: /*AIRCRAFT ACCIDENT INVESTIGATION/*CIVIL AVIATION/* FLIGHT CREWS/*FLIGHT SAFETY/*PILOT PERFORMANCE/* RESOURCES MANAGEMENT

MINS: / AIR TRAFFIC CONTROL/ AIRCRAFT MANEUVERS/ AIRCRAFT SAFETY/ COMMERCIAL AIRCRAFT/ DECISION MAKING/ PILOT TRAINING/ VERBAL COMMUNICATION/ WORKLOADS (PSYCHOPHYSIOLOGY)

ABS: A resource management approach to aircrew performance is defined and utilized in structuring an analysis of 84 exemplary incidents from the NASA Aviation Safety Reporting System. The distribution of enabling and associated (evolutionary) and recovery factors between and within five analytic categories suggests that resource management training be concentrated on: (1) interpersonal communications, with air traffic control information of major concern; (2) task management, mainly setting priorities and appropriately allocating tasks under varying workload levels; and (3) planning, coordination, and decisionmaking concerned with preventing and recovering from potentially unsafe situations in certain aircraft maneuvers.

80A47656

UTTL: A review of propeller discrete frequency noise prediction technology with emphasis on two current methods for time domain calculations
Journal of Sound and Vibration, vol. 71, Aug. 8, 1980, p. 399-419.

AUTH: A/FARASSAT, F.; B/SUCCI, G. P.

MAJS: /*ACOUSTIC EMISSION/*LANGLEY COMPLEX COORDINATOR/* NOISE POLLUTION/*NOISE PREDICTION (AIRCRAFT)/*NOISE REDUCTION/*PROPELLER BLADES

MINS: / COMPUTER PROGRAMS/ FOURIER ANALYSIS/ GENERAL AVIATION AIRCRAFT/ NASA PROGRAMS/ SOUND PRESSURE/ SUPERSONIC FLIGHT

ABS: A review of propeller noise prediction technology is

presented which highlights the developments in the field from the successful attempt of Gutin to the current sophisticated techniques. Two methods for the predictions of the discrete frequency noise from conventional and advanced propellers in forward flight are described. These methods developed at MIT and NASA Langley Research Center are based on different time domain formulations. Brief description of the computer algorithms based on these formulations are given. The output of these two programs, which is the acoustic pressure signature, is Fourier analyzed to get the acoustic pressure spectrum. The main difference between the programs as they are coded now is that the Langley program can handle propellers with supersonic tip speed while the MIT program is for subsonic tip speed propellers. Comparisons of the calculated and measured acoustic data for a conventional and an advanced propeller show good agreement in general.

80A50225

UTTL: Spinning for safety's sake
SAFE Journal, vol. 10, Fall 1980, p. 28-33.

AUTH: A/STOUGH, H. P., III; B/DICARLO, D. J.; C/PATTON, J. M., JR.

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT SPIN/*GENERAL AVIATION AIRCRAFT/*SPIN DYNAMICS

MINS: / AIRCRAFT CONFIGURATIONS/ CENTER OF GRAVITY/ FLIGHT HAZARDS/ INERTIA/ NASA PROGRAMS/ RECOVERY PARACHUTES/ RESEARCH AND DEVELOPMENT

ABS: NASA Langley is currently engaged in a comprehensive research program to improve the stall/spin characteristics of general aviation airplanes. Part of this program has included systematic flight tests of a fully instrumented airplane to determine the effects of various tail, wing, and fuselage modifications, and variation of inertia, center-of-gravity, and control positions on the spin and recovery characteristics. Airplane equipment, onboard instrumentation ground equipment, test area, and test procedures have been combined to provide a safe, practical means for conducting research in preplanned hazardous conditions. Configuration changes produced spins varying from easily recoverable to unrecoverable, and wind section design significantly influenced airplane stall, spin, and recovery characteristics.

81A13413

UTTL: Midair collisions - The accidents, the systems, and the Realpolitik
Human Factors, vol. 22, Oct. 1980, p. 521-533.
NASA-supported research.

AUTH: A/WIENER, E. L.

MAJS: /*AIRCRAFT ACCIDENT INVESTIGATION/*HUMAN FACTORS
ENGINEERING/*MAN MACHINE SYSTEMS/*MIDAIR COLLISIONS

MINS: / AIRLINE OPERATIONS/ COLLISION AVOIDANCE/ GENERAL
AVIATION AIRCRAFT/ GOVERNMENT/INDUSTRY RELATIONS/
GROUND TRACKS

ABS: Two midair collisions occurring in 1978 are described, and the air traffic control system and procedures in use at the time, human factors implications and political consequences of the accidents are examined. The first collision occurred in Memphis and involved a Falcon jet and a Cessna 150 in a situation in which the controllers handling each aircraft were not aware of the presence of the other aircraft until it was too late. The second occurred in San Diego four months later, when a Boeing 727 on a visual approach struck a Cessna 172 from the rear. Following the San Diego collision there arose a great deal of investigative activity, resulting in suggestions for tighter control on visual flight rules aircraft and the expansion of positive control airspace. These issues then led to a political battle involving general aviation, the FAA and the Congress. It is argued, however, that the collisions were in fact system-induced errors resulting from an air traffic control system which emphasizes airspace allocation and politics rather than the various human factors problems facing pilots and controllers.

81A15881

UTTL: Numerical lifting line theory applied to drooped leading-edge wings below and above stall
Journal of Aircraft, vol. 17, Dec. 1980, p. 898-904.
Research supported by the Minta Martin Fund for Aeronautical Research;

AUTH: A/ANDERSON, J. D., JR.; B/CORDA, S.; C/VAN WIE, D. M.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*DROOPED AIRFOILS/*
LEADING EDGES/*LIFT/*RECTANGULAR WINGS

MINS: / AERODYNAMIC STALLING/ AIRFOIL PROFILES/ ANGLE OF
ATTACK/ ITERATIVE SOLUTION

ABS: A numerical iterative solution to the classical Prandtl lifting-line theory, suitably modified for poststall behavior, is used to study the aerodynamic characteristics of straight rectangular finite wings with and without leading-edge droop. This study is prompted by the use of such leading-edge modifications

to inhibit stall/spins in light general aviation aircraft. The results indicate that lifting-line solutions at high angle of attack can be obtained that agree with experimental data to within 20%, and much closer for many cases. Therefore, such solutions give reasonable preliminary engineering results for both drooped and undrooped wings in the poststall region. However, as predicted by von Karman, the lifting-line solutions are not unique when sectional negative lift slopes are encountered. In addition, the present numerical results always yield symmetrical lift distributions along the span, in contrast to the asymmetrical solutions observed by Schairer in the late 1930's. Finally, a series of parametric tests at low angle of attack indicate that the effect of drooped leading edges on aircraft cruise performance is minimal.

81A19471

UTTL: A status report on NASA general aviation stall/spin flight testing
Society of Experimental Test Pilots. Technical Review, vol. 15, no. 1, 1980, p. 36-49.

AUTH: A/PATTON, J. M., JR.

MAJS: /*AERODYNAMIC STALLING/*FLIGHT TESTS/*GENERAL AVIATION
AIRCRAFT/*LIGHT AIRCRAFT/*NASA PROGRAMS/*SPIN TESTS

MINS: / AIRCRAFT STABILITY/ AIRFRAMES/ LEADING EDGES/ TEST
PILOTS/ WINGS

ABS: The NASA Langley Research Center has undertaken a comprehensive program involving spin tunnel, static and rotary balance wind tunnel, full-scale wind tunnel, free flight radio control model, flight simulation, and full-scale testing. Work underway includes aerodynamic definition of various configurations at high angles of attack, testing of stall and spin prevention concepts, definition of spin and spin recovery characteristics, and development of test techniques and emergency spin recovery systems. This paper presents some interesting results to date for the first aircraft (low-wing, single-engine) in the program, in the areas of tail design, wing leading edge design, mass distribution, center of gravity location, and small airframe changes, with associated pilot observations. The design philosophy of the spin recovery parachute system is discussed in addition to test techniques.

MISCELLANEOUS ARTICLES PUBLISHED BY NASA IN STAR

Articles published by NASA in the Scientific and Technical Aerospace Reports (STAR) Journal (1975-1981).

Most articles can be obtained from the National Technical Information Service (NTIS), Springfield, VA 22151. (Refer to Accession No. when requesting publications. Availability of article is listed in STAR Journal.)



75N19205
UTTL: Design considerations for stall/spin avoidance
 In Princeton Univ. Gen. Aviation Aircraft Safety p
 59-76 (SEE N75-19199 11-03)
AUTH: A/ANDERSON, S. B.
MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT DESIGN/*FLIGHT SAFETY
 /*GENERAL AVIATION AIRCRAFT
MINS: / ACCIDENT PREVENTION/ AERODYNAMIC CHARACTERISTICS/
 AIRCRAFT PERFORMANCE/ CONTROLLABILITY
ABS: The paper discusses three aspects of the stall/spin
 problem: (1) aerodynamic effects, (2) stall warning,
 and (3) stall limiting. The results show that the
 stall/spin problem could be alleviated by good
 handling qualities up to and beyond the stall, careful
 selection of aerodynamic parameters which promote
 spin-resistance, adequate stall warning methods and
 stall margins, and an acceptable form of limiting
 elevator effectiveness near the maximum coefficient of
 lift.

75N29004
UTTL: Current and future opportunities in aeronautical
 engineering
 In NASA. Langley Res. Center NASA/Univ. Conf. on
 Aeron. p 25-60 (SEE N75-29001 20-01)
AUTH: A/BRIZENDINE, J. C.
MAJS: /*AERONAUTICAL ENGINEERING/*AIRCRAFT INDUSTRY/*
 ECONOMIC FACTORS/*EDUCATION/*PERSONNEL DEVELOPMENT/*
 SOCIAL FACTORS
MINS: / GENERAL AVIATION AIRCRAFT/ GOVERNMENT PROCUREMENT/
 INDUSTRIAL MANAGEMENT
ABS: Current demand for aeronautical engineers is
 approximately balanced with supply, with some
 shortfall in certain specialties. In the near term (5
 years), demand will exceed supply of new graduates. A
 number of factors have brought on the state of
 imbalance: (1) the cyclic nature of the demand of our
 defense requirements; (2) drastic changes in DOD
 aircraft procurement; (3) the emergence of the space
 age; (4) evolution of social attitudes toward
 technology with resultant decline in enrollments; and
 (5) the universities themselves through their
 influences in the direction of careers selected by
 engineers. These factors have been counteracted
 somewhat by increased DOD emphasis on aircraft
 development programs but more importantly by the
 favorable growth in civil aircraft requirements.

75N29007
UTTL: The next forty years in aviation
 In NASA. Langley Res. Center NASA/Univ. Conf. on
 Aeron. p 71-102 (SEE N75-29001 20-01)
AUTH: A/HAWKINS, W. M.
MAJS: /*AIR TRANSPORTATION/*AIRLINE OPERATIONS/*GENERAL
 AVIATION AIRCRAFT/*MILITARY AIRCRAFT
MINS: / ECONOMIC FACTORS/ OPERATIONS/ PREDICTIONS/ RESEARCH/
 TECHNOLOGY ASSESSMENT
ABS: A prediction of the status of various types of
 aviation activities which may be expected in twenty
 years is presented. The basic assumptions are that the
 population of the nation will continue to grow at more
 than 7 percent and that the need for air
 transportation of passengers and cargo will increase
 accordingly. Various predictions are also made for the
 developments in vertical takeoff aircraft, short haul
 airline operations, general aviation, and military
 aircraft. Areas of improvement are indicated for air
 navigation, air traffic control, night vision, quiet
 aircraft, and the use of hydrogen as a fuel.

