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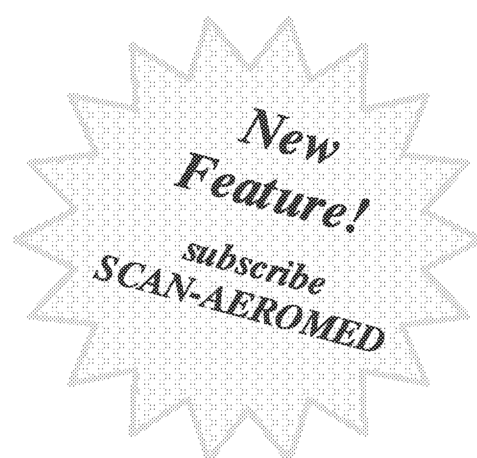

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Typical Report Citation and Abstract

❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10' to 50', and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65' swept forebody serrations tended to roll together, while vortices from 40' swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 415)

MAY 2000

01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft.

20000037804 Research and Technology Organization, Systems Concepts and Integration Panel, Neuilly-sur-Seine, France
Advances in Vehicle Systems Concepts and Integration *Les Avancees en Concepts Systemes pour Vehicules et en Integration*
April 2000; 400p; In English; In French, 26-28 Apr. 1999, Ankara, Turkey; See also 20000037805 through 20000037844; CD-ROM contains full text document in PDF format
Report No.(s): RTO-MP-44; AC/323(SCI)TP/17; ISBN 92-837-0011-2; Copyright Waived; Avail: CASI; A17, Hardcopy; A04, Microfiche; C01, CD-ROM

The meeting proceedings from this joint symposium on "Advances in Vehicle Systems Concepts and Integration" contain the Technical Evaluation Reports and papers presented at Symposium (A) on "Aircraft Update Programmes, The Economical Alternative?" and at Symposium (B) on "Warfare Automation: Procedures and Techniques for Unmanned Vehicles". It was organized by the Systems Concepts and Integration (SCI) Panel of the RTA in Ankara, Turkey from 26 to 28 April 1999. Symposium (A) was structured in five sessions covering Cockpit, Sensors, Engine, Overview and Lessons Learned (Part I and Part II) and was concluded by a panel discussion. Symposium (B) was structured in four sessions covering Operational requirements for unmanned vehicles, Integration aspects and mission management, Platform management and critical technologies and System concepts and mission experience.
Derived from text
Conferences; Warfare; Upgrading; Economics; Aircraft Engines; Avionics; Systems Engineering; Human-Computer Interface; Pilotless Aircraft; Human Factors Engineering

20000037811 Textron Bell Helicopter, Fort Worth, TX USA
Strategy for Long-Term Systems and Technology Advancement
Vaught, F. C., Textron Bell Helicopter, USA; Giles, L. B., Textron Bell Helicopter, USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A13-1 - A13-13; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

Many challenges have emerged within the past five years for both military customers, as they plan for and purchase aircraft, and for manufacturers, in producing these aircraft. Opportunities to develop new models of military rotorcraft have decreased with steady reductions in military budgets and the post cold-war environment. These budget reductions, coupled with quantum advances in computing technologies that have advanced ground-based and airborne processing power, have shifted the focus of military customers from new model development to increased aircraft performance via system upgrades and training.
Author
Upgrading; Aircraft Performance; Aircraft Industry; Systems Engineering

20000037887 Research and Technology Organization, Neuilly-sur-Seine, France
Development and Operation of UAVs for Military and Civil Applications *Developpement et utilisation des avions sans pilote (UAV) pour des applications civiles et militaires*
April 2000; 311p; In English, 13-17 Sep. 1999, Rhode-Saint-Genese, Belgium; See also 20000037888 through 20000037899; CD-ROM contains full text document in PDF format
Report No.(s): RTO-EN-9; AC/323(AVT)TP/24; ISBN 92-837-1033-9; Copyright Waived; Avail: CASI; A14, Hardcopy; A03, Microfiche; C01, CD-ROM

Lecture Notes for the RTO Applied Vehicle Panel (AVT) Special Course on ”Development and Operation of UAVs for Military and Civil Applications” have been assembled in this report. The following topics were covered: Overview of current UAV systems and potential for the future, Design and airworthiness requirements, Propulsion systems, Airbreathing propulsion for UVAVs, Microflyers, Experimental research at low Reynolds numbers, Payloads and sensors, Datalinks, Airspace policy, Air traffic management and Tools for software and system architecture validation. The material assembled in this report was prepared under the combined sponsorship of the RTO Applied Vehicle Technology Panel, the Consultant and Exchange Programme of RTO, the von Karman Institute for Fluid Dynamics (VKI), and the NATO Partnership for Peace Programme.
Author
Airspace; Air Traffic Control; Command and Control; Architecture (Computers); Air Breathing Engines; Propulsion System Configurations; Fluid Dynamics; Pilotless Aircraft

20000038229 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography with Indexes, Supplement 411
January 2000; 77p; In English
Report No.(s): NASA/SP-2000-7037/SUPPL411; NAS 1.21:7037/SUPPL411; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This supplemental issue of Aeronautical Engineering, A Continuing Bibliography with Indexes (NASA/SP-2000-7037) lists reports, articles, and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. The NASA CASI price code table, addresses of organizations, and document availability information are included before the abstract section. Two indexes- subject and author are included after the abstract section.
Author
Aerodynamics; Aeronautical Engineering; Bibliographies; Indexes (Documentation)

20000038230 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography With Indexes, Supplement 414
April 2000; 109p; In English
Report No.(s): NASA/SP-20000-7037/SUPPL414; NAS 1.21:7037/SUPPL414; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report lists reports, articles and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. The NASA CASI price code table, addresses of organizations, and document availability information are included before the abstract section. Two indexes-subject and author are included after the abstract section.
Author
Bibliographies; Ground Support Equipment; Design Analysis; Performance Tests; Fabrication

20000038232 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography With Indexes, Supplement 412
February 2000; 14p; In English
Report No.(s): NASA/SP-2000-7037/SUPPL412; NAS 1.21:7037/SUPPL412; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report lists reports, articles and other documents recently announced in the NASA STI Database.
Derived from text
Bibliographies; Aeronautical Engineering; Indexes (Documentation)

20000039412 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography with Indexes, Supplement 413
March 2000; 122p; In English
Report No.(s): NASA/SP-2000-7037/SUPPL413; NAS 1.21:7037/SUPPL413; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This supplemental issue of Aeronautical Engineering, A Continuing Bibliography with Indexes (NASA/SP-2000-7037) lists reports, articles, and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. Two indexes-subject and author are included after the abstract section.
Derived from text
Bibliographies; Aerodynamics; Aeronautical Engineering; Indexes (Documentation)

20000039430 Old Dominion Univ., Virginia Space Grant Consortium, Hampton, VA USA
National General Aviation Design Competition Guidelines 1999-2000 Academic Year ***Final Report, 1 Oct. 1998 - 30 Sep. 1999***
[1999]; 6p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG1-2212; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The National Aeronautics and Space Administration (NASA), the Federal Aviation Administration (FAA) and the Air Force Research Laboratory are sponsoring a National General Aviation Design Competition for students at U.S. aeronautical and engineering universities for the 1999-2000 academic year. The competition challenges individuals and teams of undergraduates and/ or graduate students, working with faculty advisors, to address design challenges for general aviation aircraft. Now in its sixth year, the competition seeks to increase the involvement of the academic community in the revitalization of the U.S. general aviation industry while providing real-world design and development experiences for students. It allows university students to participate in a major national effort to rebuild the U.S. general aviation sector while raising student awareness of the value of general aviation for business and personal use , and its economic relevance. Faculty and student participants have indicated that the open-ended design challenges offered by the competition have provided the basis for quality educational experiences.
Derived from text
Aeronautical Engineering; Competition; General Aviation Aircraft; NASA Programs; Universities; Aircraft Design; Students

20000039693 University Aviation Association, Auburn, AL USA
Collegiate Aviation Review, Volume 17
Carney, Thomas Q., Editor, Purdue Univ., USA; Luedtke, Jacqueline R., Editor, Utah State Univ., USA; Johnson, Jeffrey A., Editor, Nebraska Univ., USA; Barker, Ballard M., Editor, Florida Inst. of Tech., USA; Bowen, Brent D., Editor, Nebraska Univ., USA; Carstenson, Larry G., Editor, Nebraska Univ., USA; Chubb, Gerald P., Editor, Ohio State Univ., USA; Green, Mavis F., Editor, Illinois Univ. at Urbana-Champaign, USA; Harraf, Abe, Editor, Embry-Riddle Aeronautical Univ., USA; NewMeyer, David A., Editor, University of Southern Illinois, USA; October 1999; ISSN 1523-5955; 108p; In English; See also 20000039694 through 20000039699; Copyright; Avail: Issuing Activity

The Collegiate Aviation Review, published annually by the University Aviation Association and distributed to its members, is a compilation of the annual Fall Proceedings of the University Aviation Association Fall Education Conference and includes such topics as: Enhancing Global Competitiveness: Benchmarking Airline Operational Performance in Highly Regulated Environments; Multiple Expert Evaluations of a PC Computer-Based Aviation Flight Training Device; An Examination of the U.S. Collegiate Aviation Workforce in Preparing the Next Generation of Aviation Faculty Members Beyond 2000; Assessing the Environment and Outcomes of Four-Year Aviation Programs: Does Program Quality Make a Difference?; Airport Internships: Effectively Structuring a Department Rotation Internship; An Evaluation of a Major Airline Flight Internship Program: Participant's Perceptions of Curricular Preparation for, and Components of, the Internship.
Author
Airline Operations; Computer Techniques; Flight Training; Training Devices; Evaluation; Documents

20000039696 Nebraska Univ., Omaha, NE USA
An Examination of the US Collegiate Aviation Workforce in Preparing the Next Generation of Aviation Faculty Members Beyond 2000
Johnson, Jeffrey A., Nebraska Univ., USA; Collegiate Aviation Review; October 1999; Volume 17, No. 1, pp. 31-39; In English; See also 20000039693; Copyright; Avail: Issuing Activity

Aviation as an academic field of study has evolved in the span of a century. As the new millennium approaches, collegiate aviation will be called upon to prepare a new generation of highly skilled workers. These workers need to be educated by current and future generations of aviation faculty members. The purpose of this study was to examine the US collegiate aviation workforce to determine if the next generation of faculty members are being adequately prepared. A descriptive study survey questionnaire was used to collect data for this study which was sent to US University Aviation Association (UAA) institutional members in order to ascertain their workforce needs. The study found that a significant amount of hiring for qualified aviation faculty members is already occurring. The survey results also indicated a substantial number of retirements is either taking place or is anticipated to take place by the year 2000. A very significant finding was that almost all of the respondents believe the public at large does not have an adequate understanding of collegiate aviation.
Author
Surveys; Civil Aviation

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery.

20000033834 Norwegian Defence Research Establishment, Kjeller, Norway
An Estimate of the Impact of Aircraft Induced Vortices on Buildings Close to Kjevik Airport ***Et Estimat av Effekten Fra Fly-Genererte Virvler pa Bebyggelse I Nerheten av Kjevik Flyplass***
Andreassen, Oyvind, Norwegian Defence Research Establishment, Norway; Langseth, Jan Olav, Norwegian Defence Research Establishment, Norway; Jan. 10, 2000; 25p; In Norwegian; Original contains color illustrations
Contract(s)/Grant(s): Proj. FFIBM/170
Report No.(s): FFI/RAPPORT-2000/00102; ISBN 82-464-0395-8; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

At some occasions, gusty winds caused by aircrafts during approach to Kjevik airport, have caused tiles to fall down from roofs, causing potential damage. In the current study, initiated by the Norwegian air traffic and airport management, the evolution of aircraft generated vortices, as they hit simple buildings and/or the ground is simulated using the numerical package CLAWPACK. The simulations show that even for B-737 generated vortices, only modest wind-speeds (up to 10 m/s) will occur close to buildings, expected to cause in worst cases only minor if at all any damage.
Author
Boeing 737 Aircraft; Vortices; Damage; Tiles; Buildings

20000034103 Missouri Univ., Rolla, MO USA
Hypersonic Flow Control Using Upstream Focused Energy Deposition
Riggins David W., Missouri Univ., USA; Nelson, H. F., Missouri Univ., USA; [1999]; 13p; In English; 37th; 37th Aerospace Sciences Meeting, 11-14 Jan. 1999, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 99-0898; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A numerical study of centerline and off-centerline power deposition at a point upstream of a two-dimensional blunt body at Mach 6.5 at 30 km altitude are presented. The full Navier-Stokes equations are used. Wave drag, lift, and pitching moment are presented as a function of amount of power absorbed in the flow and absorption point location. It is shown that wave drag is considerably reduced. Modifications to the pressure distribution in the flow field due to the injected energy create lift and a pitching moment when the injection is off-centerline. This flow control concept may lead to effective ways to improve the performance and to stabilize and control hypersonic vehicles.
Author
Hypersonic Flow; Flow Velocity; Flow Distribution; Two Dimensional Bodies; Blunt Bodies

20000034199 NASA Langley Research Center, Hampton, VA USA
An Overview of Unsteady Pressure Measurements in the Transonic Dynamics Tunnel
Schuster, David M., NASA Langley Research Center, USA; Edwards, John W., NASA Langley Research Center, USA; Bennett, Robert M., NASA Langley Research Center, USA; [2000]; 42p; In English; Dynamics Specialists, 5-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-1770; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Langley Transonic Dynamics Tunnel has served as a unique national facility for aeroelastic testing for over forty years. A significant portion of this testing has been to measure unsteady pressures on models undergoing flutter, forced oscillations, or buffet. These tests have ranged from early launch vehicle buffet to flutter of a generic high-speed transport. This paper will highlight some of the test techniques, model design approaches, and the many unsteady pressure tests conducted in the TDT. The objectives and results of the data acquired during these tests will be summarized for each case and a brief discussion of ongoing research involving unsteady pressure measurements and new TDT capabilities will be presented.
Author
Unsteady Aerodynamics; Aeroelasticity; Flutter; Flutter Analysis; Forced Vibration; Buffeting

20000034230 Naval Postgraduate School, Monterey, CA USA
Computational Analysis of the Off-Design Performance of a Mach 6 (L/D)Ispmax Optimized Waverider
Coyne, Ellen; Sep. 1999; 145p; In English
Report No.(s): AD-A374078; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

In a continuation of ongoing Naval Postgraduate School efforts to study the performance characteristics of waverider configured vehicles, a computational fluid dynamic (CFD) analysis of the Mach 6 L/DI(sp)(max) optimized Price waverider was conducted. This analysis was performed to determine the theoretical force and moment data over a broad Mach number spectrum, and to compare theoretical and experimental results in the subsonic flight regime. The CFD determination of force and moment data represents a continuation of the ongoing analysis of the Price waverider configuration. Selected viscous and inviscid flow solutions for flight conditions in the range 0.3 is less than M(infinity) is less than 6.0, as well as a subsonic (M(infinity) = 03) angle of attack sweep, were conducted using NASA CFD software (OVERFLOW1.8b). Examination of the computed converged flow field solutions suggests that the surface pressure distributions and Mach number contours surrounding the holy are valid. Low speed force and moment coefficient data are shown to exhibit reasonable agreement with the available subsonic wind tunnel data. Additionally, supersonic CFD results show the development of the expected shock layer, exhibiting an attached shock bed at the design Mach number (M(infinity) = 6.0). Evaluation of the computed Mach number effects on lift and drag coefficients at subsonic, transonic and supersonic Mach numbers suggests that the Price waverider may exhibit some flight instabilities across the flight Mach number spectrum.
DTIC
Aerodynamic Configurations; Hypersonic Flight; Wind Tunnel Tests; Supersonic Flow; Aerodynamic Coefficients; Computational Fluid Dynamics; Subsonic Speed; Viscous Flow

20000034237 Kansas Univ. Center for Research, Inc., Flight Research Lab., Lawrence, KS USA
Aerodynamic Modeling for Aircraft in Unsteady Flight Conditions ***Final Report, 22 Mar. 1996 - 30 Sep. 1999***
Lan, C. Edward, Kansas Univ. Center for Research, Inc., USA; Apr. 06, 2000; 55p; In English
Contract(s)/Grant(s): NAG1-1821; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report summarizes the activities in unsteady aerodynamic modeling and application of unsteady aerodynamic models to flight dynamics. A public on briefing was presented on July 21, 1999 at Langley Research Center.
Derived from text
Aerodynamic Characteristics; Flight Conditions; Unsteady Aerodynamics; Mathematical Models

20000034897 NASA Dryden Flight Research Center, Edwards, CA USA
Optimal Pitch Thrust-Vector Angle and Benefits for all Flight Regimes
Gilyard, Glenn B., NASA Dryden Flight Research Center, USA; Bolonkin, Alexander, National Academy of Sciences, USA; March 2000; 28p; In English
Contract(s)/Grant(s): RTOP 522-16-14
Report No.(s): NASA/TM-2000-209021; NAS 1.15:209021; H-2402; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Dryden Flight Research Center is exploring the optimum thrust-vector angle on aircraft. Simple aerodynamic performance models for various phases of aircraft flight are developed and optimization equations and algorithms are presented

in this report. Results of optimal angles of thrust vectors and associated benefits for various flight regimes of aircraft (takeoff, climb, cruise, descent, final approach, and landing) are given. Results for a typical wide-body transport aircraft are also given. The benefits accruable for this class of aircraft are small, but the technique can be applied to other conventionally configured aircraft. The lower L/D aerodynamic characteristics of fighters generally would produce larger benefits than those produced for transport aircraft.
Author
Pitch (Inclination); Thrust Vector Control; Automatic Flight Control; Angles (Geometry)

20000034932 Analytical Services and Materials, Inc., Lancaster, CA USA
Implementation of Advanced Two Equation Turbulence Models in the USM3D Unstructured Flow Solver
Wang, Qun–Zhen, Analytical Services and Materials, Inc., USA; Massey, Steven J., Analytical Services and Materials, Inc., USA; Abdol–Hamid, Khaled S., Analytical Services and Materials, Inc., USA; April 2000; 36p; In English
Contract(s)/Grant(s): NAS4-50066; RTOP 522-31-21-01
Report No.(s): NASA/CR-2000-210102; NAS 1.26:210102; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

USM3D is a widely-used unstructured flow solver for simulating inviscid and viscous flows over complex geometries. The current version (version 5.0) of USM3D, however, does not have advanced turbulence models to accurately simulate complicated flow. We have implemented two modified versions of the original Jones and Launder k-epsilon "two-equation" turbulence model and the Girimaji algebraic Reynolds stress model in USM3D. Tests have been conducted for three flat plate boundary layer cases, a RAE2822 airfoil and an ONERA M6 wing. The results are compared with those from direct numerical simulation, empirical formulae, theoretical results, and the existing Spalart-Allmaras one-equation model.
Author
Applications Programs (Computers); Navier-Stokes Equation; Unstructured Grids (Mathematics); Turbulence Models; Airfoils; Wings; Viscous Flow; Flat Plates; Inviscid Flow; Computerized Simulation; Computational Fluid Dynamics

20000036432 NASA Langley Research Center, Hampton, VA USA
1998 NASA High-Speed Research Program Aerodynamic Performance Workshop, Volume 2, High Lift
McMillin, S. Naomi, Editor, NASA Langley Research Center, USA; December 1999; 990p; In English; Aerodynamic Performance, 9-13 Feb. 1998, Los Angeles, CA, USA; Sponsored by NASA, USA; See also 20000036433 through 20000036451; Original contains color illustrations
Contract(s)/Grant(s): RTOP 537-07-00
Report No.(s): NASA/CP-1999-209692/VOL2; L-17758C/VOL2; NAS 1.55:209692/VOL2; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

NASA's High-Speed Research Program sponsored the 1998 Aerodynamic Performance Technical Review on February 9-13, in Los Angeles, California. The review was designed to bring together NASA and industry High-Speed Civil Transport (HSCT) Aerodynamic Performance technology development participants in areas of Configuration Aerodynamics (transonic and supersonic cruise drag prediction and minimization), High-Lift, and Flight Controls. The review objectives were to (1) report the progress and status of HSCT aerodynamic performance technology development; (2) disseminate this technology within the appropriate technical communities; and (3) promote synergy among the scientists and engineers working HSCT aerodynamics. In particular, single- and multi-point optimized HSCT configurations, HSCT high-lift system performance predictions, and HSCT simulation results were presented along with executive summaries for all the Aerodynamic Performance technology areas. The HSR Aerodynamic Performance Technical Review was held simultaneously with the annual review of the following airframe technology areas: Materials and Structures, Environmental Impact, Flight Deck, and Technology Integration. Thus, a fourth objective of the Review was to promote synergy between the Aerodynamic Performance technology area and the other technology areas of the HSR Program.
Author
Civil Aviation; Supersonic Transports; NASA Programs; Aerodynamic Characteristics; Aerodynamic Configurations

20000036433 Boeing Co., High Lift Aerodynamics ITD Team, Seattle, WA USA
High Lift Aerodynamics Technology Development
Meredith, Paul T., Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 1873-1895; In English; See also 20000036432; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The overall goals and objectives of this paper are to: 1) Greatly increase L/D relative to SST Technology (suction Parameter greater than or equal to 92%; 2) Establish and Validate Analysis/Design Methodology; 3) Define Preferred High Lift System; and 4) Technology Readiness Level greater than or equal to 6. This paper is presented in viewgraph form.
Derived from text
Aerodynamic Configurations; Technology Assessment; Lift

20000036434 Boeing Co., Seattle, WA USA
TCA High Lift Preliminary Assessment
Wyatt, G. H., Boeing Co., USA; Polito, R. C., Boeing Co., USA; Yeh, D. T., Boeing Co., USA; Elzey, M. E., Boeing Co., USA; Tran, J. T., Boeing Co., USA; Meredith, Paul T., Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 1897-1931; In English; See also 20000036432
Contract(s)/Grant(s): NAS1-20220; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper presents a TCA (Technology Concept Airplane) High lift Preliminary Assessment. The topics discussed are: 1) Model Description; 2) Data Repeatability; 3) Effect of Inboard L.E. (Leading Edge) Flap Span; 4) Comparison of 14’x22’ TCA-1 With NTF (National Transonic Facility) Modified Ref. H; 5) Comparison of 14’x22’ and NTF Ref. H Results; 6) Effect of Outboard Sealed Slat on TCA; 7) TCA Full Scale Build-ups; 8) Full Scale L/D Comparisons; 9) TCA Full Scale; and 10) Touchdown Lift Curves. This paper is in viewgraph form.
CASI
Lift; Technology Assessment; Civil Aviation; Transonic Wind Tunnels; Wind Tunnel Tests

20000036435 Boeing Co., Long Beach, CA USA
TCA Planform and Leading-Edge Study at High Lift Conditions
Yeh, David T., Boeing Co., USA; Clark, Roger W., Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 1933-2003; In English; See also 20000036432; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

This report starts with the description of the objectives for the HSCT high-lift aerodynamics, followed by the numerical approach. Numerical results will be presented and comparison will be made with available test data or another CFD code. The basic flow characteristics for the TCA (Technology Concept Aircraft) configuration will be first described, followed by the discussions of the effects of spanwise extent of the leading-edge flaps, inboard leading edge camber increase and the planform variation of the TCA2.8-28 from the baseline TCA configuration. This report concludes with a summary and future plans.
Derived from text
Aircraft Configurations; Leading Edge Flaps; Planforms; Lift; Computational Fluid Dynamics; Civil Aviation

20000036436 Boeing Commercial Airplane Co., Seattle, WA USA
Prediction of High Lift Characteristics of the PTC
Ebner, Keith, Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2005-2053; In English; See also 20000036432; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper presents, in viewgraph form, Prediction of High Lift Characteristics of the PTC (Preliminary Technology Concept). The topics include: 1) PTC vs. TCA configuration aspects; 2) Common process overview; 3) Baseline wind tunnel data; 4) Buildup to PTC; 5) 3-surface optimization; 6) Programmed flap; 7) Technology projection; and 8) Touchdown performance. This paper also shows the differences between TCA and the PTC that are important to high lift aerodynamics.
CASI
Wind Tunnel Tests; Performance Prediction; Aerodynamic Characteristics; Lift; Technology Utilization; Body-Wing Configurations

20000036437 Boeing Information, Space and Defense Systems, Phantom Works, Seal Beach, CA USA
Correlation of CFD Calculations and Wind Tunnel Measurements for the M2.4-7A Arrow Wing Configuration
Woan, Chung–Jin, Boeing Information, Space and Defense Systems, USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2055-2105; In English; See also 20000036432; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

A self-contained working CFD (Computational Fluid Dynamics) procedure has been presented for wind tunnel flow simulations and applied to the 4%-scale M2.4-7A Arrow Wing inside the NASA/Ames 12-ft wind tunnel with and without model supporting posts. The effect of the tunnel wall alone was found to give larger values in forces and moment as compared with the

free-air case. However tunnel wall alone did not change the over-wing vortex flow structure existing in the free-air case. The effect of the model supporting posts has been found to eliminate the over-wing vortex flow existing in the free-air case. The test data from the NASA/LaRC 14'x22' wind tunnel tests seemed to support this observation. Good quality test data are in need to further validate CFD solutions. It is recommended to use CFD to identify locations of pressure ports for wind tunnel data measurements.
Derived from text
Aerodynamic Configurations; Arrow Wings; Computational Fluid Dynamics; Wind Tunnel Tests; Scale Models; Civil Aviation

20000036438 Boeing Co., Long Beach, CA USA
4% Arrow Wing Model Test in NASA Ames 12 ft Pressure Tunnel
Edwards, Robin, Boeing Co., USA; Polito, Ryan, Boeing Co., USA; Clark, Roger, Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2107-2159; In English; See also 20000036432; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

The test objectives of the 4% Arrow Wing Model are to: 1) Compare results with previous test in Langley 14'x22' tunnel; 2) Investigate effect of increased le radius; 3) Investigate Re no (Reynolds Number) effects on an alternate planform; 4) Optimize le/te (leading edge/trailing edge) flap deflection for climb; 5) Gather wing deformation data (LaRC); and 6) Gather flow visualization data. The main details of the test of the M2.4-7A Arrow Wing Model in the Ames 12' Pressure Tunnel are shown. This paper is presented in viewgraph form.
CASI
Arrow Wings; Wind Tunnel Tests; Scale Models; Aerodynamic Configurations; Subsonic Speed

20000036439 Boeing Co., Long Beach, CA USA
Power Effects on High Lift, Stability and Control Characteristics of the TCA Model Tested in the LaRC 14 x 22 Ft Wind Tunnel
Glessner, Paul T., Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2161-2186; In English; See also 20000036432
Contract(s)/Grant(s): NAS1-20220; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The TCA-2 wind-tunnel test was the second in a series of planned tests utilizing the 5% Technology Concept Airplane (TCA) model. Each of the tests was planned to utilize the unique capabilities of the NASA Langley 14'x22' and the NASA Ames 12' test facilities, in order to assess specific aspects of the high lift and stability and control characteristics of the TCA configuration. However, shortly after the completion of the TCA-1 test, an early projection of the Technology Configuration (TC) identified the need for several significant changes to the baseline TCA configuration. These changes were necessary in order to meet more stringent noise certification levels, as well as, to provide a means to control dynamic structural modes. The projected changes included a change to the outboard wing (increased aspect ratio and lower sweep) and a reconfiguration of the longitudinal control surfaces to include a medium size canard and a reduced horizontal tail. The impact of these proposed changes did not affect the TCA-2 test, because it was specifically planned to address power effects on the empennage and a smaller horizontal tail was in the plan to be tested. However, the focus of future tests was reevaluated and the emphasis was shifted away from assessment of TCA specific configurations to a more general assessment of configurations that encompass the projected design space for the TC.
Derived from text
Wind Tunnel Tests; Control Stability; Lift; Aerodynamic Characteristics; Civil Aviation; Powered Models; Aerodynamic Configurations

20000036440 Boeing Co., Long Beach, CA USA
Assessment of Boundary-Layer Transition Detection and Fixing Techniques
Hammer, Marvine, Boeing Co., USA; Clark, Roger, Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2187-2231; In English; See also 20000036432; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper presents an Assessment of Boundary Layer Transition Detection and Fixing Techniques. The topics include: 1) Transition Detection Techniques Evaluation and Selection; 2) Advantages/Disadvantages of Candidate Techniques; 3) TSP (Temperature Sensitive Paint) System Detail; and 3) TSP Results. This paper is presented in viewgraph form.
CASI
Boundary Layer Transition; Imaging Techniques; Detection; Laminar Flow

20000036441 Boeing Co., Long Beach, CA USA
Experimental Study of Static and Dynamic Ground Effects for Low Aspect Ratio Wings
Owens, Lewis R., Boeing Co., USA; Powell, Arthur G., Boeing Co., USA; Curry, Robert E., Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2233-2297; In English; See also 20000036432; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

This presentation includes a summary of a recent experimental study of the static and dynamic ground effects for low aspect ratio wings. For the HSCT wing planforms tested in the 14x22 ft DGE test, no significant differences were found between DGE (Dynamic Ground Effects) and SGE (Static Ground Effects) test techniques. From previous ground effects data, the aspect ratios of the model wing planforms tested were such that differences in DGE and SGE data were expected. Closer examination of all the data suggested that other factors (in addition to AR) may need to be controlled to better understand this difference. Comparisons of the ground effects increment data from the 14x22 ft DGE test and the flight test for the TU-144 were good. These ground effects increments compared well even with a very basic model that represented only the wing planform of the TU-144 aircraft dynamic ground effects of low aspect ratio wings.
Derived from text
Low Aspect Ratio Wings; Ground Effect (Aerodynamics); Static Tests; Dynamic Tests; Wind Tunnel Tests; Civil Aviation

20000036442 Boeing Commercial Airplane Co., Seattle, WA USA
Potential Flow Analysis of Dynamic Ground Effect
Feifel, W. M., Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2299-2385; In English; See also 20000036432
Contract(s)/Grant(s): NAS1-20220; No Copyright; Avail: CASI; A05, Hardcopy; A10, Microfiche

Interpretation of some flight test data suggests the presence of a 'dynamic ground effect'. The lift of an aircraft approaching the ground depends on the rate of descent and is lower than the aircraft steady state lift at a same height above the ground. Such a lift deficiency under dynamic conditions could have a serious impact on the overall aircraft layout. For example, the increased pitch angle needed to compensate for the temporary loss in lift would reduce the tail strike margin or require an increase in landing gear length. Under HSR2 an effort is under way to clarify the dynamic ground effect issue using a multi-pronged approach. A dynamic ground effect test has been run in the NASA Langley 14x22 ft wind tunnel. Northup-Grumman is conducting time accurate CFD (Computational Fluid Dynamics) Euler analyses on the National Aerodynamic Simulator facility. Boeing has been using linear potential flow methodology which are thought to provide much needed insight in, physics of this very complex problem. The present report summarizes the results of these potential flow studies.
Derived from text
Computational Fluid Dynamics; Ground Effect (Aerodynamics); Potential Flow; F-15 Aircraft; Wind Tunnel Tests; Dynamic Tests; Aerodynamic Configurations

20000036443 Northrop Grumman Corp., Bethpage, NY USA
Dynamic Ground Effects Simulation Using OVERFLOW-D
Dwyer, Bill, Northrop Grumman Corp., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2388-2469; In English; See also 20000036432; Original contains color illustrations
Contract(s)/Grant(s): NAS1-20220; ZA0867; No Copyright; Avail: CASI; A05, Hardcopy; A10, Microfiche

This presentation is broken into 5 logical sections. The Background Information section describes the technical issues being address by this study. The Approach section describes the organization of the contract effort which was laid out as the most effective means of quantifying, with validated methods, the magnitude of dynamic ground effects for the TCA (Technology Concept Aircraft) configuration. The Validation Case section describes the analysis of the XB-70 configuration in both static and dynamic ground effect, with comparisons to wind tunnel and flight test data. The TCA Analysis section then describes the application of the same codes and methodologies to the TCA in both static and dynamic ground effect. Comparisons are made between the static and dynamic, as well as to early static data from a recent wind tunnel test on the TCA configuration. Finally, the work to date is summarized and the future direction of this study is outlined.
Derived from text
B-70 Aircraft; Ground Effect (Aerodynamics); Computerized Simulation; Wind Tunnel Tests; Applications Programs (Computers); Civil Aviation; Dynamic Tests

20000036444 NASA Langley Research Center, Hampton, VA USA
Recent Results in the Study of Static Ground Effect Using an Inviscid Unstructured Grid Code
Yaros, Steven F., NASA Langley Research Center, USA; 1998 NASA High-Speed Research Program Aeodynamic Performance

Workshop; December 1999; Volume 2, pp. 2471-2507; In English; See also 20000036432; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The TetrUSS (Tetrahedral Unstructured Software System), developed at NASA LaRC, enables one to take a vehicle from its surface definition to its analyzed solution. The important parts are the shape definition, accomplished in GRIDTOOL; the initial front and volume grid generation in VGRID; the flow solver USM3D, and the various ways used to post-process the computational results.

Derived from text

Ground Effect (Aerodynamics); Unstructured Grids (Mathematics); Static Tests; Applications Programs (Computers); Wind Tunnel Tests; Inviscid Flow; Computational Fluid Dynamics

20000036445 Boeing Commercial Airplane Co., Seattle, WA USA

Potential Flow Analysis of the Mark-16 Flow Survey Probe

Roth, Eric J., Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2509-2543; In English; See also 20000036432; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

A flow survey probe is an important tool for investigating the complex flow field around a wind tunnel model. It is especially useful for quantitative measurements of profile and induced drag. These separate measurements, which cannot be distinguished using a force balance, are necessary for CFD validation. The cost of using a flow survey probe includes not only the hardware and software, but also the staff required to operate it. If modifications need to be made to the existing hardware, cost will increase as well. Installing the traverser is simple, especially if holes are drilled into the mounting surface prior to installation. Installation time in this case could be on the order of 45 minutes. A major drawback of any flow survey system is the possibility of aerodynamic influence. It is important that the traverser, whose purpose is to measure the flow field created by the model, not alter that flow field and give inaccurate data. Any changes to the flow field must be taken into account.

Derived from text

Computational Fluid Dynamics; Flow Distribution; Potential Flow; Aerodynamic Configurations; Wind Tunnel Models

20000036446 Boeing Co., High Lift Aerodynamics, Seattle, WA USA

Aerodynamic Design of Inboard Sealed Slats for the TCA-3 Wind Tunnel Test

Griffiths, Robert C., Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2545-2583; In English; See also 20000036432; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The goal of this study was to design inboard leading edge devices that would improve the baseline plain flap performance (airplane L/D). Sealed slats were selected to focus the study on because of the success seen with these devices on the sharp outboard leading edge and because of the aerodynamic benefits inherent in the sealed slat concept. Ultimately, the result of this study was to choose the best leading edge designs, build them and test them in TCA-3. Included in this discussion are reasons as to why sealed slats work, design constraints approach taken, and computational results.

Derived from text

Wind Tunnel Tests; Aircraft Design; Civil Aviation; Leading Edge Slats; Aerodynamic Configurations

20000036447 DYNACS Engineering Co., Inc., Huntsville, AL USA

Navier-Stokes Results for HSCT High-Lift Configurations

Saladino, Anthony J., DYNACS Engineering Co., Inc., USA; Chen, Allen W., Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2585-2689; In English; See also 20000036432; Original contains color illustrations; No Copyright; Avail: CASI; A06, Hardcopy; A10, Microfiche

This presentation summarizes the effects of flap span and outward wing sweep on the Ref. H, and sealed slats vs. plain flaps on the TCA. In each of the three tasks, CFD was used to determine if it can duplicate the wind tunnel results and explain the phenomena. Each task has its own conclusions. Final recommendations are made based upon the conclusions of the three tasks.

Derived from text

Aerodynamic Configurations; Civil Aviation; Navier-Stokes Equation; Supersonic Transports; Lift; Computational Fluid Dynamics; Wind Tunnel Tests

20000036448 NASA Langley Research Center, Hampton, VA USA
Code Calibration Applied to the TCA High-Lift Model in the 14 x 22 Wind Tunnel (Simulation With and Without Model Post-Mount)
Lessard, Wendy B., NASA Langley Research Center, USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2691-2733; In English; See also 20000036432; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The objective of this study is to calibrate a Navier-Stokes code for the TCA (30/10) baseline configuration (partial span leading edge flaps were deflected at 30 degs. and all the trailing edge flaps were deflected at 10 degs). The computational results for several angles of attack are compared with experimental force, moments, and surface pressures. The code used in this study is CFL3D; mesh sequencing and multi-grid were used to full advantage to accelerate convergence. A multi-grid approach was used similar to that used for the Reference H configuration allowing point-to-point matching across all the trailingedge block interfaces. From past experiences with the Reference H (ie, good force, moment, and pressure comparisons were obtained), it was assumed that the mounting system would produce small effects; hence, it was not initially modeled. However, comparisons of lower surface pressures indicated the post mount significantly influenced the lower surface pressures, so the post geometry was inserted into the existing grid using Chimera (overset grids).

