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AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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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
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MAY 2, 1997

01 AERONAUTICS

19970012720 Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA

The 'Hybrid' of Taiwan's Airspace: Close Up on Taiwan's IDF Fighter,

Daoming, S. A.; Hangkong Zhishi (Aerospace Knowledge); Apr. 04, 1996, No. 2, pp. 40-45; In English
Report No.(s): AD-A309923; NAIC-ID(RS)T-0093-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On the basis of introductions in the recent Taiwan press, the 8th flight squadron of the Taizhong Qingguangang KMT air force base held a delivery ceremony on 28 December 1994 for the first batch of 20 IDF fighters. Beginning New Year's Day 1995, they begin formal utilization to carry out combat readiness missions. As far as the Taiwan air force IDF, that is, in English--Indigenous Defense Fighter, as it is abbreviated--is concerned, it was developed by the Taiwan Zhongshan Science Institute's aviation industry development center. It is a type of supersonic multiple use fighter. The prototype model has already been named the 'Jingguo'. The local press has called it one of the Taiwan air forces four types of second generation combat aircraft. The other three types are the F-16A/BMLU (a middle life improved model), the Mirage 2000-5 fighter, and the E2-T aerial early warning aircraft. Based on the analyses of relevant personages, it goes without saying that IDF fighters--from exterior shape to internal equipment--have, in all cases, integrated and applied good amounts of designs and equipment associated with other fighters and can be said to be a 'hybrid'. Its appearance gave rise to interest from a number of readers. For this reason, we will here make a preliminary introduction with regard to such things as its development background and design requirements, development processes and applied technologies, primary characteristics, as well as future utilization, and so on, in order to provide a reference.

DTIC

Fighter Aircraft; Supersonic Aircraft; F-16 Aircraft; E-2 Aircraft; Aircraft Design; Aircraft Performance

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

19970012496 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA USA

Experimental and Computational Investigation of Lift-Enhancing Tabs on a Multi-Element Airfoil

Ashby, Dale L., National Aeronautics and Space Administration. Ames Research Center, USA; Dec. 1996; 158p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 505-59-53

Report No.(s): NASA-TM-110432; NAS 1.15:110432; A-975624; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

An experimental and computational investigation of the effect of lift-enhancing tabs on a two-element airfoil has been conducted. The objective of the study was to develop an understanding of the flow physics associated with lift-enhancing tabs on a multi-element airfoil. An NACA 63(2)-215 ModB airfoil with a 30% chord fowler flap was tested in the NASA Ames 7- by 10-Foot Wind Tunnel. Lift-enhancing tabs of various heights were tested on both the main element and the flap for a variety of flap riggings. A combination of tabs located at the main element and flap trailing edges increased the airfoil lift coefficient by 11% relative to the highest lift coefficient achieved by any baseline configuration at an angle of attack of 0 deg, and $C_{(sub)1max}$ was increased by 3%. Computations of the flow over the two-element airfoil were performed using the two-dimensional incompressible Navier-Stokes code INS2D-UP. The computed results predicted all of the trends observed in the experimental data quite well. In addition, a simple analytic model based on potential flow was developed to provide a more detailed understanding of how lift-enhancing tabs work. The tabs were modeled by a point vortex at the air-foil or flap trailing edge. Sensitivity relationships were

derived which provide a mathematical basis for explaining the effects of lift-enhancing tabs on a multi-element airfoil. Results of the modeling effort indicate that the dominant effects of the tabs on the pressure distribution of each element of the airfoil can be captured with a potential flow model for cases with no flow separation.

Author

Lift; Airfoils; Tabs (Control Surfaces); Wind Tunnel Tests; Angle of Attack; Navier-Stokes Equation; Computational Fluid Dynamics; Grid Generation (Mathematics)

19970012662 NASA Lewis Research Center, Cleveland, OH USA

Determination of Shed Ice Particle Size Using High Speed Digital Imaging

Broughton, Howard, Cortez 3 Services Corp., USA; Owens, Jay, Cortez 3 Services Corp., USA; Sims, James J., Cortez 3 Services Corp., USA; Bond, Thomas H., NASA Lewis Research Center, USA; Feb. 1997; 12p; In English; AeroSense '96, 8-12 Apr. 1996, Orlando, FL, USA; Sponsored by International Society for Optical Engineering, USA

Contract(s)/Grant(s): NAS3-24816; RTOP 505-68-10

Report No.(s): NASA-TM-107406; NAS 1.15:107406; E-10618; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A full scale model of an aircraft engine inlet was tested at NASA Lewis Research Center's Icing Research Tunnel. Simulated natural ice sheds from the engine inlet lip were studied using high speed digital image acquisition and image analysis. Strategic camera placement integrated at the model design phase allowed the study of ice accretion on the inlet lip and the resulting shed ice particles at the aerodynamic interface plane at the rear of the inlet prior to engine ingestion. The resulting digital images were analyzed using commercial and proprietary software to determine the size of the ice particles that could potentially be ingested by the engine during a natural shedding event. A methodology was developed to calibrate the imaging system and insure consistent and accurate measurements of the ice particles for a wide range of icing conditions.