75N29021
UTTL: General aviation's future need for research
 In NASA. Langley Res. Center NASA/Univ. Conf. on
 Aeron. p 379-380 (SEE N75-29001 20-01)
AUTH: A/HARNED, M.
MAJS: /*AERONAUTICAL ENGINEERING/*AIRCRAFT EQUIPMENT/*
 GENERAL AVIATION AIRCRAFT/*PROJECT MANAGEMENT/*
 RESEARCH PROJECTS/*UNIVERSITIES
MINS: / AIRCRAFT DESIGN/ DATA ACQUISITION/ EDUCATION/
 RESEARCH FACILITIES/ TECHNOLOGY ASSESSMENT
ABS: The research requirements for general aviation
 aircraft are presented. Emphasis is placed on
 improving the performance of airfoils, propellers, and
 engines. Additional requirements are expressed with
 respect to external noise reduction, internal noise
 reduction, and exhaust emission control. The
 requirement for anti-icing developments to create
 improved flight safety is discussed.

76N10998

UTTL: General overview of drag
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen.
Aviation Drag Reduction Workshop p 11-37 (SEE
N76-10997 02-01)

AUTH: A/ANDERSON, S. A.

MAJS: /*AIRCRAFT CONFIGURATIONS/*BODY-WING AND TAIL
CONFIGURATIONS/*DRAG REDUCTION

MINS: / AERODYNAMIC DRAG/ GENERAL AVIATION AIRCRAFT/
STRUCTURAL DESIGN CRITERIA

ABS: The state-of-the-art on aerodynamic drag reduction is
briefly reviewed. The various elements making up the
total drag of an aircraft include fuselage, wing,
nacelles, trim, interference, tail, and cooling drag.

76N10999

UTTL: Prospects and time tables for analytical estimation of
the drag of complete aircraft configuration
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen.
Aviation Drag Reduction Workshop p 39-41 (SEE
N76-10997 02-01)

AUTH: A/SMETANA, F. O.

MAJS: /*AERODYNAMIC DRAG/*AIRCRAFT CONFIGURATIONS/*
ESTIMATING

MINS: / AIRCRAFT DESIGN/ GENERAL AVIATION AIRCRAFT/
PREDICTION ANALYSIS TECHNIQUES/ WIND TUNNEL TESTS

ABS: Analytical drag methods and wind tunnel evaluation of
aircraft design features are used to identify
excessive drag of general aviation aircraft with
reciprocating engines.

76N11000

UTTL: Summary of drag clean-up tests in NASA Langley
full-scale tunnel
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen.
Aviation Drag Reduction Workshop p 43-60 (SEE
N76-10997 02-01)

AUTH: A/MCKINNEY, M. O.

MAJS: /*DRAG REDUCTION/*FIGHTER AIRCRAFT/*LIGHT AIRCRAFT/*
WIND TUNNEL TESTS

MINS: / AERODYNAMIC DRAG/ AIRCRAFT CONFIGURATIONS/ AIRCRAFT
DESIGN/ FULL SCALE TESTS/ GENERAL AVIATION AIRCRAFT

ABS: This summary of drag results presents tabulations on
fighter aircraft and light twin general aviation
aircraft wind tunnel tests. The figures show that the
friction drag for light twins is larger than that for
the fighters because of the greater wetted area and
the smaller wing area used for reference. Full scale
tunnel tests developed the following design features
contributing to excessive drag: cooling flow system,
engine exhaust stacks, landing gears, control surface

gaps, and wing irregularities and leakages.

76N11001

UTTL: Simplified theoretical methods for aerodynamic design
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen.
Aviation Drag Reduction Workshop p 61-76 (SEE
N76-10997 02-01)

AUTH: A/TULINIUS, J. R.

MAJS: /*AERODYNAMIC DRAG/*NUMERICAL ANALYSIS/*STRUCTURAL
DESIGN CRITERIA/*WING PROFILES

MINS: / FLUID DYNAMICS/ GENERAL AVIATION AIRCRAFT/
INTERFERENCE DRAG/ LIFT DRAG RATIO

ABS: The objective of this paper is to describe theoretical
procedures which can be utilized by the general
aviation industry for aerodynamic design. Discussed
are the design process and theoretical methods used to
design a wing. Then theoretical methods for estimating
the interference velocities due to fuselage, or other
bodies, and nacelles are elaborated. It is assumed
that flow fields due to different components can be
superimposed, and then the pressure coefficients
computed from the Bernoulli equation. Methods to
estimate the induced, viscous form, and compressible
drags are also discussed. In addition, a procedure for
modifying the surface contours to reduce adverse
pressure distributions induced by component
interference is detailed.

76N11002

UTTL: Drag reduction: Back to basics
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen.
Aviation Drag Reduction Workshop p 77-85 (SEE
N76-10997 02-01)

AUTH: A/NICKS, O. W.

MAJS: /*AIRCRAFT CONFIGURATIONS/*DRAG REDUCTION/*WIND TUNNEL
TESTS

MINS: / AERODYNAMIC DRAG/ AIRCRAFT DESIGN/ GENERAL AVIATION
AIRCRAFT

ABS: Aeronautical design engineering for general aviation
aircraft considers the iteration of wind tunnel test
data are lift, weight, drag, and thrust as the basic
balancing factor in drag reduction efforts.

76N11003

UTTL: Some comments on fuselage drag
In its Proc. of the NASA, Ind., Univ., Gen. Aviation
Drag Reduction Workshop p 87-102 (SEE N76-10997 02-01)

AUTH: A/ROSKAM, J.

MAJS: /*DRAG REDUCTION/*FUSELAGES/*INTERFERENCE DRAG/*
STRUCTURAL DESIGN CRITERIA

MINS: / GENERAL AVIATION AIRCRAFT/ SKIN FRICTION/ SURFACE

ROUGHNESS EFFECTS/ WINDSHIELDS

ABS: The following areas relating to fuselage drag are considered: (1) fuselage fineness - ratio and why and how this can be selected during preliminary design; (2) windshield drag; (3) skin roughness; and (4) research needs in the area of fuselage drag.

76N11004

UTTL: Propeller blockage research needs
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 103-105 (SEE N76-10997 02-01)

AUTH: A/TUMLINSON, R. R.

MAJS: /*AERODYNAMIC DRAG/*AIRCRAFT CONFIGURATIONS/* ESTIMATING/*PROPELLER SLIPSTREAMS

MINS: / AERODYNAMIC INTERFERENCE/ GENERAL AVIATION AIRCRAFT/ PROPULSIVE EFFICIENCY/ WING-FUSELAGE STORES

ABS: The effect of mutual propeller/nacelle of fuselage interference on aircraft propulsive efficiency is studied in order to determine accurate drag levels from flight test data by accurately estimating installed thrust and drag and the resulting aircraft performance.

76N11007

UTTL: The economic impact of drag in general aviation
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 125-135 (SEE N76-10997 02-01)

AUTH: A/NEAL, R. D.

MAJS: /*AERODYNAMIC DRAG/*ECONOMIC FACTORS/*GENERAL AVIATION AIRCRAFT

MINS: / COST EFFECTIVENESS/ DRAG REDUCTION/ FUEL CONSUMPTION / TURBOFAN ENGINES

ABS: General aviation aircraft fuel consumption and operating costs are closely linked to drag reduction methods. Improvements in airplane drag are envisioned for new models; their effects will be in the 5 to 10% range. Major improvements in fuel consumption over existing turbofan airplanes will be the combined results of improved aerodynamics plus additional effects from advanced turbofan engine designs.

76N11008

UTTL: Some methods for reducing wing drag and wing-Nacelle interference
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 137-156 (SEE N76-10997 02-01)

AUTH: A/KELLY, T. C.

MAJS: /*AIRFOILS/*DIFFUSERS/*DRAG REDUCTION/*STRUCTURAL

DESIGN CRITERIA/*WINGS

MINS: / AERODYNAMIC DRAG/ AIRCRAFT CONFIGURATIONS/ GENERAL AVIATION AIRCRAFT/ NACELLES

ABS: Primary efforts directed toward drag reduction centered on the design of both supercritical and subcritical families of airfoils, the reduction of induced drag through the use of vortex diffusers, and the reduction of interference drag for executive-type aircraft.

76N11009

UTTL: Drag reduction through higher wing loading
In its Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 157-169 (SEE N76-10997 02-01)

AUTH: A/KOHLMAN, D. L.

MAJS: /*DRAG REDUCTION/*LIGHT AIRCRAFT/*WING LOADING

MINS: / AERODYNAMIC DRAG/ AIRCRAFT CONFIGURATIONS/ AIRFOIL PROFILES/ GENERAL AVIATION AIRCRAFT

ABS: A reduction in wing area, thickness, and span increases wing loading and lowers parasitic drag for a typical light airplane by 10.5%.

76N11012

UTTL: Wing-tip vanes as vortex attenuation and induced drag reduction devices
In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 203-214 (SEE N76-10997 02-01)

AUTH: A/WENTZ, W. H., JR.; B/NAGATI, M. G.

MAJS: /*DRAG REDUCTION/*VANES/*VORTEX BREAKDOWN/*WING TIPS

MINS: / COMPUTERIZED DESIGN/ GENERAL AVIATION AIRCRAFT/ RECTANGULAR WINGS/ TURBINE BLADES

ABS: Analytical studies have been conducted to examine the feasibility of utilizing wing tip turbines to remove swirl from the wing trailing vortex, and hence reduce the potential for upset of following aircraft. Energy recovery from the turbines is also analyzed. A computer routine has been developed to permit rapid parametric studies of various tip turbine designs. It is shown that the optimum turbine is a non-rotating set of vanes which reduce swirl and recover energy in the form of reduced overall configuration induced drag. A specific case study indicates a 23% reduction in induced drag for a rectangular wing of aspect ratio 5.33, operated at a lift coefficient at 1.0.

76N11015
UTTL: Installation drag considerations as related to turboprop and turboprop engines
 In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 245-256 (SEE N76-10997 02-01)
AUTH: A/BURNETT, G. A.
MAJS: /*AIRCRAFT CONFIGURATIONS/*DRAG REDUCTION/*INSTALLING /*JET ENGINES
MINS: / GENERAL AVIATION AIRCRAFT/ INTERFERENCE DRAG/ PROPELLERS/ TURBOPROP ENGINES
ABS: Some of the specific areas associated with straight jet and turboprop engine installations are outlined where drag reduction and, thus, improved aircraft system performance is obtained. Specific areas constitute air intake sizing for general aviation aircraft, exhaust duct geometries and cooling system arrangements for propeller powered aircraft.

76N11017
UTTL: An exploratory investigation of the cooling drag associated with general aviation propulsive systems
 In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 263-272 (SEE N76-10997 02-01)
AUTH: A/CROSS, E. J.
MAJS: /*AIR COOLING/*AIRCRAFT ENGINES/*INTERFERENCE DRAG
MINS: / AIR FLOW/ AIRCRAFT CONFIGURATIONS/ FLIGHT TESTS/ GENERAL AVIATION AIRCRAFT
ABS: A systematic investigation of the drag associated with cooling air flow in contemporary general aviation engine installations is proposed. Theoretical and experimental methods include a state-of-the-art survey, determination of cooling drag by flight tests, and establishment of relative magnitude and components of cooling drag.