Derived from text

Navier-Stokes Equation; Wind Tunnel Tests; Applications Programs (Computers); Aircraft Configurations; Computational Fluid Dynamics; Civil Aviation

20000036449 ASE Technologies, Inc., Cincinnati, OH USA
Aerodynamic Analysis of TCA Wing/Body/Nacelle High Lift Configurations
Fan, Xue–Tong, ASE Technologies, Inc., USA; Hickey, Paul, ASE Technologies, Inc., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2735-2764; In English; See also 20000036432; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The objectives of this work are two fold. The first objective is to develop efficient CFD modeling procedures for the TCA high lift configurations with nacelle installation. The second objective is to evaluate the effect of nacelle installation on the aerodynamic performance of the TCA high lift configurations. to achieve the first objective, we will build multi-block CFD grids to include nacelles and diverters in the TCA high lift configurations with and without deflected LE/TE (Leading Edge/Trailing Edge) flaps. and then we will use CFL3D to obtain fully converged turbulent solutions for the TCA W/B/N (Wing/Body/Nacelle) models. For the second objective, we will, from the CFD solutions, identify and analyze important flow characteristics due to nacelle installation to support Propulsion Airframe Integration. We will also provide flow and performance data for the TCA W/B/N configurations to supplement wind tunnel test.

Derived from text

Computational Fluid Dynamics; Civil Aviation; Nacelles; Lift; Aerodynamic Characteristics; Wind Tunnel Tests; Body-Wing Configurations

20000036450 Boeing Co., Long Beach, CA USA
Canard Integration for CFD Analysis of HSCT High Lift Configurations
Yeh, David T., Boeing Co., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2765-2829; In English; See also 20000036432; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

This report starts with the description of the objectives for canard integration analysis, followed by the numerical approach. The methodologies behind the automated canard modeling procedure are described and the integration process to obtain the numerical solutions is then summarized. A sample solution is presented and analyzed for the TCA wing/body/canard configuration with a part span leading edge flap deflected at 30 degrees and the trailing edge flaps deflected at 10 degrees at a high lift condition. This report concludes with a summary and future plans.

Derived from text

Canard Configurations; Civil Aviation; Computational Fluid Dynamics; Lift; Supersonic Transports; Numerical Analysis

20000036451 ASE Technologies, Inc., Cincinnati, OH USA
Comparison of CFL3D Solutions Using Alternative Grid Interfacing Schemes
Fan, Xue–Tong, ASE Technologies, Inc., USA; Hickey, Paul, ASE Technologies, Inc., USA; 1998 NASA High-Speed Research Program Aeodynamic Performance Workshop; December 1999; Volume 2, pp. 2831-2847; In English; See also 20000036432; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The objectives of this work are twofold. The first objective is to compare and cross-examine the CFL3D solutions for the TCA W/B/N (Wing/Body/Nacelle) models using two different grid interfacing methods: face-matching (or patching) with RONNIE and overlapping with MAGGIE. The second objective is to evaluate these two methods and determine which one is better suited for the CFD modeling of the TCA W/B/N configurations. The grid interfacing method will be evaluated in terms of grid generation effort, block interface quality, and computer resources. Special attention is paid to the potential technical difficulties involved, especially in the case of deflected TE flaps for TCA (Technology Concept Aircraft) high lift configurations.
Derived from text
Computational Fluid Dynamics; Computational Grids; Civil Aviation; Applications Programs (Computers); Aerodynamic Configurations

20000037696 Naval Surface Warfare Center, Dahlgren Div., Dahlgren, VA USA
Improvements in Pitch Damping for the Aeroprediction Code with Particular Emphasis on Flare Configurations ***Final Report***
Moore, Frank G.; Hymer, Tom C.; Apr. 2000; 49p; In English
Report No.(s): AD-A375056; NSWCDD/TR-00/009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

New capability has been added to the NSWC aeroprediction code to allow aerodynamics to be predicted for Mach numbers up to 20 for configurations with flares. This new capability includes extending the static aerodynamic predictions for Mach numbers less than 1.2, improving the body alone pitch damping for Mach numbers above 2.0, and developing a new capability for pitch damping of flared configurations at Mach numbers up to 20. This new capability for flared configurations was validated for several different configurations in the Mach number range of 2 to 8.8. In general, pitch damping predictions of the improved capability was within 20 percent of either experimental data or computational fluid dynamics calculations. This accuracy level is believed to be quite adequate for dynamic derivatives in the preliminary design stage. These new additions to the aeroprediction code will be transitioned to users as part of the 2002 version of the code (APO2).
DTIC
Aerodynamic Configurations; Aerodynamic Stability; Accuracy

20000037720 NASA Langley Research Center, Hampton, VA USA
Contributions of Transonic Dynamics Tunnel Testing to Airplane Flutter Clearance
Rivera, Jose A., NASA Langley Research Center, USA; Florance, James R., NASA Langley Research Center, USA; [2000]; 20p; In English; Dynamics Specialists Conference, 5-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-1768; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Transonic Dynamics Tunnel (TDT) became in operational in 1960, and since that time has achieved the status of the world's premier wind tunnel for testing large in aeroelastically scaled models at transonic speeds. The facility has many features that contribute to its uniqueness for aeroelastic testing. This paper will briefly describe these capabilities and features, and their relevance to aeroelastic testing. Contributions to specific airplane configurations and highlights from the flutter tests performed in the TDT aimed at investigating the aeroelastic characteristics of these configurations are presented.
Author
Transonic Wind Tunnels; Aircraft Configurations; Aeroelasticity; Dynamic Tests

20000037779 NASA Dryden Flight Research Center, Edwards, CA USA
Aerodynamic Lift and Moment Calculations Using a Closed-Form Solution of the Possio Equation
Lin, Jensen, California Univ., USA; Iliff, Kenneth W., NASA Dryden Flight Research Center, USA; April 2000; 26p; In English
Contract(s)/Grant(s): NCC2-374; RTOP 529-50-04
Report No.(s): NASA/TM-2000-209019; NAS 1.15:209019; H-2374; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper, we present closed-form formulas for the lift and moment coefficients of a lifting surface in two dimensional, unsteady, compressible, subsonic flow utilizing a newly developed explicit analytical solution of the Possio equation. Numerical calculations are consistent with previous numerical tables based on series expansions or ad hoc numerical schemes. More importantly, these formulas lend themselves readily to flutter analysis, compared with the tedious table-look-up schemes currently in use.
Author
Aerodynamic Coefficients; Lift; Aeroelasticity; Method of Moments; Unsteady Aerodynamics; Laplace Transformation

20000037896 Naval Air Systems Command, Patuxent , MD USA

Tactical Payloads for UAVs

Carruso, Amy Houle, Naval Air Systems Command, USA; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 9-1 - 9-5; In English; See also 20000037887; Copyright Waived; Avail: CASI; A01, Hardcopy

The Tactical Systems Program Office of the Program Executive Officer, Cruise Missiles and Unmanned Aerial Vehicles PEO(CU) is developing and refining Payload Concepts of Operation (CONOPS) based on demonstrated capabilities, new technology, and emerging operator needs. The Tactical Systems Program Office continues to expand technical and operational capabilities for increased Unmanned Aerial Vehicle (UAV) applications. to support future military operations, the Tactical Systems Program Office foresees UAVs as a complement to manned and space based systems. Traditionally, UAV Payload operations focused on the ElectroOptical/InfraRed (EO/IR) reconnaissance role. While still the highest priority requirement, new technologies have expanded potential payload applications. Aware of the importance of newly maturing technologies, the Tactical Systems Program Office continuously monitors technologies sponsored by the Government and industry to determine their direct application to UAV airborne platforms and ground stations.

Author

Pilotless Aircraft; Payloads; Aerial Reconnaissance; Infrared Imagery; Infrared Radiation

20000038344 NASA Marshall Space Flight Center, Huntsville, AL USA

Background Simulation of the MSFC GSPC Balloon Payload

Swartz, D. A., NASA Marshall Space Flight Center, USA; Chen, Y., NASA Marshall Space Flight Center, USA; Ramsey, B. D., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 45th, 30 Jul. - 4 Aug. 2000, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Numerical simulations are used to predict the cosmic-ray induced background in a passively shielded gas scintillation proportional counter to be used as the focal plane instrument of a balloon-borne hard x-ray telescope system. The predicted background in the 20-75 keV operating range of the detector shows a spectral shape characteristic of a power law photoelectrically absorbed by the stainless steel pressure vessel walls. It is found that the dominant background radiation component is simply cosmic diffuse and atmospheric gamma-ray leakage though there is a contribution from nuclear interactions of energetic particles in the walls and nearby payload structures. The correlation between shielding properties and background flux is examined parametrically using one-dimensional slab models, within material and weight constraints, in order to optimize predicted sensitivity. The addition of a few mm thick Sn passive shielding reduces the primary photon contribution by up to 50% at the spectral peak, E 150 keV, and adds only negligibly to the flux due to photon production within the high-Z shields at lower energies.

Author

Scintillation Counters; X Ray Telescopes; Radiation Shielding; Mathematical Models

20000038422 NASA Langley Research Center, Hampton, VA USA

1998 NASA High-Speed Research Program Aerodynamic Performance Workshop, Volume 1, Configuration Aerodynamics

McMillin, S. Naomi, Editor, NASA Langley Research Center, USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; 954p; In English; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop, 9-13 Feb. 1998, Los Angeles, CA, USA; See also 20000038423 through 20000038441

Contract(s)/Grant(s): RTOP 537-07

Report No.(s): NASA/CP-1999-209692/VOL1/PT2; L-17758B; NAS 1.55:209692/VOL1/PT2; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

NASA's High-Speed Research Program sponsored the 1998 Aerodynamic Performance Technical Review on February 9-13, in Los Angeles, California. The review was designed to bring together NASA and industry High-Speed Civil Transport (HSCT) Aerodynamic Performance technology development participants in areas of Configuration Aerodynamics (transonic and supersonic cruise drag prediction and minimization), High-Lift, and Flight Controls. The review objectives were to (1) report the progress and status of HSCT aerodynamic performance technology development; (2) disseminate this technology within the appropriate technical communities; and (3) promote synergy among the scientists and engineers working HSCT aerodynamics. In particular, single and multi-point optimized HSCT configurations, HSCT high-lift system performance predictions, and HSCT simulation results were presented along with executive summaries for all the Aerodynamic Performance technology areas. The HSR Aerodynamic Performance Technical Review was held simultaneously with the annual review of the following airframe technology areas: Materials and Structures, Environmental Impact, Flight Deck, and Technology Integration. Thus, a fourth

objective of the Review was to promote synergy between the Aerodynamic Performance technology area and the other technology areas of the HSR Program.
Author
High Speed; Civil Aviation; Aerodynamic Configurations; Optimization; Engine Airframe Integration; Aircraft Design; Supersonic Transports; Computational Fluid Dynamics

20000038423 Boeing Co., Long Beach, CA USA
Aerodynamic Gradients Using Three Methods
Kuruvila, Geojoe, Boeing Co., USA; Hager, James O., Boeing Co., USA; Sundaram, P., Boeing Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 931-977; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper investigates the relative merits of three methods for computing the gradients of aerodynamic forces with respect to shape design variables. The three methods considered in this study are the finite-difference, the sensitivity equation and the adjoint. The development cost, computing cost, accuracy and overall cycle-time for each of these approaches are addressed.
Author
Aerodynamic Forces; Finite Difference Theory; Gradients; Shape Functions; Optimization; Adjoints

20000038427 Northrop Grumman Corp., USA
Nacelle Airframe Integration Aerodynamic Performance HSR Task 32
Peavey, Charlie, Northrop Grumman Corp., USA; Malone, Michael, Northrop Grumman Corp., USA; Westra, Bryan, Northrop Grumman Corp., USA; Dimanlig, Arsenio, Northrop Grumman Corp., USA; Bard, Bill, Northrop Grumman Corp., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1143-1185; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The 1997 Bleed Exhaust and Inlet Spillage Assessment study was initiated to develop an understanding of how the propulsion/inlet system affects the aerodynamic performance of the High Speed Civil Transport Technology Concept Airplane (TCA). Boeing subcontracted Northrop Grumman Corporation (NGC) to perform this analysis. The objective of the task was to perform a parametric, viscous, CFD analysis to determine the effects of bleed exhaust and inlet spillage on the external aerodynamics of the TCA. The amount of bleed air exhaust is not significant in the transonic regime and was not included in the subsonic cruise (M=0.9) or transonic climbout (M=1.2) conditions where the spill effects dominate. Likewise, the inlet operates on design (i.e. shock-on-lip) at the supersonic cruise-condition (M=2.4) without spillage, yet has significant bleed exhaust. Thus two separate investigations could be made. by analyzing the nacelles isolated and the TCA configuration with flow-through nacelles (wind tunnel configuration), a detailed drag build-up could be performed. The first section of this presentation details the bleed exhaust study and the following section discusses the effect of inlet spillage. There was no bypass flow for any of the cases in this study.
Author
Aerodynamic Characteristics; Computational Fluid Dynamics; Supersonic Transports; Aerodynamic Interference; Wing Nacelle Configurations; Aerodynamic Drag

20000038428 NASA Ames Research Center, Moffett Field, CA USA
Propulsion Induced Effects (PIE) Test Program
Cappuccio, Gelsomina, NASA Ames Research Center, USA; Won, Mark J., NASA Ames Research Center, USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1187-1239; In English; See also 20000038422; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

The Propulsion Induced Effects (PIE) test program is being lead by NASA Ames for Configuration Aerodynamics (CA). Representatives from CA, Technology Integration (TI), Inlet, and the Nozzle ITD's are working with Ames in defining and executing this test program. The objective of the CA 4-14 milestone is to assess the propulsion/airframe integration characteristics of the Technology Concept Airplane (TCA) and design variations using computational and experimental methods. The experimental aspect includes static calibrations, transonic and supersonic wind tunnel testing. The test program will generate a comprehensive database that will include all appropriate wind tunnel corrections, with emphasis placed on establishing the propulsion induced effects on the flight performance of the TCA.
Author
Aerodynamic Configurations; Aircraft Design; Engine Airframe Integration; Wind Tunnel Tests; Supersonic Transports

20000038432 Boeing Commercial Airplane Co., Seattle, WA USA

Nonlinear Cruise-pt. Validation (NCV) Model Wind Tunnel Test Summary & Posttest Analysis

Mejia, Kevin M., Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1505-1543; In English; See also 20000038422; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper provides the transcript of one of the presentations made during the 1998 HSR Biannual Airframe Technical review on February 11, 1998. This presentation reviews the events of the UPWT 1687 wind tunnel test where the HSR Configuration Aerodynamics Nonlinear Cruise-point Validation (NCV) model was tested to validate one of three nonlinear optimization processes for drag reduction. Also covered are the results of several posttest analysis exercises conducted to understand the differences between test data and pretest predictions.

Author

Aerodynamic Configurations; Drag Reduction; Wind Tunnel Tests; Supersonic Transports

20000038435 Boeing Co., Long Beach, CA USA

Effect of Aeroelasticity on the Aerodynamic Performance of the TCA

Kuruvila, George, Boeing Co., USA; Hartwich, Peter M., Boeing Co., USA; Baker, Myles L., Boeing Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1589-1647; In English; See also 20000038422; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

This paper investigates the effect of static aeroelasticity on the aerodynamic performance of the TCA in the wind-tunnel and in flight. The first part of the paper addresses the impact of wind-tunnel model deformation on the measured and predicted aerodynamic performance of the TCA. The measured model deformations are lofted on to the OML and analyzed using CFD. The results are compared with the wind-tunnel data. The second part of the paper investigates the change in shape and performance of the TCA, during supersonic cruise-climb, due to static aeroelastic effects, using nonlinear aerodynamics and structural interactions. The TCA OML is assumed to be the shape at mid-cruise. Using appropriate correction terms, the need to explicitly know the "jig shape" is alleviated.

Author

Aerodynamic Characteristics; Aeroelasticity; Wind Tunnel Models; Wind Tunnel Tests; Supersonic Transports; Aerodynamic Configurations; Elastic Deformation

20000038438 Boeing Commercial Airplane Co., Seattle, WA USA

Overview of Technology Integration Activities Related to Configuration Aerodynamics

Nelson, Chester P., Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1757-1776; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper presents a summary of recent and planned activities under the NASA High Speed Research program Technology Integration task (HSR TI) which are of particular interest to the high speed Configuration Aerodynamics (CA) technical element. The role of high speed aerodynamic design and analysis data supporting the Ti sub-tasks is outlined. The contribution of planned trade studies to the definition of an Optimized Aeroelastic Concept configuration (OAC), and the subsequent integration of the Technology Configuration (TC) planned for late 1998 are reviewed. Key trade studies supporting those efforts include those for Alternate Control Configurations (ACC), planform and propulsion system configuration trades, and high aspect ratio wing integration studies. Results of a typical technology integration sub-task using CFD are shown for the case of assessing the potential excrescence drag penalties of several proposed external configuration features.

Author

Aerodynamic Configurations; Systems Integration; Engine Airframe Integration; Technology Assessment; Supersonic Transports

20000038900 Colorado Univ., Colorado Springs, CO USA

Metamodeling Techniques and Applications *Final Report, Mar. 1996 - Sep. 1998*

Caughlin, Don; Jan. 2000; 82p; In English

Contract(s)/Grant(s): F30602-96-C-0040; AF Proj. 4594

Report No.(s): AD-A374583; AFRL-IF-RS-TR-2000-1; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This report represents a compendium of previously published response generated during the conduct of this contract. They describe model abstraction techniques in general; reduced order metamodeling as a specific abstraction technique, and other applications of metamodeling.
DTIC
Software Engineering; System Identification; Wind Tunnel Models

20000039423 Rice Univ., Dept. of Mechanical Engineering and Materials Science, Houston, TX USA
Numerical Simulation of Receptivity for a Transition Experiment, *Oct. 1997 - Nov. 1999*
Collis, S. Scott, Rice Univ., USA; Apr. 25, 2000; 6p; In English
Contract(s)/Grant(s): NAG1-1976; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The cost of fuel to overcome turbulence induced viscous drag on a commercial airplane constitutes a significant fraction of the operating cost of an airline. Achieving laminar flow and maintaining it over a large portion of the wing can significantly reduce the viscous drag, and hence the cost. Design of such laminar-flow-control wings and their practical operation requires the ability to accurately and reliably predict the transition from laminar to turbulent flow. The transition process begins with the conversion of environmental and surface disturbances into the instability waves of the flow by a process called receptivity. The goal of the current research project has been to improve the prediction of transition through a better understanding of the physics of receptivity. The initial objective of this work was to investigate the specific stability and receptivity characteristics of a particular experimental investigation of boundary layer receptivity at NASA Langley. Some simulation results using direct solutions of the linearized Navier-Stokes equations which modeled this experiment where presented in the 1999 APS DFD meeting. However, based on these initial investigations, it became clear that to cover the vast receptivity parameter space required for a practical transition prediction tool, more efficient methods would be required. Thus, the focus of this research was shifted from modeling this particular experiment to formulating and developing new techniques that could efficiently yet accurately predict receptivity for a wide range of disturbance conditions.
Derived from text
Computerized Simulation; Mathematical Models; Navier-Stokes Equation; Boundary Layer Transition; Receiving

20000044552 NASA Glenn Research Center, Cleveland, OH USA
Ice Accretions and Icing Effects for Modern Airfoils
Addy, Harold E., Jr., NASA Glenn Research Center, USA; April 2000; 292p; In English
Contract(s)/Grant(s): RTOP 548-21-23
Report No.(s): NASA/TP-2000-210031; NAS 1.60:210031; E-12228; DOT/FAA/AR-99/89; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Icing tests were conducted to document ice shapes formed on three different two-dimensional airfoils and to study the effects of the accreted ice on aerodynamic performance. The models tested were representative of airfoil designs in current use for each of the commercial transport, business jet, and general aviation categories of aircraft. The models were subjected to a range of icing conditions in an icing wind tunnel. The conditions were selected primarily from the Federal Aviation Administration's Federal Aviation Regulations 25 Appendix C atmospheric icing conditions. A few large droplet icing conditions were included. to verify the aerodynamic performance measurements, molds were made of selected ice shapes formed in the icing tunnel. Castings of the ice were made from the molds and placed on a model in a dry, low-turbulence wind tunnel where precision aerodynamic performance measurements were made. Documentation of all the ice shapes and the aerodynamic performance measurements made during the icing tunnel tests is included in this report. Results from the dry, low-turbulence wind tunnel tests are also presented.
Author
Deposition; Ice; Aircraft Icing; Two Dimensional Bodies; Airfoils; Aerodynamic Characteristics

20000044616 NASA Langley Research Center, Hampton, VA USA
First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop, Part 1
Wood, Richard M., Editor, NASA Langley Research Center, USA; December 1999; 352p; In English; See also 20000044617 through 20000044630
Contract(s)/Grant(s): RTOP 537-07-20
Report No.(s): NASA/CP-1999-209690/PT1; NAS 1:55:209690/PT1; L-17574A/PT1; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This publication is a compilation of documents presented at the First NASA/Industry High Speed Research Configuration Aerodynamics Workshop held on February 27-29, 1996 at NASA Langley Research Center. The purpose of the workshop was

to bring together the broad spectrum of aerodynamicists, engineers, and scientists working within the Configuration Aerodynamics element of the HSR Program to collectively evaluate the technology status and to define the needs within Computational Fluid Dynamics (CFD) Analysis Methodology, Aerodynamic Shape Design, Propulsion/Airframe Integration (PAI), Aerodynamic Performance, and Stability and Control (S&C) to support the development of an economically viable High Speed Civil Transport (HSCT) aircraft. to meet these objectives, papers were presented by representative from NASA Langley, Ames, and Lewis Research Centers; Boeing, McDonnell Douglas, Northrop-Grumman, Lockheed-Martin, Vigyan, Analytical Services, Dynacs, and RIACS.
Author
Aerodynamic Characteristics; Aerodynamic Configurations; Civil Aviation; Computational Fluid Dynamics; Supersonic Transports; Government/Industry Relations; Control Stability

20000044617 NASA Langley Research Center, Hampton, VA USA
HSR Aerodynamic Performance Status and Challenges
Gilbert, William P., NASA Langley Research Center, USA; Antani, Tony, McDonnell Douglas Corp., USA; Ball, Doug, Boeing Co., USA; Calloway, Robert L., NASA Langley Research Center, USA; Snyder, Phil, NASA Ames Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 1-14; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper describes HSR (High Speed Research) Aerodynamic Performance Status and Challenges. The topics include: 1) Aero impact on HSR; 2) Goals and Targets; 3) Progress and Status; and 4) Remaining Challenges. This paper is presented in viewgraph form.
CASI
Aerodynamic Characteristics; Civil Aviation; Aerodynamic Configurations; High Speed; Technology Utilization

20000044618 NASA Langley Research Center, Hampton, VA USA
Configuration Aerodynamics: Past - Present - Future
Wood, Richard M., NASA Langley Research Center, USA; Agrawal, Shreekant, McDonnell-Douglas Aerospace, USA; Bencze, Daniel P., NASA Ames Research Center, USA; Kulfan, Robert M., Boeing Commercial Airplane Co., USA; Wilson, Douglas L., Boeing Commercial Airplane Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 15-40; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Configuration Aerodynamics (CA) element of the High Speed Research (HSR) program is managed by a joint NASA and Industry team, referred to as the Technology Integration Development (ITD) team. This team is responsible for the development of a broad range of technologies for improved aerodynamic performance and stability and control characteristics at subsonic to supersonic flight conditions. These objectives are pursued through the aggressive use of advanced experimental test techniques and state of the art computational methods. As the HSR program matures and transitions into the next phase the objectives of the Configuration Aerodynamics ITD are being refined to address the drag reduction needs and stability and control requirements of High Speed Civil Transport (HSCT) aircraft. In addition, the experimental and computational tools are being refined and improved to meet these challenges. The presentation will review the work performed within the Configuration Aerodynamics element in 1994 and 1995 and then discuss the plans for the 1996-1998 time period. The final portion of the presentation will review several observations of the HSR program and the design activity within Configuration Aerodynamics.
Author
Aerodynamic Configurations; Civil Aviation; Supersonic Transports; Supersonic Flight; Technology Utilization

20000044619 NASA Langley Research Center, Hampton, VA USA
Technology Integration Overview
Coen, Peter G., NASA Langley Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 41-63; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper describes an Overview of Technology Integration. The topics include: 1) Technology Concept Airplane Description; 2) LCAP Overview; and 3) ACE (Aeroelastic Concept Engineering) Overview.
CASI
Technology Assessment; General Overviews; High Speed; Civil Aviation; Systems Integration

20000044621 NASA Langley Research Center, Hampton, VA USA
High-Speed Research Project, 4.3, Aerodynamic Performance
Bharadvaj, Bala, McDonnell-Douglas Aerospace, USA; Fischer, Mike, NASA Langley Research Center, USA; Joslin, Ronald D., NASA Langley Research Center, USA; King, Lyn, NASA Ames Research Center, USA; Parikh, Pradip, Boeing Commercial Airplane Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 81-98; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The SLFC (Supersonic Laminar Flow Control) mission is to develop and validate technologies and perform the SLFC aerodynamic design for the HSCT with an assessment of the net benefits and risks.
Derived from text
Laminar Boundary Layer; Supersonic Flow; Civil Aviation; Aerodynamic Configurations; Active Control; High Speed

20000044622 NASA Langley Research Center, Hampton, VA USA
HSR High-Lift Technology Overview
Applin, Z. T., NASA Langley Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 99-111; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

High-lift system performance will have a large impact on airplane noise and weight. Successful completion of PCD1 activities provided greater understanding of aerodynamic characteristics and configuration features important to high-lift system performance including: 1) Reynolds number effects (Ref. H); 2) Propulsion/airframe integration effects; and 3) Planform effects, canard/3-surface, alternate high-lift concepts, etc. PCD2 plans are aimed at achieving technology development performance goals and increasing technology readiness level for Technology Concept.
Derived from text
Technology Assessment; Lift; High Speed; Civil Aviation; Aerodynamic Characteristics; Aerodynamic Configurations

20000044623 NASA Ames Research Center, Moffett Field, CA USA
Experimental Results of the 2.7% Reference H Nacelle Airframe Interference High Speed Civil Transport Model
Cappuccio, Gelsomina, NASA Ames Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 113-138; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Experiments were conducted in the NASA Ames 9-Ft by 7-Ft Supersonic and 11-Ft by 11-Ft Transonic Wind Tunnels of a 2.7% Reference H (Ref. H) Nacelle Airframe Interference (NAI) High Speed Civil Transport (HSCT) model. NASA Ames did the experiment with the cooperation and assistance of Boeing and McDonnell Douglas. The Ref. H geometry was designed by Boeing. The model was built and tested by NASA under a license agreement with Boeing. Detailed forces and pressures of individual components of the configuration were obtained to assess nacelle airframe interference through the transonic and supersonic flight regime. The test apparatus was capable of measuring forces and pressures of the Wing body (WB) and nacelles. Axisymmetric and 2-D inlet nacelles were tested with the WB in both the in-proximity and captive mode. The in-proximity nacelles were mounted to a nacelle support system apparatus and were individually positioned. The right hand nacelles were force instrumented with flow through strain-gauged balances and the left hand nacelles were pressure instrumented. Mass flow ratio was varied to get steady state inlet unstart data. In addition, supersonic spillage data was taken by testing the 2-D inlet nacelles with ramps and the axisymmetric inlet nacelles with an inlet centerbody for the Mach condition of interest. The captive nacelles, both axisymmetric and 2-D, were attached to the WB via diverters. The captive 2-D inlet nacelle was also tested with ramps to get supersonic spillage data. Boeing analyzed the data and showed a drag penalty of four drag counts for the 2-D compared with the axisymmetric inlet nacelle. Two of the four counts were attributable to the external bevel designed into the 2-D inlet contour. Boeing and McDonnell Douglas used these data for evaluating Computational Fluid Dynamic (CFD) codes and for evaluation of nacelle airframe integration problems and solutions.
Author
Aerodynamic Interference; Civil Aviation; Computational Fluid Dynamics; Supersonic Transports; Wing Nacelle Configurations; Airframes; Transonic Wind Tunnels

20000044624 Boeing Aerospace Co., Seattle, WA USA
HSCT Propulsion Airframe Integration Studies
Chaney, Steve, Boeing Aerospace Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 139-181; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Lockheed Martin spillage study was a substantial effort and is worthy of a separate paper. However, since a paper was not submitted a few of the most pertinent results have been pulled out and included in this paper. The reader is urged to obtain a copy of the complete Boeing Configuration Aerodynamics final 1995 contract report for the complete Lockheed documentation of the spillage work. The supersonic cruise studies presented here focus on the bifurcated - axisymmetric inlet drag delta. In the process of analyzing this delta several test/CFD data correlation problems arose that lead to a correction of the measured drag delta from 4.6 counts to 3.1 counts. This study also lead to much better understanding of the OVERFLOW gridding and solution process, and to increased accuracy of the force and moment data. Detailed observations of the CFD results lead to the conclusion that the 3.1 count difference between the two inlet types could be reduced to approximately 2 counts, with an absolute lower bound of 1.2 counts due to friction drag and the bifurcated lip bevel.
Author
Civil Aviation; Computational Fluid Dynamics; Engine Airframe Integration; Supersonic Transports; Wind Tunnel Tests; Supersonic Inlets

20000044625 Boeing Aerospace Co., Seattle, WA USA
HSCT Nacelle Boundary Layer Diverter Study
Ogg, Steven S., Boeing Aerospace Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 183-195; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The objectives of this study were to understand how lift and drag are affected by diverter geometry, to develop a potential diverter geometry for the Technology Concept Airplane (TCA) that increased lift at constant angle of attack and lift to drag ratio, and to provide insight into how the wing camber in the vicinity of the diverters and nacelles should be shaped. The Reference H wing-body configuration was used to study the impact of boundary layer diverter planform shape on aerodynamic characteristics. In order to make the results more applicable to the TCA a systematic variation of nacelle and diverter geometry was performed. The nacelles were first scaled to 673 pps to more accurately match the TCA engine airframe matching. The impact of changing from a purely axisymmetric nacelle to one that has an axisymmetric inlet which transitions to a 2D nozzle was then explored. The diverter planform was then varied with consideration for the wing alone pressure distribution and the geometrical relationship of the 2D nozzle to the wing. Boundary layer diverters, such as the wedge-slab variant of the Reference H configuration tend to dominate the pressure field in the region of the nacelles due to the strong compression field from the wedge and the strong expansion field from the diverter shoulder. An examination using the TRANAIR full potential code of candidate diverters highlights potential areas of improvement in diverter geometry and in wing camber design in the region of the nacelles.
Author
Body-Wing Configurations; Boundary Layers; Civil Aviation; Diverters; Nacelles; Supersonic Transports

20000044626 McDonnell-Douglas Aerospace, Long Beach, CA USA
Analysis of Alternate Inlets and Nacelles for HSCT Configuration
Sundaram, P., McDonnell-Douglas Aerospace, USA; Tinetti, Ana, Eagle Aeronautics, Inc., USA; Arslan, Alan, McDonnell-Douglas Aerospace, USA; Agrawal, Shreekant, McDonnell-Douglas Aerospace, USA; Hartwich, Peter, McDonnell-Douglas Aerospace, USA; Jones, Jay, McDonnell-Douglas Aerospace, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 197-221; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper presents the computational investigation of the PAI related study to evaluate various installation parameters in an attempt to minimize the cruise drag of the HSCT configuration with nacelles installed. In particular, an assessment is made of the supersonic cruise point aerodynamic performance of axisymmetric and 2-D inlets installed on the MDC M2.4-7A Opt5 wing/body/ nacelle/diverter (W/B/N/D) geometry. Earlier analysis and experimental study on Ref. H configurations have shown that the installed axisymmetric nacelles have better drag characteristics compared to the 2-D nacelles. However, in that study, the optimum wing/body geometry for each nacelle installation was not determined. The present investigation evaluates the aerodynamic performance of the optimized wing/body geometry accounting for the effects of two inlet concepts, namely the

axisymmetric and 2-D inlets. The wing/body configuration chosen for the present investigation is the Opt5 geometry. The nacelles are sized to fit the realistic MFTF A12 engine and are installed with either axisymmetric or 2-D bifurcated inlets. Results of the analysis including nacelle position, nacelle cambering, diverter width, and diverter leading-edge sweep modifications of the baseline Opt5 nacelle configuration are presented. CFL3D Euler analysis showed that the 2-D inlet nacelles have nearly 4.5 counts of higher pressure drag compared to the axisymmetric nacelles before optimization. After wing/body optimization with the nacelle effects, the drag difference increased to 5.2 counts. Examination of the results indicates that adverse nacelle/diverter/wing geometry for the 2-D inlet nacelles may account for a significant part of the drag penalty.
Author
Body-Wing Configurations; Civil Aviation; Nacelles; Supersonic Transports; Intake Systems; Aerodynamic Characteristics; Diverters

20000044627 NASA Lewis Research Center, Cleveland, OH USA
High Speed Civil Transport (HSCT) Isolated Nacelle Transonic Boattail Drag Study and Results Using Computational Fluid Dynamics (CFD)
Midea, Anthony C., NASA Lewis Research Center, USA; Austin, Thomas, McDonnell-Douglas Aerospace, USA; Pao, S. Paul, NASA Langley Research Center, USA; DeBonis, James R., NASA Lewis Research Center, USA; Mani, Mori, McDonnell-Douglas Aerospace, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 223-270; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Nozzle boattail drag is significant for the High Speed Civil Transport (HSCT) and can be as high as 25% of the overall propulsion system thrust at transonic conditions. Thus, nozzle boattail drag has the potential to create a thrust-drag pinch and can reduce HSCT aircraft aerodynamic efficiencies at transonic operating conditions. In order to accurately predict HSCT performance, it is imperative that nozzle boattail drag be accurately predicted. Previous methods to predict HSCT nozzle boattail drag were suspect in the transonic regime. In addition, previous prediction methods were unable to account for complex nozzle geometry and were not flexible enough for engine cycle trade studies. A computational fluid dynamics (CFD) effort was conducted by NASA and McDonnell Douglas to evaluate the magnitude and characteristics of HSCT nozzle boattail drag at transonic conditions. A team of engineers used various CFD codes and provided consistent, accurate boattail drag coefficient predictions for a family of HSCT nozzle configurations. The CFD results were incorporated into a nozzle drag database that encompassed the entire HSCT flight regime and provided the basis for an accurate and flexible prediction methodology.
Author
Boattails; Civil Aviation; Computational Fluid Dynamics; Aerodynamic Drag; Nacelles; Supersonic Transports; Transonic Flow

20000044628 McDonnell-Douglas Aerospace, Long Beach, CA USA
Transonic Drag Study for the Installed Ref. H Axisymmetric Nozzle Boattail Configurations
Shieh, Chih Fang, McDonnell-Douglas Aerospace, USA; Jones, Jay, McDonnell-Douglas Aerospace, USA; Agrawal, Shreekant, McDonnell-Douglas Aerospace, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, pp. 271-289; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The transonic drag study for the installed Ref. H nozzle boattail was carried out by a NASA/Industry team. The primary objective of this study was to use CFD to estimate the installed nozzle boattail transonic drag for the Ref. H configuration. The nozzle boattail configurations included 2-D (Boeing/Northrop Grumman tasks) and axisymmetric (MDA tasks) configurations. The results of the axisymmetric nozzle boattail study, the MDA tasks, are reported here. The CFL3D Navier-Stokes code with the Baldwin-Barth turbulence model was used for the axisymmetric nozzle boattail drag study. Two configurations were analyzed: the axi/transonic (boattail angle approximately 14 deg.) and the axi/supersonic boattail angle approximately 2 deg.) configurations. In this study, the CFL3D code was first validated for a 2-D nozzle at transonic condition, the AGARD B.4.2 nozzle, where shock-induced flow separation occurs in the boattail region. Then, the code was further validated for the Ref. H wing/body at M (sub infinity) =0.9 and 1.1 for Re (sub c) = 40 million. In addition, the isolated nozzle boattail drag, and the installed wing/body/nacelle/diverter drag were computed. Based on the CFL3D solutions, the installation and interference drag due to the nacelle installation were calculated. During the course of this study, numerical instability was experienced for all of the cases calculated. Although the numerical instability problem for the AGARD B.4.2 nozzle and the Ref. H wing/body was overcome,

the problem for some of the installed nozzle boattail configurations still exists. With the limited converged solutions for the installed axi/transonic configuration, favorable interference between the wing and the nacelle installation was obtained.
Author
Boattails; Body-Wing Configurations; Computational Fluid Dynamics; Transonic Flow; Aerodynamic Drag; Axisymmetric Flow

20000044629 Northrop Grumman Corp., Military Aircraft Systems Div., Pico Rivera, CA USA
Installed Transonic 2D Nozzle Nacelle Boattail Drag Study
Malone, Michael B., Northrop Grumman Corp., USA; Peavey, Charles C., Northrop Grumman Corp., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 291-320; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Transonic Nozzle Boattail Drag Study was initiated in 1995 to develop an understanding of how external nozzle transonic aerodynamics effect airplane performance and how strongly those effects are dependent on nozzle configuration (2D vs. axisymmetric). MDC analyzed the axisymmetric nozzle. Boeing subcontracted Northrop-Grumman to analyze the 2D nozzle. AU participants analyzed the AGARD nozzle as a check-out and validation case. Once the codes were checked out and the gridding resolution necessary for modeling the separated flow in this region determined, the analysis moved to the installed wing/body/nacelle/diverter cases. The boat tail drag validation case was the AGARD B.4 rectangular nozzle. This test case offered both test data and previous CFD analyses for comparison. Results were obtained for test cases B.4.1 (M=0.6) and B.4.2 (M=0.938) and compared very well with the experimental data. Once the validation was complete a CFD grid was constructed for the full Ref. H configuration (wing/body/nacelle/diverter) using a combination of patched and overlapped (Chimera) grids. This was done to ensure that the grid topologies and density would be adequate for the full model. The use of overlapped grids allowed the same grids from the full configuration model to be used for the wing/body alone cases, thus eliminating the risk of grid differences affecting the determination of the installation effects. Once the full configuration model was run and deemed to be suitable the nacelle/diverter grids were removed and the wing/body analysis performed. Reference H wing/body results were completed for M=0.9 (a=0.0, 2.0, 4.0, 6.0 and 8.0), M=1.1 (a=4.0 and 6.0) and M=2.4 (a=0.0, 2.0, 4.4, 6.0 and 8.0). Comparisons of the M=0.9 and M=2.4 cases were made with available wind tunnel data and overall comparisons were good. The axi-inlet/2D nozzle nacelle was analyzed isolated. The isolated nacelle data coupled with the wing/body result enabled the interference effects of the installed nacelles to be determined. Isolated nacelle mm were made at M=0.9 and M=1.1 for both the supersonic and transonic nozzle settings. AU of the isolated nacelle cases were run at alpha=0. Full configuration runs were to be made at Mach numbers of 0.9, 1.1, and 2.4 (the same as the wing/body and isolated nacelles). Both the isolated nacelles and installed nacelles were run with inlet conditions designed to give zero spillage. This was to be done in order to isolate the boattail effects as much as possible. Full configuration runs with the supersonic nozzles were completed for M=0.9 and 1.1 at a=4.0 and 6.0 (4 runs total) and with the transonic nozzles at M=0.9 and 1.1 at a=2.0, 4.0 and 6.0 (6 runs total). Drag breakdowns were completed for the M=0.9 and M= 1.1 showing favorable interference drag for both cases.
Author
Boattails; Nacelles; Transonic Nozzles; Two Dimensional Flow; Body-Wing Configurations; Computational Fluid Dynamics; Wind Tunnel Tests

20000044630 NASA Langley Research Center, Hampton, VA USA
Afterbody External Aerodynamic and Performance Prediction at High Reynolds Numbers
Carlson, John R., NASA Langley Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 321-333; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This CFD experiment concludes that the potential difference between the flow between a flight Reynolds number test and a sub-scale wind tunnel test are substantial for this particular nozzle boattail geometry. The early study was performed using a linear k-epsilon turbulence model. The present study was performed using the Girimaji formulation of a algebraic Reynolds stress turbulent simulation.
Derived from text
Afterbodies; High Reynolds Number; Performance Prediction; Aerodynamic Characteristics; Computational Fluid Dynamics; Wind Tunnel Tests

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation.