Author

Aircraft Icing; Ice Formation; Engine Inlets; Image Analysis

19970012750 Old Dominion Univ., Dept. of Mechanical Engineering, Norfolk, VA USA

Sensitivity Analysis and Optimization of Aerodynamic Configurations with Blend Surfaces *Final Report, period ending 31 Dec. 1996*

Thomas, A. M., Old Dominion Univ., USA; Tiwari, S. N., Old Dominion Univ., USA; Aug. 1997; 138p; In English

Contract(s)/Grant(s): NCC1-68

Report No.(s): NASA-CR-203841; NAS 1.26:203841; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A novel (geometrical) parametrization procedure using solutions to a suitably chosen fourth order partial differential equation is used to define a class of airplane configurations. Inclusive in this definition are surface grids, volume grids, and grid sensitivity. The general airplane configuration has wing, fuselage, vertical tail and horizontal tail. The design variables are incorporated into the boundary conditions, and the solution is expressed as a Fourier series. The fuselage has circular cross section, and the radius is an algebraic function of four design parameters and an independent computational variable. Volume grids are obtained through an application of the Control Point Form method. A graphic interface software is developed which dynamically changes the surface of the airplane configuration with the change in input design variable. The software is made user friendly and is targeted towards the initial conceptual development of any aerodynamic configurations. Grid sensitivity with respect to surface design parameters and aerodynamic sensitivity coefficients based on potential flow is obtained using an Automatic Differentiation pre-compiler software tool ADIFOR. Aerodynamic shape optimization of the complete aircraft with twenty four design variables is performed. Unstructured and structured volume grids and Euler solutions are obtained with standard software to demonstrate the feasibility of the new surface definition.

Author

Design Analysis; Aerodynamic Configurations; Unstructured Grids (Mathematics); Sensitivity; Computer Systems Programs

19970012888 NASA Langley Research Center, Hampton, VA USA

Determining the Accuracy of Aerodynamic Model Parameters Estimated from Flight Test Data

Morelli, Eugene A., Lockheed Engineering and Sciences Co., USA; Klein, Vladislav, George Washington Univ., USA; Aug. 09, 1995; 14p; In English; Atmospheric Flight Mechanics Conference, 7-9 Aug. 1995, Baltimore, MD, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAS1-19000; NCC1-29

Report No.(s): NASA-CR-203351; NAS 1.26:203351; AIAA Paper 95-3499; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An important part of building mathematical models based on measured data is calculating the accuracy associated with statistical estimates of the model parameters. Indeed, without some idea of this accuracy, the parameter estimates themselves have limited value. In this work, an expression for computing quantitatively correct parameter accuracy measures for maximum likelihood parameter estimates with colored residuals is developed and validated. This result is important because experience in analyzing flight test data reveals that the output residuals from maximum likelihood estimation are almost always colored. The calculations involved can be appended to conventional maximum likelihood estimation algorithms. Monte Carlo simulation runs were used to show that parameter accuracy measures from the new technique accurately reflect the quality of the parameter estimates from maximum likelihood estimation without the need for correction factors or frequency domain analysis of the output residuals. The technique was applied to flight test data from repeated maneuvers flown on the F-18 High Alpha Research Vehicle (HARV). As in the simulated cases, parameter accuracy measures from the new technique were in agreement with the scatter in the parameter estimates from repeated maneuvers, while conventional parameter accuracy measures were optimistic.

Author

Aerodynamic Characteristics; Research Vehicles; Maximum Likelihood Estimates; Monte Carlo Method; Aerodynamic Coefficients

19970012907 Virginia Polytechnic Inst. and State Univ., Dept. of Aerospace and Ocean Engineering, Blacksburg, VA USA

The Spectral and Statistical Properties of Turbulence Generated by a Vortex/Blade-Tip Interaction Final Report

Devenport, William J., Virginia Polytechnic Inst. and State Univ., USA; Wittmer, Kenneth S., Virginia Polytechnic Inst. and State Univ., USA; Wenger, Christian W., Virginia Polytechnic Inst. and State Univ., USA; Jan. 18, 1997; 108p; In English; original contains color illustrations

Contract(s)/Grant(s): NAG1-1539

Report No.(s): NASA-CR-203875; NAS 1.26:203875; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The perpendicular interaction of a streamwise vortex with the tip of a lifting blade was studied in incompressible flow to provide information useful to the accurate prediction of helicopter rotor noise and the understanding of vortex dominated turbulent flows. The vortex passed 0.3 chord lengths to the suction side of the blade tip, providing a weak interaction. Single and two-point turbulence measurements were made using sub-miniature four sensor hot-wire probes 15 chord lengths downstream of the blade trailing edge; revealing the mean velocity and Reynolds stress tensor distributions of the turbulence, as well as its spanwise length scales as a function of frequency. The single point measurements show the flow downstream of the blade to be dominated by the interaction of the original tip vortex and the vortex shed by the blade. These vortices rotate about each other under their mutual induction, winding up the turbulent wakes of the blades. This interaction between the vortices appears to be the source of new turbulence in their cores and in the region between them. This turbulence appears to be responsible for some decay in the core of the original vortex, not seen when the blade is removed. The region between the vortices is not only a region of comparatively large stresses, but also one of intense turbulence production. Velocity autospectra measured near its center suggests the presence quasi-periodic large eddies with axes roughly parallel to a line joining the vortex cores. Detailed two-point measurements were made on a series of spanwise cuts through the flow so as to reveal the turbulence scales as they would be seen along the span of an intersecting airfoil. The measurements were made over a range of probe separations that enabled them to be analyzed not only in terms of coherence and phase spectra but also in terms of wave-number frequency (κ - ω) spectra, computed by transforming the measured cross-spectra with respect to the spanwise separation of the probes. These data clearly show the influence of the coherent eddies in the spiral wake and the turbulent region between the cores. These eddies produce distinct peaks in the upwash velocity κ - ω spectra, and strong anisotropy manifested both in the decay of the κ - ω spectrum at larger wave-numbers and in differences between the κ - ω spectra of different components. None of these features are represented in the von Karman spectrum for isotropic turbulence that is often used in broadband noise computations. Wave-number frequency spectra measured in the cores appear to show some evidence that the turbulence outside sets tip core waves, as has previously been hypothesized. These spectra also provide for the first time a truly objective method for distinguishing velocity fluctuations produced by core wandering from other motions.