76N11019
UTTL: Some comments on trim drag
 In its Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 295-305 (SEE N76-10997 02-01)
AUTH: A/ROSKAM, J.
MAJS: /*AERODYNAMIC BALANCE/*DRAG REDUCTION/*HORIZONTAL TAIL SURFACES/*PROPELLER DRIVE
MINS: / BODY-WING AND TAIL CONFIGURATIONS/ ECONOMIC FACTORS/ GENERAL AVIATION AIRCRAFT/ NACELLES/ PREDICTION ANALYSIS TECHNIQUES
ABS: A discussion of data of and methods for predicting trim drag is presented. Specifically the following subjects are discussed: (1) economic impact of trim drag; (2) the trim drag problem in propeller driven

airplanes and the effect of propeller and nacelle location; (3) theoretical procedures for predicting trim drag; and (4) research needs in the area of trim drag.

76N11028
UTTL: Possible applications of soaring technology to drag reduction in powered general aviation aircraft
 In Kansas Univ. Proc. of the NASA, Ind., Univ., Gen. Aviation Drag Reduction Workshop p 409-430 (SEE N76-10997 02-01)
AUTH: A/MCMASTERS, J. H.; B/PALMER, G. M.
MAJS: /*AIRCRAFT DESIGN/*DRAG REDUCTION/*GENERAL AVIATION AIRCRAFT/*GLIDERS/*TECHNOLOGY TRANSFER
MINS: / AERODYNAMIC COEFFICIENTS/ AERODYNAMIC STABILITY/ LIFT DRAG RATIO
ABS: A brief examination of the performance figures achieved by modern soaring machines and a little reflection on the often huge disparity in L/D values between sailplanes and GA aircraft indicates that careful attention to lessons learned in sailplane design and manufacture hold realistic promise for substantial gains in the aerodynamic efficiency of several GA types.

76N11995
UTTL: General aviation components
 In its Gen. Aviation and Community Develop. p 3-16 (SEE N76-11994 03-01)
MAJS: /*AIRCRAFT PARTS/*AIRCRAFT PERFORMANCE/*GENERAL AVIATION AIRCRAFT
MINS: / AIRCRAFT CONFIGURATIONS/ AIRCRAFT DESIGN/ SHORT TAKEOFF AIRCRAFT
ABS: An overview is presented of selected aviation vehicles. The capabilities and performance of these vehicles are first presented, followed by a discussion of the aerodynamics, structures and materials, propulsion systems, noise, and configurations of fixed-wing aircraft. Finally the discussion focuses on the history, status, and future of attempts to provide vehicles capable of short-field operations.

76N11998
UTTL: Airways and avionics
 In its Gen. Aviation and Community Develop. p 36-47 (SEE N76-11994 03-01)
MAJS: /*AIR TRAFFIC CONTROL/*NAVIGATION AIDS
MINS: / FLIGHT PATHS/ GENERAL AVIATION AIRCRAFT/ NATIONAL AVIATION SYSTEM/ RADIO NAVIGATION/ TERMINAL GUIDANCE
ABS: Terminal and enroute traffic control are summarized along with visual and radio navigation aids.

76N11999
UTTL: Human factors in general aviation
 In its Gen. Aviation and Community Develop. p 48-55
 (SEE N76-11994 03-01)
MAJS: /*GENERAL AVIATION AIRCRAFT/*HUMAN FACTORS ENGINEERING
 /*MAN MACHINE SYSTEMS
MINS: / AIRCRAFT ACCIDENTS/ AIRCRAFT DESIGN/ DISPLAY DEVICES
 / PILOT SELECTION
ABS: The relation of the pilot to the aircraft in general
 aviation is considered. The human component is
 analyzed, along with general aviation facilities. The
 man-machine interface, and the man-environment
 interface are discussed.

76N12000
UTTL: General aviation environment
 In its Gen. Aviation and Community Develop. p 59-80
 (SEE N76-11994 03-01)
MAJS: /*GENERAL AVIATION AIRCRAFT/*REGULATIONS
MINS: / AIRCRAFT RELIABILITY/ EARTH RESOURCES/ ECONOMIC
 FACTORS/ ENVIRONMENT PROTECTION
ABS: The background, development, and relationship, among
 economic factors, airworthiness, costs, and
 environment protection are examined. Government
 regulations for airports, air agencies, aircraft, and
 airmen are reviewed.

76N12001
UTTL: Physical environment
 In its Gen. Aviation and Community Develop. p 81-87
 (SEE N76-11994 03-01)
MAJS: /*AIRPORT PLANNING/*ENVIRONMENT PROTECTION/*GENERAL
 AVIATION AIRCRAFT
MINS: / AIR POLLUTION/ EARTH RESOURCES/ NOISE POLLUTION/
 REGULATIONS/ WASTE DISPOSAL/ WATER QUALITY
ABS: Environmental legislation affecting airports and the
 more common environmental effects resulting from
 airport construction are discussed with special
 emphasis on general aviation airports. The discussion
 is focused on the regulation of noise, pollution, and
 water quality.

76N12002
UTTL: Alternative modes and travel substitutes
 In its Gen. Aviation and Community Develop. p 88-104
 (SEE N76-11994 03-01)
MAJS: /*GENERAL AVIATION AIRCRAFT/*URBAN TRANSPORTATION
MINS: / AIR TRANSPORTATION/ COSTS/ HIGHWAYS/ RAIL
 TRANSPORTATION/ TECHNOLOGY ASSESSMENT/
 TELECOMMUNICATION
ABS: Modes alternative to general aviation and the

substitutability of telecommunications technology in
 lieu of intercity travel are reviewed.

76N12003
UTTL: Community perspectives
 In its Gen. Aviation and Community Develop. p 109-138
 (SEE N76-11994 03-01)
MAJS: /*DECISION MAKING/*GENERAL AVIATION AIRCRAFT/*URBAN
 PLANNING
MINS: / AIR TRANSPORTATION/ ECONOMIC FACTORS/ URBAN
 TRANSPORTATION
ABS: General aviation is considered from the perspective of
 the local community's decision-making process in
 determining its needs for access to general aviation
 services. The decision-making model, preliminary
 decision, community characteristics, and planning
 processes are discussed.

76N12004
UTTL: Developing the plan
 In its Gen. Aviation and Community Develop. p 139-149
 (SEE N76-11994 03-01)
MAJS: /*AIR TRANSPORTATION/*GENERAL AVIATION AIRCRAFT/*URBAN
 PLANNING
MINS: / AIRPORT PLANNING/ COSTS/ ECONOMIC FACTORS/
 MANAGEMENT PLANNING/ SOCIOLOGY/ URBAN TRANSPORTATION
ABS: The basic sequence in the planning development process
 is discussed. Alternative ways of satisfying estimated
 needs, and the selection of an alternative are
 described along with the development of a plan to
 implement the selected alternative.

76N12005
UTTL: Transportation and general aviation in Virginia
 In its Gen. Aviation and Community Develop. p 153-196
 (SEE N76-11994 03-01)
MAJS: /*GENERAL AVIATION AIRCRAFT/*TRANSPORTATION/*VIRGINIA
MINS: / AIR TRANSPORTATION/ HIGHWAYS/ RAIL TRANSPORTATION/
 URBAN TRANSPORTATION
ABS: The diversity of Virginia is examined with respect to
 its transportation facilities and services, the
 Virginia Air Transportation System Plan, regionalism,
 and selected case studies of individual facilities.

76N15052
UTTL: A semibuoyant vehicle for general transportation
 missions
 In MIT Proc. of the Interagency Workshop on Lighter
 than Air Vehicles p 431-439 (SEE N76-15015 06-01)
AUTH: A/HAVILL, C. D.; B/HARPER, M.

MAJS: /*AIRSHIPS/*CIVIL AVIATION/*TECHNOLOGY ASSESSMENT
MINS: / COST ESTIMATES/ FUEL CONSUMPTION/ PAYLOADS/ WEIGHT
ANALYSIS

ABS: The concept of a small, semibuoyant, lifting-body airship with either a disposable or nondisposable buoyant fluid is discussed. Estimations of fuel consumption, payload capability, power requirements and productivity are made and compared to other flight systems. Comparisons are made on the basis of equal cost vehicles. The assumption is made that, to a first-order approximation, the costs of developing, procuring, and operating a commercial air transport vehicle are proportional to vehicle empty weight. It must be noted that no historical cost data exist for the lifting-body airship and therefore these comparisons must be considered preliminary.

76N31157

UTTL: Some system considerations in configuring a digital flight control - navigation system
In NASA. Dryden Flight Res. Center Advanced Control Technol. and its Potential for Future Transport Aircraft p 3-35 (SEE N76-31135 22-01)

AUTH: A/BOONE, J. H.; B/FLYNN, G. R.

MAJS: /*AUTOMATIC FLIGHT CONTROL/*COMPUTER TECHNIQUES/*
DIGITAL TECHNIQUES

MINS: / ANALOG COMPUTERS/ AUTOMATIC PILOTS/ CIVIL AVIATION/
NAVIGATION/ RISK

ABS: A trade study was conducted with the objective of providing a technical guideline for selection of the most appropriate computer technology for the automatic flight control system of a civil subsonic jet transport. The trade study considers aspects of using either an analog, incremental type special purpose computer or a general purpose computer to perform critical autopilot computation functions. It also considers aspects of integration of noncritical autopilot and autothrottle modes into the computer performing the critical auto and functions, as compared to the federation of the noncritical modes into either a separate computer or with a R-Nav computer. The study is accomplished by establishing the relative advantages and/or risks associated with each of the computer configurations.

77N17083
UTTL: Application of automobile emission control technology to light piston aircraft engines
 In NASA. Lewis Res. Center Aircraft Piston Eng. Exhaust Emissions Symp. p 23-44 (SEE N77-17081 08-07)
AUTH: A/TRIPP, D.; B/KITTREDGE, G.
MAJS: /*AUTOMOBILE ENGINES/*HYDROCARBON COMBUSTION/*LIGHT AIRCRAFT/*PISTON ENGINES
MINS: / AIRCRAFT ENGINES/ FUEL CONTROL/ FUEL-AIR RATIO/ TECHNOLOGY UTILIZATION
ABS: The possibility was evaluated for achieving the EPA Standards for HC and CO emissions through the use of air-fuel ratio enleanment at selected power modes combined with improved air-fuel mixture preparation, and in some cases improved cooling. Air injection was also an effective approach for the reduction of HC and CO, particularly when combined with exhaust heat conservation techniques such as exhaust port liners.

77N17086
UTTL: Summary report on effects at temperature, humidity, and fuel-air ratio on two air-cooled light aircraft engines
 In its Aircraft Piston Eng. Exhaust Emissions Symp. p 85-120 (SEE N77-17081 08-07)
AUTH: A/KEMPKE, E. E., JR.
MAJS: /*AIRCRAFT ENGINES/*FUEL-AIR RATIO/*LIGHT AIRCRAFT/*TEMPERATURE EFFECTS
MINS: / AIR COOLING/ GRAPHS (CHARTS)/ HUMIDITY MEASUREMENT/ PISTON ENGINES
ABS: Five different engine models were tested to experimentally characterize emissions and to determine the effects of variation in fuel-air ratio and spark timing on emissions levels and other operating characteristics such as cooling, misfiring, roughness, power acceleration, etc. The results are given of two NASA reports covering the Avco Lycoming O-320-D engine testing and the recently obtained results on the Teledyne Continental TS10-360-C engine.