20000033823 NASA Glenn Research Center, Cleveland, OH USA
The NASA Aviation Safety Program: Overview
Shin, Jaiwon, NASA Glenn Research Center, USA; March 2000; 14p; In English; 45th; International Gas Turbine and Aeroengine Technical Congress, 8-11 May 2000, Munich, Germany; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): RTOP 577-90-20
Report No.(s): NASA/TM-2000-209810; E-12119; NAS 1.15:209810; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In 1997, the USA set a national goal to reduce the fatal accident rate for aviation by 80% within ten years based on the recommendations by the Presidential Commission on Aviation Safety and Security. Achieving this goal will require the combined efforts of government, industry, and academia in the areas of technology research and development, implementation, and operations. to respond to the national goal, the National Aeronautics and Space Administration (NASA) has developed a program that will focus resources over a five year period on performing research and developing technologies that will enable improvements in many areas of aviation safety. The NASA Aviation Safety Program (AvSP) is organized into six research areas: Aviation System Modeling and Monitoring, System Wide Accident Prevention, Single Aircraft Accident Prevention, Weather Accident Prevention, Accident Mitigation, and Synthetic Vision. Specific project areas include Turbulence Detection and Mitigation, Aviation Weather Information, Weather Information Communications, Propulsion Systems Health Management, Control Upset Management, Human Error Modeling, Maintenance Human Factors, Fire Prevention, and Synthetic Vision Systems for Commercial, Business, and General Aviation aircraft. Research will be performed at all four NASA aeronautics centers and will be closely coordinated with Federal Aviation Administration (FAA) and other government agencies, industry, academia, as well as the aviation user community. This paper provides an overview of the NASA Aviation Safety Program goals, structure, and integration with the rest of the aviation community.
Author
Aircraft Accidents; Aircraft Safety; Accident Prevention; Commercial Aircraft; Fire Prevention; Flight Safety; Human Performance

20000034032 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Remote Sensing of In-Flight Icing Conditions: Operational, Meteorological, and Technological Considerations ***Final Report***
Ryerson, Charles C., Army Cold Regions Research and Engineering Lab., USA; March 2000; 76p; In English
Contract(s)/Grant(s): NASA Order C-73343-E; RTOP 548-21-23
Report No.(s): NASA/CR-2000-209938; E-12186; NAS 1.15:209938; ERDC-CRREL-M-00-1; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Remote-sensing systems that map aircraft icing conditions in the flight path from airports or aircraft would allow icing to be avoided and exited. Icing remote-sensing system development requires consideration of the operational environment, the meteorological environment, and the technology available. Operationally, pilots need unambiguous cockpit icing displays for risk management decision-making. Human factors, aircraft integration, integration of remotely sensed icing information into the weather system infrastructures, and avoid-and-exit issues need resolution. Cost, maintenance, power, weight, and space concern manufacturers, operators, and regulators. An icing remote-sensing system detects cloud and precipitation liquid water, drop size, and temperature. An algorithm is needed to convert these conditions into icing potential estimates for cockpit display. Specification development requires that magnitudes of cloud microphysical conditions and their spatial and temporal variability be understood at multiple scales. The core of an icing remote-sensing system is the technology that senses icing microphysical conditions. Radar and microwave radiometers penetrate clouds and can estimate liquid water and drop size. Retrieval development is needed; differential attenuation and neural network assessment of multiple-band radar returns are most promising to date. Airport-based radar or radiometers are the most viable near-term technologies. A radiometer that profiles cloud liquid water, and experimental techniques to use radiometers horizontally, are promising. The most critical operational research needs are to assess cockpit and aircraft system integration, develop avoid-and-exit protocols, assess human factors, and integrate remote-sensing information into weather and air traffic control infrastructures. Improved spatial characterization of cloud and precipitation liquid-water content, drop-size spectra, and temperature are needed, as well as an algorithm to convert sensed

conditions into a measure of icing potential. Technology development also requires refinement of inversion techniques. These goals can be accomplished with collaboration among federal agencies including NASA, the FAA, the National Center for Atmospheric Research, NOAA, and the Department of Defense. This report reviews operational, meteorological, and technological considerations in developing the capability to remotely map in-flight icing conditions from the ground and from the air.
Author
Remote Sensing; In Situ Measurement; Aircraft Icing; Cockpits; Drop Size; Drops (Liquids); Moisture Content; Temperature; Cloud Physics

20000034077 Naval Research Lab., Chemical Dynamics and Diagnostics Branch, Washington, DC USA
Development of an Early Warning Multi-criteria Fire Detection System: Analysis of Transient Fire Signatures Using a Probabilistic Neural Network *Interim Report, Jan.-Sep. 1999*
Shaffer, Ronald E.; Rose–Pehrsson, Susan L.; Williams, Frederick W.; Barry, Colin; Gottuk, Daniel T.; Feb. 16, 2000; 33p; In English
Report No.(s): AD-A373837; NRL/MR/6110--00-8429; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the progress made in developing an early warning, multi-criteria, fire detection system for the Office of Naval Research (ONR) program on Damage Control: Automation for Reduced Manning (DC-ARM). In this work, the analysis of transient fire signatures is studied using a probabilistic neural network (PNN). Experiments are described to study the effects of various PNN training parameters and to determine the optimal sensor suite combination, which enables both early fire detection and high nuisance source rejection. Comparisons are made between the candidate sensor arrays, commercial fire detection systems, and sensor arrays proposed in previous reports. Recommendations and directions for future research are also given.
DTIC
Fires; Neural Nets; Early Warning Systems; Fire Prevention; Detection

20000034152 Naval Postgraduate School, Monterey, CA USA
USA Marine Corps; (USMC) KC-130J Tanker Replacement Requirements and Cost/Benefit Analysis
McCarthy, Mitchell J.; Dec. 1999; 114p; In English
Report No.(s): AD-A374094; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

NAVAIR funded a research project to answer the question: how many KC-130Js Aerial Refueling Tankers will the US Marine Corps (USMC) need to meet their future wartime requirements? This thesis supports that study. Thesis results were incorporated into the recently completed Marine KC-130 Requirements Study. by Professors Gates, Kwon, Washburn, and Anderson. Specifically, the thesis focuses on the tradeoffs the USMC faces between requirements, performance, and life-cycle costs. The KC-130J aerial refueling requirement must support expected USMC fixed-wing refueling demand during two nearly simultaneous major theater wars. Furthermore, refueling capacity must keep the average time an aircraft waits in the aerial refueling queue (CT(q)) below five minutes. To define the tradeoff between the KC-130J requirement and system performance (waiting time), the thesis develops a Simulation Model using the ARENA(copyright) simulation language. The simulation model highlights the impact of capacity failures (refueling drogues and hoses) and overlaps between KC-130J sorties, two potentially significant factors that can't be explored with standard static queuing theory models. Next, the thesis develops a Life Cycle Cost (LCC) Model that incorporates cost variability using the Crystal Ball EXCEL(copyright) spreadsheet add-on. The model defines the tradeoffs between LCC and KC-130J fleet size. The resulting analysis and conclusions specify a base-case KC-130J requirement and discuss the tradeoffs between the requirement, life-cycle cost and system performance.
DTIC
Tanker Aircraft; Cost Analysis; Cost Effectiveness

20000034220 Naval Postgraduate School, Monterey, CA USA
An Analytical Comparison of Human Factor Maintenance Related Part Failures for Naval Reserve Fleet Logistics Support Wing
Allen, Daniel L.; Dec. 1999; 122p; In English
Report No.(s): AD-A374275; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Naval Aviation has experienced extensive change in recent years. Financial constraints, force reductions, and increasing operation tempo have impacted not only the material condition of Naval aircraft, but also the personnel who maintain them. The Naval Aviation Community has extensively studied the role of human factors in aviation mishaps. However, the need to study the impact of human factors in maintenance on part failures remains. As replacement parts for aircraft continue to rise in price, the need to mitigate the unnecessary failure/destruction of piece parts is an ever increasing priority. This study examines the

relationship between part failures and human factors by comparing incident rates between VR Wing with the rest of Naval Aviation. Five hundred safety incident reports are analyzed; fiscal year totals are determined, and an incident per flying hour rate is computed. Regression results indicate an increasing trend in human factors related arts incidents, VR compares no different from the rest of Naval Aviation.
DTIC
Regression Analysis; Aircraft Accidents; Military Aircraft; Military Aviation

20000034863 Naval Postgraduate School, Monterey, CA USA
Forecasting MV-22 Aerial Refueling Training Missions for 2D Marine Aircraft Wing
Stevenson, Robert J.; Dec. 1999; 119p; In English
Report No.(s): AD-A373793; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The MV-22 ”Osprey” was designed as a ”medium-lift” replacement for the Marine Corps CH-46E ”Sea Knight” and CH-53D ”Sea Stallion” helicopters. The MV-22’s tilt-rotor technology will allow it to exploit the operational envelopes of both helicopters and turbo-prop aircraft. This expanded performance envelope, along with the capability to conduct aerial refueling, will allow a MV-22 lifted force to influence future operations through an increase in range and speed. This thesis quantifies the impact that fielding the MV-22 within the 2nd Marine Aircraft Wing (MAW) will have on its KC-130 squadrons. This impact arises from the MV- 22’s capability to receive fuel in-flight (aerial refuel). Since the CH-46E and CH-53D could not aerial refuel, their pilots did not have a need to conduct aerial refueling training, and thus
DTIC
Air to Air Refueling; C-130 Aircraft; Tilt Rotor Aircraft

20000034868 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Defense Transportation: More Reliable Information Key to Managing Airlift Services More Efficiently
Mar. 2000; 30p; In English; Report to Congressional Requesters.
Report No.(s): AD-A374285; GAO/NSIAD-00-6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The U.S. Transportation Command provides global air, land, and sea transportation services for all defense components in order to maintain a mobilization capability in time of peace and to meet national security needs in time of war. Its air transportation services are provided through the Air Force Air Mobility Command. In fiscal year 1997, the Air Mobility Command accounted for about 63 percent ($2.5 billion) of the total reported operating costs ($4.0 billion) of the U.S. Transportation Command, with most of the remaining 37 percent ($1.5 billion) representing the operating costs of the Army Military Traffic Management Command and the Navy Military Sealift Command for land and sea transportation, respectively.
DTIC
Air Transportation; Management; Marine Transportation

20000034917 Federal Aviation Administration, John A. Volpe National Transportation Systems Center, Cambridge, MA USA
Human Factors for Air Traffic Control Specialists: A User’s Manual for Your Brain *Final Report, Feb. - May 1999*
Cardosi, K. M.; Nov. 1999; 54p; In English; Original contains color illustrations
Report No.(s): PB2000-103404; DOT/VNTSC/FAA-99/6; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This document presents the findings of human factors research and other information useful to air traffic control specialists in a succinct and easy-to-read format. Topics include: controller-pilot voice communications, memory, fatigue, and the effects of stress on information processing. Techniques are presented for: helping to reduce the probability of errors in voice communications, remembering specific information, identifying signs of stress that could affect performance, and reducing fatigue.
NTIS
Air Traffic Controllers (Personnel); Human Factors Engineering; User Manuals (Computer Programs); Pilot Performance

20000036518 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA
Aviation Security: Slow Progress in Addressing Long-Standing Screener Performance Problems
Mar. 16, 2000; 13p; In English; Testimony: Before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives.
Report No.(s): AD-A374810; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We appreciate the opportunity to be here today to discuss aviation security, in particular airport screeners. Securing an air transportation system the size of this nation’s-with hundreds of airports, thousands of aircraft, and tens of thousands of flights daily carrying millions of passengers and pieces of baggage-is a difficult task. Events over the past decade have shown that the threat

of terrorism against the USA is an ever-present danger. Aviation is an attractive target for terrorists, and because the air transportation system is critical to the nation's well-being, protecting it is an important national issue. A single lapse in aviation security can result in hundreds of deaths, destruction of equipment worth hundreds of millions of dollars, and have immeasurable negative impacts on the economy and the public's confidence in air travel. A number of measures have been put in place by the Federal Aviation Administration (FAA) and the aviation industry to provide the security needed for the aviation system; among the most important ones are the passenger screening checkpoints and the screeners who operate them. Concerns have been raised for many years by GAO and others about the effectiveness of screeners and the need to improve their performance. Two Presidential commissions-established after the bombing of Pan Am Flight 103 in 1988 and the then-unexplained crash of TWA Flight 800 in 1996-as well as numerous GAO and Department of Transportation Inspector General reports have highlighted problems with screening and the need for improvements. This situation still exists, Mr. Chairman, and as I will discuss, there are long-standing problems that affect screener performance.
DTIC
Aircraft; Aeronautics; Security

20000038235 NASA Langley Research Center, Hampton, VA USA
High-Speed Research Surveillance Symbology Assessment Experiment
Kramer, Lynda J., NASA Langley Research Center, USA; Norman, R. Michael, Boeing Co., USA; April 2000; 68p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 577-60-10-01
Report No.(s): NASA/TM-2000-210107; L-17957; NAS 1.15:210107; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Ten pilots flew multiple approach and departure scenarios in a simulation experiment of the High-Speed Civil Transport to evaluate the utility of different airborne surveillance display concepts. The primary eXternal Visibility System (XVS) display and the Navigation Display (ND) were used to present tactical and strategic surveillance information, respectively, to the pilot. Three sensors, the Traffic Alert and Collision Avoidance System, radar, and the Automatic Dependent Surveillance-Broadcast system, were modeled for this simulation and the sensors surveillance information was presented in two different symbology sets to the pilot. One surveillance symbology set used unique symbol shapes to differentiate among the sensors, while the other set used common symbol shapes for the sensors. Surveillance information in the form of escape guidance from threatening traffic was also presented to the pilots. The surveillance information (sensors and escape guidance) was either presented head-up on the primary XVS display and head-down on the ND or head-down on the ND only. Both objective and subjective results demonstrated that the display concepts having surveillance information presented head-up and head-down have surveillance performance benefits over those concepts having surveillance information displayed head-down only. No significant symbology set differences were found for surveillance task performance.
Author
Human Performance; Space Surveillance (Spaceborne); Display Devices

20000039441 Transportoekonomisk Inst., Oslo, Norway
Cost Benefit Analyses in the Norwegian Aviation Sector ***Samfunnsoekonomiske Analyser innen Luftfart. Del 2. Eksempelsamling***
Brathen, S.; Eriksen, K. S.; Hjelle, H. M.; Killi, M.; Jul. 1999; 86p; In Norwegian
Report No.(s): PB2000-103150; TOI-1134/1999; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The Norwegian Civil Aviation Administration (NCAA) is responsible for building and operation of the Norwegian airport system, and the air traffic management systems. The report presents the development of a cost benefit analysis (CBA) methodology for the NCAA. Methodological problems are addressed, such as the handling of project risk and uncertainty, and projects with mutual interdependency. The report consist of two parts: Part one is the manual for how and when CBA should be carried out; Part two is a collection of four examples of CBA in the aviation sector.
NTIS
Civil Aviation; Cost Effectiveness; Norway; Airports

20000039694 Nebraska Univ., Omaha, NE USA
Enhancing Global Competitiveness: Benchmarking Airline Operational Performance in Highly Regulated Environments
Bowen, Brent D., Nebraska Univ., USA; Headley, Dean, Wichita State Univ., USA; Kane, Karisa D., Nebraska Univ., USA; Lutte, Rebecca K., Nebraska Univ., USA; Collegiate Aviation Review; October 1999; Volume 17, No. 1, pp. 1-14; In English; See also 20000039693; Copyright; Avail: Issuing Activity

Enhancing competitiveness in the global airline industry is at the forefront of attention with airlines, government, and the flying public. The seemingly unchecked growth of major airline alliances is heralded as an enhancement to global competition. However, like many mega-conglomerates, mega-airlines will face complications driven by size regardless of the many recitations of enhanced efficiency. Outlined herein is a conceptual model to serve as a decision tool for policy-makers, managers, and consumers of airline services. This model is developed using public data for the USA (U.S.) major airline industry available from the U.S. Department of Transportation, Federal Aviation Administration, the National Aeronautics and Space Administration, the National Transportation Safety Board, and other public and private sector sources. Looking at historical patterns of Airline Quality Rating results provides the basis for establishment of an industry benchmark for the purpose of enhancing airline operational performance. Applications from this example can be applied to the many competitive environments of the global industry and assist policy-makers faced with rapidly changing regulatory challenges.
Author
Airline Operations; Commercial Aircraft; Competition; Policies; Safety Management

20000040456 Honeywell Technology Center, Minneapolis, MN USA
Description of the AILS Alerting Algorithm
Samanant, Paul, Honeywell Technology Center, USA; Jackson, Mike, Honeywell Technology Center, USA; May 20000; 88p; In English
Contract(s)/Grant(s): RTOP 576-02-11-17
Report No.(s): NASA/CR-2000-210109; L-10690; NAS1.26:210109; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This document provides a complete description of the Airborne Information for Lateral Spacing (AILS) alerting algorithms. The purpose of AILS is to provide separation assurance between aircraft during simultaneous approaches to closely spaced parallel runways. AILS will allow independent approaches to be flown in such situations where dependent approaches were previously required (typically under Instrument Meteorological Conditions (IMC)). This is achieved by providing multiple levels of alerting for pairs of aircraft that are in parallel approach situations. This document#s scope is comprehensive and covers everything from general overviews, definitions, and concepts down to algorithmic elements and equations. The entire algorithm is presented in complete and detailed pseudo-code format. This can be used by software programmers to program AILS into a software language. Additional supporting information is provided in the form of coordinate frame definitions, data requirements, calling requirements as well as all necessary pre-processing and post-processing requirements. This is important and required information for the implementation of AILS into an analysis, a simulation, or a real-time system.
Author
Algorithms; Programming Languages; Software Development Tools; Spacing

20000040869 Federal Aviation Administration, Washington, DC USA
Aeronautical Information Publication, USA of America, Fifteenth Edition, Dated January 28, 1999. Amendment 2, February 24, 2000
Feb. 24, 2000; 196p; In English
Report No.(s): PB2000-103660; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

Contents include the following: National Regulations and Requirements; tables and Codes; Services; and Chares for Aerodromes/Heliports and Air Navigation Services.
NTIS
Air Navigation; USA; Civil Aviation; Aeronautical Engineering; Airports

20000041717 Federal Aviation Administration, Washington, DC USA
Notices to Airmen, Domestic/International, February 24, 2000
Feb. 24, 2000; 228p
Report No.(s): PB2000-103643; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Contents include the following: Airway Notams; Airports, Facilities, and Procedural Notams; General FDC Notams; Part 95 Revisions to Minimum En Route IFR Altitudes and Changeover Points; International Notices to Airmen; and Graphic Notices.
NTIS
Air Navigation; Runways; Airports; Navigation Aids; Instrument Flight Rules

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control.

20000037889 Remote Services Ltd., Northwood, UK

Airspace Policy and Air Traffic Management

Clot, Andre J., Remote Services Ltd., UK; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 2A-1 - 2A-26; In English; See also 20000037887; Copyright Waived; Avail: CASI; A03, Hardcopy

The world of manned aviation has been the predominant aerial activity in the skies for the 20th century. The fundamental principle by which the infrastructure and institutional arrangements have been predicated is that there is a man in the loop in the air (pilots) and on the ground (air traffic controllers). With the advent of extremely capable Unmanned Aerial Vehicle (UAV) systems, this will no longer be the case and many assumptions about how aircraft are designed, developed and operated will be challenged. However, in the 21st century this will be an evolutionary process and the organisations that will take it forward are already in place today, to begin the task of providing the necessary frameworks within which UAV systems will co-exist alongside manned aircraft. The challenges for these organisations include legislation and regulation, airspace policy, air traffic management, airworthiness, certification, communications, command and control. This lecture covers issues relating to airspace policy and air traffic management aspects.

Author

Pilotless Aircraft; Command and Control; Law (Jurisprudence); Air Traffic Control; Certification; Policies

20000038157 NASA Goddard Space Flight Center, Greenbelt, MD USA

An Automated Method for Navigation Assessment for Earth Survey Sensors Using Island Targets

Patt, F. S., General Sciences Corp., USA; Woodward, R. H., General Sciences Corp., USA; Gregg, W. W., NASA Goddard Space Flight Center, USA; Laboratory for Hydrospheric Processes Research Publications; 1997, pp. 147-148; Repr. from International Journal of Remote Sensing, v. 18, no. 16, 1997 p 3311-3336; In English; Copyright; Avail: Issuing Activity (Lab. for Hydrospheric Processes, NASA Goddard Space Flight Center, Greenbelt, MD 20771), Hardcopy, Microfiche

An automated method has been developed for performing navigation assessment on satellite-based Earth sensor data. The method utilizes islands as targets which can be readily located in the sensor data and identified with reference locations. The essential elements are an algorithm for classifying the sensor data according to source, a reference catalogue of island locations, and a robust pattern-matching algorithm for island identification. The algorithms were developed and tested for the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), an ocean colour sensor. This method will allow navigation error statistics to be automatically generated for large numbers of points, supporting analysis over large spatial and temporal ranges.

Author

Space Navigation; Remote Sensors; Islands; Ocean Color Scanner; Remote Sensing

20000038331 Hokkaido Univ., Div. of Earth and Planetary Sciences, Sapporo, Japan

GPS Measurement at Summit Peaks of the Taisetsu Mountains, Central Hokkaido, Japan

Koyama, Junji, Hokkaido Univ., Japan; Moriya, Takeo, Hokkaido Univ., Japan; Kaneso, Takayuki, Hokkaido Univ., Japan; Takahashi, Hiroaki, Hokkaido Univ., Japan; Geophysical Bulletin of Hokkaido University; March 2000; ISSN 0439-3503, No. 63, pp. 15-21; In Japanese; Copyright; Avail: Issuing Activity

To investigate the precise crustal deformation in the Taisetsu mountains, Central Hokkaido, Japan, we have conducted GPS survey in-1998 and 1999. The coordinates at summit peaks of the mountain chain, horizontal displacements and strain are evaluated in this period. Major results are summarized as (1) horizontal displacements at summit peaks are about 2cm in the direction of north, (2) horizontal strain is estimated to be compressional in the NW-SE direction. Although the precision of the estimates awaits for the future survey, this results are consistent with the direction of the compressional axes of focal mechanism solutions of local earthquakes in the surrounding region and with the deformation vector by the triangulation in central Hokkaido.

Author

Global Positioning System; Japan; Mountains; Crustal Fractures; Seismology

20000038333 Hokkaido Univ., Inst. of Seismology and Volcanology, Sapporo, Japan

Dense GPS Array Around the Craters of the Tokachi Volcano for Determination of Crustal Deformation

Takahashi, Hiroaki, Hokkaido Univ., Japan; Ichiyanagi, Masayoshi, Hokkaido Univ., Japan; Okazaki, Noritoshi, Geological Survey of Japan, Japan; Geophysical Bulletin of Hokkaido University; March 2000; ISSN 0439-3503, No. 63, pp. 33-42; In

Japanese; Copyright; Avail: Issuing Activity

To investigate the-crustal deformation in and around the craters of the Tokachi volcano, Central Hokkaido, we established a new dense GPS array with 15 sites in 1996 and made temporal observations in April 1998, October 1998 and September 1999. by the data analysis using static and rapid-static methods, site coordinates were collocated from the GSI-BIEI fixed site for each campaign. Displacements of the GSI-HKGS site, about 2.5km from the craters, were small within 2mm on horizontal and 18mm on vertical component in this period. Displacements of another sites also did not exceed the precision of the GPS survey. We concluded remarkable crustal deformation did not occur in this region between April 1998 and September 1999.

Author

Craters; Crustal Fractures; Global Positioning System; Volcanoes; Seismology

20000039219 NASA Marshall Space Flight Center, Huntsville, AL USA

Lab Development for INS/GPS Testing of Launch and Space Vehicles

Schrock, Ken, NASA Marshall Space Flight Center, USA; Freestone, Todd, NASA Marshall Space Flight Center, USA; Bell, Leon, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; International Telemetering Conference, 23-26 Oct. 2000, San Diego, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA Marshall Space Flight Center's experience with different GPS simulators and receivers over the last 10 years has shown a need for testing the receivers in more than just a nominal mission. The Spaceliner 100 program is researching blended INS/GPS data tuned specifically for launch vehicles and orbital deployments. The paper will discuss layout of the testing lab, the test equipment, test scenarios that all receivers will be evaluated under, and a discussion of receiver types planned to test. It will conclude with a discussion of some of the current tests and goals of future testing.

Author

Global Positioning System; Launch Vehicles; Inertial Navigation; Spacecraft Launching; Test Equipment

20000039786 NASA Marshall Space Flight Center, Huntsville, AL USA

ProSEDS Telemetry System Utilization of GPS Position Data for Transmitter Cycling

Kennedy, Paul, NASA Marshall Space Flight Center, USA; Sims, Herb, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; International Telemetering Conference, 23-26 Oct. 2000, San Diego, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA Marshall Space Flight Center will launch the Propulsive Small Expendable Deployer System (ProSEDS) space experiment in late 2000. ProSEDS will demonstrate the use of an electrodynamic tether propulsion system and will utilize a conducting wire tether to generate limited spacecraft power. This paper will provide an overview of the ProSEDS mission and will discuss the design, development and test of the spacecraft telemetry system which utilizes a custom designed GPS subsystem to determine spacecraft position relative to ground station location and to control transmitter on/off cycling based on spacecraft state vector and ground station visibility.

Author

Telemetry; Global Positioning System; Data Bases; Transmitters; Spaceborne Experiments

20000044095 Lembaga Penerbangan dan Antariksa Nasional, Peneliti Bidang Dinamika Ionosfer, Jakarta, Indonesia

TEC Determination Using Code Data and Phase Data from GPS Satellites ***Penentuan TEC Dengan Menggunakan Data Kode Dan Data Fase Dari Satelit GPS***

Saroso, Sarmoko, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Majalah LAPAN; July - September 1999; Volume 1, No. 3, pp. 18-25; In Malay-Indonesian; See also 20000044092; Copyright; Avail: Issuing Activity

GPS (Global Positioning System) is a highly accurate global navigation service available to use for all-weather precision navigation by land, sea and air to anybody. Recently, GPS is a valuable tool for many purposes, such as for TEC (Total Electron Content) measurements. Since the GPS Satellites broadcast signals in two frequencies, TEC determination is possible by analyzing the different path delays undergone by the signals in both frequencies. This paper will present an algorithm for TEC determination using dual frequencies GPS pseudorange and carrier phase.

Author

Electron Density (Concentration); Atmospheric Composition; Earth Atmosphere; Algorithms

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology.

20000034240 Naval Postgraduate School, Monterey, CA USA
Modeling and Simulation Support for the Operational Test and Evaluation of a Tactical Airborne Reconnaissance System
Schmidt, Kevin J.; Dec. 1999; 179p; In English
Report No.(s): AD-A374081; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Today's decreasing defense budget has forced the military to reduce its spending on operational testing of new equipment, among many other areas. Reduced testing has forced evaluators to focus their attention on possible sensitive issues prior to and during testing of new equipment. The Simulation, Test, and Evaluation Process implemented in 1995 to help reduce testing costs has been an integral part of the test and evaluation process. This thesis develops stochastic simulations to suggest the sensitive aspects of operating and maintaining a system of mobile reconnaissance platforms, specifically a helicopter force, (more specifically the RAH-66 Comanche) prior to and during actual testing. The simulation can also be implemented to compare the effectiveness of different mobile reconnaissance platforms to augment the conduct of side by side field testing of actual platforms. This simple, stochastic, event driven simulation may be used to conduct sensitivity analysis on system design and operational issues, including attrition, for mobile reconnaissance platforms in order to focus the attention of the testers and evaluators on influential parameters during testing. It may also be used to inform force design decision makers.
DTIC
Aerial Reconnaissance; Helicopters; Aircraft Reliability; Flight Simulation; Computerized Simulation

20000034241 Naval Postgraduate School, Monterey, CA USA
Time Domain Validation of the Sikorsky General Helicopter (GenHel) Flight Dynamics Simulation Model for the UH-60L Wide Chord Blade Modification
Barrie, Robert L., Jr; Dec. 1999; 158p; In English
Report No.(s): AD-A374100; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Helicopter design at the Sikorsky Aircraft Corporation is aided by the use of the Sikorsky General Helicopter (GenHel(R)) Flight Dynamics Simulation Model. Specifically, GenHel output is used by both handling qualities and maneuver loads engineers as a predictive design tool. Inherent in the use of an analytical model is the requirement for validation. This report seeks to validate the GenHel(R) flight dynamics simulation models used in the design of the UH-60L Wide Chord Blade (WCB) modification. initially comparisons are made between the current analytical models and flight test data for selected trim flight conditions and dynamic maneuvers. Based on the correlation of the data, modifications are made to the analytical model where necessary. The modified analytical model will be validated through a final comparison with test flight data. The goal of this report is to validate the use of Sikorsky's GenHel(R) flight simulation program as an analytic predictive tool in the design of the WCB modification and identify any areas where improvements could be applied. Validation of the WCB GenHel model serves two purposes. First it confirms the ability of GenHel to model the flight dynamic response of the UH-60L with the WCB modification. Second it confirms the predictive loads forwarded to the structural engineers during the design phase of the WCB.
DTIC
Helicopters; Flight Simulation; Aircraft Models; Computerized Simulation; Helicopter Design; Sikorsky Aircraft

20000034246 Tennessee Univ., Dept. of Mechanical and Aerospace Engineering, Knoxville, TN USA
Performance Investigation and Characterization of Scramjet and Dual-Mode Scramjet Flow-Fields
Riggins, David W., Tennessee Univ., USA; [2000]; 51p; In English
Contract(s)/Grant(s): NAG1-2167; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The following compilation documents significant deliverables under this grant. Note that this summary is extracted from a larger report provided to the Hyper-X office last year at the conclusion of the grant. Current status is documented of the ongoing JANNAF (Joint-Army-Navy-NASA-AirForce) Scramjet Test standards activity from the standpoint of the Analysis SubGroup of which the PI was requested by NASA to be chairman. Also included are some representative contributions to date from the Principle investigator relating to this activity.
Derived from text
Flow Distribution; Supersonic Combustion Ramjet Engines; Combustion Efficiency; Performance Prediction

20000034252 Naval Postgraduate School, Monterey, CA USA
Dissemination and Storage of Tactical Unmanned Aerial Vehicle Digital Video Imagery at the Army Brigade Level
Apostolopoulos, Andreas K.; Tisdale, Riley O.; Sep. 1999; 185p; In English
Report No.(s): AD-A374041; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The Department of Defense Joint Technical Architecture has mandated a migration from analog to digital technology in the Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) community. The Tactical Unmanned Aerial Vehicle (TUAV) and Tactical Control System (TCS) are two brigade imagery intelligence systems that the Army will field within the next three years to achieve information superiority on the modern digital battlefield. These two systems provide the brigade commander with an imagery collection and processing capability never before deployed under brigade control. The deployment of the Warfighter Information Network (WIN), within three to five years, will ensure that a digital dissemination network is in place to handle the transmission bandwidth requirements of large digital video files. This thesis examines the storage and dissemination capabilities of this future brigade imagery system. It calculates a minimum digital! storage capacity requirement for the TCS Imagery Product Library, analyzes available storage media based on performance, and recommends a high capacity storage architecture based on modern high technology fault tolerance and performance. A video streaming technique is also recommended that utilizes the digital interconnectivity of the WIN for dissemination of video imagery throughout the brigade.

DTIC

Aerial Reconnaissance; Video Signals; Pilotless Aircraft; Surveillance; Digital Television; Command and Control

20000034865 Warner Robins Air Logistics Center, Robins AFB, GA USA
An Evaluation of Air Force Aircraft Battle Damage Repair Techniques Applicable to Repair Activities Onboard the International Space Station
Chaudhary, Ravi; Hall, Stephen; Feb. 1999; 11p; In English
Report No.(s): AD-A373801; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

USA Air Force (USAF) Aircraft Battle Damage Repair (ABDR) strategies, techniques and technologies are directly applicable to NASA efforts to develop on-orbit repair capabilities for the International Space Station (ISS). At the operational level, USAF repair strategies developed since the Vietnam War stressed the need for methodical damage assessment, categorization, and repair. This approach should be adopted for future repair operations onboard the ISS. At the technical level, repairs based upon material ultimate properties, preparation for damage to multiple systems and specialized damage effects have shaped ABDR techniques to provide flexible repair strategies for Air Force aircraft. These techniques should also be considered when developing ISS repair strategies. Overall, a baseline for comparison between ISS repair and ABDR clearly demonstrates the need for further technical interchange. Lessons learned from ABDR experiences with provide early insight into techniques and strategies proposed for on-orbit ISS repair operations.