Author

Blade-Vortex Interaction; Blade Tips; Aerodynamic Noise; Incompressible Flow; Interactional Aerodynamics; Helicopters; Blade Slap Noise; Rotary Wings; Aeroacoustics; Noise Prediction; Statistical Distributions; Turbulent Wakes

19970012937 Florida Agricultural and Mechanical Univ., Dept. of Mechanical Engineering, Tallahassee, FL USA

Thrust-Induced Effects on a Pitching-Up Delta Wing Flow Field Final Report, 1 Oct. 1992 - 30 Sep. 1995

Lourenco, L., Florida Agricultural and Mechanical Univ., USA; Shih, C., Florida Agricultural and Mechanical Univ., USA; van-Dommelen, L., Florida Agricultural and Mechanical Univ., USA; Krothopaili, A., Florida Agricultural and Mechanical Univ., USA; May 23, 1996; 41p; In English

Contract(s)/Grant(s): F49620-93-1-0013

Report No.(s): AD-A310244; FMRL-TR96-1; AFOSR-TR-96-0260; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experimental study of thrust-induced effects on a pitching-up 60 deg. delta wing was conducted. A downward vectored trailing edge jet has a significant effect in delaying the vortex breakdown. Strong asymmetric vortex bursting can be induced using asymmetric jet control. Detailed PIV measurements are taken to characterize the vortex flow field with and without jet control. A parallel experiment of the vortex flow over a 75 deg. delta wing is made to further the understanding of the vortex breakdown phenomenon. Related investigations of dynamic stall phenomena over a pitching airfoil are also summarized. Concurrently, considerable efforts have been made in the development of an innovative computational scheme. A grid-free vortex distribution technique is introduced to simulate the diffusion process of a vortex-dominated flow. This allows the ready extension of the 2-D vortex method to be used in a 3-D flow field such as a pitching-up delta wing configuration. Several computational examples will be discussed.

DTIC

Delta Wings; Trailing Edges; Vortex Breakdown; Flow Distribution; Jet Control; Diffusion; Aerodynamic Stalling; Aerodynamic Configurations

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

19970012493 Federal Aviation Administration, Atlantic City, NJ USA

User Preferred Fire Extinguishing Agents for Engine and Auxiliary Power Unit (APU) Compartments *Final Report*

Mehta, Harendra K., Federal Aviation Administration, USA; Benedictus, Jelle, Federal Aviation Administration, USA; Blackburn, John, Federal Aviation Administration, USA; Dunker, Bernd, Federal Aviation Administration, USA; Grabow, Thomas, Federal Aviation Administration, USA; Hill, Richard G., Editor, Federal Aviation Administration, USA; Aug. 1996; 15p; In English

Report No.(s): AD-A315998; DOT/FAA/AR-96/80; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of the 'User Preferred Agent for Engine and Auxiliary Power Unit (APU) Compartment Fire Extinguishing System' survey sent to airlines and airframe manufacturers are compiled in this report.

DTIC

Fire Extinguishers; Commercial Aircraft; Fire Control

19970012924 Federal Aviation Administration, Atlantic City, NJ USA

User Preferred Fire Suppression Agent for Lavatory Trash Container Fire Protection *Final Report*

Grimstad, Greg, Federal Aviation Administration, USA; Apr. 1996; 18p; In English

Report No.(s): AD-A310105; DOT/FAA/AR-96/8; AAR-422; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of the survey sent to airlines and airframe manufacturers on lavatory trash receptacle fire suppression agent preference are compiled in this report. Tests are recommended to define the quantity of water required for fire extinguishment.

DTIC

Waste Disposal; Fire Prevention; Fire Extinguishers

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

19970012466 Boeing Commercial Airplane Co., Seattle, WA USA

Conflict Probe Concepts Analysis in Support of Free Flight

Warren, Anthony W., Boeing Commercial Airplane Co., USA; Schwab, Robert W., Boeing Commercial Airplane Co., USA; Geels, Timothy J., Boeing Commercial Airplane Co., USA; Shakarian, Arek, Boeing Commercial Airplane Co., USA; Jan. 1997; 148p; In English

Contract(s)/Grant(s): NAS1-20267; RTOP 538-04-14-01

Report No.(s): NASA-CR-201623; NAS 1.26:201623; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This study develops an operational concept and requirements for en route Free Flight using a simulation of the Cleveland Air Route Traffic Control Center, and develops requirements for an automated conflict probe for use in the Air Traffic Control (ATC) Centers. In this paper, we present the results of simulation studies and summarize implementation concepts and infrastructure requirements to transition from the current air traffic control system to mature Free Flight. The transition path to Free Flight envisioned in this paper assumes an orderly development of communications, navigation, and surveillance (CNS) technologies based on results from our simulation studies. The main purpose of this study is to provide an overall context and methodology for evaluating airborne and ground-based requirements for cooperative development of the future ATC system.