77N17098
UTTL: Summary of the general aviation manufacturers' position on aircraft piston engine emissions
 In NASA. Lewis Res. Center Aircraft Piston Eng. Exhaust Emissions Symp. p 329-336 (SEE N77-17081 08-07)
AUTH: A/HELMS, J. L.
MAJS: /*AIRCRAFT ENGINES/*CONFERENCES/*EXHAUST GASES/*MANUFACTURING/*PISTON ENGINES
MINS: / AERONAUTICS/ FUEL CONSUMPTION/ GOVERNMENT/INDUSTRY RELATIONS/ NOISE REDUCTION

ABS: The General Aviation Manufacturers recommended that the EPA rescind the aircraft piston engine emissions regulations currently on the books. The reason was the very small emission reduction potential and the very poor benefit-cost ratio involved in this form of emission reduction. The limited resources of this industry can far better be devoted to items of much greater benefit to the citizens of this country - reducing noise, improving fuel efficiency (which will incidently reduce exhaust emissions), and improving the safety, operational, and economic aspects of aircraft, all far greater contributions to our total national transportation system.

77N18087
UTTL: General aviation approach and landing practices
 In its Aircraft Safety and Operating Problems p 91-120 (SEE N77-18081 09-03)
AUTH: A/PARKER, L. C.; B/GOODE, M. W.
MAJS: /*AIR TRAFFIC/*AIRCRAFT LANDING/*AIRPORTS/*GENERAL AVIATION AIRCRAFT/*LIGHT AIRCRAFT/*PILOT PERFORMANCE
MINS: / AIRCRAFT SAFETY/ FLIGHT CHARACTERISTICS/ FLIGHT SAFETY/ MIDAIR COLLISIONS
ABS: The characteristics of air traffic patterns at uncontrolled airports and techniques used by a group of general aviation pilots in landing light airplanes are documented. The results of some 1,600 radar tracks taken at four uncontrolled airports and some 600 landings made by 22 pilots in two, four place, single engine light airplanes show that the uncontrolled traffic pattern is highly variable. The altitudes, distances, and piloting procedures utilized may affect the ability for pilots to see-and-avoid in this environment. Most landing approaches were conducted at an airspeed above recommended, resulting in significant floating during flare and touchdowns that were relatively flat and often nose-low.

77N18101
UTTL: General aviation crash safety program at Langley Research Center
 In its Aircraft Safety and Operating Problems p 369-390 (SEE N77-18081 09-03)
AUTH: A/THOMSON, R. G.
MAJS: /*AIRCRAFT SAFETY/*CRASH LANDING/*NASA PROGRAMS/*SAFETY MANAGEMENT
MINS: / COMPUTER PROGRAMS/ ENERGY ABSORPTION/ FAILURE MODES/ RESEARCH AND DEVELOPMENT/ STRUCTURAL ANALYSIS
ABS: The purpose of the crash safety program is to support development of the technology to define and demonstrate new structural concepts for improved crash safety and occupant survivability in general aviation

aircraft. The program involves three basic areas of research: full-scale crash simulation testing, nonlinear structural analyses necessary to predict failure modes and collapse mechanisms of the vehicle, and evaluation of energy absorption concepts for specific component design. Both analytical and experimental methods are being used to develop expertise in these areas. Analyses include both simplified procedures for estimating energy absorption capabilities and more complex computer programs for analysis of general airframe response. Full-scale tests of typical structures as well as tests on structural components are being used to verify the analyses and to demonstrate improved design concepts.

77N18109

UTTL: Effects of aircraft noise on flight and ground structures

In Its Aircraft Safety and Operating Problems p 513-526 (SEE N77-18081 09-03)

AUTH: A/MIXSON, J. S.; B/MAYES, W. H.; C/WILLIS, C. M.

MAJS: /*AIRCRAFT NOISE/*NASA PROGRAMS/*SHOCK WAVES/*SOUND PRESSURE

MINS: / AIRCRAFT CONFIGURATIONS/ DYNAMIC RESPONSE/ EXTERNALLY BLOWN FLAPS/ LIGHT AIRCRAFT/ NOISE POLLUTION/ STRUCTURAL VIBRATION

ABS: Acoustic loads measured on jet-powered STOL configurations are presented for externally blown and upper surface blown flap models ranging in size from a small laboratory model up to a full-scale aircraft model. The implications of the measured loads for potential acoustic fatigue and cabin noise are discussed. Noise transmission characteristics of light aircraft structures are presented. The relative importance of noise transmission paths, such as fuselage sidewall and primary structure, is estimated. Acceleration responses of a historic building and a residential home are presented for flyover noise from subsonic and supersonic aircraft. Possible effects on occupant comfort are assessed. The results from these three examples show that aircraft noise can induce structural responses that are large enough to require consideration in the design or operation of the aircraft.

77N29772

UTTL: Remotely piloted aircraft in the civil environment
In JPL The 2nd Conf. on Remotely Manned Systems (RMS)
p 47-48 (SEE N77-29750 20-54)

AUTH: A/GREGORY, T. J.; B/NELMS, W. P., JR.; C/KARMAKAR, J.

MAJS: /*AERIAL RECONNAISSANCE/*CIVIL AVIATION/*PILOTLESS

AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION

MINS: / AIR TRANSPORTATION/ MAPPING/ MONITORS/ REMOTE SENSORS/ RESCUE OPERATIONS/ TELECOMMUNICATION

ABS: Existing remotely piloted vehicle application programs are described along with the technology of several important subsystems and the potential vehicle uses and operational concepts. Regulatory constraints and present and future study activities that may lead to demonstration and then operational programs, are discussed.

78N11073
UTTL: General aviation piston-engine exhaust emission reduction
 In its Aircraft Eng. Emissions p 243-275 (SEE N78-11063 02-07)
AUTH: A/KEMPKE, E. E., JR.; B/HOUTMAN, W. H.; C/WESTFIELD, W. T.; D/DUKE, L. C.; E/REZY, B. J.
MAJS: /*AIR POLLUTION/*AIRCRAFT ENGINES/*EXHAUST GASES/*GENERAL AVIATION AIRCRAFT/*PISTON ENGINES/*POLLUTION CONTROL
MINS: / AIR POLLUTION/ AIR QUALITY/ STANDARDS/ SYSTEMS ENGINEERING
ABS: To support the promulgation of aircraft regulations, two airports were examined, Van Nuys and Tamiami. It was determined that the carbon monoxide (CO) emissions from piston-engine aircraft have a significant influence on the CO levels in the ambient air in and around airports, where workers and travelers would be exposed. Emissions standards were set up for control of emissions from aircraft piston engines manufactured after December 31, 1979. The standards selected were based on a technologically feasible and economically reasonable control of carbon monoxide. It was concluded that substantial CO reductions could be realized if the range of typical fuel-air ratios could be narrowed. Thus, improvements in fuel management were determined as reasonable controls.

78N12137
UTTL: Legal Issues inherent in space shuttle operations
 In Comm. on Sci. and Technol. (U. S. Senate) Space Transportation System p 611-637 (SEE N78-12127 03-16)
MAJS: /*LAW (JURISPRUDENCE)/*NASA PROGRAMS/*SPACE SHUTTLES/*SPACE TRANSPORTATION
MINS: / CIVIL AVIATION/ COMMERCIAL AIRCRAFT/ GOVERNMENT/INDUSTRY RELATIONS/ PROJECT MANAGEMENT/ PUBLIC LAW
ABS: The legal issues inherent in NASA's proceeding into the day-to-day operations of the space shuttle and other elements of the Space Transportation System are considered in light of the National Aeronautics and Space Act of 1958. Based on this review, it was concluded that there is no immediate need for substantive amendments to that legislation.

78N19727
UTTL: Summary report of the General Aviation Committee
 In Tennessee Univ. Space Inst. Proc. of the 1st Ann. Meteorol. and Environ. Inputs to Aviation Systems Workshops p 304-308 (SEE N78-19711 10-47)
AUTH: A/GOODRICH, W. C.

MAJS: /*CIVIL AVIATION/*GENERAL AVIATION AIRCRAFT/*SUMMARIES
MINS: / AIRCRAFT ACCIDENTS/ AIRPORTS/ METEOROLOGICAL SERVICES/ METEOROLOGY/ PILOT TRAINING/ WEATHER FORECASTING/ WIND SHEAR
ABS: Fatal weather involved general aviation accidents and the criteria for weather observations at general aviation airports were discussed. It was generally agreed that: (1) meteorologists do not seem to have sufficient understanding of general aviation requirements, (2) pilots are not aware of the meteorological services and publications which are available to them; (3) Uniform capability is not being utilized to the degree possible; and (4) there is a wealth of weather data available within the Department of Defense which is not available in the system for civil use. The committee recommends that student pilot training programs include actual inflight weather experience accomplished through instructor training, and efforts be made to make real time weather data available to the pilot from all sources to include military installations, Unicom operators, tower and approach controllers, and air traffic controllers.

78N19728
UTTL: Summary report of Committee A
 In Tennessee Univ. Space Inst. Proc. of the 1st Ann. Meteorol. and Environ. Inputs to Aviation Systems Workshop p 309-313 (SEE N78-19711 10-47)
AUTH: A/SPRINKLE, C. H.
MAJS: /*AIRCRAFT DESIGN/*ATMOSPHERIC MODELS/*CIVIL AVIATION /*METEOROLOGICAL SERVICES
MINS: / ATMOSPHERIC TURBULENCE/ HUMIDITY/ METEOROLOGY/ SUMMARIES/ WEATHER FORECASTING/ WIND SHEAR
ABS: Sessions were held with the standing committees on aircraft design, simulation, general services, and general aviation. It was stated that current procedures for designing structural components with respect to turbulence forcing functions were adequate. It was agreed that the ultimate goal of aviation weather services was the delivery of accurate and timely information to the cockpit flight crew.

78N19729
UTTL: Summary report of Committee B
 In Tennessee Univ. Space Inst. Proc. of the 1st Ann. Meteorol. and Environ. Inputs to Aviation Systems Workshop p 314-320 (SEE N78-19711 10-47)
AUTH: A/LENSCHOW, D. H.
MAJS: /*AIRCRAFT DESIGN/*ATMOSPHERIC MODELS/*CIVIL AVIATION /*METEOROLOGICAL SERVICES
MINS: / LANDING/ LIGHTNING/ PILOT TRAINING/ STRUCTURAL DESIGN/ WEATHER FORECASTING/ WIND SHEAR

ABS: Topics discussed in this summary include: (1) general aviation and services; (2) aircraft design; and (3) simulation. It was concluded that private pilots need to be more knowledgeable about weather. Improvement is needed in providing general aviation pilots with changes in the weather reporting and forecasting systems. There should also be some simulation of various severe shear profiles in training simulators, although there is still a problem in simulating shear conditions using mathematical models and data.

79N15064

UTTL: New NASA-Ames wind-tunnel techniques for studying airplane spin and two-dimensional unsteady aerodynamics
In AGARD Dyn. Stability Parameters 12 p (SEE N79-15061 06-08)

AUTH: A/MALCOLM, G. N.; B/DAVIS, S. S.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*COMMERCIAL AIRCRAFT/*FIGHTER AIRCRAFT/*WIND TUNNEL TESTS

MINS: / AERODYNAMICS/ ANGLE OF ATTACK/ DATA ACQUISITION/ MEASURING INSTRUMENTS/ REYNOLDS NUMBER/ SPIN TESTS/ UNSTEADY FLOW/ WIND TUNNEL MODELS

ABS: Two new wind tunnel test apparatuses were developed at NASA-Ames Research Center. The first is a rotary-balance apparatus to be used in the Ames 12-Foot Pressure Tunnel for investigating the effects of Reynolds number, spin rate, and angle of attack on the aerodynamics of fighter and general aviation aircraft in a steady spin motion. The second apparatus provides capability for oscillating a large two dimensional wing (0.5 m chord, 1.35 m span) instrumented with steady and unsteady pressure transducers in the Ames 11 x 11 ft. Transonic Wind Tunnel. A complete description of both apparatuses, their capabilities, and some typical wind tunnel results are presented.