DTIC

Damage Assessment; Aircraft Maintenance; International Space Station; Technology Transfer

20000036491 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
F-22 Aircraft: Development Cost Goal Achievable If Major Problems Are Avoided
Mar. 2000; 28p; In English; Report to Congressional Committees.
Report No.(s): AD-A374624; GAO/NSIAD-00-68; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Since the beginning of the F-22 development program in 1991, the Air Force's estimated cost to develop the aircraft has increased. Cost trends in 1995 showed a potential for costs to increase further. Concerned about these growing costs, the Assistant Secretary of the Air Force for Acquisition established the Joint Estimating Team to estimate the most probable costs to complete F-22 development and production. The team consisted of personnel from the Air Force, DOD, and private industry. The team concluded in 1997 that additional time would be required to complete the development program and estimated that costs would increase from $17.4 billion to $18.688 billion. The team recommended several changes to the development program's schedule, including slower manufacturing for a more efficient transition from development to low-rate initial production and an additional 12 months to complete avionics development. The Air Force and the Under Secretary of Defense for Acquisition, Technology, and Logistics generally adopted the team's recommendations to extend the development program schedule, including the dates for accomplishing interim events.

DTIC

Fighter Aircraft; Cost Estimates; Avionics

20000036540 RAND Corp., Santa Monica, CA USA

Innovative Management in the DARPA High Altitude Endurance Unmanned Aerial Vehicle Program

Drezner, Jeffrey A.; Sommer, Geoffrey; Leonard, Robert S.; Jan. 1999; 161p; In English

Contract(s)/Grant(s): DASW01-95-C-0059

Report No.(s): AD-A374660; RAND/MR-1054-DARPA; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The High Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) program, a joint program conducted under the direction of the Defense Advanced Research Projects Agency (DARPA), incorporates a number of innovative elements in its acquisition strategy. The objectives of this research are to understand how the various innovations affect the program outcomes and to identify the lessons of the HAE UAV program that might be applied to a wider variety of projects to improve DoD acquisition strategies. The HAE UAV program includes two air vehicle programs, the Tier II Plus Global Hawk and the Tier III Minus DarkStar, and a Common Ground Segment. The program is divided into four phases. This study was initiated in 1994. The RAND study approach is to observe and report on the program, phase by phase. A report covering the Phase I experience of the Global Hawk was issued in 1997.1 This report covers the Phase II experience of all three components of the RAE UAV program; neither DarkStar nor the Common Ground Segment experienced Phase I. The information is complete through August 1998. The reports covering the HAE UAV program are intended to be cumulative; that is, each successive report provides coverage of the entire program up to that point. Thus, some of the data presented in the earlier report on Phase I of the Global Hawk program is reproduced here in an abbreviated form.

DTIC

Remotely Piloted Vehicles; Pilotless Aircraft

20000037692 Air Force Research Lab., Air Vehicles Directorate, Wright-Patterson AFB, OH USA

Modular Control Law Design for the Innovative Control Effectors (ICE) Tailless Fighter Aircraft Configuration 101-3 ***Final Report, 1 Apr 1997-1 May 1999***

Buffington, James F.; Jun. 1999; 154p; In English

Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A374954; AFRL-VA-WP-TR-1999-3057; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

A modular flight control system is developed for a tailless fighter aircraft with innovative control effectors. Dynamic inversion control synthesis is used to develop a full envelope flight control law. Minor dynamic inversion command variable revisions are required due to the tailless nature of the configuration studied to achieve nominal stability and performance. Structured singular value and simulation analysis shows that robust stability is achieved and robust performance is slightly deficient due to modeling errors. A multi-branch linear programming based method is developed and used for allocation of redundant limited control effectors.

DTIC

Aerodynamic Configurations; Fighter Aircraft; Tailless Aircraft; Dynamic Control; Error Analysis

20000037702 Advanced Research and Applications Corp., Sunnyvale, CA USA

Integrated Detector Technology for Corrosion Inspection ***Final Report, 1 Jun. 1999-28 Feb. 2000***

Smith, Jerel A., Advanced Research and Applications Corp., USA; Feb. 28, 2000; 21p; In English

Contract(s)/Grant(s): F49620-99-C-0032

Report No.(s): AD-A374752; P-014-FR-00; AFRL-SR-BL-TR-00-0065; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This project investigated the use of gas micro-strip detectors as a means of improving the throughput of an innovative technique for detecting hidden corrosion in aging aircraft. The evaluations included the development of system, detector and data-readout concepts capable of meeting the resolution and throughput goals for this instrument, and the modeling and computation of x-ray and electron interactions in the detector. The results of this evaluation indicate that these detectors can be adapted to this application and can achieve the spatial resolution and count rates required to support a system throughput up to 25 m/hr for detection of 5% corrosion in lap joints. This throughput, nearly two orders-of-magnitude faster than the existing demonstration system, is sufficient to support the use of this instrument as a practical adjunct to existing technologies. The next step in development would be the fabrication of this detector and the demonstration that the sensitivity and throughput targets can be achieved in a demonstration system.

DTIC

Aircraft Maintenance; X Rays; Corrosion; Readout; Gas Detectors; Fabrication

20000037805 Textron Bell Helicopter, H-1 Upgrade Program, Fort Worth, TX USA

The H-1 Upgrade Program: Affordable War Fighting Capability for the US Marines

Myers, Alan W., Textron Bell Helicopter, USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A2-1 - A2-18; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

In late 1996, Bell Helicopter Textron Inc. was awarded a contract from the USA Marine Corps for the H-1 Upgrade Program. The program award was preceded by studies of all aircraft and approaches available to provide helicopter war fighting capability for the Marine Air Ground Task Force through the first quarter of the 21st century and beyond. Upgrades were defined for both the UH-1N utility helicopter and the AH-1W attack helicopter to integrate the following enhancements: Improved mission capability; Increased performance and maneuverability; Additional survivability features; Reduced pilot workload; Potential for growth; These enhancements give the Marine Corps the equivalent of new, state-of-the-art, zero-time aircraft, with 10,000-hour service lives. Total ownership cost affordability was, of course, a major requirement. Commonality, improvements in reliability and maintainability, the use of COTS/NDI equipment, and the reuse of existing equipment were encouraged to enhance squadron operability and supportability and help reduce recurring and O&S costs. Cost As An Independent Variable (CAIV) studies were also required to continuously evaluate potential cost reduction elements in trade against program and technical requirements. Bell and NAVAIR formed Integrated Product Teams (IPT) with representatives from all functional disciplines, to improve communication and to ensure the configuration designs were not only adequate technically but were also cost-effective to manufacture and to operate and support in the fleet. This IPT process has been instrumental in improving the contractor/customer approval process during design reviews. This paper summarizes the H-1 Upgrade Program. The Marine Corps modernization plan is described and the role of the H-1 is defined. The resulting configurations are described, as is the process of optimizing configuration details within program constraints.

Author

Upgrading; Maneuverability; Warfare; Aircraft Survivability

20000037807 Dassault Aviation, Direction Technique Systemes, Saint-Cloud, France

MIRAGE 2000 Combat Aircraft Upgrade in Dassault Aviation: Solution for NWDS System Open and Affordable

Picard, Alain, Dassault Aviation, France; Madon, Laurent, Dassault Aviation, France; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A5-1 - A5-4; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

MIRAGE 2000 are in operational service within several Air Forces since 1983. The outstanding structural sturdiness of the Mirage allowing them to fly over 2015-2020, allow Dassault Aviation to consider mid-life update. MIRAGE 2000 mid-life update shall comply with the following criteria : Multirole aircraft, able to carry a wide variety of Air to Air and Air to Surface missions, Affordable costs, Replacement of current sensors (for example : RDM radar) by state of the art modern sensors with up to date operational performances (for example : multi shoot fire control), Replacement of the current WNDS core system by an open system based on modular avionics architecture allowing, in particular, to separate application software and hardware, Replacement of the current cockpit lay out by a modern glass cockpit taking benefit of the numerous advantages of the Man - Machine - Interface fitted on the MIRAGE 2000-5, Implementation of new functions, by the customer's national industry, thanks to a modem software workshop installed at the customer's facilities. The target of this mid-life update is to obtain a new version of MIRAGE 2000 with a fly away price for new aircraft of 80% of the one of MIRAGE 2000-5 but with attractive operational characteristics.

Author

Software Engineering; Upgrading; Mirage Aircraft

20000037808 National Defence Headquarters, Ottawa, Ontario Canada

Aircraft Life Extension: CC130 Hercules Avionics Update

Daley, C. P., National Defence Headquarters, Canada; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A10-1 - A10-11; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

The Canadian Department of National Defence (DND), having taken measures to ensure the structural integrity of the CC130 Hercules to beyond 2010, studied a number of technical and economic options with respect to extending the life of its ageing CC130 Hercules avionics suite. The Department selected the option of a consolidated and comprehensive avionics update as the preferred option to ensure the aircraft can perform its missions with peak efficiency and that the avionics would meet or outlast the estimated life expectancy for the aircraft.

Author

Structural Failure; Upgrading; Life (Durability); C-130 Aircraft

20000037809 Alenia Aeronautica, Turin, Italy

Enhancing Tactical Transport Capabilities: Cockpit Evolution from G222 to C-27J

Evangelisti, Gianluca, Alenia Aeronautica, Italy; Spinoni, Maurizio, Alenia Aeronautica, Italy; Jones, Patrick F., Lockheed Martin Aeronautical Systems, USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A11-1 - A11-9; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

The C-27J is the latest derivative of the service-proven G222 tactical transport. With over 20 years of production and more than 100 aircraft delivered, the G222 has served the military transport needs of Air Forces around the world including the Italian Air Force (AMI) and USAF. In 1996, Alenia Aerospazio and Lockheed Martin Aeronautical Systems (LMAS) decided to jointly develop the C-27J Spartan tactical transport aircraft. Based on the rugged G222 / C-27A design, the C-27J maintains the existing well-proven military airframe while updating those systems that could best take advantage of state-of-the-art technologies. The avionics, propulsion, and general aircraft systems were selected for upgrades, including the incorporation of avionics and cockpit upgrades developed for and certified on the LMAS C-130J aircraft. After a brief historic overview of the G222 family, from its early VTOL roots through intermediate experiences such as the USAF C-27A and Italian Air Force G222 3A avionics modernization program, this paper illustrates the process followed for the development of the C-27J cockpit. The process used to select a cockpit configuration that allows optimized operational capabilities while reducing overall development costs is presented, together with a description of main cockpit features.

Author

Cockpits; Upgrading; Structural Design

20000037812 Defence Evaluation Research Agency, Farnborough, UK

Integration of Defensive Aids

Zanker, Philip M., Defence Evaluation Research Agency, UK; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A14-1 - A14-10; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

This paper, arising from project and research work at DERA UK, considers the application of, and options and possibilities for, the integration of electronic combat (EC) equipments, specifically defensive aids systems (DAS) into air vehicles, focusing upon the problems and issues of retrofit and upgrade programmes. The paper describes the threat to air platforms, citing both intense conflict and peace - keeping scenarios, and introduces the potential advantages of fully integrated defensive aids in terms of aircraft survivability, and in contributing towards overall situational awareness. The retrofit and integration of defensive aids into an in-service aircraft present some challenging problems. The level of integration is a determinant of the cost and complexity of the programme. The choices range from the basic mechanical integration of separate subsystems; through the integration of a defensive aids system within itself; the integration of the system into existing cockpit displays and controls and into other avionic systems; to the ultimate level of integration in which the defensive aids become an intimate part of the flight avionics suite. The style of avionics and cockpit controls present in the target aircraft is another key factor in the cost and complexity of the upgrade task. Retrofit into well integrated avionics, and multifunction displays, implies that software modification, and hence re-certification, will represent a major part of the integration task. The paper describes the features of integration which may be achieved at the different integration levels. A high level of integration is needed to facilitate data fusion, an important contributor to situational awareness. The paper discusses the structure of data fusion implementations, and the accompanying problems. Modifications and additions to ground support elements are identified as essential to the success of the retrofit or upgrade programme as a whole. The desired level of EC integration will be driven by the customer's specification, which in turn is scoped by his understanding of the detailed issues in integration: the features and facilities which are both feasible and operationally useful. The risk exists that integration features may be sacrificed to contain costs, resulting in fits of expensive and capable items of kit which cannot be used operationally to their full potential.

Author

Upgrading; Avionics; Defense Program; Systems Engineering; Systems Integration

20000037817 Flight Test Squadron (0416th), Edwards AFB, CA USA

Lessons from the Front Line: The Role of Flight Test in Aircraft Update Programs

Hoey, David J., Flight Test Squadron (0416th), USA; Skeen, Matt E., Flight Test Squadron (0416th), USA; Thomas, Evan C., Flight Test Squadron (0416th), USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A21-1 - A21-6; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

Many nations today face the choice between procuring new aircraft or upgrading their existing fleet aircraft, An upgrade is frequently seen as a cost-effective solution to meet new mission requirements in a timely fashion. An upgrade allows the user to capitalize on technological advances since the development of the basic airframe. A key aspect of any aircraft program, whether an upgrade or an initial development, is the flight test phase. Flight test is the final stage where the new capabilities are evaluated

for their likelihood to deliver added utility to the war fighter. However, given an avionics upgrade for a proven aircraft system, such as the F-16, the need for a flight test program is often questioned. "After all, it is only software" is a common comment. This paper will explore the need for, and benefits of, flight test in upgrade programs. It will address the economics of testing, examine the limitations of upgrades, and touch on issues of incorporating new technology into existing weapon systems. Examples and lessons learned from actual programs either tested or currently under test at the 416th Flight Test Squadron, Edwards AFB, California will be incorporated. These flight test lessons can be easily applied to other procurement programs.
Author
Upgrading; Flight Tests; Avionics

20000037818 Boeing Co., Mesa, AZ USA
The AH-64D Apache Longbow: Affordable Evolution
Dimmery, Hugh M., Boeing Co., USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A22-1 - A22-3; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

The US Army and Boeing Rotorcraft are enhancing the capabilities that made the AH-64A Apache the best attack helicopter in the world. These enhancements are resulting in the most capable, fully integrated, combat weapons platform for the twenty-first century: the AH-64D Apache Longbow. The Apache was the result of the requirement for an advanced attack helicopter. In the early 1970s the US Army decided to replace its AH-l Cobra fleet based on lessons learned from its history (Vietnam), and an analysis of its primary threat, the former Warsaw Pact. The Army's concept was to use "massed forces for massed effects." New technologies enabling standoff weapons employment; the ability to perform multiple target engagements; and night operations capabilities were combined with redundant systems; ballistically tolerant components; and a crashworthy airframe and cockpit resulting in the AH-64A. The AH-64A entered service in 1986 with the US Army and later with five international defense forces (Israel, Egypt, Saudi Arabia, the United Arab Emirates, and Greece). In the Army's endeavor to field a twenty-first century platform, the AH-64A Apache provides the basic airframe; and all the basic survivability features that make it a great, survivable aircraft are retained. Boeing is digitizing the combat proven AH-64A Apache. Using "state-of-the-art" technology, the AH-64D now merges sensor inputs; generates mission data; generates graphical displays (a picture is worth a thousand words); and manages a wealth of information resulting in a totally integrated weapons platform.
Derived from text
AH-64 Helicopter; Design Analysis; Aircraft Structures

20000037819 Georgia Tech Research Inst., Aerospace and Transportation Lab., Smyrna, GA USA
MH-53J Service Life Extension Program: A Special Operational Forces Rotorcraft Winner
Crawford, Charles C., Georgia Tech Research Inst., USA; Mason, Henry, Warner Robins Air Logistics Center, USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A23-1 - A23-12; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

This paper presents a summary of the air vehicle modifications (largely structural) that were made and the airworthiness qualification flight test program that was conducted to expand the operational gross weight capability and enhance the structural integrity of the subject helicopter. The impact on both vibration and dynamic component retirement times are discussed. The paper includes both technical and cost information to support program benefits of this modernization approach, but will address only the basic air vehicle, including its rotor/drive and propulsion systems. Discussion of special mission equipment peculiar to the special operational forces mission and most shipboard operations features, can not be included.
Author
Service Life; Rotary Wing Aircraft; Aircraft Reliability

20000037820 National Defence Headquarters, Directorate of Technical Airworthiness, Ottawa, Ontario Canada
The Canadian Air Force Experience: Selecting Aircraft Life Extension as the Most Economical Solution
Landry, Normand, National Defence Headquarters, Canada; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A24-1 - A24-10; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

Canada like several other countries has limited resources to trade-in its outdated and ageing fleets for state-of-the-art weapon systems. With the CFl88 and the CP140, the Canadian Forces (CF) have chosen, as with the CFl16 before, to perform a structural and systems upgrade. These upgrades will allow the aircraft to meet their operational requirements until the first quarter of the next century. The choice for this course of action is based on option analysis studies. In the end, fleet modernization has proven to be the most economical solution. This paper will present the approach taken and the assumptions made for the various scenarios studied to reach that conclusion. Avionics packages are readily available off-the-shelf and in most cases the decision is based mostly on structural limitations. Hence in-service failures and results of full scale fatigue tests obtained through collaborative

agreements can be a cost effective way to determine the cost of ownership of each fleet. The paper will briefly talk about the concept taken for the CP140 but will use the CF188 as the demonstration test case.
Author
Life (Durability); Aircraft Structures; Upgrading

20000037821 DaimlerChrysler Aerospace A.G., Manching, Germany
Transall C-160 Life Extension and Avionics Upgrade Programs
Blumschein, P., DaimlerChrysler Aerospace A.G., Germany; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A26-1 - A26-5; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

Since 1967 the Transall C-160 is the transport aircraft of the German Air Force. After carrying out of life extension measures, avionics upgrade and other improvements of the technical equipment, the Transall C-160 can be operated under economical conditions far beyond 2010. Life extension measures for C-160 started in 1984 (LEDA I and LEDA II). These measures were only carried out for the wings. After taking apart the aircraft in this high scope, more than 30% of complaints were discovered in comparison to the normal preventive maintenance activities. As a result an investigation of aircraft areas and zones not yet subject to inspection measures (PUNIB) was carried out. PUNIB was the basis for LEDA III. In LEDA III the whole structure of the aircraft was inspected. In this manner the life time of the aircraft was extended step by step. Primarily the specification of the original air frame lifetime was restricted to 1995 or 8000 flights (LEDA I, LEDA II). After LEDA III the lifetime for C-l60 was extended to 2010 or 12000 flights. Because of the spare part situation avionic upgrades in 1987 and the replacement of the flight management system (FMS) and the flight control/flight director system (FCS) in 1993 in combination with the replacement of the wiring was carried out. These measures will be finished in 1999. Over and above, the replacement of the intercom system, the improvement of the self defense suite and the integration of a traffic alert and collision avoidance system (TCAS II) as well as other technical measures will be taken. These increase the reliability and improve the precision of the mission management. Moreover the spare part situation was improved since the mid 80’s by the aircraft update programmes.
Author
Life (Durability); Upgrading; C-160 Aircraft

20000037822 Eurocopter France, Marseille, France
The Cougar C.SAR: An Example of Optimization of an Existing Helicopter ***Le Cougar C.SAR, un Exemple d’Optimisation d’un Helicoptere existant***
Cabrit, P., Eurocopter France, France; Jaillet, P., Eurocopter France, France; Giacino, T., Eurocopter France, France; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A27-1 - A27-4; In French; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

The COUGAR is a military transport helicopter in the 9-ton class which is primary used in various versions by many armies worldwide (45 client countries). Since this helicopter was launched, EUROCOPTER has consistently developed improvements to this apparatus so that its users may benefit from the most up-to-date equipment on the market while retaining its fundamental military qualities. A special effort was made to provide a very high-performance apparatus for the ”SAR” (*) combat mission.
Derived from text
F-9 Aircraft; Military Helicopters

20000037823 Woodall (David), Fairfax, VA USA
Technical Evaluation Report
Woodall, David, Woodall (David), USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. TB-1 - TB-5; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

The Systems Concepts and Integration Panel (SCIP) Joint symposium on Advances In Vehicle Systems Concepts and Integration was held in Ankara, Turkey from 26 to 28 April 1999. Symposium (A) Aircraft Update Programmes, The Economical Alternative? Is reported separately. Symposium (B) Warfare Automation Procedures and Techniques for Unmanned Vehicles, reported on here, was the continuation of a series of symposia initially addressing unmanned tactical air vehicles (UTAs) and more recently broadened to include other forms of unmanned vehicles (UVS). The potential importance of UTAs to NATO was identified in the Advisory Group for Aerospace Research & Development (AGARD) Aerospace 2020 report and addressed during two symposia during 1997. Many of the concepts of interest, potential system elements and their performance, and issues associated with the development of UTA capabilities were initially addressed during the earlier symposia. This symposium provided an update on progress in these areas and other forms of UVs.
Derived from text
Conferences; North Atlantic Treaty Organization (NATO); Research and Development; Economics; Aeronautical Engineering

20000037825 Dassault Aviation, Technical Systems Dept., Saint-Cloud, France

Unmanned Fighter Planes (UCAV): The Viewpoint of an Airframe Designer ***Les Avions de Combat Non Habites (UCAV): Le Point de vue d'un Avionneur***

Condroyer, Daniel, Dassault Aviation, France; Helie, Pierre, Dassault Aviation, France; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B2-1 - B2-6; In French; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

After discussing the context of growing interest in promoting the development of unmanned planes, the article will first demonstrate how, following a first step devoted to offsetting the operator in order to free it from the latter's limitations (such as endurance)-a step which takes the form of systems at the demonstration and operation levels-it is possible to plan for innovation concepts in unmanned fighter planes integrated into complex devices which will meet users' criteria (cost, lethality, flexibility, availability, attrition). Secondly, on the basis of work performed along these lines by Dassault Aviation, the article discusses the techniques and technologies considered necessary for implementing these devices in terms of perception, control, man/system interaction.

Derived from text

Airframes; Design Analysis; Pilotless Aircraft

20000037826 Turkish Land Forces Command, Technical and Project Management Dept., Ankara, Turkey

UAV Requirements and Design Consideration

Torun, Erdal, Turkish Land Forces Command, Turkey; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B4-1 - B4-8; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

This paper deals with the UAV requirements based on the battlefield experiences. UAV roles in tactical areas and constraints which affect the UAV mission to be conducted are explained and suggestions are given. Constraints: such as environmental conditions, effects on UAV missions, battlefield situations, operational restrictions and technological limits are overviewed. Based on the current applications and systems, some remarks are presented. Considering the future requirements: air vehicle performance data link and expected payload specifications for a general UAV system are addressed. Assessments and recommendations are given for system design consideration.

Derived from text

Pilotless Aircraft; Systems Engineering; Reconnaissance

20000037840 Atlas Elektronik G.m.b.H., Bremen, Germany

Unmanned Air Vehicles for the Army: Future Concepts

Baeker, Joachim, Atlas Elektronik G.m.b.H., Germany; Grobecker, Helmut, Atlas Elektronik G.m.b.H., Germany; Hastedt, Ralf, Atlas Elektronik G.m.b.H., Germany; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B20-1 - B20-7; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

The micro drones are not considered in this report because the required technologies and special branches have to be applicated with partly completely new attempts and approaches. As examples for this statement I will mention only the aerodynamics, the microelectronics and micromechanics as well as bio-chemical sensors and neuronal intelligent structures. The way shown here to future UAV systems goes ahead from of the existing and in near future developed technologies for tactical UAV systems and demonstrates about application variants the direction towards far-reaching UAV systems with NATO compatibility.

Derived from text

Pilotless Aircraft; Defense Program; Drone Vehicles; Aerodynamics; Micromechanics; Smart Structures; Microelectronics

20000037844 Lockheed Martin Tactical Aircraft Systems, Fort Worth, TX USA

UCAV Concepts for CAS

Chaput, Armand, Lockheed Martin Tactical Aircraft Systems, USA; Henson, Ken C., Lockheed Martin Tactical Aircraft Systems, USA; Ruszkowski, Robert A., Jr., Lockheed Martin Tactical Aircraft Systems, USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B27-1 - B27-12; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

A system concept is described that would give individual combat users access to and (limited) control of a network of unmanned air vehicles. Applications would be both lethal and nonlethal. In the nonlethal form, unmanned combat air vehicles could respond to fire support requests as if they were the virtual equivalent of organic, long-range artillery. In the nonlethal form, unmanned reconnaissance air vehicles could point their sensors at locations and/or areas of interest and respond with target imagery or coordinates of selected target types. Capabilities currently exist to evaluate these concepts in simulated or actual field trials and/or to develop an initial operating capability (IOC).

Derived from text

Combat; Pilotless Aircraft; Aerial Reconnaissance; Systems Engineering

20000037888 European Unmanned Vehicle Systems Association, Paris, France
UAVs: Current Situation and Considerations for the Way Forward
vanBlyenburgh, Peter, European Unmanned Vehicle Systems Association, France; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 1-1 - 1-27; In English; See also 20000037887; Copyright Waived; Avail: CASI; A03, Hardcopy

This document will try to give the reader an overview of the current situation pertaining to unmanned aerial vehicle (UAV) systems in the world and it is will endeavour to give some indications on what the future may have in store for us. It does not have the pretention of being complete and covering everything going on in this field in every country, but rather it will try to give a representative overview of the UAVs currently in use, being considered for purchase and the general state of UAV-related technology and the industry involved.
Derived from text
Pilotless Aircraft; Remote Control; Range; Endurance

20000037892 Defence Procurement Agency, Bristol, UK
Design and Airworthiness Requirements for Military Unmanned Air Vehicle Systems
Rogers, Bernard C., Defence Procurement Agency, UK; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 4-1 - 4-14; In English; See also 20000037887; Copyright Waived; Avail: CASI; A03, Hardcopy

This paper examines the safety implications and factors to be considered for the procurement of a UAV and identities the design requirements to be used as a guide to produce an air vehicle specification. It will touch on matters covered in more detail by other presenters because of the need to reflect the information they provide within the new standard. It should be noted that while appreciating that dirigibles and micro UAV#s will be introduced in the future, it was agreed that the current UK Defence Standard 00-970 should comply with current policy agreed within the UK (UK) Ministry of Defence (MOD), and that by the Civil Aviation Authority (CAA), which is, that UAV Systems under 20kgs should be treated as models and as such do not need to comply with the regulations governing aircraft. This paper also identifies the role of the "Airworthiness, Design Requirements and Procedures (ADRP) organisation" of the UK MOD Defence Procurement Agency (DPA) and details the work being carried out in developing a set of general design and airworthiness requirements for UAV systems. ADRP are part of the new Defence Procurement Agency (DPA). which was formed on the 1st of April 1999, to take forward the "SMART" Procurement initiative, which aims to use faster, cheaper and better ways of equipping the UK armed forces. This involves Integrated Project Teams (IPT) managing the programmes throughout the life of the equipment. This paper discusses the current and future UAV Systems requirements and gives a brief insight into the strategy adopted to produce a set of regulatory documents and procedures for the guidance of the MOD Integrated Project Team leader (IPT/L). This is done by ensuring adequate procedures are in place for the safe and airworthy operation of such aircraft. These procedures set the minimum standard required to accommodate the safe operation of all UAV systems in all airspace conditions subject to any limitations and constraints imposed by the design.
Author
Aircraft Reliability; Pilotless Aircraft; Aircraft Design; Safety Factors; Airships

20000037895 Georgia Tech Research Inst., Atlanta, GA USA
MicroFlyers and Aerial Robots: Missions and Design Criteria
Michelson, Robert C., Georgia Tech Research Inst., USA; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 7-1 - 7-13; In English; See also 20000037887; Copyright Waived; Avail: CASI; A03, Hardcopy

This paper provides an overview of the issues surrounding the design and choice of appropriate missions for a new class of unmanned flying vehicles known as MicroFlyers, Micro Air Vehicles, and Aerial Robots. These terms are often used interchangeably to refer to small flying machines varying from what amounts to "intelligent dust" up to vehicles in the size range of small radio-controlled models (i.e., having a typical maximum dimension of one meter). Because of the size of this class of air vehicle, it can engage in missions that are non-traditional, such as indoor flight through confined spaces, or en mass, to overwhelm a target in swarms. Also because of size, many of these vehicles will have to be autonomous. In some cases, the design of the vehicle will benefit from biological mimicry wherein the behavioral and locomotive techniques used by birds and insects will be of advantage. However, the small size of these air vehicles will also constrain them in the physical environment in much the same way that insects are not necessarily free to navigate at will in the presence of wind and precipitation.
Author
Aircraft Design; Design Analysis; Robots; Pilotless Aircraft

20000037897 Royal Military Academy, Brussels, Belgium
Various Sensors Aboard UAVs
Schweicher, E. J., Royal Military Academy, Belgium; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 10-1 - 10-72; In English; See also 20000037887; Copyright Waived; Avail: CASI; A04, Hardcopy

In order to deal with all possible UAV imaging sensors, we better choose the example of a recently introduced UAV: the General Atomics Predator UAV. The Predator sensor payload includes an q (Electra-Optical) suite, a Ku-band SAR sensor, Ku-band and UHF-band satellite communications (SATCOM), a C-band light-of-sight data link, and a GPS/INS navigator. The Predator's SAR sensor is the Northrop Grumman (Westinghouse) Tactical Endurance Synthetic Aperture Radar (TESAR). TESAR provides continuous, near real time strip-map transmitted imagery over an 800 meter swath at slant ranges up to 11km. Maximum data rate is 500,000 pixels per second. The target resolution is 0.3meters. TESAR weight and power consumption are 80kg and 1200W respectively. A lighter weight, lower cost SAR is currently in development for Predator. The Predator's EO sensor suite is the VERSATRON Skyball SA-144/18 quartet sensor. It consists of a PtSi 512x512 MWIR (Mid Wave IR) FLIR with six fields of view (to easily perform either detection or recognition or identification), a color TV camera with a 10X zoom, a color TV 9OOmm camera and an eyesafe pulsed Er: glass laser rangefinder (this Er: glass laser could advantageously be replaced by an eyesafe Er: YAG laser because YAG is a better heat sink than glass enabling a higher efficiency). The diameter of the EO sensor turret is relatively small-35cm. The turret has precision pointing with a line-of-sight stabilization accuracy of 10 microrad. It is anticipated that high performance UAV's of the year 2010 will have a broad range of missions, including surveillance, reconnaissance, communication , intelligence gathering of threat electronic emissions, target designation for weapons attacking moving targets, and communication relay.
Author
Synthetic Aperture Radar; Satellite Communication; Payloads; Laser Range Finders; Imaging Techniques; FLIR Detectors; Communication Satellites

20000037899 Notre Dame Univ., Dept. of Aerospace and Mechanical Engineering, IN USA
Aerodynamic Measurements at Low Reynolds Numbers for Fixed Wing Micro-Air Vehicles
Mueller, Thomas J., Notre Dame Univ., USA; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 8-1 - 8-32; In English; See also 20000037887; Copyright Waived; Avail: CASI; A03, Hardcopy

A description of the micro-air vehicle (MAV) concept and design requirements is presented. These vehicles are very small and therefore operate at chord Reynolds numbers below 200,000 where very little data is available on the performance of lifting surfaces, i.e., airfoils and low aspect-ratio wings. This paper presents the results of a continuing study of the methods that can be used to obtain reliable force and moment data on thin wings in wind and water tunnels. to this end, a new platform force and moment balance, similar to an already existing balance, was designed and built to perform lift, drag and moment measurements at low Reynolds numbers. Balance characteristics and validation data are presented. Results show a good agreement between published data and data obtained with the new balance. Results for lift, drag and pitching moment about the quarter chord with the existing aerodynamic balance on a series of thin flat plates and cambered plates at low Reynolds numbers are presented. They show that the cambered plates offer better aerodynamic characteristics and performance. Moreover, it appears that the trailing-edge geometry of the wings and the turbulence intensity up to about 1% in the wind tunnel do not have a strong effect on the lift and drag for thin wings at low Reynolds numbers. However, the presence of two endplates for two-dimensional tests and one endplate for the semi-infinite tests appears to have an undesirable influence on the lift characteristics at low Reynolds numbers. The drag characteristics for thin flat-plate wings of aspect ratio greater than one do not appear to be affected by the endplates. The effect of the endplates on the drag characteristics of cambered-plate wings is still under investigation. It is known, however, that endplates do have an effect on the drag and lift characteristics of a cambered Eppler 61 airfoil/wing.
Author
Fixed Wings; Aerodynamic Characteristics; Low Reynolds Number; Pilotless Aircraft; Aerodynamic Drag; Drag Measurement

20000038197 Georgia Inst. of Tech., Atlanta, GA USA
Elementary Model of Nose Gear Retraction and Oleo-Pneumatic Strut Compression
Beachkofski, Brian K.; Aug. 06, 1999; 28p; In English
Report No.(s): AD-A374308; AFIT-FY00-68; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Landing gear systems have two major non-linear components that need to be modeled in order to fully represent a complete landing profile, the extension actuator and the oleo-pneumatic strut. In order to test the equations of motion, the components were put together as part of a system similar to the F-15 nose gear. Working Model tested the geometry, yielding a geometry specific force time diagram that compares well to experimental results. A real system's actuator follows a control system input, which is designed to follow a force displacement path. The equations governing a typical actuator are integrated to compare two models:

a simplified model and one that assumes no leaking nor compressibility of the fluid. The strut acts as a spring mass system, with a non-linear spring and a damper proportional to the square of the velocity. The strut equations of motion are formulated as well as the constraints for both constant velocity and a simulated drop test. These equations are also integrated to show either a force displacement or time displacement diagrams. The results are then compared to the expected values for each type of test, showing data consistent with experimental and other computational methods.
DTIC
Pneumatic Control; Control Valves; Actuators; Hydraulic Control; Hydraulic Equipment; Fluidics; Landing Gear; Nose Wheels

20000038214 Institute for Human Factors TNO, Soesterberg, Netherlands
Task and Training Analysis Image Interpreter SPERWER ***Interim Report*** ***Taak- en Trainingsanalyse Beeldanalist SPERWER***
vandenBosch, K., Institute for Human Factors TNO, Netherlands; Barnard, Y. F., Institute for Human Factors TNO, Netherlands; Helsdingen, A. S., Institute for Human Factors TNO, Netherlands; Feb. 23, 1999; 66p; In Dutch
Contract(s)/Grant(s): A98/KL/602; TNO Proj. 730.3
Report No.(s): TD99-0021; TM-99-A018; Copyright; Avail: Issuing Activity

Starting midway 2000 the 101 RPV company of the Royal Netherlands Army will be responsible for the deployment of unmanned aerial vehicles (the SPERWER) for military intelligence and reconnaissance in enemy territory. The information collected by the SPERWERs sensors [daylight and Thermal InfraRed (TIR)] are being sent to a Ground Control Station (GCS), and is interpreted by an image interpreter. For the development of training in interpreting thermal images, the Royal Netherlands Army requested the TNO Human Factors Research Institute, in cooperation with the school for military intelligence, to conduct a task- and training analysis. The task analysis was based on the basis of provisional functional-technical en tactical information on the SPERWER. Three main tasks were identified: device operation, image interpretation, and reporting. The most important one, image interpretation, can be further subdivided into: perception, analysing, interpreting and concluding. These tasks need to be performed simultaneously and integrated rather than sequentially. The training analysis provides suggestions with respect to the best training approach. Because the image interpreter works with dynamic images, a high level of skill in device operation is required for setting the instruments accurately and rapidly. This demands frequent and intensive practice. The acquisition of skill in image interpretation requires sufficient, systematic, and representative images for practice. Sufficient to ensure that image interpretation takes place on thermal signature and not on superficial image features; systematic to show effects of environmental conditions (day/night, rain, etc.); and representative to make sure that students practice on the type of images that they are likely to encounter in real missions. Skill in reporting involves selection (what do I report and what not) and correct communication procedures. The results in this report will be used to develop databases and models required for generating the thermal images needed for training. The effectivity of training will be investigated empirically in a field study. It is recommended to conduct research into mental work load, to the use of advanced technologies for improving image quality (data fusion) and to methods for data reduction (area-of-interest).
Author
Data Bases; Data Reduction; Image Resolution; Infrared Radiation; Multisensor Fusion; Remotely Piloted Vehicles; Training Analysis; Workloads (Psychophysiology)

20000038403 NASA Langley Research Center, Hampton, VA USA
Design of Supersonic Transport Flap Systems for Thrust Recovery at Subsonic Speeds
Mann, Michael J., NASA Langley Research Center, USA; Carlson, Harry W., Lockheed Engineering and Sciences Co., USA; Domack, Christopher S., Lockheed Engineering and Sciences Co., USA; December 1999; 52p; In English
Contract(s)/Grant(s): RTOP 537-09-20-02
Report No.(s): NASA/TP-1999-209536; NAS 1.60:209536; L-17279; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A study of the subsonic aerodynamics of hinged flap systems for supersonic cruise commercial aircraft has been conducted using linear attached-flow theory that has been modified to include an estimate of attainable leading edge thrust and an approximate representation of vortex forces. Comparisons of theoretical predictions with experimental results show that the theory gives a reasonably good and generally conservative estimate of the performance of an efficient flap system and provides a good estimate of the leading and trailing-edge deflection angles necessary for optimum performance. A substantial reduction in the area of the inboard region of the leading edge flap has only a minor effect on the performance and the optimum deflection angles. Changes in the size of the outboard leading-edge flap show that performance is greatest when this flap has a chord equal to approximately 30 percent of the wing chord. A study was also made of the performance of various combinations of individual leading and trailing-edge flaps, and the results show that aerodynamic efficiencies as high as 85 percent of full suction are predicted.