Author

Free Flight; Automated En Route ATC; Flight Control; Flight Management Systems

19970012685 Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA

Measurement of Group Delay at ns Level Precision in Exterior Ballistic Measurements

Bixian, Luo; Jian, Luo; Cama, China Astronautics and Missilery Abstracts; May 1996; Volume 2, No. 3, pp. 60-70; In English Report No.(s): AD-A310013; NAIC-ID(RS)T-0083-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The importance of making use of GPS measurement systems to carry out external measurement track determinations is briefly described. Test measurement levels which have been reached inside and outside China are elucidated as well as problems which exist. Pulse modulation and demodulation technologies to effectively resolve test measurement accuracies are put forward. Opting for the use of time interval measurements in place of phase measurements, it is possible to effectively make systems with the same frequencies and different frequencies attain ns level group time delay measurement precisions and it is possible to help in resolving GPS system zero correction difficulties.

DTIC

Time Lag; Frequency Modulation; Global Positioning System; Pulse Modulation; Frequency Shift Keying; Tracking (Position)

19970012877 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Fast Positioning Algorithm of Carrier Phase DGPS,

Li, Yonghong; Zhang, Wendong; Cama, China Astronautics and Missilery Abstracts; Apr. 02, 1996; Vol. 2, Nr. 3, pp. 21-26; Transl. into English of Cama, China Astronautics and Missilery Abstracts (China) v2 n3 p21-26 1995; In English Report No.(s): AD-A310073; NAIC-ID(RS)T-0085-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

DGPS system principles are introduced. Analyses and discussions are made of the major residual errors in carrier wave phase DGPS positioning and influences under low dynamic states. A type of algorithm is put forward which in carrier wave phase DGPS receivers does not require solving for integral cycle ambiguity but calculates positioning rapidly.

DTIC

Global Positioning System; Navigation Satellites; Algorithms

19970012942 Federal Aviation Administration, Atlantic City, NJ USA

National Simulation Capability (NSC) Program Reduced Vertical Separation Minima (RVSM), Phase 2 Final Report, Sep. 94

Seeger, Diana, Federal Aviation Administration, USA; Kopardekar, Parimal, Federal Aviation Administration, USA; Mar. 1996; 96p; In English

Report No.(s): AD-A310139; DOT/FAA/CT-TN96-6; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Reduced Vertical Separation Minima (RVSM) experiment resulted from the conclusion reached by the North Atlantic System Planning Group to carry out studies aimed at achieving early implementation of RVSM in the North Atlantic (NAT) Region. RVSM is an approved International Civil Aviation Organization concept to reduce aircraft vertical separation from the Conventional Vertical Separation Minima (CVSM) of 2000 ft to 1000 ft, between flight levels 290 and 410, within a designated portion of the NAT Region. RVSM Phase 2 studies were conducted in September 1994 at the New York Air Route Traffic Control Center (ARTCC) Dynamic Simulation Laboratory. Phase 2 investigated workload effects and the feasibility of transitioning aircraft to and from CVSM altitudes and from and to RVSM altitudes within radar sectors R65 and R86 under various traffic conditions. The study was also aimed at determining whether RVSM should be employed exclusively in sector R65 or in both sectors R65 and R86. RVSM was instrumental in reducing controller workload when a majority of the traffic traveled eastbound. A decrease in workload was not observed while utilizing RVSM for westbound traffic. Post-mn discussions and questionnaires also revealed some concerns over the implementation of RVSM. Frequently reported concerns were: separating RVSM-equipped and non-RVSM-equipped aircraft, difficulty maintaining data block separation during RVSM, and the possibility of aircraft flying into

CVSM airspace at an RVSM altitude due to a temporary lack of communication. Simulation results indicated that it is feasible to use domestic oceanic sectors R65 and R86 as RVSM transition airspace’.

DTIC

Air Traffic Control; Workloads (Psychophysiology); Controllers; Civil Aviation; Airspace

19970012956 Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA

Applications of GPS in Airborne Electronic Countermeasure Reconnaissance

Zhigang, Zhang; CAMA: China Astronautics and Missilery Abstracts; Apr. 1996; Volume 2, No. 3, pp. 39-43; In English Report No.(s): AD-A310003; NAIC-ID(RS)T-0082-96; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

When implementing electronic counter reconnaissance or other electronic countermeasure missions on moving platforms, operating personnel working on the platforms must grasp in real time the exact position of the platform itself. In command posts or control centers, there is a need to understand, in real time, the direction of platform movements. When implementing the positioning of emitting sources, precise platform locations are even more indispensable. In the past, on aircraft, reliance was put on inertial navigation systems and aviation instruments to provide data and, after processing, precise positions. The limitations associated with making use of this type of method are relatively large. precisions are not high. Real time characteristics are relatively bad. Opting for the use of digital transmission navigation display systems based on global satellite navigation systems avoids the shortcomings discussed above. Moreover, it is possible to conveniently generalize application to various types of mobile platforms.