79N15962

UTTL: Overview of NASA general aviation program
In NASA. Lewis Res. Center The Rotary Combust. Engine p 1-11 (SEE N79-15961 07-07)

AUTH: A/WINBLADE, R. L.

MAJS: /*AIRCRAFT ENGINES/*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS/*PROJECT PLANNING/*RESEARCH MANAGEMENT

MINS: / AIRCRAFT PERFORMANCE/ AIRCRAFT RELIABILITY/ ENVIRONMENT EFFECTS/ FLIGHT SAFETY

ABS: The NASA efforts devoted to new technology for general aviation are summarized. Areas covered include: (1) improved safety through improved crashworthy structural design, spin resistance, and improved operations around uncontrolled airports; (2) reduced environmental impact for both reciprocating and turbine engines; and (3) research for improvement in the performance of both aerodynamic and system components.

79N15963

UTTL: General aviation energy-conservation research programs
In its The Rotary Combust. Engine p 13-35 (SEE N79-15961 07-07)

AUTH: A/WILLIS, E. A.

MAJS: /*AIRCRAFT ENGINES/*ENERGY CONSERVATION/*GENERAL AVIATION AIRCRAFT/*NASA PROGRAMS/*RESEARCH MANAGEMENT

MINS: / AIRCRAFT FUELS/ COMBUSTION EFFICIENCY/ DIESEL ENGINES/ ENGINE DESIGN/ EXHAUST GASES/ FUEL CONSUMPTION/ MECHANICAL DRIVES/ POLLUTION CONTROL

ABS: A review is presented of nonturbine general aviation engine programs underway at the NASA-Lewis Research Center. The program encompasses conventional, lightweight diesel, and rotary engines. Its three major thrusts are: (1) reduced SFC's; (2) improved fuels tolerance; and (3) reducing emissions. Current and planned future programs in such areas as lean operation, improved fuel management, advanced cooling techniques, and advanced engine concepts, are described. These are expected to lay the technology base, by the mid to latter 1980's, for engines whose total fuel costs are as much as 30% lower than today's conventional engines.

79N15964

UTTL: Development status of rotary engine at Toyo Kogyo
In NASA. Lewis Res. Center The Rotary Combust. Engine p 37-84 (SEE N79-15961 07-07)

AUTH: A/YAMAMOTO, K.

MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*GENERAL AVIATION AIRCRAFT/*MECHANICAL DRIVES

MINS: / COMBUSTION EFFICIENCY/ EXHAUST GASES/ FUEL CONSUMPTION/ JAPAN/ POLLUTION CONTROL

ABS: Progress in the development of rotary engines which use a thermal reactor as the primary part of the exhaust emission control system is reviewed. Possibilities of further improvements in fuel economy of future rotary engines are indicated.

79N15965

UTTL: Update of development on the new Audi NSU rotary engine generation
In NASA. Lewis Res. Center The Rotary Combust. Engine 85-107 (SEE N79-15961 07-07)

AUTH: A/VANBASSHUYSEN, R.

MAJS: /*AIRCRAFT ENGINES/*AUTOMOBILE ENGINES/*ENGINE DESIGN /*GENERAL AVIATION AIRCRAFT/*MECHANICAL DRIVES

MINS: / COMBUSTION EFFICIENCY/ EXHAUST GASES/ FUEL CONSUMPTION/ POLLUTION CONTROL/ TECHNOLOGY TRANSFER

ABS: Rotary engines with a chamber volume of 750 cc as a two rotor automotive powerplant, called KKM 871 are described. This engine is compared to a 3 liter or 183

cubic inch, six-cylinder reciprocating engine. Emphasis is placed on exhaust emission control and fuel economy.

79N15966

UTTL: Review of the Rhein-Flugzeugbau Wankel powered aircraft program
In NASA. Lewis Res. Center The Rotary Combust. Engine p 109-122 (SEE N79-15961 07-07)

AUTH: A/RIETHMUELLER, M.

MAJS: /*AIRCRAFT ENGINES/*DUCTED FAN ENGINES/*ENGINE DESIGN
/*GENERAL AVIATION AIRCRAFT/*MECHANICAL DRIVES

MINS: / AUTOMOBILE ENGINES/ EXHAUST GASES/ FUEL CONSUMPTION/
LIGHT AIRCRAFT/ POLLUTION CONTROL/ TECHNOLOGY TRANSFER

ABS: The development of light aircraft with special emphasis on modern propulsion systems and production is discussed in terms of the application of rotary engines to aircraft. Emphasis is placed on the integrated ducted-fan propulsion system using rotary engines.

79N15967

UTTL: Rotary engine developments at Curtiss-Wright over the past 20 years and review of general aviation engine potential

In NASA. Lewis Res. Center The Rotary Combust. Engine p 123-174 (SEE N79-15961 07-07)

AUTH: A/JONES, C.

MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*FUEL INJECTION/*
GENERAL AVIATION AIRCRAFT/*MECHANICAL DRIVES

MINS: / AUTOMOBILE ENGINES/ ENERGY CONSERVATION/ EXHAUST
GASES/ FUEL CONSUMPTION/ NOISE REDUCTION/ POLLUTION
CONTROL/ TECHNOLOGY TRANSFER

ABS: The development of the rotary engine as a viable power plant capable of wide application is reviewed. Research results on the stratified charge engine with direct chamber injection are included. Emission control, reduced fuel consumption, and low noise level are among the factors discussed in terms of using the rotary engine in general aviation aircraft.

79N15968

UTTL: Engine requirements for future general aviation aircraft

In NASA. Lewis Res. Center The Rotary Combust. Engine p 175-186 (SEE N79-15961 07-07)

AUTH: A/STICKLE, J. W.

MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*GENERAL AVIATION
AIRCRAFT/*MARKET RESEARCH/*MECHANICAL DRIVES

MINS: / AUTOMOBILE ENGINES/ ENERGY CONSERVATION/ POLLUTION
CONTROL/ TECHNOLOGICAL FORECASTING/ TECHNOLOGY

TRANSFER

ABS: The market place is examined for general aviation aircraft into the 1980's. The visible constraints that engine manufacturers must face regardless of the type of cycle are indicated.

79N17427

UTTL: Summary report of the Lightning and Static Electricity Committee

In Tenn. Univ. Space Inst. Proc. of the 2nd Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems p 203-214 (SEE N79-17413 08-47)

AUTH: A/PLUMER, J. A.

MAJS: /*AERONAUTICS/*ATMOSPHERIC ELECTRICITY/*LIGHTNING/*
STATIC ELECTRICITY

MINS: / AIRCRAFT DETECTION/ DATA SYSTEMS/ ENVIRONMENT
PROTECTION/ GENERAL AVIATION AIRCRAFT/ IMPACT DAMAGE/
INDEPENDENT VARIABLES/ PILOT TRAINING/ PREDICTIONS/
TECHNOLOGY ASSESSMENT

ABS: Lightning protection technology as applied to aviation and identifying these technology needs are presented. The flight areas of technical needs include: (1) the need for In-Flight data on lightning electrical parameters; (2) technology base and guidelines for protection of advanced systems and structures; (3) improved laboratory test techniques; (4) analysis techniques for predicting induced effects; (5) lightning strike incident data from General Aviation; (6) lightning detection systems; (7) obtain pilot reports of lightning strikes; and (8) better training in lightning awareness. The nature of each problem, timeliness, impact of solutions, degree of effort required, and the roles of government and industry in achieving solutions are discussed.

79N18075

UTTL: An assessment of the risks presented by the use of carbon fiber composites in commercial aviation:

Executive summary

In its An Assessment of the Risks Presented by the Use of Carbon Fiber Composites in Com. Aviation p 1-24 (SEE N79-18074 09-31)

MAJS: /*AIRCRAFT STRUCTURES/*CARBON FIBERS/*COMMERCIAL
AIRCRAFT/*COMPOSITE MATERIALS/*RISK

MINS: / AIRCRAFT ACCIDENTS/ CIVIL AVIATION/ DISPERSING/
PROBABILITY THEORY/ PROJECT PLANNING/ RELIABILITY
ANALYSIS/ TABLES (DATA)

ABS: To support the investigation, experimental data from a number of different sources were used, including tests of carbon fibers (CF) release from burning composites and vulnerability tests for selected equipment. Field survey were conducted in the vicinity of several

major airports in order to characterize the types of facilities that might be exposed to CF releases. Census data were employed to enumerate the number of residential and commercial establishments in the vicinity of the 26 large hub airports. These data formed part of the input to a risk simulation model which produced a conditional risk profile, showing the probability of different amounts of loss given that an accidental release of CF has occurred. A national risk profile was developed, which estimates the annual losses due to CF usage in commercial aircraft based upon the anticipated usage in 1993.

79N20001

UTTL: Flight test techniques for low speed airfoil evaluation
In NASA. Langley Res. Center Advanced Technol. Airfoil Res., Vol. 1, Pt. 2 p 623-642 (SEE N79-19989 11-01)

AUTH: A/HOFFMANN, M. J.; B/GREGOREK, G. M.; C/WEISLOGEL, G. S.

MAJS: /*AIRFOILS/*FLIGHT TESTS/*LOW SPEED

MINS: / AIRCRAFT WAKES/ ANGLE OF ATTACK/ DATA REDUCTION/ IN-FLIGHT MONITORING/ INSTRUMENTS/ PRESSURE MEASUREMENTS

ABS: Techniques for in-flight evaluation of new airfoils by modifying a single engine general aviation aircraft and measuring and recording airfoil surface pressures, airfoil wake pressures, and aircraft angle of attack and airspeed are presented. Included are descriptions of the aircraft modifications, instrumentation, data reduction techniques, illustrations of typical results and comments on new equipment for flight test applications.

79N22199

UTTL: Carbon fibers and composites
In its Carbon Fiber Risk Anal. p 29-40 (SEE N79-22196 13-24)

AUTH: A/PRIDE, R. A.

MAJS: /*CARBON FIBERS/*GRAPHITE-EPOXY COMPOSITE MATERIALS/* RISK

MINS: / AIRCRAFT CONSTRUCTION MATERIALS/ AIRCRAFT STRUCTURES / CIVIL AVIATION/ HAZARDS/ WEIGHT (MASS)

ABS: The basic nature of composite materials is considered. Carbon fiber composites and their area of current and planned application in civil aircraft are discussed, specifically within the framework of the various aspects of risk analysis.

79N22200

UTTL: Source of released carbon fibers
In its Carbon Fiber Risk Anal. p 41-71 (SEE N79-22196 13-24)

AUTH: A/BELL, V. L.

MAJS: /*AIRCRAFT ACCIDENTS/*CARBON FIBERS/*GRAPHITE-EPOXY COMPOSITE MATERIALS/*RISK

MINS: / AIRCRAFT ACCIDENTS/ CIVIL AVIATION/ CRASHES/ FIRES/ HAZARDS

ABS: The potential for the release of carbon fibers from aircraft crashes/fires is addressed. Simulation of the conditions of aircraft crash fires in order to predict the quantities and forms of fibrous materials which might be released from civilian aircraft crashes/fires is considered. Figures are presented which describe some typical fiber release test activities together with some very preliminary results of those activities. The state of the art of carbon fiber release is summarized as well as some of the uncertainties concerning accidental fiber release.

79N22208

UTTL: An assessment of national risk: General concepts and overall approach
In NASA. Langley Res. Center Carbon Fiber Risk Anal. p 199-234 (SEE N79-22196 13-24)

AUTH: A/KALELKAR, A. S.