Author

Subsonic Speed; Supersonic Transports; Design Analysis; Flapping; Aerodynamic Configurations

20000038424 Boeing Co., Long Beach, CA USA

CFD-Based Flap Optimization of the TCA in Transonic Flight Conditions

Narducci, Robert P., Boeing Co., USA; Unger, Eric R., Boeing Co., USA; Yeh, David T., Boeing Co., USA; Novean, Michael G., Boeing Co., USA; Sundaram, P., Boeing Co., USA; Magee, Todd E., Boeing Co., USA; Kuruvila, Geojoe, Boeing Co., USA; Martin, Grant L., Boeing Co., USA; Arslan, Alan E., Boeing Co., USA; Agrawal, Shreekant, Boeing Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 979-1041; In English; See also 20000038422; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

Until recently, the emphasis of non-linear aerodynamic shape design for HSCT configurations has been on drag minimization at the supersonic cruise condition. The performance of the aircraft at the transonic flight condition, as well as for the acceleration and deceleration through the subsonic and low supersonic flight regimes, can be much improved with flap deflections. The primary objective of this study was to incorporate CFD simulations and a grid perturbation tool to model flap deflections with optimization theory to determine the flap deflections for least drag at a given flight condition. The procedure leveraged lessons learned from an earlier procedure developed under an Independent Research and Development (IRAD) project at Boeing Long Beach for flap optimization of the M2.4-7A HSCT configuration. Optimization runs were performed at a series of Mach numbers using Euler analyses on a coarse grid. Fine grid Navier-Stokes analyses were performed on baseline and finalized flap configurations to measure a drag reduction. The optimization procedure was validated through testing at the NASA Langley 16-foot transonic wind tunnel.

Author

Aerodynamic Configurations; Computational Fluid Dynamics; Navier-Stokes Equation; Optimization; Supersonic Transports; Flaps (Control Surfaces); Aircraft Design

20000038425 NASA Langley Research Center, Hampton, VA USA

Viscous Design of TCA Configuration

Krist, Steven E., NASA Langley Research Center, USA; Bauer, Steven X. S., NASA Langley Research Center, USA; Campbell, Richard L., NASA Langley Research Center, USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1043-1069; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The goal in this effort is to redesign the baseline TCA configuration for improved performance at both supersonic and transonic cruise. Viscous analyses are conducted with OVERFLOW, a Navier-Stokes code for overset grids, using PEGSUS to compute the interpolations between overset grids. Viscous designs are conducted with OVERDISC, a script which couples OVERFLOW with the Constrained Direct Iterative Surface Curvature (CDISC) inverse design method. The successful execution of any computational fluid dynamics (CFD) based aerodynamic design method for complex configurations requires an efficient method for regenerating the computational grids to account for modifications to the configuration shape. The first section of this presentation deals with the automated regridding procedure used to generate overset grids for the fuselage/wing/diverter/nacelle configurations analysed in this effort. The second section outlines the procedures utilized to conduct OVERDISC inverse designs. The third section briefly covers the work conducted by Dick Campbell, in which a dual-point design at Mach 2.4 and 0.9 was attempted using OVERDISC; the initial configuration from which this design effort was started is an early version of the optimized shape for the TCA configuration developed by the Boeing Commercial Airplane Group (BCAG), which eventually evolved into the NCV design. The final section presents results from application of the Natural Flow Wing design philosophy to the TCA configuration.

Author

Aircraft Design; Viscous Flow; Supersonic Transports; Aerodynamic Configurations; Applications Programs (Computers); Computational Fluid Dynamics; Computational Grids

20000038426 Boeing Co., Long Beach, CA USA

Progress Towards a Multipoint Optimization Procedure

Narducci, Robert P., Boeing Co., USA; Agrawal, Shreekant, Boeing Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1071-1142; In English; See also 20000038422; No

Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

This paper investigates the relative merits of two multipoint design approaches for the HSCT. In the first, a supersonic cruise point design is used as initial conditions for a flap optimization at the transonic cruise condition. In the second approach, the shape of the HSCT is optimized with considerations of aerodynamic performance at the supersonic and transonic cruise conditions weighed according to its impact on the maximum take-off gross weight (MTOGW). Results using the first approach are presented using the Boeing Long Beach (BLB), and NASA Ames Cycle 2 designs. The impact of the initial configuration shape on transonic cruise performance and flap deflection angles is addressed. An intermediate multipoint design using the second approach is also presented and compared with designs from the first approach.

Author

Supersonic Transports; Optimization; Aircraft Design; Flaps (Control Surfaces); Design Analysis; Aerodynamic Configurations

20000038429 Boeing Co., Long Beach, CA USA

Transonic Installed Nacelle Analyses

Chaney, Steve, Boeing Co., USA; Blom, Gordon, Boeing Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1241-1363; In English; See also 20000038422; No Copyright; Avail: CASI; A06, Hardcopy; A10, Microfiche

The primary objective for propulsion/airframe integration (PAI) work stated in the planning and control document (PCD) is to develop technology required to support the development of the High Speed Civil Transport (HSCT). The technology development includes: 1) Developing computational and empirical based tools for the aerodynamic design & analysis of complex geometry configurations. This development consists primarily of adapting current state-of-the-art computational fluid dynamics (CFD) codes to the HSCT PAI configurations and conditions. This is followed by validation with wind tunnel or flight aerodynamic data. 2) Identifying the key design variables for HSCT PAI installations with the tools described above. Exercising these variables in parametric or direct design optimization studies in order to develop design guidelines for efficient nacelle installations. These overall three year objectives for sub-task 3 lead to the specific objectives for 1997 as described herein.

Author

Computational Fluid Dynamics; Design Analysis; Engine Airframe Integration; Supersonic Transports; Aerodynamic Configurations

20000038430 Boeing Co., Long Beach, CA USA

Nacelle Diverter Design and Nozzle Boattail Drag Studies

Sundaram, P., Boeing Co., USA; Shieh, Chih F., Boeing Co., USA; Arslan, Alan E., Boeing Co., USA; Wallace, Hoyt, Boeing Co., USA; Agrawal, Shreekant, Boeing Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1365-1455; In English; See also 20000038422; Original contains color illustrations; No Copyright; Avail: CASI; A05, Hardcopy; A10, Microfiche

The paper presents the results of the various PAI related effort performed during FY97 at Boeing Long Beach (BLB). One of the important studies performed was the TCA nacelle diverter parametric shape modifications carried out to improve the TCA baseline nacelle installation drag. CFL3D Navier-Stokes solutions for wing/body/nacelle/diverter configurations incorporating simple shape modifications to the TCA baseline nacelles and diverters have been obtained at the supersonic cruise Mach number of M(sub infinity) = 2.4 for Re(sub c) = 212 million. These shape modifications, called N/D cycle 1, kinked the inboard and outboard nacelles to align the local flow at the nacelle inlet face and pitched the inboard nacelle to reduce the diverter volume by lowering the diverter leading-edge height requirement of 0.14% boundary layer run. The N/D cycle 1 design reduced the TCA baseline drag by nearly 1.2 count at the Right Reynolds number and 1.4 counts at the wind-tunnel Reynolds number (Re(sub c) = 6.36 million). The paper also describes the successful completion of the CFL3D Navier-Stokes solutions for the Reference H installed transonic nozzle boattail configurations for axisymmetric and 2-D powered nozzles at both the transonic and reference settings. These installed nozzle computations were obtained on parallel platforms using the CFL3Dhp code with a fast turn-around time. Using these solutions, the jet effects on the aftbody for the axisymmetric nozzles at transonic Mach numbers of M(sub infinity) = 0.9 and 1.1 were calculated. Finally, the paper also presents the isolated nozzle study that investigated the effect of turbulence models on the nozzle boattail pressures. This study provided an insight into CFL3D Navier-Stokes solutions for powered nozzle simulations.

Author

Aerodynamic Configurations; Navier-Stokes Equation; Engine Airframe Integration; Supersonic Transports; Computerized Simulation; Computational Fluid Dynamics

20000038431 NASA Ames Research Center, Moffett Field, CA USA
Model 2b Test Results
Goodsell, Aga M., NASA Ames Research Center, USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1461-1503; In English; See also 20000038422; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This activity is part of the Wind Tunnel Database and Wind Tunnel Data Corrections Programs. The main purpose of this test was to evaluate the aerodynamic performance of the TCA Baseline configuration around the supersonic cruise point.
Author
Aerodynamic Characteristics; Wind Tunnel Tests; Supersonic Transports

20000038433 NASA Langley Research Center, Hampton, VA USA
Aftbody Closure Model Design: Lessons Learned
Capone, Francis J., NASA Langley Research Center, USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1545-1568; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

An Aftbody Closure Test Program is necessary in order to provide aftbody drag increments that can be added to the drag polars produced by testing the performance models (models 2a and 2b). These models had a truncated fuselage, thus, drag was measured for an incomplete configuration. In addition, trim characteristics cannot be determined with a model with a truncated fuselage. The stability and control tests were conducted with a model (model 20) having a flared aftbody. This type aftbody was needed in order to provide additional clearance between the base of the model and the sting. This was necessary because the high loads imposed on the model for stability and control tests result in large model deflections. For this case, the aftbody model will be used to validate stability and control performance.
Author
Aircraft Models; Aerodynamic Configurations; Wind Tunnel Models; Wind Tunnel Tests; Supersonic Transports; Afterbodies; Aircraft Design

20000038434 NASA Langley Research Center, Hampton, VA USA
HSR Model Deformation Measurements from Subsonic to Supersonic Speeds
Burner, A. W., NASA Langley Research Center, USA; Erickson, G. E., NASA Langley Research Center, USA; Goodman, W. L., NASA Langley Research Center, USA; Fleming, G. A., NASA Langley Research Center, USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1569-1588; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper describes the video model deformation technique (VMD) used at five NASA facilities and the projection moire interferometry (PMI) technique used at two NASA facilities. Comparisons between the two techniques for model deformation measurements are provided. Facilities at NASA-Ames and NASA-Langley where deformation measurements have been made are presented. Examples of HSR model deformation measurements from the Langley Unitary Wind Tunnel, Langley 16-foot Transonic Wind Tunnel, and the Ames 12-foot Pressure Tunnel are presented. A study to improve and develop new targeting schemes at the National Transonic Facility is also described. The consideration of milled targets for future HSR models is recommended when deformation measurements are expected to be required. Finally, future development work for VMD and PMI is addressed.
Author
Moire Interferometry; Elastic Deformation; Wind Tunnel Tests; Photogrammetry; Wind Tunnel Models

20000038437 Boeing Co., Long Beach, CA USA
Initial Predictions of Canard Integration
Magee, Todd E., Boeing Co., USA; Hager, James O., Boeing Co., USA; Yeh, David T., Boeing Co., USA; Haynes, Tim, DYNACS Engineering Co., Inc., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1671-1755; In English; See also 20000038422; No Copyright; Avail: CASI; A05, Hardcopy; A10, Microfiche

This paper presents the initial CFD predictions obtained by Boeing Long Beach (BLB) and Dynacs Engineering Company for the integration of a canard on the TCA (Technology Concept Aircraft) wing/body configuration. Each company analyzed different canard configurations. Boeing analyzed the PTC (Preliminary Technology Concept) canard planform, while Dynacs focused on the ACC (Alternate Controls Concept) canard planform. Euler and Navier-Stokes solutions are presented in this paper. The results from both analyses were used to define a wind-tunnel test program, that is outlined in the paper. The results indicate

that the PTC planform has a small impact on the wing/body/canard performance. The ACC planform has greater impact on the wing/body/canard performance, because of its close proximity to the wing and its larger planform size.
Author
Aircraft Configurations; Body-Wing Configurations; Canard Configurations; Computational Fluid Dynamics; Navier-Stokes Equation; Planforms; Wind Tunnel Tests; Euler Equations of Motion

20000038439 Boeing Commercial Airplane Co., Seattle, WA USA
Cross-Discipline Evaluation of Optimized Designs and Features
Vegter, Chris A., Boeing Commercial Airplane Co., USA; Stanislaw, Greg S., Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1777-1796; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The NCV (optimized TCA geometry) contains many features which are different from the TCA. Some of the more obvious differences are the body cross sectional shape changes, the wing shear (or gulling), and the span-wise curvature variations (bumps). One of the drawbacks of the optimization, is that it proceeds in the direction of lowest drag, whether the shape change results in a large or small drag improvement. Some of the features have impact on other disciplines. It was unknown which of the features were contributing significantly to the drag reduction. The purpose of this study was to better understand the drag benefits of the various features, and how those features affect the other disciplines.
Author
Drag Reduction; Supersonic Transports; Optimization; Aerodynamic Configurations; Aerodynamic Drag

20000038441 NASA Ames Research Center, Moffett Field, CA USA
CFD Data Generation Process for Nonlinear Loads
Arslan, Alan, Boeing Co., USA; Magee, Todd, Boeing Co., USA; Unger, Eric, Boeing Co., USA; Hartwich, Peter, Boeing Co., USA; Agrawal, Shreekant, Boeing Co., USA; Giesing, Joseph, Boeing Co., USA; Bharadvaj, Bala, Boeing Co., USA; Chaderjian, Neal, NASA Ames Research Center, USA; Murman, Scott, NASA Ames Research Center, USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1817-1871; See also 20000038422; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

This paper discusses the development of a process to generate a CFD database for the non-linear loads process capability for critical loads evaluation at Boeing Long Beach. The CFD simulations were performed for wing/body configurations at high angles of attack and Reynolds numbers with transonic and elastic deflection effects. Convergence criteria had to be tailored for loads applications rather than the usual drag performance. The time-accurate approach was subsequently adopted in order to improve convergence and model possible unsteadiness in the flowfield. In addition, uncertainty issues relating to the turbulence model and grid resolution in areas of high vortical flows were addressed and investigated for one of the cases.
Author
Body-Wing Configurations; Computational Fluid Dynamics; Critical Loading; Data Bases; Computerized Simulation; Supersonic Transports

20000042895 Range Commanders Council, White Sands Missile Range, NM USA
Range Safety Criteria for Unmanned Air Vehicles
Dec. 1999; 21p; In English
Report No.(s): AD-A375224; RCC-323-99; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This document provides a common approach for the Range Commander to make decisions regarding Unmanned Air Vehicle flight operations. The use of this tool depends on the needs of the Range Commander. The five criteria are described in this document along with the conditions necessary to meet the criteria.
DTIC
Range Safety; Pilotless Aircraft; Flight Operations

20000043604 Northrop Corp., Aircraft Div., Hawthorne, CA USA
Maximum Normalized Rate as a Flying Qualities Parameter
Onstott, E. D., Northrop Corp., USA; Warner, J. S., Northrop Corp., USA; Hodgkinson, J., Northrop Corp., USA;]1984]; 28p; In English; 20th; Manual Control Conference, 12-14 Jun. 1984, Moffett Field, VA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Discrete attitude commands have become a standard task for flying qualities evaluation and control system testing. Much pilot opinion data is now available for ground-based and in-flight simulations, but adequate performance measures and prediction

methods have not been established. The Step Target Tracking Prediction method, introduced in 1978, correlated time-on-target and rms tracking data with NT-33 in-flight longitudinal simulations, but did not employ parameters easily measured in manned flight and simulation. Recent application of the Step Target Tracking Prediction method to lateral flying qualities analysis has led to a new measure of performance. This quantity, called Maximum Normalized Rate (MNR), reflects the greatest attitude rate a pilot can employ during a discrete maneuver without excessive overshoot and oscillation. MNR correlates NT-33 lateral pilot opinion ratings well, and is easily measured during night test or simulation. Furthermore, the Step Target MNR method can be used to analyze large amplitude problems concerning rate limiting and nonlinear aerodynamics.
Author
Flight Characteristics; In-Flight Simulation; Prediction Analysis Techniques; Quality; Performance Prediction

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology.

20000033824 NASA Glenn Research Center, Cleveland, OH USA
Wireless Telemetry for Gas-Turbine Applications
DeAnna, Russell G., Army Research Lab., USA; March 2000; 26p; In English
Contract(s)/Grant(s): RTOP 577-40-20; DA Proj. 1L1-61102-AH-45
Report No.(s): NASA/TM-2000-209815; E-12124; NAS 1.15:209815; ARL-MR-474; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Wireless telemetry technology for transmitting power and data to and from sensors located inside a gas-turbine engine is reviewed. Two scenarios are considered: a rotating sensor hardwired to a shaft-mounted, inductively-coupled system; and a stationary or rotating microsensor telemetry module. Applications of these telemetry scenarios in the gas-turbine operating environment, the types of sensor measurements, the principles of telemetry, and a review of the current state of microfabricated components for telemetry systems are given. Inductive coupling for both data and power transmission is emphasized in the first scenario. The microsensor telemetry module discussed in the second scenario would need battery power or an alternative power source. These technologies are emerging and do not represent available products. A brief list of alternative technologies for providing power is presented at the end.
Author
Wireless Communication; Telemetry; Gas Turbine Engines; Technology Assessment; Data Processing; Data Transmission

20000037810 Litton Guidance and Control Systems, Northridge, CA USA
A Modern Integrated Avionics System for the Next Generation U.S.M.C. Attack and Utility Helicopters
Dowell, John A., Litton Guidance and Control Systems, USA; Wade, Ronald C., Naval Air Systems Command, USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A12-1 - A12-12; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

The USA Marine Corps awarded the first phase of the H-1 platform upgrade program to Bell Helicopter in late 1996. This effort resulted in substantial improvements to both the AH-1 Gunship and UH-1 Utility aircraft. Upgrades included a new transmission and a 4-bladed rotor with resulting improvements in mission effectiveness and cost of ownership. In 1997, the program was expanded to provide a modern suite of avionics incorporating improved sensors, cockpits, weapons processing, helmet-mounted displays and an advanced centralized mission processing subsystem. This technical paper will review the basis for architectural decisions of the avionics and the criteria for selection of key sensors and displays. Major attributes of redundancy and commonality are described, together with an overview of an advanced open architecture mission computer.
Author
Avionics; Attack Aircraft; Upgrading

20000037813 Societe d’Applications Generales d’Electricite et de Mecanique, Defense and Security Div., Nanterre, France
Modular Avionics Upgrade: The Cost Effective Solution to Adapt Existing Fighters to the Operational Requirements of Today’s Battlefield
Dedieu, Christian, Societe d’Applications Generales d’Electricite et de Mecanique, France; Loffler, Eric, Societe d’Applications Generales d’Electricite et de Mecanique, France; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A15-1 - A15-4; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

This paper presents already fielded implementations of an avionics upgrade package developed to offer a modular solution to a wide range of modem operational requirements. The SAGEM SA upgrade concept allows to match specifications ranging from basics performance enhancement, such as high accuracy navigation for low level flight, up to full multi-role capability with sophisticated air-to-surface weapon delivery and multi-target air-to-air fire control. The upgraded system implements all state of art features available on the most recent fighters, particularly for pilot interface (HOTAS, glass cockpit, NVG compatibility, ...) as well as for system architecture (modular avionics, high level of redundancy and back-up modes, ADA HOL programming, object oriented software ...). The presentation will describe how the most recent technologies can be inducted in older platforms more rapidly than on newly developed airframes, therefore ensuring that the most demanded operational requirements are fully satisfied. In particular, sensor technologies (pulse-Doppler Radar, thermal imaging and IRST ...) will be addressed, as well as smart weapons (guidance kits, advanced tire control software ...) which are driving factors for the overall accuracy for the success of the mission. A special highlight will be given on ground support equipment and procedures both at operational and maintenance levels. These facilities include part-task trainers and mission planning systems to help the pilots optimize their missions; in parallel an integrated logistic support is deployed to give all necessary tools to the maintenance crews.
Author
Avionics; Upgrading; Fighter Aircraft; Systems Engineering

20000037898 Societe Nationale de Construction Aeronautique, Gosselies, Belgium
The B-HUNTER UAV System
Delonge, Robert, Jr., Societe Nationale de Construction Aeronautique, Belgium; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 11-1 - 11-17; In English; See also 20000037887; Copyright Waived; Avail: CASI; A03, Hardcopy

The purpose of this paper consists to provide a general overview of the B-HUNTER UAV System that has been chosen by the Belgian Army Ground Forces. From year 2001, the B-HUNTER UAV system will replace the Epervier UAV System which was in use in the Belgian Army since more than 20 years. The B-HUNTER UAV System is derived from the US Short Range HUNTER Tactical UAV that has been developed and qualified according to the most severe NATO requirements by a joint venture composed of Israel Aircraft Industries Ltd. (IAI) and TRW Inc. It has been recently successfully deployed in Kosovo operation with proven operational results that have been reported in profusion of press releases. This paper will describe the main upgrades at system and subsystem level that will be performed in the frame of the Belgian Contract by the Belgian EAGLE Temporary Association. The B-HUNTER UAV system and subsystem are described. In the course of the B-HUNTER UAV Program, a lot of attention will be paid to the potential integration of the B-HUNTER UAV System in the civil air space. According to the Belgian law, UAV Systems have to comply with the following overall safety objective: 'The B-HUNTER UAV System must allow during all its life safely execution of UAV missions above populated areas taking into account Belgian environmental conditions'. A short introduction to the activities performed in the frame of the B-HUNTER UAV program with regards to airworthiness issues is presented.
Author
Pilotless Aircraft; Aircraft Reliability; Aircraft Industry; Aircraft Design

20000041753 NASA Dryden Flight Research Center, Edwards, CA USA
Development of a Flush Airdata Sensing System on a Sharp-Nosed Vehicle for Flight at Mach 3 to 8
Davis, Mark C., NASA Dryden Flight Research Center, USA; Pahle, Joseph W., NASA Dryden Flight Research Center, USA; White, John Terry, NASA Dryden Flight Research Center, USA; Marshall, Laurie A., NASA Dryden Flight Research Center, USA; Mashburn, Michael J., Micro Craft, Inc., USA; Franks, Rick, Sverdrup Technology, Inc., USA; May 2000; 25p; In English; 38th; 38th Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 522-51-54
Report No.(s): NASA/TM-2000-209017; NAS 1.15:209017; H-2396; AIAA Paper 2000-0504; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA Dryden Flight Research Center has developed a flush airdata sensing (FADS) system on a sharp-nosed, wedge-shaped vehicle. This paper details the design and calibration of a real-time angle-of-attack estimation scheme developed to meet the onboard airdata measurement requirements for a research vehicle equipped with a supersonic-combustion ramjet engine. The FADS system has been designed to perform in flights at speeds between Mach 3 and Mach 8 and at angles of attack between -6 deg. and 12 deg. The description of the FADS architecture includes port layout, pneumatic design, and hardware integration. Predictive models of static and dynamic performance are compared with wind-tunnel results across the Mach and angle-of-attack

range. Results indicate that static angle-of-attack accuracy and pneumatic lag can be adequately characterized and incorporated into a real-time algorithm.
Author
Mach Number; Research Vehicles; Supersonic Combustion Ramjet Engines; Wind Tunnel Tests; Air Data Systems; Design Analysis; Detection

20000044327 NASA Marshall Space Flight Center, Huntsville, AL USA
Using Modern Design Tools for Digital Avionics Development
Hyde, David W., NASA Marshall Space Flight Center, USA; Lakin, David R., II, NASA Marshall Space Flight Center, USA; Asquith, Thomas E., NASA Marshall Space Flight Center, USA; [2000]; 2p; In English; 19th; 19th Digital Avionics System Conference, 7-12 Oct. 2000, Philadelphia, PA, USA
Contract(s)/Grant(s): RTOP 477-72-W3; No Copyright; Avail: Issuing Activity; Abstract Only

Using Modem Design Tools for Digital Avionics Development Shrinking development time and increased complexity of new avionics forces the designer to use modem tools and methods during hardware development. Engineers at the Marshall Space Flight Center have successfully upgraded their design flow and used it to develop a Mongoose V based radiation tolerant processor board for the International Space Station's Water Recovery System. The design flow, based on hardware description languages, simulation, synthesis, hardware models, and full functional software model libraries, allowed designers to fully simulate the processor board from reset, through initialization before any boards were built. The fidelity of a digital simulation is limited to the accuracy of the models used and how realistically the designer drives the circuit's inputs during simulation. by using the actual silicon during simulation, device modeling errors are reduced. Numerous design flaws were discovered early in the design phase when they could be easily fixed. The use of hardware models and actual MIPS software loaded into full functional memory models also provided checkout of the software development environment. This paper will describe the design flow used to develop the processor board and give examples of errors that were found using the tools. An overview of the processor board firmware will also be covered.
Author
Circuits; Computer Programming; Computer Programs; Digital Simulation; Hardware Description Languages; Simulation; Water Reclamation

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

20000033822 NASA Glenn Research Center, Cleveland, OH USA
Implementation of a Compressor Face Boundary Condition Based on Small Disturbances
Slater, John W., NASA Glenn Research Center, USA; Paynter, Gerald C., Boeing Co., USA; March 2000; 14p; In English; 45th; International Gas Turbine and Aeroengine Technical Congress, 8-11 May 2000, Munich, Germany; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): RTOP 714-04-50
Report No.(s): NASA/TM-2000-209945; E-12193; NAS 1.15:209945; ASME-2000-GT-0005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A compressor-face boundary condition that models the unsteady interactions of acoustic and convective velocity disturbances with a compressor has been implemented into a three-dimensional computational fluid dynamics code. Locally one-dimensional characteristics along with a small-disturbance model are used to compute the acoustic response as a function of the local stagger angle and the strength and direction of the disturbance. Simulations of the inviscid flow in a straight duct, a duct coupled to a compressor, and a supersonic inlet demonstrate the behavior of the boundary condition in relation to existing boundary conditions. Comparisons with experimental data show a large improvement in accuracy over existing boundary conditions in the ability to predict the reflected disturbance from the interaction of an acoustic disturbance with a compressor.
Author
Computational Fluid Dynamics; Boundary Conditions; Simulation; Dimensional Analysis; Unsteady State; Three Dimensional Models

20000033864 SyPort Systems, Inc., Bridgewater, NJ USA
Evaluation of Reciprocating Aircraft Engines with Unleaded Fuels *Final Report, Feb. 1997 - Sep. 1998*
Atwood, David H., SyPort Systems, Inc., USA; Knopp, Kenneth J., Federal Aviation Administration, USA; Dec. 1999; 82p; In English
Contract(s)/Grant(s): DTFA03-95-C-00004
Report No.(s): AD-A373996; DOT/FAA/AR-99/70; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Recent Clean Air Act legislation banned the uses of leaded fuels however, due to significant safety concerns, the EPA has not enforced compliance on the general aviation community. Nonetheless, significant economic pressures will continue to mount concerning the purchase, handling, and shipping of lead containing fuels and the disposal of lead tainted engine oils. This is driving the need to develop a high Motor Octane unleaded alternative to the current leaded stock. The cost to develop this alternatives expected to be exponentially proportional to the motor octane number of the fuel. historically, safety margins were determined by ensuring that the particular engine be without limiting detonation throughout its operating envelope on a particular aviation fuel. There is very limited data on the actual motor octane requirement of the majority of the fleet. A Coordinating Research Council Subcommittee has been formed to address the development of an unleaded fuel, with the current focus being the determination of the minimum motor octane number required for knock free operation of the majority of the piston engine fleet. This report details ongoing FAA efforts toward this effort. Data from both ground based engine testing and in-flight testing are included. The findings suggest that greater than 100 motor octane number will be required with lean fuel flow schedule conditions requiring substantially greater motor octane numbers. The data also suggest that significant decrease in octane requirement can be obtained by substantial power deration for the large turbocharged engines.
DTIC
Engine Design; Aircraft Design; Piston Engines

20000034011 Texas A&M Univ., College Station, TX USA
Unsteady High Turbulence Effects on Turbine Blade Film Cooling Heat Transfer Performance Using a Transient Liquid Crystal Technique *Final Report*
Han, J. C., Texas A&M Univ., USA; Ekkad, S. V., Texas A&M Univ., USA; Du, H., Texas A&M Univ., USA; Teng, S., Texas A&M Univ., USA; February 2000; 228p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG3-1656; RTOP 714-01-4A
Report No.(s): NASA/CR-2000-209929; E-12173; NAS 1.26:209929; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Unsteady wake effect, with and without trailing edge ejection, on detailed heat transfer coefficient and film cooling effectiveness distributions is presented for a downstream film-cooled gas turbine blade. Tests were performed on a five-blade linear cascade at an exit Reynolds number of 5.3 x 10(exp 5). Upstream unsteady wakes were simulated using a spoke-wheel type wake generator. Coolant blowing ratio was varied from 0.4 to 1.2; air and CO2 were used as coolants to simulate different density ratios. Surface heat transfer and film effectiveness distributions were obtained using a transient liquid crystal technique; coolant temperature profiles were determined with a cold wire technique. Results show that Nusselt numbers for a film cooled blade are much higher compared to a blade without film injection. Unsteady wake slightly enhances Nusselt numbers but significantly reduces film effectiveness versus no wake cases. Nusselt numbers increase only slic,htly but film cooling, effectiveness increases significantly with increasing, blowing ratio. Higher density coolant (CO2) provides higher effectiveness at higher blowing ratios (M = 1.2) whereas lower density coolant (Air) provides higher 0 effectiveness at lower blowing ratios (M = 0.8). Trailing edge ejection generally has more effect on film effectiveness than on the heat transfer, typically reducing film effectiveness and enhancing heat transfer. Similar data is also presented for a film cooled cylindrical leading edge model.
Author
Film Cooling; Heat Transfer; Liquid Crystals; Turbine Blades; Turbulence Effects; Gas Turbine Engines; Unsteady Flow

20000034012 NASA Glenn Research Center, Cleveland, OH USA
On Flowfield Periodicity in the NASA Transonic Flutter Cascade, Part 2, Numerical Study
Chima, Rodrick V., NASA Glenn Research Center, USA; McFarland, Eric R., NASA Glenn Research Center, USA; Wood, Jerry R., NASA Glenn Research Center, USA; Lepicovsky, Jan, DYNACS Engineering Co., Inc., USA; March 2000; 14p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 523-26-13
Report No.(s): NASA/TM-2000-209933/PT1; NAS 1.15:209933/PT1; E-12177/PT1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The transonic flutter cascade facility at NASA Glenn Research Center was redesigned based on a combined program of experimental measurements and numerical analyses. The objectives of the redesign were to improve the periodicity of the cascade in steady operation, and to better quantify the inlet and exit flow conditions needed for CFD predictions. Part I of this paper describes the experimental measurements, which included static pressure measurements on the blade and endwalls made using both static taps and pressure sensitive paints, cobra probe measurements of the endwall boundary layers and blade wakes, and shadowgraphs of the wave structure. Part II of this paper describes three CFD codes used to analyze the facility, including a multibody panel code, a quasi-three-dimensional viscous code, and a fully three-dimensional viscous code. The measurements and analyses both showed that the operation of the cascade was heavily dependent on the configuration of the sidewalls. Four configurations of the sidewalls were studied and the results are described. For the final configuration, the quasi-three-dimensional viscous code was used to predict the location of mid-passage streamlines for a perfectly periodic cascade. by arranging the tunnel sidewalls to approximate these streamlines, sidewall interference was minimized and excellent periodicity was obtained.
Author
Flow Distribution; Periodic Variations; Transonic Flow; Inlet Flow; Outlet Flow; Transonic Flutter

20000034013 General Electric Co., Aircraft Engines, Cincinnati, OH USA
Full 3D Analysis of the GE90 Turbofan Primary Flowpath *Final Report*
Turner, Mark G., General Electric Co., USA; March 2000; 100p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-26617; RTOP 509-10-11
Report No.(s): NASA/CR-2000-209951; E-12205; NAS 1.26:209951; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The multistage simulations of the GE90 turbofan primary flowpath components have been performed. The multistage CFD code, APNASA, has been used to analyze the fan, fan OGV and booster, the 10-stage high-pressure compressor and the entire turbine system of the GE90 turbofan engine. The code has two levels of parallel, and for the 18 blade row full turbine simulation has 87.3 percent parallel efficiency with 121 processors on an SGI ORIGIN. Grid generation is accomplished with the multistage Average Passage Grid Generator, APG. Results for each component are shown which compare favorably with test data.
Author
Three Dimensional Models; Turbofans; Computational Fluid Dynamics; Computational Grids; Simulation

20000034022 Texas A&M Univ., Dept. of Mechanical Engineering, College Station, TX USA
Effect of Film-Hole Shape on Turbine Blade Film Cooling Performance *Final Report*
Han, J. C., Texas A&M Univ., USA; Teng, S., Texas A&M Univ., USA; February 2000; 64p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG3-1656; RTOP 714-01-4A
Report No.(s): NASA/CR-2000-209932; E-12176; NAS 1.26:209932; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The detailed heat transfer coefficient and film cooling effectiveness distributions as well as tile detailed coolant jet temperature profiles on the suction side of a gas turbine blade A,ere measured using a transient liquid crystal image method and a traversing cold wire and a traversing thermocouple probe, respectively. The blade has only one row of film holes near the gill hole portion on the suction side of the blade. The hole geometries studied include standard cylindrical holes and holes with diffuser shaped exit portion (i.e. fanshaped holes and laidback fanshaped holes). Tests were performed on a five-blade linear cascade in a low-speed wind tunnel. The mainstream Reynolds number based on cascade exit velocity was 5.3 x 10(exp 5). Upstream unsteady wakes were simulated using a spoke-wheel type wake generator. The wake Strouhal number was kept at 0 or 0.1. Coolant blowing ratio was varied from 0.4 to 1.2. Results show that both expanded holes have significantly improved thermal protection over the surface downstream of the ejection location, particularly at high blowing ratios. However, the expanded hole injections induce earlier boundary layer transition to turbulence and enhance heat transfer coefficients at the latter part of the blade suction surface. In general, the unsteady wake tends to reduce film cooling effectiveness.
Author
Heat Transfer Coefficients; Coolants; Temperature Profiles; Suction; Turbine Blades; Heat Measurement; Film Cooling

20000034102 National Academy of Sciences - National Research Council, Hampton, VA USA
Numerical Simulation of Dual-Mode Scramjet Combustors
Rodriguez, C. G., National Academy of Sciences - National Research Council, USA; Riggins, D. W., Tennessee Univ., USA; Bittner, R. D., FDC/NYMA, Inc., USA; [2000]; 29p; In English
Contract(s)/Grant(s): NAG1-2167; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results of a numerical investigation of a three-dimensional dual-mode scramjet isolator-combustor flow-field are presented. Specifically, the effect of wall cooling on upstream interaction and flow-structure is examined for a case assuming jet-to-jet symmetry within the combustor. Comparisons are made with available experimental wall pressures. The full half-duct for the isolator-combustor is then modeled in order to study the influence of side-walls. Large scale three-dimensionality is observed in the flow with massive separation forward on the side-walls of the duct. A brief review of convergence-acceleration techniques useful in dual-mode simulations is presented, followed by recommendations regarding the development of a reliable and unambiguous experimental data base for guiding CFD code assessments in this area.
Author
Simulation; Three Dimensional Models; Mathematical Models; Supersonic Combustion Ramjet Engines; Combustion; Combustion Chambers

20000034104 Missouri Univ., Rolla, MO USA
The Numerical Investigation of a Dual-Mode Scramjet Combustor
Riggins, David, Missouri Univ., USA; [1998]; 18p; In English
Contract(s)/Grant(s): NAG1-189; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A numerical investigation of a multiple-jet array dual-mode scramjet combustor has been performed utilizing a three-dimensional Navier-Stokes code with finite-rate chemistry. Results indicate substantial upstream interaction in the form of an oblique shock/expansion train upstream of the combustor, culminating in completely subsonic flow in the vicinity of fuel injectors. The flow returns to supersonic velocities in the downstream (diverging) portion of the combustor. Mixing and combustion are rapid in this flow and predicted combustion efficiency closely matches experimental data. However, comparisons of wall pressure between the simulation and the experiment show i) substantial underprediction of the upstream interaction distance and ii) moderate overprediction of peak pressure in the vicinity of the entrance of the combustor. This can be at least partially explained by examination of available experimental data; this data shows a very significant movement of the entering vitiated airflow to the sides of the combustor (around the injector array and the upstream interaction front as a whole). This important effect is currently being examined by an extension of the modeling to include the entire half-duct of the same combustor geometry.
Author
Supersonic Combustion Ramjet Engines; Combustion; Combustion Chambers; Three Dimensional Models; Navier-Stokes Equation; Oblique Shock Waves