DTIC

Global Positioning System; Electronic Countermeasures; Aerial Reconnaissance; Satellite Navigation Systems; Command and Control; Digital Navigation; Inertial Navigation; Navigation Aids; Real Time Operation; Artificial Satellites

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19970012097 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA USA

Finite Element Aircraft Simulation of Turbulence

McFarland, R. E., National Aeronautics and Space Administration. Ames Research Center, USA; Feb. 1997; 48p; In English Contract(s)/Grant(s): RTOP 505-64-84

Report No.(s): NASA-TM-110437; NAS 1.15:110437; A-975955; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A turbulence model has been developed for realtime aircraft simulation that accommodates stochastic turbulence and distributed discrete gusts as a function of the terrain. This model is applicable to conventional aircraft, V/STOL aircraft, and disc rotor model helicopter simulations. Vehicle angular activity in response to turbulence is computed from geometrical and temporal relationships rather than by using the conventional continuum approximations that assume uniform gust immersion and low frequency responses. by using techniques similar to those recently developed for blade-element rotor models, the angular-rate filters of conventional turbulence models are not required. The model produces rotational rates as well as air mass translational velocities in response to both stochastic and deterministic disturbances, where the discrete gusts and turbulence magnitudes may be correlated with significant terrain features or ship models. Assuming isotropy, a two-dimensional vertical turbulence field is created. A novel Gaussian interpolation technique is used to distribute vertical turbulence on the wing span or lateral rotor disc, and this distribution is used to compute roll responses. Air mass velocities are applied at significant centers of pressure in the computation of the aircraft’s pitch and roll responses.

Author

Turbulence Models; Stochastic Processes; Gusts; Roll; Pitching Moments; Turbulence Effects; Finite Element Method

19970012143 Defence Science and Technology Organisation, Canberra, Australia

Installation-Induced Stress in a Black Hawk Inner Fuselage Panel

Knight, C. G., Defence Science and Technology Organisation, Australia; May 1996; 63p; In English Report No.(s): AD-A315874; DODA-AR-009-682; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Some S-70A-9 Black Hawk helicopters of the Australian Army fleet are experiencing cracking on the starboard side internal fuselage skin panel. The panel is installed onto curved frames which causes installation-induced stresses in the panel. The PAFEC Finite Element package has been used to model the panel and to indicate the stresses and stress concentrations within it induced

by the installation process. The methods used for constructing and verifying the model are presented. The maximum stresses and stress concentration factors produced by the model are discussed.

DTIC

Helicopters; Fuselages; Finite Element Method; Stress Concentration; Stress Distribution

19970012719 Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA

'Lieh Ying'-The Chinese-Built LY-60 Surface-to-Air Missile Weapon System

Hua, An; Unknown; May 1996; 14p; In English

Report No.(s): AD-A310011; NAIC-ID(RS)T-0253-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

At the weapons exhibition held in Greece in October, 1994, the China Precision Machinery Import-Export Corporation (CPMIEC) put the Chinese-built 'Lieh Ying' ('Falcon') LY-60 surface-to-air missile weapon system on display for the first time. This indicated that this system has become a new member of China's series of anti-aircraft missiles, and will compete in the international marketplace.

DTIC

Surface to Air Missiles; Anti-aircraft Missiles; Missile Systems; Target Acquisition

19970012895 NASA Langley Research Center, Hampton, VA USA

Overview of HATP Experimental Aerodynamics Data for the Baseline F/A-18 Configuration

Hall, Robert M., NASA Langley Research Center, USA; Murri, Daniel G., NASA Langley Research Center, USA; Erickson, Gary E., NASA Langley Research Center, USA; Fisher, David F., NASA Dryden Flight Research Center, USA; Banks, Daniel W., NASA Dryden Flight Research Center, USA; Lanser, Wendy, R., NASA Ames Research Center, USA; 1996; 52p; In English; High-Angle-of-Attack Technology, 17-19 Sep. 1996, Hampton, VA, USA

Report No.(s): NASA-TM-112360; NAS 1.15:112360; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Determining the baseline aerodynamics of the F/A-18 was one of the major objectives of the High-Angle-of-Attack Technology Program (HATP). This paper will review the key data bases that have contributed to our knowledge of the baseline aerodynamics and the improvements in test techniques that have resulted from the experimental program. Photographs are given highlighting the forebody and leading-edge-extension (LEX) vortices. Other data representing the impact of Mach and Reynolds numbers on the forebody and LEX vortices will also be detailed. The level of agreement between different tunnels and between tunnels and flight will be illustrated using pressures, forces, and moments measured on a 0.06-scale model tested in the Langley 7- by 10-Foot High Speed Tunnel, a 0.16-scale model in the Langley 30- by 60-Foot Tunnel, a full-scale vehicle in the Ames 80- by 120-Foot Wind Tunnel, and the flight F/A-18 High Alpha Research Vehicle (HARV). Next, creative use of wind tunnel resources that accelerated the validation of the computational fluid dynamics (CFD) codes will be described. Lastly, lessons learned, deliverables, and program conclusions are presented.