MAJS: /*CARBON FIBERS/*CIVIL AVIATION/*RISK/*UTILIZATION

MINS: / AIRCRAFT STRUCTURES/ COMMERCIAL AIRCRAFT/ EVALUATION / HAZARDS

ABS: The analysis of risk presented by carbon fiber utilization in commercial aviation is reported. The discussion is presented in three parts: (1) general concepts; (2) overall approach; and (3) risk evaluation and perspective.

79N23896

UTTL: Some new airfoils
In NASA. Langley Res. Center The Sci. and Technol. of Low Speed and Motorless Flight, Pt. 1 p 131-154 (SEE N79-23889 15-01)

AUTH: A/EPPLER, R.

MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRFOILS/*COMPUTERS/* STRUCTURAL ANALYSIS/*STRUCTURAL DESIGN

MINS: / AERODYNAMIC COEFFICIENTS/ CANARD CONFIGURATIONS/ COMPUTER PROGRAMS/ COORDINATES/ GLIDERS/ GRAPHS (CHARTS)/ LIFT/ LIGHT AIRCRAFT/ PROBLEM SOLVING/ TABLES (DATA)/ VELOCITY DISTRIBUTION

ABS: A computer approach to the design and analysis of airfoils and some common problems concerning laminar separation bubbles at different lift coefficients are briefly discussed. Examples of application to

ultralight airplanes, canards, and sailplanes with flaps are given.

79N23918

UTTL: A review of the icing situation from the standpoint of general aviation
In NASA. Lewis Res. Center Aircraft Icing p 31-38
(SEE N79-23912 15-02)

AUTH: A/NEWTON, D. W.

MAJS: /*AIRCRAFT HAZARDS/*GENERAL AVIATION AIRCRAFT/*ICE FORMATION/*PROGRAM TREND LINE ANALYSIS

MINS: / AIRCRAFT SAFETY/ CERTIFICATION/ INDICATING INSTRUMENTS/ WEATHER FORECASTING

ABS: An overview of the present situation in the field of aircraft icing with respect to certification and operation of nontransport category airplanes is given. Problems of definition and inconsistencies are pointed out. Problems in the forecasting and measurement of icing intensities are discussed. The present regulatory environment is examined with respect to its applicability and appropriateness to nontransport airplanes.

79N27078

UTTL: Treatment of the control mechanisms of light airplanes in the flutter clearance process
In Its Sci. and Technol. of Low Speed and Motorless Flight p 437-466 (SEE N79-27070 18-01)

AUTH: A/BREITBACH, E. J.

MAJS: /*FLUTTER/*LIGHT AIRCRAFT

MINS: / FLIGHT CONTROL/ MATHEMATICAL MODELS/ NONLINEARITY

ABS: It has become more and more evident that many difficulties encountered in the course of aircraft flutter analyses can be traced to strong localized nonlinearities in the control mechanisms. To cope with these problems, more reliable mathematical models paying special attention to control system nonlinearities were established by means of modified ground vibration test procedures in combination with suitably adapted modal synthesis approaches. Three different concepts are presented.

80N14634
UTTL: Meteorological input to general aviation pilot training
 In Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems p 30-36 (SEE N80-14633 05-47)
AUTH: A/COLOMY, J. R.
MAJS: /*GENERAL AVIATION AIRCRAFT/*METEOROLOGY/*PILOT TRAINING
MINS: / AIRCRAFT ACCIDENTS/ EDUCATION/ FLIGHT SAFETY/ INSTRUMENT FLIGHT RULES/ LEARNING
ABS: The meteorological education of general aviation pilots is discussed in terms of the definitions and concepts of learning and good educational procedures. The effectiveness of the meteorological program in the training of general aviation pilots is questioned. It is suggested that flight instructors provide real experience during low ceilings and visibilities, and that every pilot receiving an instrument rating should experience real instrument flight.

80N14636
UTTL: Accident investigation
 In Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems p 46-57 (SEE N80-14633 05-47)
AUTH: A/BRUNSTEIN, A. I.
MAJS: /*AIRCRAFT ACCIDENT INVESTIGATION/*GENERAL AVIATION AIRCRAFT/*TRANSPORT AIRCRAFT/*WEATHER
MINS: / AIRCRAFT ACCIDENTS/ METEOROLOGICAL PARAMETERS/ STATISTICAL ANALYSIS/ TABLES (DATA)
ABS: Aircraft accident investigations are discussed with emphasis on those accidents that involved weather as a contributing factor. The organization of the accident investigation board for air carrier accidents is described along with the hearings, and formal report preparation. Statistical summaries of the investigations of general aviation accidents are provided.

80N19194
UTTL: Approach to the assessment of the hazard
 In its Assessment of Carbon Fiber Elec. Effects p 11-27 (SEE N80-19193 10-24)
AUTH: A/HUSTON, R. J.
MAJS: /*AIRCRAFT ACCIDENTS/*CARBON FIBERS/*COMPOSITE MATERIALS/*ELECTRIC EQUIPMENT/*FIRES
MINS: / AIRCRAFT CONSTRUCTION MATERIALS/ ATMOSPHERIC DIFFUSION/ CIVIL AVIATION/ ELECTRICAL FAULTS/ ELECTRICAL INSULATION/ VULNERABILITY

ABS: An overview of the carbon fiber hazard assessment is presented. The potential risk to the civil sector associated with the accidental release of carbon fibers from aircraft having composite structures was assessed along with the need for protection of civil aircraft from carbon fibers.

80N19201
UTTL: Assessment of risk due to the use of carbon fiber composites in commercial and general aviation
 In NASA. Langley Res. Center Assessment of Carbon Fiber Elec. Effects p 183-211 (SEE N80-19193 10-24)
AUTH: A/FIKSEL, J.; B/ROSENFELD, D.; C/KALELKAR, A.
MAJS: /*AIRCRAFT SAFETY/*CARBON FIBERS/*COMMERCIAL AIRCRAFT /*FIBER COMPOSITES/*GENERAL AVIATION AIRCRAFT/*RISK
MINS: / ACCIDENT INVESTIGATION/ AIRCRAFT ACCIDENTS/ FIRE DAMAGE/ FLAME PROPAGATION/ MONTE CARLO METHOD
ABS: The development of a national risk profile for the total annual aircraft losses due to carbon fiber composite (CFC) usage through 1993 is discussed. The profile was developed using separate simulation methods for commercial and general aviation aircraft. A Monte Carlo method which was used to assess the risk in commercial aircraft is described. The method projects the potential usage of CFC through 1993, investigates the incidence of commercial aircraft fires, models the potential release and dispersion of carbon fibers from a fire, and estimates potential economic losses due to CFC damaging electronic equipment. The simulation model for the general aviation aircraft is described. The model emphasizes variations in facility locations and release conditions, estimates distribution of CFC released in general aviation aircraft accidents, and tabulates the failure probabilities and aggregate economic losses in the accidents.

80N19541
UTTL: Emulation applied to reliability analysis of reconfigurable, highly reliable, fault-tolerant computing systems
 In AGARD Avionics Reliability, Its Tech. and Related Disciplines 11 p (SEE N80-19519 10-38)
AUTH: A/MIGNEAULT, G. E.
MAJS: /*AIRBORNE/SPACEBORNE COMPUTERS/*MICROPROGRAMMING/* RELIABILITY ANALYSIS
MINS: / CIVIL AVIATION/ COMPUTER PROGRAMS/ COMPUTERIZED SIMULATION/ ERROR ANALYSIS
ABS: Emulation techniques applied to the analysis of the reliability of highly reliable computer systems for future commercial aircraft are described. The lack of credible precision in reliability estimates obtained

by analytical modeling techniques is first established. The difficulty is shown to be an unavoidable consequence of: (1) a high reliability requirement so demanding as to make system evaluation by use testing infeasible; (2) a complex system design technique, fault tolerance; (3) system reliability dominated by errors due to flaws in the system definition; and (4) elaborate analytical modeling techniques whose precision outputs are quite sensitive to errors of approximation in their input data. Next, the technique of emulation is described, indicating how its input is a simple description of the logical structure of a system and its output is the consequent behavior. Use of emulation techniques is discussed for pseudo-testing systems to evaluate bounds on the parameter values needed for the analytical techniques. Finally an illustrative example is presented to demonstrate from actual use the promise of the proposed application of emulation.

80N21305

UTTL: Civil applications of global positioning systems
In NASA, Washington Global Positioning System for
Gen. Aviation: Joint FAA-NASA Seminar p 75-81 (SEE
N80-21299 12-04)

AUTH: A/CALIBI, V.

MAJS: /*AIR NAVIGATION/*CIVIL AVIATION/*GLOBAL POSITIONING
SYSTEM

MINS: / GENERAL AVIATION AIRCRAFT/ RADIO RECEIVERS/ USER
REQUIREMENTS

ABS: User requirements germane to civil applications in the
GPS are discussed. The Z-set is discussed as a
possible low cost set which might meet the civil
requirement as a GPS receiver.

80N21306

UTTL: A program for predicting antenna radiation patterns
In NASA, Washington Global Positioning System for
Gen. Aviation: Joint FAA-NASA Seminar p 83-105 (SEE
N80-21299 12-04)

AUTH: A/GILREATH, M.

MAJS: /*AIRCRAFT ANTENNAS/*ANTENNA DESIGN/*ANTENNA RADIATION
PATTERNS/*COMPUTER PROGRAMS/*MICROWAVE LANDING SYSTEMS

MINS: / BOEING 737 AIRCRAFT/ C-135 AIRCRAFT/ COMPUTERIZED
SIMULATION/ GENERAL AVIATION AIRCRAFT/ LEAR JET
AIRCRAFT

ABS: The status of the aircraft antenna prediction program
at Langley is reviewed with emphasis on the analytical
techniques and computer programs developed for antenna
siting and performance prediction. Scale-model
aircraft are used to obtain experimental data for
verification of analytical results. Computer generated

models of the Boeing 737, the KC-135, the Cessna 402B,
and the Gates Lear jet are discussed.

80N21307

UTTL: Designing low cost receivers for general aviation
users
In NASA, Washington Global Positioning System for
Gen. Aviation: Joint FAA-NASA Seminar p 107-117 (SEE
N80-21299 12-04)

AUTH: A/NATALI, F. D.

MAJS: /*AREA NAVIGATION/*GENERAL AVIATION AIRCRAFT/*GLOBAL
POSITIONING SYSTEM/*RECEIVERS/*SYSTEMS ENGINEERING

MINS: / ANALOG CIRCUITS/ ANTENNA DESIGN/ LOW COST/
MICROPROCESSORS/ MULTIPATH TRANSMISSION/ OSCILLATORS

ABS: Approaches to the design of a low cost receiver which
meets all IFR requirements for 2D area navigation are
discussed. These include: (1) using current technology
with a minimum of specialized LSI, a minimum of
circuit complexity, and minimal use of critical
components; (2) emphasized microprocessor technology;
and (3) a special analog/digital chip fabrication. A
low cost GPS receiver configuration with a single
sequencing tracking channel is examined. Problem areas
are indicated.

80N21308

UTTL: Design approaches for GPS receivers/processors
In NASA, Washington Global Positioning System for
Gen. Aviation: Joint FAA-NASA Seminar p 119-128 (SEE
N80-21299 12-04)

AUTH: A/NINO, R. V.

MAJS: /*GENERAL AVIATION AIRCRAFT/*GLOBAL POSITIONING SYSTEM
/*RECEIVERS

MINS: / AVIONICS/ COSTS/ SYSTEMS ENGINEERING/ TECHNOLOGY
UTILIZATION

ABS: The design philosophy for a low-cost GPS
receiver-processor is discussed.