20000036536 California Univ., San Diego, Dept. of the Aerospace and Mechanical Engineering Sciences, La Jolla, CA USA
A Second Generation of Backstepping Designs and Robust Nonlinear Control of Aeroengines ***Final Report, 1 Feb. 1998-30 Sep. 1999***
Krstic, Miroslav; Nov. 23, 1999; 11p; In English
Contract(s)/Grant(s): F49620-98-1-0064; F08671-98-0-0319
Report No.(s): AD-A374640; AFRL-SR-BL-TR-00-0059; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research completed has established connections between systematic methods of nonlinear stabilization and nonlinear optimal control. The redesigns of adaptive and robust nonlinear controllers developed under this grant are inverse optimal, and thus use less control effort and possess a certain margin of robustness to some uncertainties. This grant has also produced the first methods for stabilization for stochastic nonlinear systems. The most significant among the results is disturbance attenuation and adaptive stabilization for systems with noise of unknown covariance. Finally, the grant has revived a whole research area called extremum seeking control which deals with non-model-based on-line optimization. The PI and the group obtained the first stability guarantees for extremum seeking schemes and proposed techniques for their application to much more general classes of systems than previously possible. The ultimate deal of the theoretical research was an application to nonlinear instabilities arising in aeroengines. The PI has advanced the state of the art in this area in three directions. First, he developed the first nonlinear control laws with guaranteed regions of attraction and robustness to some modeling errors. Second, he pioneered the methods for seeking of the maximum of the compressor pressure rise characteristic. Third, he designed the first model-based adaptive controllers for thermoacoustic instabilities in combustion chambers. The results of the work have been published (or submitted for publication) in 1 book, 22 journal pacers, a number of conference papers, and four book chapters.
DTIC
Aircraft Engines; Nonlinear Systems; Control Theory; Adaptive Control; Error Analysis

20000037815 Rolls-Royce Allison, Indianapolis, IN USA
Achieving Helicopter Modernization with Advanced Technology Turbine Engines
Dickens, Fred W., Rolls-Royce Allison, USA; Thomason, Tommy, Rolls-Royce Allison, USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A18-1 - A18-9; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

Military and commercial helicopter operators worldwide are faced with a common dilemma-when to replace existing fleets with newer, more capable, and yes, more expensive helicopters. Alternatively, how often and how much should they spend on upgrades. Either decision may be based on operational needs, operational support costs, or a combination of both. On a personal level, you go through a similar process when deciding to replace the family car with a new or used car. As long as the basic mission remains unchanged, such as the daily commute to and from work, and the vehicle is reliable and replacement parts are readily available, then you probably can't economically rationalize a new car. Automobile upgrades are virtually limitless as there are many sources for new engines, radios, security systems, power door locks, stereo systems, cruise controls, trailer hitches, and fog lights, among others. All of these options serve the same purpose: to make an existing car more functional or to extend its life. A replacement can be rationalized when repair costs become too expensive, you experience a major failure, the car is no longer reliable, fuel costs or fuel consumption become prohibitive, or there is no longer room for the growing family. Likewise, there are many examples where helicopter replacements are necessary in lieu of upgrades. Helicopter replacements are appropriate when the mission need and capability of the replacement is so compelling that upgrades to the existing system are simply cost prohibitive and/or the desired performance is not achievable within the existing airframe structure. Crashworthiness, cargo volume, night/adverse weather capability, payload, range, speed, battle damage vulnerability, multi-engine requirements, and marinization, among many other considerations, might contribute to the replacement decision. A few examples of cost and mission effective replacement helicopters are listed in Figure 1. The replacement of the CH-46 helicopter with the V-22 Osprey tiltrotor is the most compelling example of an extraordinary aircraft capability redefining an operational mission.
Author
Turbine Engines; Upgrading; Military Helicopters; Aircraft Engines

20000037816 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Military Engines Div., Evry, France
The Modernization of Snecma Military Engines: Recent Developments and Perspectives ***La Modernisation des Moteurs Militaires Snecma Developpements Recents et Perspectives***
Coquelet, Michel, Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, France; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. A20-1 - A20-6; In French; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

To date, 47 armed forces have used over 6,000 engines sold by Snecma of CFMI, the common (50/50) subsidiary of Snecma (France) and GE (US). Among the engines currently in use, some have been in service for over 30 years. In order to maintain a high level of satisfaction among our clientele, Snecma has adopted an agenda of continuous improvement, including: Extending life span and reducing maintenance costs; Proposing modifications due to changes in use; Industry participation in client countries.
Author
Aircraft Engines; Product Development; Aircraft Production

20000037894 Naval Air Systems Command, Patuxent , MD USA
The Development and Operational Challenges of UAV and UCAV Airbreathing Propulsion
Cifone, Anthony, Naval Air Systems Command, USA; Parsons, Wayne, Naval Air Systems Command, USA; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 6-1 - 6-14; In English; See also 20000037887; Copyright Waived; Avail: CASI; A03, Hardcopy

There are a large number of Unmanned Aerial Vehicles (UAVs) throughout the world performing a variety of functions. The variety of conditions under which they operate, e.g., speed, altitude, endurance, VTOL, payload etc. impact or limit the type and size of propulsion system needed. This paper will define the various UAV categories and will characterize the types of engines and propulsors available for them. The variability of design features and their effect on characteristics will be shown. The effect of propulsion system trades on total system capability will be discussed.
Derived from text
Air Breathing Engines; Pilotless Aircraft

20000038013 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Recommended Practices for Monitoring Gas Turbine Engine Life Consumption ***Pratiques Recommandees pour le Controle du Vieillissement des turbomoteurs***
April 2000; 181p; In English; CD-ROM contains full text document in PDF format
Report No.(s): RTO-TR-28; AC/323(AVT)TP/22; ISBN 92-837-1032-0; Copyright Waived; Avail: CASI; A09, Hardcopy; A02, Microfiche; C01, CD-ROM

The Task Group analysed the use of life monitoring systems in modern engines (from 1990) and in ageing fleets. The design and operational factors to be considered beforehand are described. Particular attention is paid to turbine disks. Regulatory requirements for safety standards are considered. Civil military practices, maintenance policies and procedures, modes and mechanics of service usage are covered as well as their influence on life consumption. Lifting procedures, monitoring system verification and validation, operational management considerations an usage monitoring approaches are dealt with.
Author
Gas Turbine Engines; Engine Monitoring Instruments; Systems Health Monitoring

20000038018 California Univ., Combustion Lab., Irvine, CA USA
Effect of Jet Injection Angle and Number of Jets on Mixing and Emissions From a Reacting Crossflow at Atmospheric Pressure *Final Report*
St.John, D., California Univ., USA; Samuelsen, G. S., California Univ., USA; April 2000; 20p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG3-1110; RTOP 714-02-20
Report No.(s): NASA/CR-2000-209949; E-12202; NAS 1.26:209949; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mixing of air jets into hot, fuel-rich products of a gas turbine primary zone is an important step in staged combustion. Often referred to as "quick quench," the mixing occurs with chemical conversion and substantial heat release. An experiment has been designed to simulate and study this process, and the effect of varying the entry angle (0 deg, 22.5 deg and 45 deg from normal) and number of the air jets (7, 9, and 11) into the main flow, while holding the jet-to-crossflow mass-low ratio, MR, and momentum-flux ratio, J, constant (MR = 2.5;J = 25). The geometry is a crossflow confined in a cylindrical duct with side-wall injection of jets issuing from orifices equally spaced around the perimeter. A specially designed reactor, operating on propane, presents a uniform mixture to a module containing air jet injection tubes that can be changed to vary orifice geometry. Species concentrations of O2, CO, CO2, NO(x) and HC were obtained one duct diameter upstream (in the rich zone), and primarily one duct radius downstream. From this information, penetration of the jet, the spatial extent of chemical reaction, mixing, and the optimum jet injection angle and number of jets can be deduced.
Author
Air Jets; Cross Flow; Injection; Flow Characteristics; Flow Geometry; Jet Mixing Flow; Fuel Injection; Emission; Gas Turbines

20000038440 Boeing Commercial Airplane Co., Seattle, WA USA
TRANAIR Applications for Technology Integration Propulsion Trades
Dees, Paul W., Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1797-1816; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Propulsion trade studies often require rapid, inexpensive drag increments between several candidate geometries. Typically a linear potential analysis tool such as A389 is used to get a quick and reasonable drag impact. Some configuration analyses require a tool with the ability to quickly evaluate complex 3D geometry changes. The TRANAIR 3D full potential CFD code offers the capability to evaluate more complex geometry with less cost than the OVERFLOW Navier-Stokes CFD code. It is well validated with experimental test data. TRANAIR was recently applied as a preliminary design tool to support the TI Task 20 nozzle aspect ratio trade study. This paper compares A389, TRANAIR, and OVERFLOW nacelle pressure drag for the TCA configuration with 2D bifurcated and axi-symmetric nacelles. Several 2D nacelle nozzle aspect ratio analyses will be discussed including the high speed drag results.
Author
Computational Fluid Dynamics; Pressure Drag; Supersonic Transports; Drag Measurement; Wing Nacelle Configurations

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots.

20000037722 NASA Langley Research Center, Hampton, VA USA

Contributions of the Transonic Dynamics Tunnel to the Testing of Active Control of Aeroelastic Response

Perry, Boyd, III, NASA Langley Research Center, USA; Noll, Thomas E., NASA Langley Research Center, USA; Scott, Robert C., NASA Langley Research Center, USA; [2000]; 18p; In English; Dynamics Specialists Conference, 5-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-1769; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

By the 1960s, researchers began to investigate the feasibility of using active controls technology (ACT) for increasing the capabilities of military and commercial aircraft. Since then many researchers, too numerous to mention, have investigated and demonstrated the usefulness of ACT for favorably modifying the aeroelastic response characteristics of flight vehicles. As a result, ACT entered the limelight as a viable tool for answering some very difficult design questions and had the potential for obtaining structural weight reductions optimizing maneuvering performance, and satisfying the multimission requirements being imposed on future military and commercial aircraft designs. Over the past 40 years, the NASA Langley Research Center (LaRC) has played a major role in developing ACT in part by its participation in many wind-tunnel programs conducted in the Transonic Dynamics Tunnel (TDT). These programs were conducted for the purposes of: (1) establishing concept feasibility; (2) demonstrating proof of concept; and (3) providing data for validating new modeling, analysis, and design methods. This paper provides an overview of the ACT investigations conducted in the TDT. For each program discussed herein, the objectives of the effort, the testing techniques, the test results, any, signIficant findings, and the lessons learned with respect to ACT testing are presented.

Derived from text

Active Control; Aeroelasticity; Dynamic Response; Transonic Wind Tunnels; Wind Tunnel Tests; Aircraft Design

20000037837 Turkish Aerospace Industries, Avionics Group, Ankara, Turkey

Flight Control Law Design and HIL Simulation of a UAV

Ulku, A., Turkish Aerospace Industries, Turkey; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B17-1 - B17-6; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

An adaptive control methodology, merging two known approaches to flight control problem, gain-scheduling and direct eigenspace assignment (DEA), is developed. A gain-scheduled inner (stability) loop structure is shown to minimize the variance of the outer (guidance) loop gains and increase the robustness of the system. The employment of DEA with gain scheduling is observed to decouple the longitudinal and lateral flight modes resulting adequate system stability, enhanced robustness and control surface effectiveness. This methodology is used in the flight control law design of a UAV.

Derived from text

Adaptive Control; Flight Control; Hardware-In-The-Loop Simulation; Pilotless Aircraft; Control Systems Design

20000037838 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Unmanned Research Vehicle (URV): Development, Implementation, and Flight Test of a MIMO Digital Flight Control System Designed using Quantitative Feedback Theory

Houpis, C. H., Air Force Inst. of Tech., USA; Rasmussen, S. J., Air Force Inst. of Tech., USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B18-1 - B18-12; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

The Quantitative Feedback Theory (QFT) design technique, which has the ability to bridge the gap between theory and the real-world control design problem, is utilized in the design of a MIMO digital flight control system for an unmanned research vehicle (URV) that is presented in this paper. The design illustrates how the real-world knowledge of the plant to be controlled and the desired performance specifications can be utilized in trying to achieve a successful robust design for a nonlinear control problem. This paper presents some of the issues involved in developing, implementing, and flight testing a flight control system (FCS) designed using QFT. Achieving a successful FCS involves a number of steps: specification of the control problem, aircraft model data, theoretical flight control system design, implementation, ground testing, and flight test. The last three steps embody the practical engineering aspects that are vital to achieving a successful FCS. The main emphasis of this paper is on these steps, First, there is a brief explanation of the MIMO design QFT process. This is followed by a description of the steps involved in the implementation and testing of a QFT designed FCS. Thus, this presentation provides an overview of using robust control system design to increase quality in attempting to demonstrate the Bridging the Gap between control theory and the realities of a

successful control system design. In facing the technological problems of the future. it is necessary that engineers of the future must be able to bridge the gap, i.e., this Bridging the Gap must be addressed to better prepare the engineers for the 21st century.
Author
Control Systems Design; Flight Tests; MIMO (Control Systems); Research Vehicles; Pilotless Aircraft; Feedback

20000038436 Boeing Co., Long Beach, CA USA
Initial TCA Stability and Control Assessment
Blake, David A., Boeing Co., USA; Glessner, Paul T., Boeing Co., USA; Kubiatko, Paul, Boeing Co., USA; Nishida, Brian A., Boeing Commercial Airplane Co., USA; Wilson, Douglas L., Boeing Commercial Airplane Co., USA; 1998 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 2, pp. 1649-1670; In English; See also 20000038422; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This presentation documents work performed by the Stability and Control groups at the Boeing Company in both Seattle and Long Beach. This work along with the delivery of the corresponding report completed Configuration Aerodynamics Milestone 4-13. There were two main objectives for this milestone. The first was to assess the high speed Stability and Control (S&C) characteristics of the TCA. The second was to make inputs to help guide future updates of the High Speed Civil Transport. The approach proposed included the evaluation of flying qualities of the TCA for specific Flying Qualities Requirements. An experimental and computational database would be generated and incorporated into a computer simulation to evaluate the S&C characteristics. Due to proposed configuration changes to the baseline, the Flight Controls ITD team abandoned plans for a full-flight envelope nonlinear simulation. Therefore, both rigid and elastic airplane comparisons between the TCA and Reference H were used in order to perform the assessment. With regards to pitch stability, two items were of concern. The first involved significant pitch-up at higher angles-of-attack for the TCA while no pitch-up was observed for the Reference H. The second item was the dramatic impact on the Time-to-Double (T(sub 2)) values for the TCA. Compared to a (T(sub 2)) of 6 seconds for the Reference H, the TCA had a (T(sub 2))of between 1 and 2 seconds at cruise angle-of-attack and less at higher angles-of-attack. The TCA appears to have about 80% of the lateral control authority of the Reference H. With new proposed changes to the time-to-bank requirements, the TCA should have acceptable control authority for this critical maneuver. Similar to the Reference H, the TCA will also not be able to meet the emergency decent requirements using only spoiler slot deflectors for the speedbrake function.
Author
Flight Control; Supersonic Transports; Aircraft Stability; Flight Characteristics; Aerodynamic Configurations

20000038742 NASA Langley Research Center, Hampton, VA USA
Active Control Technology at NASA Langley Research Center
Antcliff, Richard R., NASA Langley Research Center, USA; McGowan, Anna–Marie R., NASA Langley Research Center, USA; [2000]; 16p; In English; Active Control Technology for Enchanced Performance Operational Capabilities of Military Aircraft, Land Vehicles and Sea Vehicles, 8-11 May 2000, Braunschweig, Germany; Sponsored by North Atlantic Treaty Organization; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA Langley has a long history of attacking important technical opportunities from a broad base of supporting disciplines. The research and development at Langley in this subject area range from the test tube to the test flight. The information covered here will range from the development of innovative new materials, sensors and actuators, to the incorporation of smart sensors and actuators in practical devices, to the optimization of the location of these devices, to, finally, a wide variety of applications of these devices utilizing Langley's facilities and expertise. Advanced materials are being developed for sensors and actuators, as well as polymers for integrating smart devices into composite structures. Contributions reside in three key areas: computational materials; advanced piezoelectric materials; and integrated composite structures. The computational materials effort is focused on developing predictive tools for the efficient design of new materials with the appropriate combination of properties for next generation smart airframe systems. Research in the area of advanced piezoelectrics includes optimizing the efficiency, force output, use temperature, and energy transfer between the structure and device for both ceramic and polymeric materials. For structural health monitoring, advanced non-destructive techniques including fiber optics are being developed for detection of delaminations, cracks and environmental deterioration in aircraft structures. The computational materials effort is focused on developing predictive tools for the efficient design of new materials with the appropriate combination of properties for next generation smart airframe system. Innovative fabrication techniques processing structural composites with sensor and actuator integration are being developed.
Derived from text
Active Control; Technology Assessment; Aircraft Structures; Composite Structures; Fabrication; Fiber Optics; Piezoelectricity

20000041704 Calspan Advanced Technology Center, Buffalo, NY USA
Effects of Control System Dynamics on Fighter Approach and Landing Longitudinal Flying Qualities, Volume 1 ***Interim Report, Jun. 1977 - Mar. 1978***
Smith, Rogers E., Calspan Advanced Technology Center, USA; March 1978; 234p; In English
Contract(s)/Grant(s): F33615-73-C-3051; AF Proj. 2403
Report No.(s): AK-5280-F-12-Vol-1; AFFDL-TR-78-122-Vol-1; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The effects of significant control system dynamics on fighter approach and landing longitudinal flying qualities were investigated in flight using the USAF/Calspan variable stability NT-33 aircraft. Two pilots evaluated 49 different combinations of control system and short period dynamics while performing representative approach and landing tasks. The landing task for the majority of the evaluations included an actual touchdown. Pilot rating and comment data, supported by task performance records, indicate that the landing task, in particular the last 50 ft of the task, is clearly critical task for aircraft with significant control system lags. For these aircraft, a sharp degradation in flying qualities takes place during this critical phase of the landing task; for example, severe pilot induced oscillations occurred during the landing task but were not in evidence during the approach task. The results provide a data base for the development of suitable flying qualities requirements which are applicable to aircraft with significant control system dynamics; the results show that the present landing approach requirements in MIL-F-8785B(ASG) are not adequate; in particular, they are not applicable to aircraft with complex flight control systems.
Author
Approach; Flight Control; Aircraft Landing; Longitudinal Control; Fighter Aircraft; Aerodynamics

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems.

20000034014 NASA Glenn Research Center, Cleveland, OH USA
Restoration of the Hypersonic Tunnel Facility at NASA Glenn Research Center, Plum Brook Station
Woodling, Mark A., NASA Glenn Research Center, USA; March 2000; 18p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 282-20-02-02
Report No.(s): NASA/TM-2000-209930; E-12174; NAS 1.15:209930; AIAA Paper 2000-0163; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Glenn Research Center's Hypersonic Tunnel Facility (HTF), located at the Plum Brook Station in Sandusky, Ohio, is a non-vitiated, free-jet facility, capable of testing large-scale propulsion systems at Mach Numbers from 5 to 7. As a result of a component failure in September of 1996, a restoration project was initiated in mid- 1997 to repair the damage to the facility. Following the 2-1/2 year effort, the HTF has been returned to an operational condition. Significant repairs and operational improvements have been implemented in order to ensure facility reliability and personnel safety. As of January 2000, this unique, state-of-the-art facility was ready for integrated systems testing.
Author
Component Reliability; Hypersonic Wind Tunnels; Maintenance; Propulsion System Performance; Reliability; Restoration

20000034099 NASA Langley Research Center, Hampton, VA USA
Past, Present, and Future Capabilities of the Transonic Dynamics Tunnel from an Aeroelasticity Perspective
Cole, Stanley R., NASA Langley Research Center, USA; Garcia, Jerry L., NASA Langley Research Center, USA; [2000]; 24p; In English; Dynamics Specialists Conference, 5-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-1767; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Langley Transonic Dynamics Tunnel (TDT) has provided a unique capability for aeroelastic testing for forty years. The facility has a rich history of significant contributions to the design of many USA commercial transports, military aircraft, launch vehicles, and spacecraft. The facility has many features that contribute to its uniqueness for aeroelasticity testing, perhaps the most important feature being the use of a heavy gas test medium to achieve higher test densities. Higher test medium densities substantially improve model-building requirements and therefore simplify the fabrication process for building aeroelastically scaled wind tunnel models. Aeroelastic scaling for the heavy gas results in lower model structural frequencies. Lower model frequencies tend to a make aeroelastic testing safer. This paper will describe major developments in the testing

capabilities at the TDT throughout its history, the current status of the facility, and planned additions and improvements to its capabilities in the near future.
Author
Aeroelasticity; Transonic Wind Tunnels; Wind Tunnel Models; Wind Tunnel Tests; Test Facilities

20000034231 NASA Glenn Research Center, Cleveland, OH USA
Flow Quality Studies of the NASA Glenn Research Center Icing Research Tunnel Circuit (1995 Tests)
Arrington, E. Allen, NYMA, Inc., USA; Kee–Bowling, Bonnie A., NASA Glenn Research Center, USA; Gonsalez, Jose C., NYMA, Inc., USA; March 2000; 170p; In English
Contract(s)/Grant(s): RTOP 523-90-1A
Report No.(s): NASA/TM-2000-107479; NAS 1.15:107479; E-10767; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The purpose of conducting the flow-field surveys described in this report was to more fully document the flow quality in several areas of the tunnel circuit in the NASA Glenn Research Center Icing Research Tunnel. The results from these surveys provide insight into areas of the tunnel that were known to exhibit poor flow quality characteristics and provide data that will be useful to the design of flow quality improvements and a new heat exchanger for the facility. An instrumented traversing mechanism was used to survey the flow field at several large cross sections of the tunnel loop over the entire speed range of the facility. Flow-field data were collected at five stations in the tunnel loop, including downstream of the fan drive motor housing, upstream and downstream of the heat exchanger, and upstream and downstream of the spraybars located in the settling chamber upstream of the test section. The data collected during these surveys greatly expanded the data base describing the flow quality in each of these areas. The new data matched closely the flow quality trends recorded from earlier tests. Data collected downstream of the heat exchanger and in the settling chamber showed how the configuration of the folded heat exchanger affected the pressure, velocity, and flow angle distributions in these areas. Smoke flow visualization was also used to qualitatively study the flow field in an area downstream of the drive fan and in the settling chamber/contraction section.
Author
Flow Distribution; Wind Tunnel Tests; Flow Visualization; Ice Formation

20000038519 Institute for Human Factors TNO, Soesterberg, Netherlands
A Critical Review of Validation Methods for Man-In-The-Loop Simulators ***Interim Report Een Kritisch Overzicht van Validatiemethoden voor Man-in-the Loop Simulatoren***
Korteling, J. E., Institute for Human Factors TNO, Netherlands; Sluimer, R. R., Institute for Human Factors TNO, Netherlands; Mar. 16, 1999; 40p; In English
Contract(s)/Grant(s): A98/KL/301; TNO Proj. 730.3
Report No.(s): TD-99-0026; TM-99-A023; Copyright; Avail: Issuing Activity

This review examines the methodological concepts, paradigms and pitfalls related to validation- and fidelity studies of man-in-the-loop simulators. A distinction is made between validation methods for training simulators and for research simulators. Validation methods for training simulator are applied in experiments which assess effects of simulator variables (e.g. resolution of the display, cue augmentation, moving base characteristics) on the effectiveness of a simulator as a training device. Validation methods for research simulators are applied in experiments which assess the effects of simulator variables an the effectiveness of a simulator as a research tool. The review is particularly focussed on the various artefacts that may affect the outcome of such validation experiments. The artefacts are separately described for each single validation method. It will be demonstrated that validation of simulators is a very complicated matter and prone to various methodological flaws and confounding factors. After the discussion of the common methods including their advantages and disadvantages the following recommendations for future research are given: 1 . Terminology in the field of simulator research is ambiguous. It is advised to standardize terms, which will lead to more comprehensible communication among researchers. 2. Validity is not a single, independent attribute, The term validity in simulator research only makes sense if related to functional aspects of simulators, such as the purpose of the simulator (training, research) and the tasks and training methods involved. This will reduce the amount of overgeneralizations that are now encountered too frequently. 3. Always take face validity into consideration. If people do not believe in the simulator they are not very likely to use it properly. 4. Apply more than one method in a simulator validity study. Combination of e.g. objective with subjective methods reduces the risk of erroneous conclusions and combines the benefits of both kinds of methods. 5. Aim more research at creating task-specific formulas, which relate physical simulator variables to psycho-physical and human performance variables. This will reduce the need to measure human task performance in simulator validation studies. 6. Always allocate

substantial effort to find a practical method that still compares simulator performance with on-the-job performance by subjects. A relatively simple and practical method is proposed to assess the effectiveness of a driving simulator training.
Author
Procedures; Education; Human Performance; Simulators; Training Simulators

20000039438 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA
Year 2000 Test Report for the Airport Movement Area Safety System (AMASS)
Livings, Jeffrey; Feb. 2000; 22p; In English
Report No.(s): AD-A374584; DOT/FAA/CT-TN99/3; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This test report documents the tests performed on the Airport Movement Area Safety System (AMASS) to ensure that the system is Year 2000 compliant. The AMASS is an enhancement to the Airport Surface Detection Equipment (ASDE-3) AMASS receives digitized radar data, synchronization data, and a time/date stamp from the ASDE. AMASS does not process the ASDE data/time information but only logs the event. AMASS does not transmit time or date information to the ASDE or any other system. AMASS also receives digitized beacon radar data through its Terminal Automation Interface Unit (TAIU) . The TAIU receives data from the Airport Surveillance Radar (ASR-9) . There is no date information transferred to or from the AMASS TAIU interface. The AMASS system has met all of the Year 2000 compliance criteria. Additional checks have been added to the AMASS acceptance data package (ADP) which will insure that the built-in operating system (BIOS) of each production AMASS will be compliant. The Surveillance Branch, ACT-310, recommends certifying the AMASS as Year 2000 compliant.
DTIC
Airport Surface Detection Equipment; Safety; Search Radar

20000039705 Technische Hochschule, Institut fuer Raumfahrtsysteme, Stuttgart, Germany
Diagnostic Tools for Plasma Wind Tunnels and Reentry Vehicles at the IRS
Auweter–Kurtz, Monika, Technische Hochschule, Germany; Feigl, Markus, Technische Hochschule, Germany; Winter, Michael, Technische Hochschule, Germany; Measurement Techniques for High Enthalpy and Plasma Flows; April 2000, pp. 2B-1 - 2B-78; In English; See also 20000039703; Copyright Waived; Avail: CASI; A05, Hardcopy

Various plasma wind tunnels have been built for developing reusable space transportation systems and space probes entering the atmospheres of celestial bodies. All together they cover almost the whole reentry trajectory of a space craft. They generate continuous plasma flows of high specific enthalpy and velocity with thermal or magnetoplasmadynamic generators. Plasma wind tunnels are used for: (1) development and qualification of radiation and ablative cooling materials and thermal protection systems, (2) validation of numerical codes for reentry prediction, and (3) development and qualification of reentry measurement devices. The accuracy of the simulation of reentry conditions strongly depends on the ability to determine the flow conditions. These three lectures give an overview of the diagnostic methods which are qualified and in use at the IRS. Both intrusive probe measurement techniques (part A) including mass spectrometry and non-intrusive, optical techniques (part B) such as emission spectroscopy and laser induced fluorescence (LIF) are used to investigate high enthalpy plasma flows. Several measurement techniques are being developed for flight application (see part C). The minimum set of parameters which have to be duplicated during the tests for material qualification are the specific enthalpy of the gas, the stagnation pressure and the surface temperature in the case of a radiation cooling material, or the heat flux for an ablative material. This is a minimum set of parameters which has to be adjusted during the test. A whole series of probes and non-intrusive techniques were developed to determine these parameters. The average specific enthalpy of the flow in the exit plane of the plasma generator nozzle can be derived for all kinds of plasma wind tunnels by an energy balance. Therefore, the electric power consumed by the plasma source, the mass flow rate and the heat losses within the plasma generator are measured. The average specific enthalpy at the end of the plasma generator is then derived as the difference of the electrical power and the total heat loss related to the mass flow rate.
Author
Emission Spectra; Laser Induced Fluorescence; Magnetohydrodynamic Flow; Mathematical Models; Nonintrusive Measurement; Thermal Protection; Wind Tunnels; Simulation

20000039708 Rouen Univ., Centre National de la Recherche Scientifique, France
Overview of Measurement Techniques at CORIA
Robin, L., Rouen Univ., France; Boubert, P., Rouen Univ., France; Bourdon, A., Rouen Univ., France; Bultel, A., Rouen Univ., France; vanOotegem, B., Rouen Univ., France; Vervisch, P., Rouen Univ., France; Measurement Techniques for High Enthalpy and Plasma Flows; April 2000, pp. 4A-1 - 4A-14; In English; See also 20000039703; Copyright Waived; Avail: CASI; A03, Hardcopy

At CORIA, three wind tunnels have been built up to simulate reentry conditions of different planetary atmospheres. They have been implemented by numerous optical and probe measurement techniques to carry out flow parameters to improve understanding of the aerodynamic behavior and chemical processes.
Author
Wind Tunnels; Fabrication; Aerodynamic Characteristics; Flow Characteristics; Optical Measurement

20000039718 Technische Hochschule, Institut fuer Raumfahrtsysteme, Stuttgart, Germany
Overview of IRS Plasma Wind Tunnel Facilities
Auweter–Kurtz, Monika, Technische Hochschule, Germany; Wegmann, Thomas, Technische Hochschule, Germany; Measurement Techniques for High Enthalpy and Plasma Flows; April 2000, pp. 2A-1 - 2A-20; In English; See also 20000039703; Copyright Waived; Avail: CASI; A03, Hardcopy

Upon entering the atmosphere of celestial bodies, spacecrafts encounter gases at velocities of more than ten km/s, thereby being subjected to great heat loads. The Artist's concept of X-38 reentering Earth's atmosphere are shown. The X-38 is a technology demonstrator for the proposed Crew Return Vehicle (CRV), which will be designed for an emergency return from the International Space Station.
Derived from text
Celestial Bodies; Proving; X-38 Crew Return Vehicle; Temperature Effects; Reentry Vehicles

20000042294 NASA Johnson Space Center, Houston, TX USA
Bioregenerative Planetary Life Support Systems Test Complex (BIO-Plex): NASA's Next Human-Rated Testing Facility
Tri, Terry O., NASA Johnson Space Center, USA; Nov. 28, 1999; 1p; In English, 28-30 Nov. 1999, Malmo, Sweden; Sponsored by Lund Technical Univ., Sweden
Contract(s)/Grant(s): RTOP 131-50-10-24; No Copyright; Avail: Issuing Activity; Abstract Only

As a key component in its ground test bed capability, NASA's Advanced Life Support Program has been developing a large-scale advanced life support test facility capable of supporting long-duration evaluations of integrated bioregenerative life support systems with human test crews. This facility-targeted for evaluation of hypogravity compatible life support systems to be developed for use on planetary surfaces such as Mars or the Moon-is called the Bioregenerative Planetary Life Support Systems Test Complex (BIO-Plex) and is currently under development at the Johnson Space Center. This test bed is comprised of a set of interconnected chambers with a sealed internal environment which are outfitted with systems capable of supporting test crews of four individuals for periods exceeding one year. The advanced technology systems to be tested will consist of both biological and physicochemical components and will perform all required crew life support functions. This presentation provides a description of the proposed test "missions" to be supported by the BIO-Plex and the planned development strategy for the facility.
Author
Planetary Surfaces; Closed Ecological Systems; NASA Programs; Test Facilities

20000044620 NASA Langley Research Center, Hampton, VA USA
Wind Tunnel Test Technique and Instrumentation Development at LaRC
Putnam, Lawrence E., NASA Langley Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 1, pp. 65-79; In English; See also 20000044616; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

LaRC has an aggressive test technique development program underway. This program has been developed using 3rd Generation R&D management techniques and is a closely coordinated program between suppliers and wind tunnel operators-wind tunnel customers' informal input relative to their needs has been an essential ingredient in developing the research portfolio. An attempt has been made to balance this portfolio to meet near term and long term test technique needs. Major efforts are underway to develop techniques for determining model wing twist and location of boundary layer transition in the NTF (National Transonic Facility). The foundation of all new instrumentation developments, procurements, and upgrades will be based on uncertainty analysis.
Derived from text
Research and Development; Wind Tunnel Tests; Measuring Instruments; Management Methods

10
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms.