Author

Vortices; Reynolds Number; Mach Number; Angle of Attack; F-18 Aircraft; Wind Tunnel Tests; Flight Tests; Flow Visualization; Aerodynamics

19970012917 NASA Langley Research Center, Hampton, VA USA

Unsteady Velocity Measurements Taken Behind a Model Helicopter Rotor Hub in Forward Flight

Berry, John D., Army Aviation Materiel Command, USA; Mar. 1997; 248p; In English

Contract(s)/Grant(s): RTOP 505-59-36-01

Report No.(s): NASA-TM-4738; NAS 1.15:4738; L-17524; ATCOM-TR-97-A-001; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Drag caused by separated flow behind the hub of a helicopter has an adverse effect on aerodynamic performance of the aircraft. To determine the effect of separated flow on a configuration used extensively for helicopter aerodynamic investigations, an experiment was conducted using a laser velocimeter to measure velocities in the wake of a model helicopter hub operating at Mach-scaled conditions in forward flight. Velocity measurements were taken using a laser velocimeter with components in the vertical and downstream directions. Measurements were taken at 13 stations downstream from the rotor hub. At each station, measurements were taken in both a horizontal and vertical row of locations. These measurements were analyzed for harmonic content based on the rotor period of revolution. After accounting for these periodic velocities, the remaining unsteady velocities were treated as turbulence. Turbulence intensity distributions are presented. Average turbulent intensities ranged from approximately

2 percent of free stream to over 15 percent of free stream at specific locations and azimuths. The maximum average value of turbulence was located near the rear-facing region of the fuselage.

Author

Velocity Measurement; Horizontal Flight; Separated Flow; Helicopters; Turbulence Effects; Velocity Distribution; Wind Tunnel Tests; Aerodynamic Configurations; Unsteady Flow

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.

19970012316 Naval Postgraduate School, Monterey, CA USA

A Comparative Study into the Coking Resistivity of Swirlplates with Various Surface Finishes

Williamson, Stephen Frederick, Naval Postgraduate School, USA; Jun. 1996; 140p; In English

Report No.(s): AD-A316033; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Gas turbine nozzle swirlplates used in the T56-A-427 engines of the E-2C Hawkeye aircraft were tested for their resistivity to fuel deposit formation, or 'coking'. The coking occurred after the engines were shut down due to the fuel trapped in the line and temperature ranges present at the nozzle tip. As the coke built up, the holes in the swirlplate clogged and the aircraft required intensive servicing. The search for alternative solutions led to the possibility of using swirlplates that had been polished or coated in an attempt to reduce the coking rates. Several swirlplates surface finishes were investigated.

DTIC

E-2 Aircraft; Gas Turbines; Pipe Nozzles; Aircraft Engines; Surface Finishing; High Temperature; Jet Engine Fuels; Coke; Coatings

19970012654 NASA Dryden Flight Research Center, Edwards, CA USA

An Inlet Distortion Assessment During Aircraft Departures at High Angle of Attack for an F/A-18A Aircraft

Steenken, William G., General Electric Co., USA; Williams, John G., General Electric Co., USA; Yuhas, Andrew J., AS&M, Inc., USA; Walsh, Kevin R., NASA Dryden Flight Research Center, USA; Mar. 1997; 34p; In English; High-Angle-of-Attack Technology, 17-19 Sep. 1996, Hampton, VA, USA; Sponsored by NASA Langley Research Center, USA

Contract(s)/Grant(s): RTOP 505-68-30

Report No.(s): NASA-TM-104328; NAS 1.15:104328; H-2162; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The F404-GE-400-powered F/A-18A High Alpha Research Vehicle (HARV) was used to examine the quality of inlet airflow during departed flight maneuvers, that is, during flight outside the normal maneuvering envelope where control surfaces have little or no effectiveness. Six nose-left and six nose-right departures were initiated at Mach numbers between 0.3 and 0.4 at an altitude of 35 kft. The entry yaw rates were approximately 40 to 90 deg/sec. Engine surges were encountered during three of the nose-left and one of the nose-right departures. Time-variant inlet-total-pressure distortion levels at the engine face did not significantly exceed those at maximum angle-of-attack and sideslip maneuvers during controlled flight. Surges caused by inlet distortion levels resulted from a combination of high levels of inlet distortion and rapid changes in aircraft position. These rapid changes indicate a combination of engine support and gyroscopic loads being applied to the engine structure that impact the aerodynamic stability of the compressor through changes in the rotor-to-case clearances. This document presents the slides from an oral presentation.

Author

Aircraft Maneuvers; Research Vehicles; Air Flow; Inlet Flow; Flow Distortion; Aerodynamic Stability; Angle of Attack; Aircraft Engines; Subsonic Speed

19970012744 Naval Postgraduate School, Dept. of Mechanical Engineering, Monterey, CA USA

Design and Method for the Evaluation of the Coking Resistance of Swirl Plates of the E-2C Aircraft Fuel Nozzles

Vassiloyanakopoulos, Vassilios P., Naval Postgraduate School, USA; Mar. 1996; 123p; In English