80N22286

UTTL: Flight selection at United Airlines
In NASA, Ames Res. Center Resource Management on the
Flight Deck p 61-75 (SEE N80-22283 13-03)

AUTH: A/TRAUB, W.

MAJS: /*FLIGHT CREWS/*PERSONNEL MANAGEMENT/*PILOT SELECTION

MINS: / CIVIL AVIATION/ COMPUTER ASSISTED INSTRUCTION/
COMPUTER PROGRAMS/ FLIGHT TIME/ PERSONALITY TESTS/
PILOT TRAINING/ PSYCHOLOGICAL TESTS/ PSYCHOMOTOR
PERFORMANCE

ABS: Airline pilot selection procedures are discussed
including psychological and personality tests,
psychomotor performance requirements, and flight

skills evaluation. Necessary attitude and personality traits are described and an outline of computer selection, testing, and training techniques is given.

BON22287

UTTL: British Airways' pre-command training program
In NASA. Ames Res. Center Resource Management on the
Flight Deck p 76-86 (SEE N80-22283 13-03)
AUTH: A/HOLDSTOCK, L. F. J.
MAJS: /*FLIGHT CREWS/*FLIGHT TRAINING/*PERSONNEL MANAGEMENT
/*PILOT TRAINING
MINS: / AIRLINE OPERATIONS/ CIVIL AVIATION/ FLIGHT
SIMULATORS/ PILOT SELECTION
ABS: Classroom, flight simulator, and in-flight sessions of
an airline pilot training program are briefly
described. Factors discussed include initial command
potential assessment, precommand airline management
studies course, precommand course, and command course.

BON22328

UTTL: AiResearch QCGAT engine, airplane, and nacelle design
features
In NASA. Lewis Res. Center Gen. Aviation Propulsion
p 11-43 (SEE N80-22327 13-07)
AUTH: A/HELDENBRAND, R. W.
MAJS: /*AIRCRAFT DESIGN/*ENGINE DESIGN/*GENERAL AVIATION
AIRCRAFT/*NACELLES/*QUIET ENGINE PROGRAM/*TURBOFAN
ENGINES
MINS: / ENGINE CONTROL/ EXHAUST GASES/ NOISE REDUCTION/
NOZZLE DESIGN/ PROPULSION SYSTEM CONFIGURATIONS
ABS: The quiet, clean, general aviation turbofan engine and
nacelle system was designed and tested. The engine
utilized the core of the AiResearch model TFE731-3
engine and incorporated several unique noise- and
emissions-reduction features. Components that were
successfully adapted to this core include the fan,
gearbox, combustor, low-pressure turbine, and
associated structure. A highly versatile workhorse
nacelle incorporating interchangeable acoustic and
hardwall duct liners, showed that large-engine
attenuation technology could be applied to small
propulsion engines. The application of the mixer
compound nozzle demonstrated both performance and
noise advantages on the engine. Major performance,
emissions, and noise goals were demonstrated.

BON22329

UTTL: AiResearch QCGAT engine performance and emissions
tests
In NASA. Lewis Res. Center Gen. Aviation Propulsion
p 45-64 (SEE N80-22327 13-07)
AUTH: A/NORGREN, W. M.
MAJS: /*ENGINE NOISE/*EXHAUST GASES/*GENERAL AVIATION
AIRCRAFT/*JET AIRCRAFT NOISE/*QUIET ENGINE PROGRAM/*
TURBOFAN ENGINES
MINS: / ENGINE TESTS/ FUEL CONSUMPTION/ NOISE REDUCTION/
NOZZLE FLOW/ PERFORMANCE TESTS
ABS: Results of aerodynamic performance and emission tests.
conducted on a specially designed QCGAT engine in the
17,793-N (4,000 lb) thrust class, are presented.
Performance of the AiResearch QCGAT engine was
excellent throughout all testing. No serious
mechanical malfunctions were encountered, and no
significant test time was lost due to engine-related
problems. Emissions were drastically reduced over
similar engines, and the engine exhibited good smoke
performance.

BON22330

UTTL: AiResearch QCGAT engine: Acoustic test results
In NASA. Lewis Res. Center Gen. Aviation Propulsion
p 65-100 (SEE N80-22327 13-07)
AUTH: A/KISNER, L. S.
MAJS: /*ENGINE NOISE/*GENERAL AVIATION AIRCRAFT/*JET
AIRCRAFT NOISE/*NOISE PREDICTION (AIRCRAFT)/*QUIET
ENGINE PROGRAM/*TURBOFAN ENGINES
MINS: / ACOUSTIC DUCTS/ ACOUSTIC MEASUREMENTS/ LININGS/
NACELLES/ NOISE REDUCTION/ NOZZLE GEOMETRY
ABS: The noise levels of the quiet, general aviation
turbofan (QCGAT) engine were measured in ground static
noise tests. The static noise levels were found to be
markedly lower than the demonstrably quiet AiResearch
model TFE731 engine. The measured QCGAT noise levels
were correlated with analytical noise source
predictions to derive free-field component noise
predictions. These component noise sources were used
to predict the QCGAT flyover noise levels at FAR Part
36 conditions. The predicted flyover noise levels are
about 10 decibels lower than the current quietest
business jets.

BON22331

UTTL: QCGAT aircraft/engine design for reduced noise and
emissions
In NASA. Lewis Res. Center Gen. Aviation Propulsion
p 101-133 (SEE N80-22327 13-07)
AUTH: A/LANSON, L.; B/TERRILL, K. M.
MAJS: /*AIRCRAFT DESIGN/*ENGINE DESIGN/*GENERAL AVIATION

MINS: AIRCRAFT/*NOISE REDUCTION/*TURBOFAN ENGINES / AIRCRAFT CONSTRUCTION MATERIALS/ COMPOSITE STRUCTURES/ EXHAUST GASES/ FUEL CONSUMPTION/ NACELLES
ABS: The high bypass ratio QCGAT engine played an important role in shaping the aircraft design. The aircraft which evolved is a sleek, advanced design, six-place aircraft with 3538 kg (7,800 lb) maximum gross weight. It offers a 2778 kilometer (1500 nautical mile) range with cruise speed of 0.5 Mach number and will take-off and land on the vast majority of general aviation airfields. Advanced features include broad application of composite materials and a supercritical wing design with winglets. Full-span fowler flaps were introduced to improve landing capability. Engines are fuselage-mounted with inlets over the wing to provide shielding of fan noise by the wing surfaces. The design objectives, noise, and emission considerations, engine cycle and engine description are discussed as well as specific design features.

80N22332

UTTL: Avco Lycoming QCGAT program design cycle, demonstrated performance and emissions
In NASA, Lewis Res. Center Gen. Aviation Propulsion p 135-154 (SEE N80-22327 13-07)

AUTH: A/FOGEL, P.; B/KOSCHIER, A.

MAJS: /*ENGINE DESIGN/*EXHAUST GASES/*GENERAL AVIATION AIRCRAFT/*QUIET ENGINE PROGRAM/*THERMODYNAMIC CYCLES/*TURBOFAN ENGINES

MINS: / COMBUSTION CHAMBERS/ COMBUSTION EFFICIENCY/ ENGINE TESTS/ FUEL CONSUMPTION/ NACELLES/ TURBOSHAFTS

ABS: A high bypass ratio, twin spool turbofan engine of modular design which incorporates a front fan module driven by a modified LT5101 core engine was tested. The engine is housed in a nacelle incorporating full length fan ducting with sound treatment in both the inlet and fan discharge flow paths. Design goals of components and results of component tests are presented together with full engine test results. The rationale behind the combustor design selected for the engine is presented as well as the emissions test results. Total system (engine and nacelle) test results are included.

80N22333

UTTL: Avco Lycoming quiet clean general aviation turbofan engine
In NASA, Lewis Res. Center Gen. Aviation Propulsion p 155-187 (SEE N80-22327 13-07)

AUTH: A/WILSON, C. A.

MAJS: /*ENGINE NOISE/*GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION/*QUIET ENGINE PROGRAM/*TURBOFAN ENGINES

MINS: / ACOUSTIC MEASUREMENTS/ ENGINE DESIGN/ MIXERS/ NACELLES/ NOISE PREDICTION (AIRCRAFT)

ABS: A fan module was developed using an existing turboshaft engine. The fan was designed using the latest in large engine noise control technology. A mixer was added to reduce the already low exhaust gas velocity. A nacelle incorporating sound treatment was provided for the test engine. A noise prediction model was used through the design process to evaluate the various design alternatives. Acoustic tests were then made to verify the prediction and identify the noise characteristics of the fan, core, jet, and sound treatment. Analysis of the recorded data yielded close agreement with the expected results. Core noise, as was expected, was the predominant source of noise for the quiet clean general aviation turbofan (QCGAT) engine. Flyover noise predictions were made which indicated that the Avco Lycoming QCGAT engine would meet the goals set for the QCGAT program.

80N22334

UTTL: Summary of NASA QCGAT program
In its Gen. Aviation Propulsion p 189-193 (SEE N80-22327 13-07)

AUTH: A/SIEVERS, G. K.

MAJS: /*ENGINE NOISE/*GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION/*QUIET ENGINE PROGRAM/*TURBOFAN ENGINES

MINS: / ENGINE DESIGN/ ENGINE TESTS/ EXHAUST EMISSION/ FUEL CONSUMPTION/ NOISE MEASUREMENT

ABS: The application of large turbofan engine technology to small general aviation turbofan engines to achieve low noise, low emissions, and acceptable fuel consumption is described.

80N22335

UTTL: New opportunities for future, small, General-Aviation Turbine Engines (GATE)
In its Gen. Aviation Propulsion p 195-219 (SEE N80-22327 13-07)

AUTH: A/STRACK, W. C.

MAJS: /*GENERAL AVIATION AIRCRAFT/*TECHNOLOGICAL FORECASTING /*TURBINE ENGINES

MINS: / ECONOMICS/ ENGINE DESIGN/ FUEL CONSUMPTION/ MARKET RESEARCH/ TECHNOLOGY ASSESSMENT

ABS: The results of four independent contracted studies to explore the opportunities for future small turbine engines are summarized in a composite overview. Candidate advanced technologies are screened, various cycles and staging arrangements are parametrically evaluated, and optimum conceptual engines are identified for a range of 300 to 600 horsepower applications. Engine improvements of 20 percent in

specific fuel consumption and 40 percent in engine cost were forecast using high risk technologies that could be technically demonstrated by 1988. The ensuing economic benefits are in the neighborhood of 20 to 30 percent for twin-engine aircraft currently powered by piston engines.

80N22336

UTTL: An overview of NASA research on positive displacement general-aviation engines
In its Gen. Aviation Propulsion p 227-229 (SEE N80-22327 13-07)

AUTH: A/KEMPKE, E. E., JR.

MAJS: /*AIRCRAFT ENGINES/*GENERAL AVIATION AIRCRAFT/*
RESEARCH AND DEVELOPMENT/*TECHNOLOGY ASSESSMENT
MINS: / DIESEL ENGINES/ ENGINE DESIGN/ EXHAUST EMISSION/
FUEL CONSUMPTION/ FUEL INJECTION/ PISTON ENGINES/
SPARK IGNITION

ABS: The research and technology program related to improved and advanced general aviation engines is described. Current research is directed at the near-term improvement of conventional air-cooled spark-ignition piston engines and at future alternative engine systems based on all-new spark-ignition piston engines, lightweight diesels, and rotary combustion engines that show potential for meeting program goals in the midterm and long-term future. The conventional piston engine activities involve efforts on applying existing technology to improve fuel economy, investigation of key processes to permit leaner operation and reduce drag, and the development of cost effective technology to permit flight at high-altitudes where fuel economy and safety are improved. The advanced engine concepts activities include engine conceptual design studies and enabling technology efforts on the critical or key technology items.