20000033833 NASA Dryden Flight Research Center, Edwards, CA USA
X-43 Composite Tape, ***March 99 - March 00***
Dec. 16, 1999; In English; Videotape: 7 min. 26 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000045251; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

Live footage shows Project Manager Joel Sitz participating in an interview about the X-43 project. Sitz mentions several tests that will be performed on the X-43. He also mentions that the main objective of this project is to validate the design code for hypersonic air breathing vehicles. He discusses the projected data collection to prove that the predictions that were made in the laboratories and wind tunnels are correct. Scenes include the roll of the X-43 and an animation of the flight.
CASI
X-43 Vehicle; Hypersonic Flight; Air Breathing Boosters; Air Breathing Engines; Airframes

20000034909 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-34: Galileo TCDT, ***13-15 Sep. 1989***
Sep. 15, 1989; In English; Videotape: 38 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000039773; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Live footage shows the crewmembers of STS-34, Commander Donald E. Williams, Pilot Michael J. McCulley, and Mission Specialists Franklin R. Chang-Diaz, Shannon W. Lucid, and Ellen S. Baker, participating in Terminal Countdown and Demonstration Tests. The crew is seen arriving in the T-38 aircraft, driving the M113 vehicle. Upon arrival at Kennedy Space Center, Williams addresses the waiting audience. The Crew discusses some of the experiments for their mission. They mention Remote Sensing, Recrystallization and Ozone experiments.
CASI
Astronaut Training; T-38 Aircraft; Space Transportation System; Space Transportation System Flights; Atlantis (Orbiter)

20000036516 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-34: Galileo Payload Canister Doors Closing in VPF
Aug. 24, 1989; In English; Videotape: 9 min. 40 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000043348; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

Live footage shows the closing of the Payload Bay doors in the Vertical Processing Facility (VPF) at Kennedy Space Center.
CASI
Payloads; Bays (Structural Units); Doors; Aircraft Compartments; Closing

20000039309 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-37: TCDT Pad B Atlantis GRO (3 of 3)
Mar. 20, 1991; In English; Videotape: 40 min. 48 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000013418; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Live footage shows some beautiful panoramic views of STS-37 on the pad. Scenes include the narration of simulated auto sequence start, engine start, engine firing and cut-off. Also shown is the crew emergency egress procedure. This is tape 3 of 3. Tape 1 has a report # of NONP-NASA-VT-2000013416, and tape 2 has a report # of NONP-NASA-VT-2000013417.
CASI
Crew Procedures (Preflight); Astronaut Training; Training Simulators; Flight Simulation; Prelaunch Tests; Preflight Operations; Test Firing; Prefiring Tests; Preflight Analysis; Systems Analysis

20000039310 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-37: TCDT Pad B Atlantis GRO (2 of 3)
Mar. 20, 1991; In English; Videotape: 55 min. 49 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000013417; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Live footage shows the remaining two crewmembers of STS-37, Mission Specialists Jerry L. Ross, and Jay Apt, entering the White Room, putting on their life preservation vest, and then entering the launch vehicle. Video playbacks, of the crew during

the earlier stage of the Terminal Countdown and Demonstration Test, and the processing of the primary payload (Gamma Ray Observatory) are shown. Scenes showing the arrival of Ross at Kennedy Space Center in the T-38 aircraft, the crew on the launch complex during familiarization activities, and training with the M113 vehicle are presented. Also shown are some beautiful panoramic views of the shuttle on the pad. This is tape 2 of 3. Tape 1 has a report # of NONP-NASA-VT-2000013416, and tape 3 has a report # of NONP-NASA-VT-2000013418.
CASI
Crew Procedures (Preflight); Astronaut Training; Training Simulators; Flight Simulation; Flight Tests; Prelaunch Tests; Preflight Operations; Test Firing

20000039311 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-37: TCDT Pad B Atlantis GRO (1 of 3)
Mar. 20, 1991; In English; Videotape: 1 hr. 1 min. 32 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000013416; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

Live footage shows the crewmembers of STS-37, Commander Steven R. Nagel, Pilot Kenneth D. Cameron, and Mission Specialists Jerry L. Ross, Jay Apt, and Linda M. Godwin, participating in Terminal Countdown Demonstration Test. The crew is seen in the breakfast room, in the Operations and Checkout Building suiting up and walking out to the Astronaut-Van. Scenes include the drive out to the launch pad, the boarding of the crew on the elevator, crew entrance in the White Room, and the ingress of the crew into the launch vehicle. Linda and Jerry are seen standing on the Gantry (bridge) looking out as they wait to enter the White Room to finish suiting up to enter the vehicle. Also shown are some beautiful panoramic views of the shuttle on the pad. This is tape 1 of 3. Tape 2 has a report # of NONP-NASA-VT-2000013417, and tape 3 has a report # of NONP-NASA-VT-2000013418.
CASI
Crew Procedures (Preflight); Astronaut Training; Training Simulators; Flight Simulation; Flight Tests; Prelaunch Tests; Preflight Operations; Test Firing

20000039385 NASA Johnson Space Center, Houston, TX USA
X-38 Experimental Controls Laws
Munday, Steve, NASA Johnson Space Center, USA; Estes, Jay, NASA Johnson Space Center, USA; Bordano, Aldo J., NASA Johnson Space Center, USA; [2000]; 1p; In English; 85th; Aerospace Control and Guidance Systems Meeting, 15-17 mAR. 2000, Lake Tahoe NV, USA; Sponsored by Society of Automotive Engineers, Inc.
Contract(s)/Grant(s): RTOP 487-20-XC-RV; No Copyright; Avail: Issuing Activity; Abstract Only

X-38 Experimental Control Laws X-38 is a NASA JSC/DFRC experimental flight test program developing a series of prototypes for an International Space Station (ISS) Crew Return Vehicle, often called an ISS "lifeboat." X- 38 Vehicle 132 Free Flight 3, currently scheduled for the end of this month, will be the first flight test of a modem FCS architecture called Multi-Application Control-Honeywell (MACH), originally developed by the Honeywell Technology Center. MACH wraps classical P&I outer attitude loops around a modem dynamic inversion attitude rate loop. The dynamic inversion process requires that the flight computer have an onboard aircraft model of expected vehicle dynamics based upon the aerodynamic database. Dynamic inversion is computationally intensive, so some timing modifications were made to implement MACH on the slower flight computers of the subsonic test vehicles. In addition to linear stability margin analyses and high fidelity 6-DOF simulation, hardware-in-the-loop testing is used to verify the implementation of MACH and its robustness to aerodynamic and environmental uncertainties and disturbances.
Author
Aircraft Models; Control Theory; Flight Control; Flight Tests; Free Flight; Simulation; X-38 Crew Return Vehicle

20000040788 Boeing Co., Space and Communications Group, Huntsville, AL USA
How X-37 Technology Demonstration Supports Reusable Launch Vehicles
Manley, David J., Boeing Co., USA; Cervisi, Richard T., Boeing Co., USA; Staszak, Paul R., Boeing Co., USA; [2000]; 26p; In English; Space Technology and Applications, 1 Jan. - 3 Feb. 2000, Albuquerque, NM, USA; Original contains color illustrations
Contract(s)/Grant(s): NCC8-190; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This presentation discusses, in viewgraph form, how X-37 Technology Demonstration Supports Reusable Launch Vehicles. The topics include: 1) X-37 Program Objectives; 2) X-37 Description; 3) X-37 Vehicle Characteristics; 4) X-37 Expands the Testbed Envelope to Orbital Capability; 5) Overview of X-37 Flight Test Program; 6) Thirty-Nine Technologies and Experiments are Being Demonstrated on the X-37; 7) X-37 Airframe/Structures Technologies; 8) X-37 Mechanical, Propulsion, and Thermal

System Technologies and Experiments; 9) X-37 GN&C Technologies; 10) X-37 Avionics, Power, and Software Technologies and Experiments; and 11) X-37 Technologies and Experiments Support Reusable Launch Vehicle Needs.
CASI
Reusable Launch Vehicles; Technology Utilization; X-37 Vehicle; Flight Tests; Aircraft Structures

20000037787 NASA Langley Research Center, Hampton, VA USA
Aerothermal Analysis and Design of the Gravity Recovery and Climate Experiment (GRACE) Spacecraft
Mazanek, Daniel D., NASA Langley Research Center, USA; Kumar, Renjith R., Analytical Mechanics Associates, Inc., USA; Qu, Min, Analytical Mechanics Associates, Inc., USA; Seywald, Hans, Analytical Mechanics Associates, Inc., USA; April 2000; 48p; In English
Contract(s)/Grant(s): RTOP 259-30-10-51
Report No.(s): NASA/TM-2000-210095; L-17946; NAS 1.15:210095; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Gravity Recovery and Climate Experiment (GRACE) primary mission will be performed by making measurements of the inter-satellite range change between two co-planar, low altitude near-polar orbiting satellites. Understanding the uncertainties in the disturbance environment, particularly the aerodynamic drag and torques, is critical in several mission areas. These include an accurate estimate of the spacecraft orbital lifetime, evaluation of spacecraft attitude control requirements, and estimation of the orbital maintenance maneuver frequency necessitated by differences in the drag forces acting on both satellites. The FREEMOL simulation software has been developed and utilized to analyze and suggest design modifications to the GRACE spacecraft. Aerodynamic accommodation bounding analyses were performed and worst-case envelopes were obtained for the aerodynamic torques and the differential ballistic coefficients between the leading and trailing GRACE spacecraft. These analyses demonstrate how spacecraft aerodynamic design and analysis can benefit from a better understanding of spacecraft surface accommodation properties, and the implications for mission design constraints such as formation spacing control.
Author
Aerothermodynamics; Design Analysis; Gravitation; Climate; Spacecraft Design; Thermal Analysis; Attitude Control; Orbital Lifetime; Spacecraft Control

20000036511 NASA Marshall Space Flight Center, Huntsville, AL USA
Ceramic Matrix Composite Turbine Disk for Rocket Engines
Effinger, Mike, NASA Marshall Space Flight Center, USA; Genge, Gary, NASA Marshall Space Flight Center, USA; Kiser, Doug, NASA Glenn Research Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

NASA has recently completed testing of a ceramic matrix composite (CMC), integrally bladed disk (blisk) for rocket engine turbopumps. The turbopump's main function is to bring propellants from the tank to the combustion chamber at optimal pressures, temperatures, and flow rates. Advantages realized by using CMC blisks are increases in safety by increasing temperature margins and decreasing costs by increasing turbopump performance. A multidisciplinary team, involving materials, design, structural analysis, nondestructive inspection government, academia, and industry experts, was formed to accomplish the 4.5 year effort. This article will review some of the background and accomplishments of the CMC Blisk Program relative to the benefits of this technology.
Author
Ceramic Matrix Composites; Turbine Engines; Rocket Engines; Turbine Pumps; Fuel Pumps

20000038202 Alabama Univ., Huntsville, AL USA
RBCC Mixing Studies: Ejector Ramjet Design Optimization ***Final Report, 1 Oct. 1996 - 31 May 1999***
[1999]; 39p; In English
Contract(s)/Grant(s): NCC8-123; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research project reported herein extended over a period from October 1997 through August 1999. The research resulted in three technical papers presented at the AIAA/SAE/ASME/ASEE 35th Joint Propulsion Conference in Los Angeles in July 1999. These three papers are attached to this Executive Summary to constitute the final report. Objective: The objective of this research was to determine the mixing characteristics between the primary rocket jets and the turbine exhaust stream in a simulated Rocket Based Combined Cycle propulsion concept operating in the air augmented rocket mode.
Derived from text
Rocket-Based Combined-Cycle Engines; Design Analysis; Optimization; Mixing; Ejectors; Turbine Engines; Ramjet Engines

11
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft.

20000036523 Virginia Univ., Dept. of Materials Science and Engineering, Charlottesville, VA USA
Electron Beam - Directed Vapor Deposition of Low Cost Thermal Barrier Coatings *Final Report, 1 Apr. 1997-31 Dec. 1999*
Wadley, Haydn N.; Parrish, Phillip A.; Mar. 06, 2000; 4p; In English
Contract(s)/Grant(s): N00014-97-1-0106
Report No.(s): AD-A374859; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this research is the development of improved performance, more affordable thermal barrier coatings via electron beam - directed vapor deposition (EB-DVD), a high efficiency vapor deposition technology developed and patented by the principle investigator and graduate student in University of Virginia's Intelligent Processing of Materials laboratory. During the research effort, experiments and modeling efforts were directed at development of coating structures with ultralow thermal conductivities. Yttria-stabilized zirconia layers with "zig-zag" morphologies and fine pore microstructures were produced with measured thermal conductivities of 0.8 W/mK. These coatings are of significant interest to industry engaged in production of naval aircraft and marine turbine engine applications, and specimens have been produced for their evaluation.
DTIC
Gas Turbine Engines; Thermal Control Coatings; Marine Propulsion

20000033857 NASA Marshall Space Flight Center, Huntsville, AL USA
Sandwich Composite, Syntactic Foam Core Based, Application for Space Structures
Hodge, Andrew J., NASA Marshall Space Flight Center, USA; Kaul, Raj K., NASA Marshall Space Flight Center, USA; McMahon, William M., NASA Marshall Space Flight Center, USA; Reinarts, Thomas, United Space Alliance, USA; [2000]; 12p; In English; 45th; 45th SAMPE Symposium, 21-25 May 2000, Long Beach, CA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The current Solid Rocket Booster (SRB) launch vehicle has several metal based components that require a Thermal Protective System (TPS) be applied to the exterior surface to ensure its structural integrity and to protect the interior hardware from aerodynamic heating. TPS materials have distinct disadvantages associated with their use. One disadvantage to the application of TPS is that it can act as a debris source to the Space Shuttle Orbiter during flight and it also adds weight to the system without directly contributing any structural strength. One of the specific areas examined under this program was to replace a metal/TPS system with polymer based composites. A polymer matrix based sandwich composite was developed which had both structural and insulative properties to meet the high aerodynamic structural and heating load survival requirements. The SRB Nose Cap was selected as a candidate for this application. The sandwich system being qualified for this application is a carbon/epoxy outer and inner skin with a high strength-low thermal conductivity syntactic foam core.
Author
Sandwich Structures; Epoxy Matrix Composites; Polymer Matrix Composites; Foams; Thermal Protection; Heat Shielding; Aerodynamic Heating

20000037781 Queensland Univ., Dept. of Mechanical Engineering, Brisbane, Australia
HyShot-T4 Supersonic Combustion Experiments
Paull, A., Queensland Univ., Australia; Frost, M., Queensland Univ., Australia; Alesi, H., Queensland Univ., Australia; [2000]; 32p; In English
Contract(s)/Grant(s): NAG1-2113; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of experiments were initiated to investigate the operation of a two-dimensional, hypersonic, airbreathing engine (scramjet) inclined at angles of attack to the freestream. The experiments were undertaken to obtain data for use in the Hyshot flight test program. Experiments on the Hyshot scramjet were under taken in the T4 shock tunnel. Experiments were made at a nominal total enthalpy of 3.0MJkg (exp -1) using a nozzle that produced flows with a Mach number of approximately 6.5. The conditions produced correspond to flight at Mach 7.6 at an altitude range of 35.7-21.4km. A summary of the flow conditions is included. The scramjet was tested at 0, plus 2, plus 4, minus 2 and minus 4 degrees angle of attack. Experiments were also undertaken at 2 and 4 degrees angle of skew.
Derived from text
Air Breathing Engines; Hypersonic Speed; Shock Tunnels; Supersonic Combustion Ramjet Engines; Two Dimensional Models; Angle of Attack

20000040431 NASA Langley Research Center, Hampton, VA USA

Advances in Fatigue and Fracture Mechanics Analyses for Metallic Aircraft Structures

Newman, J. C., Jr., NASA Langley Research Center, USA; April 2000; 45p; In English; 17th; Aeronautical Fatigue, 12-16 Jul. 1999, Seattle, WA, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 706-11-11-01

Report No.(s): NASA/TM-2000-210084; L-17955; NAS 1.15:210084; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper reviews some of the advances that have been made in stress analyses of cracked aircraft components, in the understanding of the fatigue and fatigue-crack growth process, and in the prediction of residual strength of complex aircraft structures with widespread fatigue damage. Finite-element analyses of cracked metallic structures are now used to determine accurate stress-intensity factors for cracks at structural details. Observations of small-crack behavior at open and rivet-loaded holes and the development of small-crack theory has lead to the prediction of stress-life behavior for components with stress concentrations under aircraft spectrum loading. Fatigue-crack growth under simulated aircraft spectra can now be predicted with the crack-closure concept. Residual strength of cracked panels with severe out-of-plane deformations (buckling) in the presence of stiffeners and multiple-site damage can be predicted with advanced elastic-plastic finite-element analyses and the critical crack-tip-opening angle (CTOA) fracture criterion. These advances are helping to assure continued safety of aircraft structures.

Author

Aircraft Structures; Cracks; Finite Element Method; Fracture Mechanics; Stress Analysis; Metals; Crack Propagation; Metal Fatigue

12
ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention.

20000037832 Marconi Communications S.p.A., Defence Communications Div., Genoa, Italy

Advances in UAV Data Links: Analysis of Requirement Evolution and Implications on Future Equipment

Baiotti, S., Marconi Communications S.p.A., Italy; Scazzola, G. L., Marconi Communications S.p.A., Italy; Battaini, G., Marconi Communications S.p.A., Italy; Crovari, E., Marconi Communications S.p.A., Italy; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B10-1 - B10-13; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

This paper resumes the fundamental operational requirements that a UAV must accomplish to be effectively performant in a military and civil environment. Moving from these considerations, a list of technical requirements for Data Link systems to be employed is derived and a suitable Data Link architecture, based on the evolution of current Marconi's J-Band Data Link for CATRIN-SORAO programme is presented.

Author

Data Links; Pilotless Aircraft; Military Technology

20000037834 Office of Naval Research, Arlington, VA USA

Distributed Intelligence, Sensing, and Control for Fully Autonomous Agents

Moshfegh, Allen, Office of Naval Research, USA; Siegel, David S., Office of Naval Research, USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B12-1 - B12-9; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

Future naval missions at sea or shore will require effective and intelligent utilization of real-time information and sensory data to assess unpredictable situations, identify and track hostile targets, make rapid decisions, and robustly influence, control, and monitor various aspects of the theater of operation. Littoral missions and operations are expected to be highly dynamic and extremely uncertain. Communication interruption and delay are likely, and active deception and jamming are anticipated. There is an evolving need for a new generation of unmanned aerial vehicles (UAVs) to perform the tasks traditionally attributed to manned aircraft. For example, UAVs such as Global Hawk are rapidly becoming integral part of military surveillance and reconnaissance operations. UAVs are economical, capable of carrying powerful sensors, and complement manned aircraft missions. Other inherent advantages are (a) removal of personnel from hazardous environments; (b) elimination of error-prone repetitive tasks; (c) reduction of cost associated with operational safety and training; (d) expansion of operational envelope; and (e) performing long endurance mission. Recent advances in high speed computing, information processing, sensors, wireless communications, Internet technologies, and mobile telecommunications have led to emergence of network-centric systems. The

technology focus is shifting from individual platforms with limited number of agents to multiple platforms with transparent agents. The software and hardware agents are becoming smarter and capable of continuously adapting to changes in the operational environment. The agents can strategize and make decisions to achieve the desired objectives of mission. At the Office of Naval Research (ONR) we envision airborne intelligent autonomous agents will have the ability to collect, process, fuse, and disseminate real- time information while exploiting and/or denying an enemy similar opportunities. These airborne intelligent autonomous agents are referred to as unmanned combat the notion of network-centric warfare. It is well understood that network-centric operations can deliver to the US military a distinct edge over the enemy. At the strategic level it provides, not simply raw data but a detailed understanding and situational awareness of the appropriate competitive space. At the tactical level, network-centric warfare allows forces to develop rapid response capability and the ability to command and control the littoral environment in real-time settings.
Derived from text
Autonomy; Distributed Parameter Systems; Pilotless Aircraft; Control Theory; Artificial Intelligence

20000037839 Thomson-CSF Detexis, Elancourt, France
CRECUS: A Radar Sensor for Battlefield Surveillance UAVs
Boucard, H., Thomson-CSF Detexis, France; Gach, T., Thomson-CSF Detexis, France; Sicsik–Pare, E., SPOT/ST/OER, France; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B19-1 - B19-11; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

The paper describes a SAR/MTI radar sensor for Air-to- Ground Surveillance UAVs designed as a slow-flying, medium-altitude UAV payload. We present experimental results and emphasize salient conclusions obtained following the developmental flight test phase.
Derived from text
Moving Target Indicators; Radar Detection; Surveillance; Pilotless Aircraft; Synthetic Aperture Radar

20000037890 Remote Services Ltd., Northwood, UK
Communications Command and Control: The Crowded Spectrum
Clot, Andre J., Remote Services Ltd., UK; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 2B-1 - 2B-8; In English; See also 20000037887; Copyright Waived; Avail: CASI; A02, Hardcopy

Two key issues arise when the crew are removed from the aircraft. The first is how to get data to and from the aircraft (communications); and the second is how to operate the aircraft effectively (Command and Control). All the various methods used rely on the electromagnetic spectrum and useable space in this spectrum is becoming increasingly scarce. The provision and protection of this resource for the aviation community is an important issue. For UAV systems it could be the difference between success and failure. Whilst the number of UAVs remains small the problem may be contained. However if the UAV industry is to experience the growth it expects, this may well be the most limiting factor.
Author
Aircraft Communication; Command and Control; Electromagnetic Spectra; Pilotless Aircraft

20000037893 DaimlerChrysler Aerospace A.G., Ulm, Germany
UAV Data-Links: Tasks, Types, Technologies and Examples
Rochus, Wolfgang W., DaimlerChrysler Aerospace A.G., Germany; Development and Operation of UAVs for Military and Civil Applications; April 2000, pp. 5-1 - 5-43; In English; See also 20000037887; Copyright Waived; Avail: CASI; A03, Hardcopy

This paper provides an overview of Data-Links for UAVs. Based on the functions, which have to be performed in different UAV missions, requirements for data-links are identified. After highlighting the basic variants of data-links and their general advantages and disadvantages a detailed discussion of some important design aspects is provided. Some real-world examples of data-links show how theory has been put to use, namely: (1) Global Hawk SATCOM Data-Link as an example for an off-the-shelf solution; (2) HF Data-Link for Mucke UAV System as an example for the adaptation of MOTS hardware to a small UAV; and (3) The BREVEL Microwave DATA-Link as an example for a solution to a specific requirement. The BREVEL Data-Link is one of the most advanced solutions available today. It was developed jointly between DaimlerChrysler Aerospace AG and MATRA SYSTEM and Information until 1998 and is expected to go into production in Germany in 1999.
Author
Pilotless Aircraft; Communication Satellites; Data Links

20000033825 NASA Glenn Research Center, Cleveland, OH USA
The Effects of Blade Count on Boundary Layer Development in a Low-Pressure Turbine
Dorney, Daniel J., Virginia Commonwealth Univ., USA; Flitan, Horia C., Virginia Commonwealth Univ., USA; Ashpis, David E., NASA Glenn Research Center, USA; Solomon, William J., Ohio Aerospace Inst., USA; January 2000; 22p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): NCC3-645; RTOP 523-26-33
Report No.(s): NASA/TM-2000-209911; E-12138; NAS 1.15:209911; AIAA Paper 2000-0742; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experimental data from jet-engine tests have indicated that turbine efficiencies at takeoff can be as much as two points higher than those at cruise conditions. Recent studies have shown that Reynolds number effects contribute to the lower efficiencies at cruise conditions. In the current study numerical simulations have been performed to study the boundary layer development in a two-stage low-pressure turbine, and to evaluate the models available for low Reynolds number flows in turbomachinery. In a previous study using the same geometry the predicted time-averaged boundary layer quantities showed excellent agreement with the experimental data, but the predicted unsteady results showed only fair agreement with the experimental data. It was surmised that the blade count approximation used in the numerical simulations generated more unsteadiness than was observed in the experiments. In this study a more accurate blade approximation has been used to model the turbine, and the method of post-processing the boundary layer information has been modified to more closely resemble the process used in the experiments. The predicted results show improved agreement with the unsteady experimental data.
Author
Boundary Layers; Turbines; Low Pressure; Experimentation; Data Acquisition; Jet Engines; Engine Tests; Rotor Blades (Turbomachinery)

20000037738 Cornell Univ., Sibley School of Mechanical and Aerospace Engineering, Ithaca, NY USA
Interaction between Near-Wall Turbulent Flows and Compliant Surfaces *Final Report, 1 Oct. 1998-30 Sep. 1999*
Lumley, John, Cornell Univ., USA; Rempfer, Dietmar, Cornell Univ., USA; Feb. 18, 2000; 12p; In English
Contract(s)/Grant(s): F49620-99-1-0012; AF Proj. 2307
Report No.(s): AD-A374877; AFRL-SR-BL-TR-00-064; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The general aim of this project is to get an improved understanding of the interaction between wall-generated turbulence and compliant surface coatings using analysis and direct numerical simulation in an integrated approach, with a view towards the reduction of turbulent sound production and turbulent drag. For this purpose, in a first step that is targeted at identifying interesting domains in the space of parameters describing properties of a compliant wall coating, we are developing low-dimensional models based on Galerkin projection of the Navier-Stokes equations onto systems of eigenfunction obtained via Proper Orthogonal Decomposition. Because of the relatively small effort involved in simulating and analyzing such models, this will allow us to scan large regions of parameter space, allowing us to find regions that lead to a reduction of turbulent drag and turbulent sound production. Among the ultimate goals of this project are thus, first, to obtain a fundamental understanding of flow-structure interaction phenomena for the case of the compliant- wall/turbulence interaction, and second, to use this understanding to enhance the flight performance of air vehicles by increasing their lift-to-drag ratio.
DTIC
Turbulent Flow; Aerodynamic Drag; Direct Numerical Simulation; Displacement; Domains; Navier-Stokes Equation

20000037782 George Washington Univ., School of Engineering and Applied Science, Hampton, VA USA
Joint Institute for Advancement of Flight Sciences *Final Report, Sep. 1995 - Nov. 1999*
Cutler, Andrew D., George Washington Univ., USA; [1999]; 8p; In English
Contract(s)/Grant(s): NCC1-217; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Experiments were designed, implemented, and evaluated in the thermal and fluid sciences at the NASA Langley Research Center. This research was conducted cooperatively with NASA employees using, where necessary, equipment and facilities provided by the U.S. Government. The research fell within the scope of the University Agreement between the NASA Langley Research Center and The George Washington University for Joint Research and Education Projects dated June 7, 8, 1994, which continues the Joint Institute for the Advancement of Flight Sciences (JIAFS).
Author
Flight Mechanics; Aerothermodynamics; Education

20000039707 NASA Ames Research Center, Moffett Field, CA USA

Nonintrusive Diagnostic Strategies for Arcjet Stream Characterization

Fletcher, Douglas G., NASA Ames Research Center, USA; Measurement Techniques for High Enthalpy and Plasma Flows; April 2000, pp. 3B-1 - 3B-37; In English; See also 20000039703; Copyright Waived; Avail: CASI; A03, Hardcopy

In the previous lecture, the issues related to arcjet flow modeling were introduced, and the limitations of conventional instrumentation in addressing these issues were discussed. The general level of understanding of the arcjet flows was seen to preclude the use of arcjets as aerothermodynamic test facilities beyond the current role in aerothermal material testing, despite their long test duration capability. In this section, the focus will be on new developments in spectroscopic instrumentation and techniques that can be brought to bear on the fundamental problem of arcjet stream characterization. Although a wide selection of arcjet facilities were introduced in the previous section, the discussion of nonintrusive diagnostic instrumentation will be restricted to the large-scale, segmented, constricted-arc heater facilities that are most widely used in thermal protection material testing for aerospace applications. After a brief review of the important features of arcjet flows, the topic of nonintrusive, optical diagnostics is introduced with a discussion of some of the basic aspects of radiative transitions. The lecture is then organized into two sections covering emission measurements and laser-induced fluorescence measurements. Emission measurements are presented next for different regions of arcjet flows, while the fluorescence measurements are presented for the free stream region only. Summaries are given for each of the two main sections, and observations on arcjet characterization by optical diagnostics in general are given at the end.

Author

Intrusion; Arc Heating; Aerothermodynamics; Characterization; Diagnosis

20000039709 Rouen Univ., Centre National de la Recherche Scientifique, France

Laser Induced Fluorescence in High Enthalpy Facilities in the Tsniimach Center (Moscow - Russia)

Robin, L., Rouen Univ., France; Measurement Techniques for High Enthalpy and Plasma Flows; April 2000, pp. 4B-1 - 4B-18; In English; See also 20000039703; Copyright Waived; Avail: CASI; A03, Hardcopy

The requirements for accurate measurements, the higher sophistication in the design, the need for monitoring, control and diagnostics in difficult circumstances and the request for data bases to validate numerical codes have incited the advanced measurement techniques to the investigation of ground test facilities. This lecture presents an experimental work and the results obtained by Laser Induced Fluorescence (LIF) in continuous high enthalpy supersonic airflows. The test campaign is performed at the Central Research Institute of Machine Building (Tsniimach, Moscow region) in ground experimental facilities designed for aerodynamics and heat transfer studies of supersonic and hypersonic aircrafts. The main objective of this test campaign was to perform measurements of species concentrations, temperature and velocity in the incoming flow, and in the boundary and shock layers over a Thermal Protection System (TPS) model simulating a misalignment of tiles, by means of techniques developed by the plasma team from the University of Rouen. So, an original method using LIF diagnostic has been implemented to measure simultaneously the three parameters. Fluorescence of NO was induced in the high enthalpy air plasma flow by a tunable ArF-excimer laser via the epsilon-band system D(exp 2)sigma(+) (sub nu = 0) left arrow Chi(exp 2)Pi(sub nu = 1). Measurements of the rotational temperature and NO number density have been performed. The spatial resolution of the LIF technique permitted accurate characterization of the boundary and shock layer, as well as shock thickness. Finally, flow velocity is deduced from the Doppler-shift measurements of excited rovibrational NOE band. Analysis of the results will allow to assess the validity of the computational tools in order to control the representativity of future industrial tests devoted to local aerodynamic studies.

Derived from text

Aerodynamic Heat Transfer; Diagnosis; Ground Tests; Laser Induced Fluorescence; Research Facilities; Software Development Tools; Temperature Measurement; Thermal Protection

20000038740 Kyushu Univ., Graduate School of Engineering, Fukuoka, Japan

Drag Reduction of Darrieus-Type Runner Blade and Tentative Assessment of the Water Turbine Performance

Okuma, Kusuo, Kyushu Univ., Japan; Furukawa, Akinori, Kyushu Univ., Japan; Watanabe, Satoshi, Kyushu Univ., Japan; Technology Reports of Kyushu University; March 2000; ISSN 0023-2718; Volume 73, No. 2, pp. 195-201; In Japanese; Copyright; Avail: Issuing Activity

The Darrieus-type cross-flow turbine, set in a parallel walled duct casing, has been proposed for electricity generation utilizing low head water power. Considering the practical use in near future, the turbine efficiency must be improved up to almost the same as that of conventional type turbines. In the present paper, effects of drag reduction of Darricus blade on turbine

performance are tentatively examined based on the fact that drag coefficient is reduced with increase in blade Reynolds number. Then, a guiding principle of the practical runner size is discussed to obtain higher efficiency.
Author
Drag Reduction; Aerodynamic Drag; Turbine Blades; Performance Tests; Aerodynamic Coefficients

20000039218 NASA Marshall Space Flight Center, Huntsville, AL USA
Manufacturing and NDE of Large Composite Aerospace Structures at MSFC
Whitaker, Ann, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 9th; ASNT's 2000 Spring Conference, 27-31 Mar. 2000, Birmingham, AL, Birmingham, AL, USA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA's vision for transportation to orbit calls for new vehicles built with new materials technology. The goals of this new launch system development are to improve safety, dramatically reduce cost to orbit, and improve vehicle turn around time. Planned Space Shuttle upgrades include new reusable liquid propellant boosters to replace the solid propellant boosters. These boosters are to have wings and return to the launch site for a horizontal landing on an airport runway. New single and two stages to orbit concepts are being investigated. to reduce weight and improve performance composite materials are proposed for fuel and oxidizer tanks, fuel feedlines, valve bodies, aerostructures, turbomachinery components. For large composite structures new methods of fabrication are being proposed and developed. Containment of cryogenic fuel or oxidizer requires emphases on composite material densification and chemical compatibility. Ceramic matrix and fiber composites for hot rotating turbomachinery have been developed with new fabrication processes. The new requirements on the materials for launcher components are requiring development of new manufacturing and inspection methods. This talk will examine new and proposed manufacturing methods to fabricate the revolutionary components. New NDE methods under consideration include alternative X-ray methods, X-ray laminagraphy, advanced CT, Thermography, new ultrasonic methods, and imbedded sensors. The sizes, complexity, use environment, and contamination restrictions will challenge the inspection process. In flight self-diagnosis and rapid depot inspection are also goals of the NDE development.
Author
Composite Structures; Manufacturing; Nondestructive Tests; Aeronautical Engineering; Spacecraft Launching

13
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology.

20000036452 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
Warta LAPAN, Volume 1
September 1999; ISSN 0126-9754; 48p; In Malay-Indonesian; See also 20000036453 through 20000036457; Copyright; Avail: Issuing Activity

+This paper presents Warta LAPAN (Indonesian National Institute of Aeronautics and Space). Volume 1. No. 3. The topics include: 1) An investigation of GCM (Global Circulation Model) CSIRO-9 (Commonwealth Scientific and Industrial Research Organization) External Divergency and Vorticity Profiles and Their Relationship to Rainfall; 2) A Date Time Series Autocorrelation Analysis of Annual Rainfall in Bandung 1952-1997; 3) Simulation of ENSO Phenomena Based on a Global Circulation Model; 4) An Analysis of Climate Change in Bandung Based on Rainfall Data; and 5) Management of Solid-State Rocket Motor Propulsion Static Testing Operations.
CASI
Indonesian Space Program; Atmospheric General Circulation Models; Aeronautics; Rain; Computerized Simulation

20000034076 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA
Aviation and the Environment: Aviation's Effects on the Global Atmosphere Are Potentially Significant and Expected to Grow
Feb. 2000; 51p; In English; Report to the Honorable James L. Oberstar, Ranking Democratic Members, Committee on Transportation and Infrastructure, House of Representatives.
Report No.(s): AD-A373835; GAO/RCED-00-57; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Concerns about global warming are focusing increasingly on the contribution of human activities, including aviation. Jet aircraft are among many sources of greenhouse gases-gases that can trap heat, potentially increasing the temperature of the earth's surface and leading to changes in climate." According to a recent report by the National Research Council, the average global temperature at the earth's surface has risen 0.7 to 1.4 degrees Fahrenheit over the last century. Many experts agree that, in total,

greenhouse gases are warming the earth and that this warming could have harmful effects on the environment and human health. For example, some scientists are concerned that with global warming, glaciers and ice sheets could melt, leading to a rise in sea levels and subsequent coastal flooding. In addition, they expressed concern that the incidence of malaria and other tropical infectious diseases could increase in moderate climates.
DTIC
Environment Effects; Climate Change; Global Warming; Greenhouse Effect; Jet Aircraft; Emission

20000040162 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Sorption of the Aircraft Deicing Fluid Component Methyl-Benzotriazole in SOIl
Kellner, David L.; Mar. 1999; 216p; In English
Report No.(s): AD-A374457; AFIT/GEE/ENV/99M-11; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The air transportation industry requires deicing/anti-icing (ADAF) fluids to maintain flight operations in cold weather conditions. Additives to the ADAF aid in the performance of these agents. Approximately 52M liters of concentrated aircraft deicing fluid are used in North America per year in an attempt to correct this safety problem. Among the additives to ADAF are corrosion inhibitors flame retardants, wetting agents, and thickening agents. Some of these agents are known to be toxic to microorganisms. Identification of the transport processes of these agents in the environment is a necessary first step to understanding how to remediate ADAF. Methyl-Benzotriazole (MeBT) is a corrosion inhibitor/flame retardant toxic additive in ADAF. This study investigates the sorption characteristics of MeBT in various soils. Three soil types were used to evaluate the sorption characteristics of MeBT at 1000 mg/L, 100 mg/L, and a mixture of MeBT and propylene glycol (PG). A High Pressure Liquid Chromatograph (HPLC) was used to conduct the recovery experimentation after the samples had reached equilibrium. Resulting sorption coefficients revealed that MeBT did not sorb well to any of the soils types used. The organic carbon content affects the sorption coefficient by slightly raising the sorbed amount of MeBT.
DTIC
Aircraft Maintenance; Airframes; Sorption; Methyl Compounds; SOIls; Propylene

20000038154 NASA Wallops Flight Center, Wallops Island, VA USA
Altimeter Estimation of Sea Surface Wind Stress for Light to Moderate Winds
Vandemark, Douglas, NASA Wallops Flight Center, USA; Edson, James B., Woods Hole Oceanographic Inst., USA; Chapron, Bertrand, Institut Francais de Recherche pour l'Exploitation de la Mer, France; Laboratory for Hydrospheric Processes Research Publications; 1997, pp. 159-160; Repr. from Journal of Atmospheric and Oceanic Technology, v. 14, no. 3, Pt. 2, Jun. 1997 p 716-722; In English; Copyright; Avail: Issuing Activity (Lab. for Hydrospheric Processes, NASA Goddard Space Flight Center, Greenbelt, MD 20771), Hardcopy, Microfiche

Aircraft altimeter and in situ measurements are used to examine relationships between altimeter backscatter and the magnitude of near-surface wind and friction velocities. Comparison of altimeter radar cross section with wind speed is made through the modified Chelton-Wentz algorithm. Improved agreement is found after correcting 10-m winds for both surface current and atmospheric stability. An altimeter friction velocity algorithm is derived based on the wind speed model and an open-ocean drag coefficient. Close agreement between altimeter- and in situ-derived friction velocities is found. For this dataset, quality of the altimeter inversion to surface friction velocity is comparable to that for adjusted winds and clearly better than the inversion to true 10-m wind speed.
Author
Ocean Surface; Altimeters; Wind Shear; Wind Velocity; Remote Sensing

14
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions.