Report No.(s): AD-A310082; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The extensive coking observed on the swirl plates of the fuel nozzles of the E-2C HAWKEYE aircraft is the initiative of this investigation. A testing rig reproducing the shut down procedure of the engine was designed and a method for the evaluation of the resistance in coking for different types of swirl plates is presented. The method is based on measurements of weight increase and holes closure, and on microscopic examination. It can be applied to the evaluation of any suggested modification of swirl plates in the future and provides the NAVY with a reliable easy to use and modify experimental set-up able to produce comparative

data. Results for two different types of swirl plates with different surface finish are presented, together with conclusions and comments arising from the experimental results and the design process. Recommendations for future search objectives to the problem are also presented

DTIC

E-2 Aircraft; Aircraft Fuels

19970012902 Hampton Univ., VA USA

Start Up Research Effort in Fluid Mechanics. Advanced Methods for Acoustic and Thrust Benefits for Aircraft Engine Nozzle *Progress Report, 1 Jun. 1996 - 28 Feb. 1997*

White, Samuel G., Hampton Univ., USA; Gilinsky, Mikhail M., Hampton Univ., USA; Mar. 1997; 11p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG1-1835; HU Proj. 1

Report No.(s): NASA-CR-203965; NAS 1.26:203965; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In accordance with the project plan for the report period in the proposal titled above, HU and FML teams investigated two sets of concepts for reduction of noise and improvement in efficiency for jet exhaust nozzles of aircraft engines and screws for mixers, fans, propellers and boats. The main achievements in the report period are: (a) Publication of the paper in the AIAA Journal, which described our concepts and some results. (b) The Award in the Civil Research and Development Foundation (CRDF) competition. This 2 year grant for Hampton University (HU) and Central AeroHydrodynamic Institute (TSAGI, Moscow, Russia) supports the research implementation under the current NASA FAR grant. (c) Selection for funding by NASA HQ review panel of the Partnership Awards Concept Paper. This two year grant also will support our current FAR grant. (d) Publication of a Mobius Strip concept in NASA Technical Briefs, June, 1996, and a great interest of many industrial companies in this invention. Successful experimental results with the Mobius shaped screw for mixers, which save more than 30% of the electric power by comparison with the standard screws. Creation of the scientific-popular video-film which can be used for commercial and educational purposes. (e) Organization work, joint meetings and discussions of the NASA LARC JNL Team and HU professors and administration for the solution of actual problems and effective work of the Fluid Mechanics Laboratory at Hampton University. In this report the main designs are enumerated. It also contains for both concept sets: (1) the statement of the problem for each design, some results, publications, inventions, patents, our vision for continuation of this research, and (2) present and expected problems in the future.

Derived from text

Noise Reduction; Effectiveness; Exhaust Nozzles; Jet Exhaust; Screws

19970012908 NASA Lewis Research Center, Cleveland, OH USA

An Experimental Study of the Effect of Wake Passing on Turbine Blade Film Cooling

Heidmann, James D., NASA Lewis Research Center, USA; Lucci, Barbara L., NASA Lewis Research Center, USA; Reshotko, Eli, Case Western Reserve Univ., USA; Mar. 1997; 12p; In English; 42nd; Turbo Expo, 2-5 Jun. 1997, Orlando, FL, USA; Sponsored by American Society of Mechanical Engineers, USA

Contract(s)/Grant(s): RTOP 505-62-10

Report No.(s): NASA-TM-107425; NAS 1.15:107425; E-10671; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effect of wake passing on the showerhead film cooling performance of a turbine blade has been investigated experimentally. The experiments were performed in an annular turbine cascade with an upstream rotating row of cylindrical rods. Nickel thin-film gauges were used to determine local film effectiveness and Nusselt number values for various injectants, blowing ratios, and Strouhal numbers. Results indicated a reduction in film effectiveness with increasing Strouhal number, as well as the expected increase in film effectiveness with blowing ratio. An equation was developed to correlate the span-average film effectiveness data. The primary effect of wake unsteadiness was found to be correlated by a streamwise-constant decrement of 0.094.St. Steady computations were found to be in excellent agreement with experimental Nusselt numbers, but to overpredict experimental film effectiveness values. This is likely due to the inability to match actual hole exit velocity profiles and the absence of a credible turbulence model for film cooling.

Author

Experimentation; Wakes; Turbine Blades

19970012948 Rockwell International Corp., Rocketdyne Div., Canoga Park, CA USA

Comparative Study of Advanced Turbulence Models for Turbomachinery Final Report, Feb 1992 - Oct. 1995

Hadid, Ali H., Rockwell International Corp., USA; Sindir, Munir M., Rockwell International Corp., USA; Oct. 1996; 287p; In English

Contract(s)/Grant(s): NAS8-38860

Report No.(s): NASA-CR-203937; NAS 1.26:203937; RI/RD96-182; CDR-DR-3; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