80N22338

UTTL: Lightweight diesel aircraft engines for general aviation
In NASA, Lewis Res. Center Gen. Aviation Propulsion p 247-285 (SEE N80-22327 13-07)

AUTH: A/BERENYI, S. G.; B/BROUWERS, A. P.

MAJS: /*AIRCRAFT ENGINES/*DIESEL ENGINES/*ENGINE DESIGN/*
GENERAL AVIATION AIRCRAFT
MINS: / AIRCRAFT PERFORMANCE/ CONFIGURATIONS/ COST ANALYSIS/
DESIGN ANALYSIS/ FUEL CONSUMPTION/ WEIGHT REDUCTION

ABS: A methodical design study was conducted to arrive at new diesel engine configurations and applicable advanced technologies. Two engines are discussed and the description of each engine includes concept

drawings. A performance analysis, stress and weight prediction, and a cost study were also conducted. This information was then applied to two airplane concepts, a six-place twin and a four-place single engine aircraft. The aircraft study consisted of installation drawings, computer generated performance data, aircraft operating costs and drawings of the resulting airplanes. The performance data shows a vast improvement over current gasoline-powered aircraft. At the completion of this basic study, the program was expanded to evaluate a third engine configuration. This third engine incorporates the best features of the original two, and its design is currently in progress. Preliminary information on this engine is presented.

80N22341

UTTL: NASA propeller technology program
In its Gen. Aviation Propulsion p 315-325 (SEE N80-22327 13-07)

AUTH: A/MIKKELSON, D. C.

MAJS: /*NASA PROGRAMS/*PROPELLER EFFICIENCY/*PROPELLERS
MINS: / AIRCRAFT NOISE/ AIRSPEED/ DESIGN ANALYSIS/ PROPELLER
BLADES/ TURBOFANS

ABS: A program on propeller technology applicable to both low and high speed general aviation aircraft is summarized, and the overall program objectives and approach are outlined.

80N22342

UTTL: Low speed propellers: Impact of advanced technologies
In NASA, Lewis Res. Center Gen. Aviation Propulsion p 327-343 (SEE N80-22327 13-07)

AUTH: A/KEITER, I. D.

MAJS: /*GENERAL AVIATION AIRCRAFT/*PROPELLER EFFICIENCY/*
PROPELLERS

MINS: / AIRCRAFT NOISE/ AIRCRAFT PERFORMANCE/ COMPOSITE
MATERIALS/ COST REDUCTION/ FUEL CONSUMPTION/ PROPELLER
BLADES/ WEIGHT REDUCTION

ABS: Sensitivity studies performed to evaluate the potential of several advanced technological elements on propeller performance, noise, weight, and cost for general aviation aircraft are discussed. Studies indicate that the application of advanced technologies to general aviation propellers can reduce fuel consumption in future aircraft an average of ten percent, meeting current regulatory noise limits. Through the use of composite blade construction, up to 25 percent propeller weight reduction can be achieved. This weight reduction in addition to seven percent propeller efficiency improvements through application of advanced technologies result in four percent

reduction in direct operating costs, ten percent reduction in aircraft acquisition cost, and seven percent lower gross weight for general aviation aircraft.

80N22343

UTTL: Advanced turboprop potential for high speed
In NASA, Lewis Res. Center Gen. Aviation Propulsion
p 345-359 (SEE N80-22327 13-07)

AUTH: A/GATZEN, B. S.

MAJS: /*AIRCRAFT PERFORMANCE/*TURBOFAN AIRCRAFT/*TURBOPROP
AIRCRAFT

MINS: / AIRCRAFT NOISE/ COMPOSITE MATERIALS/ COST REDUCTION/
FUEL CONSUMPTION/ GENERAL AVIATION AIRCRAFT/ HIGH
SPEED/ PROPELLER BLADES/ PROPELLER EFFICIENCY

ABS: A turboprop propulsion system for general aviation
aircraft, allowing high speed flight (to 0.8 Mach) is
discussed. Design methodologies for aerodynamic and
acoustic considerations and the performance and cost
advantages of a prop-fan aircraft are presented.

80N22347

UTTL: NASA propeller noise research
In NASA, Lewis Res. Center Gen. Aviation Propulsion
p 405-420 (SEE N80-22327 13-07)

AUTH: A/GREENE, G. C.

MAJS: /*AIRFOILS/*GENERAL AVIATION AIRCRAFT/*NOISE REDUCTION
/*PROPELLERS

MINS: / COST EFFECTIVENESS/ FLIGHT TESTS/ NOISE PREDICTION
(AIRCRAFT)/ OPTIMIZATION/ TECHNOLOGY ASSESSMENT/ WIND
TUNNEL TESTS

ABS: The research in propeller noise prediction,
noise/performance optimization, and interior reduction
is described. Selected results are presented to
illustrate the status of the technology and the
direction of future research.

80N23511

UTTL: Emergency in-flight egress opening for general
aviation aircraft
In Its Proc. of the 14th Aerospace Mech. Symp. p
173-194 (SEE N80-23495 14-31)

AUTH: A/BEMENT, L. J.

MAJS: /*BAILOUT/*EGRESS/*GENERAL AVIATION AIRCRAFT

MINS: / ACCIDENT PREVENTION/ AIRCRAFT ACCIDENTS/ STRUCTURAL
DESIGN

ABS: An emergency in-flight egress system was installed in
a light general aviation airplane. The airplane had no
provision for egress on the left side. To avoid a
major structural redesign for a mechanical door, an
add on 11.2 kg (24.6 lb) pyrotechnic-actuated system

was developed to create an opening in the existing
structure. The skin of the airplane was explosively
severed around the side window, across a central
stringer, and down to the floor, creating an opening
of approximately 76 by 76 cm. The severed panel was
jettisoned at an initial velocity of approximately
13.7 m/sec. System development included a total of 68
explosive severance tests on aluminum material using
small samples, small and full scale flat panel
aircraft structural mockups, and an actual aircraft
fuselage. These tests proved explosive
sizing/severance margins, explosive initiation,
explosive product containment, and system dynamics.
This technology is applicable to any aircraft of
similar construction.

80N23512

UTTL: A spin-recovery parachute system for light
general-aviation airplanes
In its Proc. of the 14th Aerospace Mech. Symp. p
195-209 (SEE N80-23495 14-31)

AUTH: A/BRADSHAW, C.

MAJS: /*AIRCRAFT SPIN/*GENERAL AVIATION AIRCRAFT/*
JETTISONING/*PARACHUTES

MINS: / MECHANICAL DEVICES/ RELIABILITY ANALYSIS/ SPIN TESTS
/ STATIC LOADS/ SYSTEMS ENGINEERING

ABS: A tail mounted spin recovery parachute system was
designed and developed for use on light general
aviation airplanes. The system was designed for use on
typical airplane configurations, including low wing,
high wing, single engine and twin engine designs. A
mechanically triggered pyrotechnic slug gun is used to
forcibly deploy a pilot parachute which extracts a bag
that deploys a ring slot spin recovery parachute. The
total system weighs 8.2 kg. System design factors
included airplane wake effects on parachute
deployment, prevention of premature parachute
deployment, positive parachute jettison, compact size,
low weight, system reliability, and pilot and ground
crew safety. Extensive ground tests were conducted to
qualify the system. The recovery parachute was used
successfully in flight 17 times.

80N29305

UTTL: A methodology for long-range prediction of air
transportation
In NASA, Lewis Res. Center Aircraft Res. and
Technol. for Future Fuels p 25-30 (SEE N80-29300
20-07)

AUTH: A/AYATI, M. B.; B/ENGLISH, J. M.

MAJS: /*AIR TRANSPORTATION/*AIRCRAFT FUELS/*PREDICTION
ANALYSIS TECHNIQUES

MINS: / AIRCRAFT PERFORMANCE/ CIVIL AVIATION/ DEMAND (ECONOMICS)/ ECONOMIC ANALYSIS/ SOCIAL FACTORS
ABS: A framework and methodology for long term projection of demand for aviation fuels is presented. The approach taken includes two basic components. The first was a new technique for establishing the socio-economic environment within which the future aviation industry is embedded. The concept utilized was a definition of an overall societal objective for the very long run future. Within a framework so defined, a set of scenarios by which the future will unfold are then written. These scenarios provide the determinants of the air transport industry operations and accordingly provide an assessment of future fuel requirements. The second part was the modeling of the industry in terms of an abstracted set of variables to represent the overall industry performance on a macro scale. The model was validated by testing the desired output variables from the model with historical data over the past decades.

BON33340

UTTL: NASA general aviation stall/spin flight testing
In Society of Experimental Test Pilots Tech. Rev.,
Vol. 15, No. 1 p 36-49 (SEE N80-33337 24-01)

AUTH: A/PATTON, J. M., JR.

MAJS: /*AERODYNAMIC STALLING/*AIRCRAFT SPIN/*FLIGHT TESTS/*
GENERAL AVIATION AIRCRAFT

MINS: / FULL SCALE TESTS/ WIND TUNNEL TESTS

ABS: A comprehensive program incorporating spin tunnel, static and rotary balance wind tunnel, full scale wind tunnel, free flight radio control model, flight simulation, and full scale flight testing was undertaken. Work includes aerodynamic definition of various configurations at high angles of attack, testing of stall and spin prevention concepts, definition of spin and spin recovery characteristics, and development of test techniques and emergency spin recovery systems. Some of the more interesting results to date are presented for the first airplane in the program in the areas of tail design, wind leading edge design, mass distribution, center of gravity location, and small airframe changes, with associated pilot observations. Design philosophy of the spin recovery parachute system is discussed, in addition to test techniques.

81N12980

UTTL: NASA Research in aeropropulsion
In Its Impact for the 80's: Proc. of a Conf. on
Selected Technol. for Business and Ind. p 11-26 (SEE
N81-12978 03-99)

AUTH: A/STEWART, W. L.

MAJS: /*CIVIL AVIATION/*COMMERCIAL AIRCRAFT/*PROPULSION
SYSTEM CONFIGURATIONS/*TECHNOLOGY ASSESSMENT

MINS: / AIRCRAFT INDUSTRY/ EXHAUST EMISSION/ GENERAL
AVIATION AIRCRAFT/ PROPULSION SYSTEM PERFORMANCE/
VARIABLE CYCLE ENGINES

ABS: The role of the Lewis Research Center in aeronautical
propulsion is described. The state of the art in
engine systems and components are discussed and some
of the problems that confront the civil and military
aeronautic sectors are addressed. Some of the programs
that are under way are summarized with emphasis on the
future needs and opportunities in aeronautics.

81N14560

UTTL: Aircraft icing instrumentation: Unfilled needs
In NASA. Marshall Space Flight Center Proc: Fourth
Ann. Workshop on Meteorol. and Environ. Inputs to
Aviation Systems p 61-65 (SEE N81-14555 05-47)

AUTH: A/KITCHENS, P. F.

MAJS: /*ATMOSPHERIC TEMPERATURE/*ICE FORMATION/*
METEOROLOGICAL PARAMETERS/*ROTARY WING AIRCRAFT

MINS: / AIRCRAFT SPECIFICATIONS/ ATMOSPHERIC MOISTURE/ DROP
SIZE/ DROPS (LIQUIDS)/ SOLAR RADIATION

ABS: A list of icing instrumentation requirements are
presented. Because of the Army's helicopter
orientation, many of the suggestions are specific to
rotary wing aircraft; however, some of the
instrumentation are also suitable for general aviation
aircraft.

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