20000034019 Mississippi State Univ., Dept. of Industrial Engineering, Mississippi State, MS USA
Situation Awareness and Levels of Automation *Final Report, 1 Jan. - 31 Dec. 1999*
Kaber, David B., Mississippi State Univ., USA; [1999]; 8p; In English
Contract(s)/Grant(s): NCC1-330; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the first year of this project, a taxonomy of theoretical levels of automation (LOAs) was applied to the advanced commercial aircraft by categorizing actual modes of McDonald Douglas MD-11 autoflight system operation in terms of the

taxonomy. As well, high LOAs included in the taxonomy (e.g., supervisory control) were modeled in the context of MD-11 autoflight systems through development of a virtual flight simulator. The flight simulator was an integration of a re-configurable simulator developed by the Georgia Institute Technology and new software prototypes of autoflight system modules found in the MD-11 cockpit. In addition to this work, a version of the Situation Awareness Global Assessment Technique (SAGAT) was developed for application to commercial piloting tasks. A software package was developed to deliver the SAGAT and was integrated with the virtual flight simulator.
Author
Flight Simulators; MD 11 Aircraft; Cockpits; Taxonomy

20000039426 Institute for Human Factors TNO, Soesterberg, Netherlands
Effects of Three-Dimensional Auditory Information on Spatial Situation Awareness of Pilots *Final Report De rol van stereo-zien bij het besturen van pantservoetuigen in ruw terrein*
Oving, A. B., Institute for Human Factors TNO, Netherlands; vanBreda, L., Institute for Human Factors TNO, Netherlands; Werkhoven, P. J., Institute for Human Factors TNO, Netherlands; Dec. 14, 1998; 44p; In English; Original contains color illustrations
Contract(s)/Grant(s): A97/KLu/308; TNO Proj. 788.1
Report No.(s): TD98-0284; TM-98-A069; Copyright; Avail: Issuing Activity

The potential benefits of a three-dimensional (3D) auditory display in enhancing the spatial situation awareness (SA) of a pilot were investigated in a flight simulation experiment. The study was aimed at the application of 3D audio in the cockpit of civil aircraft. Participants were required to follow a specific route that was presented on a map display. This display also contained information pertaining to that route. Primary flight information was available on another visual display. to increase the task load during a flight, the participants had to perform a secondary cognitive task now and then. This task required the participants to respond to target letters that were presented either visually or orally. to assess the spatial SA of the participants, the simulation was stopped on two occasions during a single flight run by blanking the outside imagery and all displays in the cockpit. Subsequently, a questionnaire was presented to the participants on one of the visual displays with three different sets of questions, regarding knowledge about elements in the environment and elements of the flight task. In the experiment, 3D audio was used to present spatial information about the environment and specific elements of the route. The auditory messages were presented in clusters of four with 40 s between the start of each cluster. In half of the experimental flight runs, 3D audio was available to the participants. SA-performance was measured by the response times to the questions and the accuracy of the answers. It was hypothesized that the use of 3D audio would result in a better SA of the participants, because 3D audio contains spatial information. Results showed no effects of 3D audio on spatial SA. The only significant effects of 3D audio were related to the performance on the secondary cognitive task, with worst performance on the visual secondary task and when 3D audio was present. Based on these results, it is hypothesized that the participants preferred to use the visual displays instead of the 3D audio messages to acquire the needed spatial information for answering the SA-questions. This preference may be due to limitations in the level of integration with 3D audio, because the 3D audio messages were presented sequentially. Also, constraints in the availability and accessibility of the 3D audio messages in the present experimental setup, may have biased the participants to use the visual displays.
Author
Auditory Signals; Display Devices; Flight Simulation; Three Dimensional Models; Human Factors Engineering; Aircraft Pilots; Spatial Dependencies

20000041707 British Airways Safety Services, London, UK
Situational Awareness: Has EFIS Delivered?
OLeary, Mike, British Airways Safety Services, UK; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment: Proceedings; [2000], pp. 9.1 - 9.6; In English; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment, 23 Mar. 2000, London, UK; Sponsored by Royal Aeronautical Society, UK; ISBN 1-85768-186-X; Copyright; Avail: Issuing Activity

This paper considers whether the introduction into the flight deck of modem digital technology has been beneficial to the level of flight crew situation awareness. Modem technology has dramatically changed the way aircraft are operated. Much of the physical work has now been eliminated, theoretically allowing the flight crew more time for higher level planning and supervisory activities. However, accidents caused by situation awareness failures have not gone away as a consequence. Accident and serious incident rate statistics suggest that these have been fairly stable over the last decade during which time more and more of the latest generation of aircraft have been brought into operation. Incidents of a less serious nature also occur but are normally less frequently catalogued and categorized as less effort is applied to these cases than is the norm for their more serious brothers. Data from the British Airways Human Factors reporting programme is presented here indicating that modem technology does not necessarily

augment situation awareness. The author suggests that the reduced requirement for both physical and cognitive data gathering activity on the flight deck may be partly responsible. Alleviation of this may require changes to both training and operating procedures.
Author
Cognition; Human Factors Engineering; Stability; Technology Assessment; Flight Safety

20000041708 Thomson-CSF Sextant, Meudon-la-Foret, France
Situational Awareness on the Flight Deck Current Solutions Contributions: HFDS(R), FMS, GCAS/TAWS
Adams, Hal E., Thomson-CSF Sextant, France; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment: Proceedings; [2000], pp. 8.1 - 8-5; In English; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment, 23 Mar. 2000, London, UK; Sponsored by Royal Aeronautical Society, UK; ISBN 1-85768-186-X; Copyright; Avail: Issuing Activity

Controlled Flight Into Terrain (CFIT) remains as the primary contributor to the aircraft accident rate. The aviation industry has taken the challenge to reduce the fatal aircraft accident rate by 80% by the year 2000. Development of functionality that is designed to reduce CFIT accidents is an evolutionary, continuous process. The evolutionary process involves the interaction of diverse interests such as infrastructure, funding, cost, timing, safety, intellectual rights protection, technology, resources, etc. Imaginative, revolutionary CFIT solutions are restrained by interest interaction and by how expensive or technically challenging the solution. However, the change rate of the solutions process is tempered by public sensitivity. Currently there are available three avionics elements that contribute to improving the CIFIT situation but are not widely utilized as an integrated solution. These three key elements are Heads Up Flight Display System (HFDSO), advanced Flight Management System (FMS) and Ground Collision Avoidance System (GCAS Terrain Awareness & Warning System/ TAWS). These elements are evolving and being constantly refined. The expectation of HFDS 0 is that the flight crew can operate in instrument meteorological conditions as if they are operating in visual meteorological conditions. This allows coupling of the external environment with awareness of aircraft state within bounded parameters. The expectation of advanced FMS is that the flight crew can operate in a non-FANS (Future Air Navigation System) as if they were operating in a FANS environment. This allows for use of tactical "FANS tools" to manage the flight deck tasks more efficiently. The expectation of GCAS/TAWS is that terrain can be made "visible" to the flight deck when the terrain is not physically or mentally "visible." This allows the inclusion of unrecognized, potentially and, or actually hazardous operations as part of the flight deck decision process. Revolutionary CFIT solutions are apparently required but it will require more awareness and drive by industry for revolutionary solutions to be employed.
Author
Flight Control; Terrain; Warning Systems; Safety Devices; Flight Management Systems; Display Devices; Aircraft Accidents

20000041710 Honeywell, Inc., Airline Avionics, Redmond, WA USA
Flight Safety Improvements Through Advanced Avionics Solutions
Carman, Mike, Honeywell, Inc., USA; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment: Proceedings; [2000], pp. 6.1 - 6.6; In English; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment, 23 Mar. 2000, London, UK; Sponsored by Royal Aeronautical Society, UK; ISBN 1-85768-186-X; Copyright; Avail: Issuing Activity

There has been continuous improvement in'the effectiveness of individual flight safety-related systems. Originally, these systems did not communicate with each other; more recently there has been a trend for systems to be coordinated (e.g. prioritization of alert messages). In the future, to gain the benefits of improved performance and reduced cost, the trend will continue towards complete functional integration of these systems.
Author
Flight Safety; Technology Assessment; Functional Integration; Communication

20000041712 Airbus Industrie, Toulouse, France
Integration of Situational Awareness on Airbus Flight Decks
Wainwright, William, Airbus Industrie, France; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment: Proceedings;]2000], pp. 4.1 - 4.9; In English; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment, 23 Mar. 2000, London, UK; Sponsored by Royal Aeronautical Society, UK; ISBN 1-85768-186-X; Copyright; Avail: Issuing Activity

The need for situational awareness is not new, but enormous progress has been made since the introduction of the first real "glass cockpit" aircraft - the A320. Where we have been able to improve situational awareness is in giving the pilot an uncluttered cockpit, with an unobstructed view of his primary displays, where all the information needed is concentrated directly in front of

his eyes. Situational awareness includes awareness in the horizontal & vertical planes, as well as awareness of energy. I will describe the history of situational awareness in Airbus Flight Decks up to & including the introduction of EGPWS (Enhanced Ground Proximity System). I will then discuss the near future with the "Peaks" display & vertical cut, & how awareness of energy is treated at Airbus is discussed. Finally, our method for ensuring a good Human/Machine interface & future technological advances, including navigation on the ground is discussed.
Author
Cockpits; Display Devices; Field of View

20000041714 Boeing Co., Seattle, WA USA
Vertical Situation Awareness Display
Jacobsen, Alan R., Boeing Co., USA; Chen, Sherwin S., Boeing Co., USA; Wiedemann, John, Boeing Co., USA; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment: Proceedings; [2000], pp. 2.1 - 2.8; In English; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment, 23 Mar. 2000, London, UK; Sponsored by Royal Aeronautical Society, UK; ISBN 1-85768-186-X; Copyright; Avail: Issuing Activity

Of the more than 200 heavy air transport accidents involving hull loss and/or fatalities over the last 10 years, more than 50% have been associated with either Controlled Flight Into Terrain (CFIT) or the Approach and Landing phases of flight. A large portion of these accidents have resulted from inadequate or loss of vertical situation awareness on the part of the flight crew. Over the past several years, various types of interventions have been investigated in an attempt to address this issue on the flight deck. While many new, and often high-priced, technology items promise to deliver improved situation awareness, cost effective solutions that are relatively easy to retro-fit must be found to significantly enhance safety in the world-wide fleet. Presenting flight crews with a side looking profile of the vertical dimension is one such solution. While not the final answer to overall situation awareness, the vertical situation display (VSD) has been shown to be an effective format for significantly enhanced vertical awareness on the part of the flight crew and can be implemented into today's flight decks in a cost effective manner. It is expected that this type of display concept can significantly reduce the accident rate over the next 5 to 10 years. The VSD complements and enhances the overall effectiveness of other systems like the Terrain Avoidance Warning System. By allowing flight crews to more easily acquire and maintain a stable flight path the VSD also yields other benefits such as decreased occurrences of landing incidents and missed approaches.
Author
Terrain Analysis; Safety; Losses; Landing; Flight Control; Cost Effectiveness; Air Transportation; Accident Prevention

20000041722 British Aerospace Aircraft Group Systems North America, Rockville, MD USA
Enhancing Situational Awareness in the Civil Aircraft Cockpit
Tucker, Brian G. S., British Aerospace Aircraft Group Systems North America, USA; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment: Proceedings; [2000], pp. 1.1 - 1.33; In English; Situational Awareness on the Flight Deck: The Current and Future Contribution by Systems and Equipment, 23 Mar. 2000, London, UK; Sponsored by Royal Aeronautical Society, UK; ISBN 1-85768-186-X; Copyright; Avail: Issuing Activity

Contents include the following: impact of increased traffic; the advantages of visual guidance systems (VGS); controlled flight into terrain-statistics;runway inclusion; and future benefits of VGS.
CASI
Cockpits; Flight Control

20000034079 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA
The Human-Electronic Crew: The Right Stuff? Proceedings of the 4th Joint GAF/RAF/USAF Workshop on Human-Computer Teamwork
Reising, John; Taylor, Robert; Onken, Reiner; Dec. 1999; 226p; In English
Contract(s)/Grant(s): Proj-2403
Report No.(s): AD-A373926; AFRL-HE-WP-TR-1999-023; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The components integral to the operation of an Electronic Crew member (EC) have started to take shape. Questions have been raised as to the nature of the EC when finished. What are the key components that will ensure a successful emergence of this new technology? How can we plan for their development and incorporate the software and hardware elements to function in concert with one another. The purpose of this workshop was to examine these concerns. The key questions to be addressed were: (1) What are the core qualities that the Electronic Crew member must possess? (2) How does one estimate the amount of software code

involved? (3) What are the key software modules? (4) What is necessary to ensure the modules function symbiotically? (5) What is sufficient functionality within the Electronic Crew member to satisfy the human operator requirements?
DTIC
Conferences; Cockpits; Human Factors Engineering; Human-Computer Interface; Aircraft Pilots

20000037836 Boeing Co., Mesa, AZ USA
Test and Evaluation of the Man-Machine Interface Between the Apache Longbow(tm) and an Unmanned Aerial Vehicle
Kraay, Anthony G., Boeing Co., USA; Pouliot, Michelle L., Boeing Co., USA; Wallace, William J., Boeing Co., USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B14-1 - B14-7; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

The Boeing Company is studying a concept that involves teaming a manned rotorcraft, the Apache Longbow, with a unmanned air vehicle (UAV). During 1997 Boeing developed a preliminary man-machine interface between the Apache Longbow and an unmanned air vehicle. An early assessment of the man-machine interface in a virtual simulation environment was conducted. The study concentrated on the effects of crew workload during manned- unmanned teaming operations and acceptability of the design in terms of presentation of the data, functionality, and utility. A limited assessment of operational measures of effectiveness was also conducted. Subject pilots were satisfied with the man-machine interface, did not experience task overload and were able to perform UAV control tasks. Subjects did experience some difficulty with target acquisition and tracking, however. Initial data suggests that the potential exists to detect targets beyond the organic sensor range of current attack/reconnaissance rotorcraft without being exposed to threat detection.
Author
Pilotless Aircraft; Rotary Wing Aircraft; Man Machine Systems; Human-Computer Interface

20000038777 Institute for Human Factors TNO, Soesterberg, Netherlands
Use of Adaptable Displays for Fighter Aircraft Flight Support ***Final Report*** ***Gebruik van Aanpasbare Displays met Gezichtspunt ter Ondersteuning van Vliegtaken in Gevechtsvliegtuigen***
deVries, S. C., Institute for Human Factors TNO, Netherlands; Veltman, J. A., Institute for Human Factors TNO, Netherlands; vanBreda, L., Institute for Human Factors TNO, Netherlands; Feb. 02, 1999; 46p; In English; Original contains color illustrations
Contract(s)/Grant(s): A95/KLu/341; TNO Proj. 788.1
Report No.(s): TD-99-0013; TM-99-A011; Copyright; Avail: Issuing Activity

In a flight simulator experiment pilots were subjected to a large range of tasks, namely waypoint flying, interception of intruders, threat zone detection and object localization. The set of tasks was chosen to cover all aspects of local and global navigation. The pilots were aided in their task by displays providing them with the necessary information. Goal of the research was to determine which type of display is optimal for which task and whether pilots choose the most optimal display when given a choice of displays. Five types of displays were used: a 2D north-up display, a 2D north/south-up display, a 2D heading- up display, a 3D egocentric display and a 3D exocentric (wi.igman) display. The experimental conditions allowed the pilots either the full choice of all display types, a choice of display types one and four only, display type one only or display type four only. The results show that for global navigation tasks (object localization) the use of the 2D north-up display leads to a significantly better performance than the use of the 3D egocentric display while the variable display conditions show intermediate results. Local guidance tasks are best served with the 3D egocentric display and worst with the 2D north-up display. Again, the use of variable displays yields intermediate results. A remarkable finding is that most pilots rarely adjusted their displays to the flight phase they were in. Apparently, a preference for a certain display is quickly adopted. This behaviour is probably sub-optimal and attention should be paid to this whenever a multiple-representation display like the one tested here will be implemented in an actual fighter aircraft. Worrisome was the finding that when using the five-choices option the number of crashes increased threefold. Though this effect was not significant, the sheer size calls for further research.
Author
Detection; Display Devices; Flight Simulators

20000039421 Institute for Human Factors TNO, Soesterberg, Netherlands
Human Factors Issues and Advanced Interface Design in Maritime Unmanned Aerial Vehicles: A Project Overview 1995-1998 ***Final Report*** ***Technisch Menskundige Aspecten en Innovatieve Voor Maritieme Onbemande Luchtvaartuigen : Een Projectoverzicht 1995-1998***
vanErp, J. B. F., Institute for Human Factors TNO, Netherlands; vanBreda, L., Institute for Human Factors TNO, Netherlands; Jan. 25, 1999; 29p; In English
Contract(s)/Grant(s): A95/KM/372; TNO Proj. 788.1

Report No.(s): TD-99-0006; TM-99-A004; Copyright; Avail: Issuing Activity

This report presents an overview of the studies conducted for the Royal Netherlands Navy under contract A95/KM/372 on the human-machine interface for steering Maritime Unmanned Aerial Vehicles (MUAVS) and controlling their remote cameras. While manual control is preferable for specific tasks, the operator misses critical sensory information, such as proprioceptive feedback on camera viewing direction. Furthermore, the information on the remote environment which is presented, namely the payload images, is of degraded quality due to the restricted data-link. This may result in camera images with low temporal and spatial resolution, and a small field of view. The six studies performed mainly focussed on the negative effects of the degraded visual information (including low update rates, transmission delays and zoomed-in camera images), and the possibilities to compensate these effects by innovative human-machine interface design. An important point of departure was that the improvements did not result in additional claims on the data-link. The applied techniques included the use of graphical overlays, ecological interface design, head-coupled control, and prediction techniques. The results show that carefully designed human-machine interfaces are able to partially compensate specific image degradations. The studies also served as a contribution to NATO Project Group 35 (PG35). The current report includes an overview of the progress within this Project Group. PG35 activities resulted in the identification of near-term research areas, e.g. interoperability, combined MUAV/heli operations, and the MUAV tactical information display.

Author

Cameras; Human Factors Engineering; Pilotless Aircraft; Remote Control; Human-Computer Interface; Design Analysis

20000039422 Institute for Human Factors TNO, Soesterberg, Netherlands

Remotely Controlled Flying Aided by a Head-Slaved Camera and HMD: Effects of MMD Type, Vehicle References and Stereo ***Interim Report Afstandsbestuurd Vliegen Ondersteund Door een Hoofdgekoppelde Camera en HMD: Effecten van HMD Type, Voertuigreferenties en Stereo***

deVries, S. C., Institute for Human Factors TNO, Netherlands; Padmos, P., Institute for Human Factors TNO, Netherlands; Dec. 14, 1998; 27p; In English

Contract(s)/Grant(s): B97-032; TNO Proj. 788.1

Report No.(s): TD-98-0282; TM-98-B016; Copyright; Avail: Issuing Activity

In the simulator experiment reported here we examined several parameters influencing the performance of the operator of a (simulated) Unmanned Aerial Vehicle (UAV). This operator was fitted with an HMD which showed images from the (virtual) camera onboard of the UAV. The camera was slaved to the operator's head so that the camera movements mimicked the head movements. We examined steering performance for two HMD types: the low-end, LCD-based Virtual I0 i-glasses, and the high-end, CRT-based n-vision Datavisor. Additional parameters were the presence of vehicle references in the images as an indication of camera orientation and the presence of stereo and hyper-stereo (large baseline stereo). Performance with the n-vision HMD was considerably better than with the i-glasses HMD, a difference which could not be attributed solely to the difference in field-of-view. The presence of vehicle references led to a modest improvement in performance. Stereo and hyper-stereo did not improve performance for this particular task.

Author

Pilotless Aircraft; Head-Up Displays; Flight Simulators; Cameras; Human Factors Engineering; Remote Control

15
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science.

20000034861 Alphatech, Inc., Burlington, MA USA

Workshop: Future Directions in Systems and Control Theory, Wednesday, June 23. Viewgraphs - Volume 2

Tenney, Robert R.; Pascoal, A.; Kaminer, I.; Oliveira, P.; Silvestre, C.; Jun. 23, 1999; 121p; In English

Report No.(s): AD-A373778; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report contains several reports concerning future directions in systems and control theory.

DTIC

Control Theory; Robotics; Autonomous Navigation; Drone Aircraft

20000037828 Defence Evaluation Research Agency, Land Systems, Robotic Land Vehicles Dept., Chertsey, UK

UK Military Requirements for Unmanned Land Vehicle Combat Engineer Support

Warren, H. A., Defence Evaluation Research Agency, UK; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B6-1 - B6-5; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

The paper describes the operational requirements and methods of achieving remote operation of Combat Engineer Equipments for use by the UK Army during periods immediately prior to combat, possibly during combat and extensively in post conflict clearance operations. The techniques could also be used in peace support or for non-military applications. Unmanned ground vehicles have several potential applications on the battlefield including reconnaissance, mine clearance and other engineer tasks. The paper examines the teleoperational requirements for the adaptation of existing Combat Engineer Vehicles such as the Chieftain Armoured Vehicle Royal Engineer (CHAVRE), and the Combat Engineer Tractor (CET) and future requirements for service replacement vehicles such as Future Engineer Tank (FET) and Terrier (replacement CET). The benefits of the use of technologies to improve remote control equipment for the combat engineer are discussed with the evolutionary approach of developing vehicles which have greater intelligence, independence, versatility, and which reduce certain manpower tasks at favourable costs savings. The paper discusses specific topics on:- UK Engineer support requirements, direction of UK RLV programme, design philosophy, advantages and disadvantages of using UGVs instead of manned vehicles, safety features and some technology limitations.

Author

Combat; UK; Military Technology; Pilotless Aircraft; Support Systems; Operations

20000037829 Defence Evaluation Research Agency, Land Systems, Robotic Land Vehicles Dept., Chertsey, UK

UK Experience with Unmanned Land Vehicles for Combat Engineer Applications

Gibson, P. J., Defence Evaluation Research Agency, UK; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B7-1 - B7-4; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

DERA is currently conducting applied research in support of the UK MOD programme for Combat Engineer Equipments which includes Robotic Land Vehicles. Three examples of research into remote operation of combat engineer equipment are described, the Scatterable Mine Clearance Device (SMCD) on a 15 tonne truck, Chieftain Armoured Vehicle Royal Engineers (CHAVRE) with mine plough and fascines, and Combat Engineer Tractor (CET) fitted with 4-in- 1 bucket. The paper addresses the advantages and limitations of operating via remote control and suggests techniques that alleviate some of these problems. All of the systems described used applique kits on in-service vehicles with no vehicle modifications and were intended to be capable of use in operational environments. Adaptation was achievable in less than a day and there was minimum interference with normal operation, change-over to remote control being near instantaneous. The presentation includes a short video clip of aspects such as tele-operation from moving vehicles, vision needs and problems encountered when undertaking specific tasks such as digging and obstacle negotiation. Results of our trials are summarized and pointers given to future research and features that should be incorporated in future systems. Mr. Peter Gibson - Robotics Technical Expert, Defence Evaluation and Research Agency (DERA), Land Systems, Chobham Lane, Chertsey, Surrey, KT16 OEE, UK

Author

UK; Pilotless Aircraft; Combat; Engineers

20000037830 Institute for Human Factors TNO, Soesterberg, Netherlands

Controlling Unmanned Vehicles: The Human Factors Solution

vanErp, Jan B. F., Institute for Human Factors TNO, Netherlands; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B8-1 - B8-12; In English; See also 20000037804; Copyright Waived; Avail: CASI; A03, Hardcopy

Recent developments and experiences have proven the usefulness and potential of Unmanned Vehicles (UVs). Emerging technologies enable new missions, broadening the applicability of UVs from simple remote spies towards unmanned combat vehicles carrying lethal weapons. However, despite the emerging technology, unmanned does not implicate that there is no operator involved. Humans still excel in certain tasks, e.g. tasks requiring high flexibility or tasks that involve pattern perception, and decision making. An important subsystem in which the technology driven aspects and the human factors driven aspects of UVs meet is in the data-link between the remote vehicle and the operator. The human factors engineer wants to optimize operator performance, which may require a data-link with an extremely large capacity, while other design criteria typically limit the bandwidth (e.g. to lower costs, or because no more bandwidth is available in certain situations). This field of tension is the subject of the present paper. The paper describes two human factors approaches that may help to resolve this field of tension. The first approach is to reduce data-link requirements (without affecting operator performance) by presenting task-critical information only. Omitting information that is not needed by the operator to perform the task frees capacity. The second approach is to optimize performance by developing advanced interface designs which present task-critical information without additional claims on the data-link. An example will be given of both approaches.

Author

Human Factors Engineering; Tension; Operator Performance; Pilotless Aircraft

20000037831 Defence Evaluation Research Agency, Manpower Integration Dept., Farnborough, UK
An Evaluation of Input Devices and Menu Systems for Remote Workstations
White, J., Defence Evaluation Research Agency, UK; McCrerie, C., Defence Evaluation Research Agency, UK; Miles, C., Defence Evaluation Research Agency, UK; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B9-1 - B9-8; In English; See also 20000037804; Copyright Waived; Avail: CASI; A02, Hardcopy

It is likely that the future air fleet will include uninhabited air vehicles (UAVs) that can be controlled by an operator in a remote location. Such a system will require the operator to experience the same view as the onboard camera to maintain control and keep track of the uninhabited vehicle. It should be borne in mind that uninhabited vehicles are not likely to be continuously operational but deployed only when necessary. The interface must therefore be intuitive, as long periods of time could elapse between missions. The training needs of the operator should therefore be less intensive than those currently necessary for the manned aircraft fleet. As missions may employ a semi-autonomous mode of operation, there is a requirement for transparency between the system and the operator inputs. This paper reports an investigation of the utility of three Windows- driven menu systems and four input devices. Performance with a touchscreen, touchpad, keyboard and mouse was compared on a waypoint re-routing task. It was anticipated that the innovative touchscreen would enhance performance when compared to the more conventional input methods of keyboard or mouse. The literature suggested that performance with the touchpad would not be optimal. The experiment was run in three phases, each phase using a different menu structure. Pull-down menus, pop-up menus and horizontal menus were included. The results show that in this type of scenario, less emphasis should be placed on the menu system to be used than the input device, although pop-up menus may be less desirable. The mouse and the touchscreen provide performance advantages in comparison to the keyboard and the touchpad.
Derived from text
Workstations; Pilotless Aircraft; Control Systems Design; Computer Programs; Devices

20000037827 Tusas Aerospace Industries, Design and Development Dept., Ankara, Turkey
An Analysis on Operability of Tactical Unmanned Aerial Vehicle Systems over Turkish Territory
Ertem, Ozcan, Tusas Aerospace Industries, Turkey; Mandas, Gokhan, Tusas Aerospace Industries, Turkey; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B5-1 - B5-7; In English; See also 20000037804; No Copyright; Avail: CASI; A02, Hardcopy

The requirements for operational arena of Tactical Unmanned Aerial Vehicles (TUAV) are highly effected with the geographical and weather conditions. A TUAV requirement for a flat terrain with moderate weather over the year varies dramatically from a mountainous terrain with severe weather conditions. Availability of the infrastructure such as airfields, highways is another contributing factor towards the system requirements. Transportability brings another concern when TUAV system is to be deployed by existing aerial assets. This paper evaluates the conditions of Turkish territory and infrastructure; transportability/mobility and therefore tries to approach to the best set of requirements for a TUAV system, with a review of crew and ground vehicles that can operate in Turkish Armed Forces.
Author
Pilotless Aircraft; Turkey; Operational Problems; Geography; Armed Forces

20000037842 General Atomics Aeronautical Systems, Inc., San Diego, CA USA
US Predator Operations: Update
Porter, John C., General Atomics Aeronautical Systems, Inc., USA; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B24-1 - B24-5; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

The U.S. Predator unmanned aerial vehicle system produced by General Atomics Aeronautical Systems. Inc. has completed three extended operational deployments and has recently commenced a fourth deployment in support of United Nations and American operations in Bosnia-Herzegovina. The Predator system has also recently commenced a deployment to a site in Kuwait. Predator provides operational commanders and their intelligence staffs with valuable and timely live imagery and imagery derived intelligence, often not available from any other source. Through the conduct of these deployments, the operational concept to make best use of the real time reconnaissance capability of Predator has continued to evolve. This paper will provide an overview of the system and a description of the operations with a focus on the changes that have occurred since the original deployment in July 1995.
Derived from text
Deployment; Pilotless Aircraft; USA; Operations Research

20000037843 Bundesamt fuer Wehrtechnik und Beschaffung, Koblenz, Germany
Short Range Reconnaissance: The LUNA Experimental UAV Program
Sabarz, Werner, Bundesamt fuer Wehrtechnik und Beschaffung, Germany; Wernicke, Joachim, EMT Ingenieurgesellschaft Dip. Ing. Hartmut Euer m.b.H., Germany; Advances in Vehicle Systems Concepts and Integration; April 2000, pp. B25-1 - B25-5; In English; See also 20000037804; Copyright Waived; Avail: CASI; A01, Hardcopy

This paper reports on the background, the performance requirements, technical characteristics, special program features and lessons learned from the LUNA Experimental UAV Program. This program is being funded by the R&D Program of the Bundeswehr. This 18 month effort will be finalized by phase 2 field trials in may/june 1999. Main goals to be proven are, reconnaissance performance in an operational environment and easy handling i.e. mission planning, mission conduct and maintenance. The lessons learned from LUNA so far can be applied to other programs - already today, but also particularly in the future.

Derived from text

Pilotless Aircraft; Aerial Reconnaissance; Aircraft Performance

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics.

20000034261 Clarkson Univ., Dept. of Mechanical and Aeronautical Engineering, Potsdam, NY USA
Jet Mixing Enhancement by Feedback Control ***Final Report, 1 Jan. - 31 Dec. 1999***
Glauser, Mark, Clarkson Univ., USA; Taylor, Jeffrey, Clarkson Univ., USA; [1999]; 22p; In English
Contract(s)/Grant(s): NCC1-325; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this work has been to produce methodologies for high speed jet noise reduction based on natural mechanisms and enhanced feedback control to affect frequencies and structures in a prescribed manner. In this effort the two-point hot wire measurements obtained in the Langley jet facility by Ukeiley were used in conjuction with linear stochastic estimation (LSE) to implement the LSE component of the complementary technique. This method combines the Proper Orthogonal Decomposition (POD) and LSE to provide an experimental low dimensional time dependent description of the flow field. From such a description it should be possible to identify short time high strain rate events in the jet which contribute to the noise. The main task completed for this effort is summarized: LSE experiments were performed at the downstream locations where the two point hot wire measurements have been obtained by Ukeiley. These experiments involved sampling simultaneously hot wire signals from a relatively course spatial grid in gamma and theta. From this simultaneous data, coupled with the two-point measurements of Ukeiley via the LSE components of the complementary technique, an experimental low dimensional description of the jet at 4, 5, 6, 7 and 8 diameters downstream was obtained for Mach numbers of 0.3 and 0.6. We first present an overview of the theory involved. We finish up with a statement of the work performed and finally provide charts from a 1999 APS talk which summarizes the results.

Derived from text

Feedback Control; Jet Aircraft Noise; Jet Mixing Flow; Noise Reduction; Fluid Jets; Augmentation

20000038209 NASA Langley Research Center, Hampton, VA USA
Flight Test Measurements From The TU-144LL Structure/Cabin Noise Follow-On Experiment
Rizzi, Stephen A., NASA Langley Research Center, USA; Rackl, Robert G., Boeing Co., USA; Andrianov, Eduard V., ANTK Tupolev, Russia; February 2000; 108p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 537-06-37-20
Report No.(s): NASA/TM-2000-209859; L-17951; NAS 1.15:209859; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This follow-on flight experiment on the TU-144LL Supersonic Flying Laboratory, conducted during the period September 1998 to April 1999, was a continuation of previous Structure/Cabin Noise Experiment 2.1. Data was obtained over a wide range of altitudes and Mach numbers. Measured were: turbulent boundary layer pressure fluctuations on the fuselage over its length; structural response on skin panels using accelerometers; and flow direction over three windows using 'flow cones'. The effect of steps in the flow was also measured using two window blank pairs; each pair bridged by a plate which created small sharp forward and aft facing steps. The effect of transducer flushness with the exterior surface was also measured during flight. Height test points were chosen to cover much of the TU-144's flight envelope, as well as to obtain as large a unit Reynolds number range as possible at various Mach numbers: takeoff, subsonic, transonic, and supersonic cruise conditions up to Mach 2. Data on engine

runups and background noise were acquired on the ground. The data in the form of time histories of the acoustic signals, together with auxiliary data and basic MATLAB processing modules, are available on CD-R disks.
Author
Flight Tests; TU-144 Aircraft; Aircraft Noise; Acceleration Measurement; Aircraft Structures

20000038213 NASA Langley Research Center, Hampton, VA USA
Flight Test Measurements From The TU- 144LL Structure/Cabin Noise Experiment
Rizzi, Stephen A., NASA Langley Research Center, USA; Rackl, Robert G., Boeing Co., USA; Andrianov, Eduard V., ANTK Tupolev, Russia; 20000101; 206p; In English
Contract(s)/Grant(s): RTOP 537-06-37-20
Report No.(s): NASA/TM-2000-209858; NAS 1.15:209858; L-17950; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

During the period September 1997 to February 1998, the Tupolev 144 Supersonic Flyine Laboratory was used to obtain data for the purpose of enlarging the data base used by models for the prediction of cabin noise in supersonic passenger airplanes. Measured were: turbulent boundary layer pressure fluctuations on the fuselage in seven instrumented window blanks distributed over the length of the fuselage; structural response with accelerometers on skin panels close to those window blanks-, interior noise with microphones at the same fuselage bay stations as those window blanks. Flight test points were chosen to cover much of the TU- 144's flight envelope, as well as to obtain as large a unit Reynolds number range as possible at various Mach numbers: takeoff, landing, six subsonic cruise conditions, and eleven supersonic conditions up to Mach 2. Engine runups and reverberation times were measured with a stationary aircraft. The data in the form of time histories of the acoustic signals, together with auxiliary data and basic MATLAB processing modules, are available on CD-R disks.
Author
Flight Tests; Tupolev Aircraft; Aircraft Noise; Acceleration Measurement; Supersonic Aircraft; Aircraft Structures

20000039433 Virginia Polytechnic Inst. and State Univ., Dept. of Aerospace and Ocean Engineering, Blacksburg, VA USA
Turbulence Measurements and Computations for the Predication of Broadband Noise in High Bypass Ratio Fans ***Final Report, 1 Feb. 1996 - 31 Jan. 2000***
Devenport, William J., Virginia Polytechnic Inst. and State Univ., USA; Ragab, Saad A., Virginia Polytechnic Inst. and State Univ., USA; April 2000; 5p; In English
Contract(s)/Grant(s): NAG1-1801; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Work was performed under this grant with a view to providing the experimental and computational results needed to improve the prediction of broadband stator noise in large bypass ratio aircraft engines. The central hypothesis of our study was that a large fraction of this noise was generated by the fan tip leakage vortices. More specifically, that these vortices are a significant component of the fan wake turbulence and they contain turbulent eddies of a type that can produce significant broadband noise. to test this hypothesis we originally proposed experimental work and computations with the following objectives: (1) to build a large scale two-dimensional cascade with a tip gap and a stationary endwall that, as far as possible, simulates the fan tip geometry, (2) to build a moving endwall for use with the large scale cascade, (3) to measure, in detail, the turbulence structure and spectrum generated by the blade wake and tip leakage vortex, for both endwall configurations, (4) to use the CFD to compute the flow and turbulence distributions for both the experimental configurations and the ADP fan, (5) to provide the experimental and CFD results for the cascades and the physical understanding gained from their study as a basis for improving the broadband noise prediction method. In large part these objectives have been achieved. The most important achievements and findings of our experimental and computational efforts are summarized below. The bibliography at the end of this report includes a list of all publications produced to date under this project. Note that this list is necessarily incomplete the task of publication (particularly in journal papers) continues.
Derived from text
Aircraft Engines; Broadband; Bypass Ratio; Computational Fluid Dynamics; Noise Prediction; Turbulent Flow; Fan Blades; Cascade Wind Tunnels

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SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula.

20000039699 University of Southern Illinois, Carbondale, IL USA

An Evaluation of a Major Airline Flight Internship Program: Participant's Perceptions of Curricular Preparation for, and Components of, the Internship

Ruiz, Jose R., University of Southern Illinois, USA; NewMyer, David A., University of Southern Illinois, USA; Worrells, D. Scott, University of Southern Illinois, USA; Collegiate Aviation Review; October 1999; Volume 17, No. 1, pp. 74-94; In English; See also 20000039693; Copyright; Avail: Issuing Activity

This article presents the results of a follow-up survey administered to 110 former university interns who served a semester-long flight operations internship at United Airlines. The intent of the survey was to obtain the participant's opinions concerning their academic preparation for the internship experience, as well as their overall assessment of the internship experience itself. of the 78 respondents, 75.7% indicated that their university aviation curriculum had prepared them "very well" or "well" for the internship. Further, 80.7% of all respondents indicated that the semester-long internship had a "great impact" or "significant impact" in helping them achieve their career goals. Also, 96.2% of all respondents said that they would recommend a United Airlines internship to students seeking an aviation career.

Author

Education; Surveys; Flight Operations; Commercial Aircraft; Airline Operations

20000037798 NASA Dryden Flight Research Center, Edwards, CA USA

50 Years of Flight Research: An Annotated Bibliography of Technical Publications of NASA Dryden Flight Research Center, *1946-1996*

Fisher, David F., NASA Dryden Flight Research Center, USA; Binkley, Robert L., NASA Dryden Flight Research Center, USA; March 2000; In English; CD-ROM contains full text document in pdf formation of the bibliography, an audio and text of the welcome and introduction, plus selected video clips from the NASA Dryden Movie Gallery

Contract(s)/Grant(s): RTOP 953-36-00

Report No.(s): NASA/TP-1999-206568; NAS 1.60:206568; H-2346; No Copyright; Avail: CASI; C01, CD-ROM

Titles, authors, report numbers, and abstracts are given for more than 2200 unclassified and unrestricted technical reports and papers published from September 1946 to December 1996 by NASA Dryden Flight Research Center and its predecessor organizations. These technical reports and papers describe and give the results of 50 years of flight research performed by the NACA and NASA, from the X-1 and other early X-airplanes, to the X-15, Space Shuttle, X-29 Forward Swept Wing, and X-31 aircraft. Some of the other research airplanes tested were the D-558, phase 1 and 2; M-2, HL-10 and X-24 lifting bodies; Digital Fly-By-Wire and Supercritical Wing F-8; XB-70; YF-12; AFTI F-111 TACT and MAW; F-15 HiDEC; F-18 High Alpha Research Vehicle, and F-18 Systems Research Aircraft. The citations of reports and papers are listed in chronological order, with author and aircraft indices. In addition, in the appendices, citations of 233 contractor reports, more than 200 UCLA Flight System Research Center reports and 25 video tapes are included.

Author

Abstracts; F-111 Aircraft; F-15 Aircraft; HL-10 Reentry Vehicle; X-29 Aircraft; X-31 Aircraft; Yf-12 Aircraft

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Report Documentation Page

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