A computational study has been undertaken to study the performance of advanced phenomenological turbulence models coded in a modular form to describe incompressible turbulent flow behavior in two dimensional/axisymmetric and three dimensional complex geometry. The models include a variety of two equation models (single and multi-scale k-epsilon models with different near wall treatments) and second moment algebraic and full Reynolds stress closure models. These models were systematically assessed to evaluate their performance in complex flows with rotation, curvature and separation. The models are coded as self contained modules that can be interfaced with a number of flow solvers. These modules are stand alone satellite programs that come with their own formulation, finite-volume discretization scheme, solver and boundary condition implementation. They will take as input (from any generic Navier-Stokes solver) the velocity field, grid (structured H-type grid) and computational domain specification (boundary conditions), and will deliver, depending on the model used, turbulent viscosity, or the components of the Reynolds stress tensor. There are separate 2D/axisymmetric and/or 3D decks for each module considered. The modules are tested using Rocketdyn's proprietary code REACT. The code utilizes an efficient solution procedure to solve Navier-Stokes equations in a non-orthogonal body-fitted coordinate system. The differential equations are discretized over a finite-volume grid using a non-staggered variable arrangement and an efficient solution procedure based on the SIMPLE algorithm for the velocity-pressure coupling is used. The modules developed have been interfaced and tested using finite-volume, pressure-correction CFD solvers which are widely used in the CFD community. Other solvers can also be used to test these modules since they are independently structured with their own discretization scheme and solver methodology. Many of these modules have been independently tested by Professor C.P. Chen and his group at the University of Alabama at Huntsville (UAH) by interfacing them with own flow solver (MAST).

Author

K-Epsilon Turbulence Model; Incompressible Flow; Turbulent Flow; Reynolds Stress; Finite Volume Method; Turbomachinery; Stress Tensors; Navier-Stokes Equation; Computational Fluid Dynamics

08

AIRCRAFT STABILITY AND CONTROL

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

19970012340 Technische Hogeschool, Faculty of Aerospace Engineering, Delft, Netherlands

Delft Aircraft Simulation Model and Analysis Tool (DASMAT)

vanderLinden, C. A. A. M., Technische Hogeschool, Netherlands; Aug. 1996; 213p; In English

Report No.(s): LR-781; ISBN-90-5623-053-0; Copyright; Avail: Issuing Activity (Delft University of Technology, P.O. Box 5058, 2600 GB Delft, The Netherlands), Hardcopy, Microfiche

Computer Assisted Design (CAD) environments have become important devices for the design and evaluation flight control systems. For general use, different aircraft and operational conditions should be easily implemented in such a CAD environment and it should be equipped with a set of simulation and analysis tools. To extend its functionalities, it is best integrated in a high-performance computing environment with an extensive library of control design routines. This report documents the CAD environment DASMAT, which stands for Delft University Aircraft Simulation Model and Analysis Tool. It operates in the computing environment MATLAB/SIMULINK, having high performance numeric computation and visualization functionalities. The essential element in the DASMAT package is a generic nonlinear simulation model conceived with well-defined and generalized interfaces. For linear flight control design, the package contains special tools for trimming and linearizing the aircraft at user-defined operating points. A finished design may be evaluated by visualizing the time behaviour in nonlinear simulations. Both on-line and off-line analysis functions are available with the possibility of 3D flight-path and attitude visualization through animation. For analyzing flight test data, the package also includes identification routines of which results are easily implemented in the simulation model. After a short introduction of DASMAT, this report focuses on the models, signals and variables present in the DASMAT package. The operational aspects for the simulation and analysis tools are discussed next, followed by the application of the DASMAT package for control design purposes. The appendices include a complete list of files of the DASMAT package, the

complete lists of signal formats and all essential variables used in the generic models, and the lay-out plus equations of the SIMU-LINK models.

Author

Aircraft Models; Computer Aided Design; Flight Control; Control Systems Design; Computerized Simulation; Applications Programs (Computers)

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

19970012125 Tennessee Univ., Knoxville, TN USA

Research and Development of a New Heliport Lighting System with Implications for Further Research

Weis, Michael J., Tennessee Univ., USA; May 1996; 48p; In English

Report No.(s): AD-A308849; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the past, the majority of helicopter precision instrument approaches were conducted to a runway utilizing the Instrument Landing System (ILS). Recent developments in the Global Positioning System will soon make it possible to shoot precision instrument approaches to every airport and heliport without the use of the ILS. This should greatly expand the roles in which helicopters are used today. To support the growth in precision instrument procedures that will accompany the expansion, a new heliport lighting system has been developed. The proposed lighting system is simple, compact, and affordable. It is composed of fewer lights than the previous systems, requires less space, and can be adapted to existing helipads.

DTIC

Aircraft Landing; Approach Indicators; Luminaires

19970012318 Federal Aviation Administration, Atlantic City, NJ USA

New Generation Runway Visual Range (RVR) Final Operational Test and Evaluation Report, Volume 2

Benner, William, Federal Aviation Administration, USA; Carty, Thomas, Federal Aviation Administration, USA; Jones, Michael, Raytheon Service Co., USA; Jul. 1996; 211p; In English

Report No.(s): AD-A315944; DOT/FAA/CT-TN95/32-VOL-2; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This report summarizes Operational Test and Evaluation (OT&E) activities for the New Generation Runway Visual Range (RVR) system. Testing consisted of an initial OT&E, seven individual retests and several specialized tests. DOT/FAA/CT-TN92/37 provides results of the initial OT&E conducted in March 1992. This document summarizes results of seven retests as well as specialized tests conducted from August 1992 through June 1994. The purpose and intent of OT&E was to verify RVR National Airspace Requirements (NAS) and to verify the operational effectiveness and suitability of the RVR within the NAS environment. At the completion of the retest and specialized test efforts results indicated that the most significant sensor and system problems had been resolved via permanent design changes as well as interim 'work-arounds.' It was recommended that the RVR system be deployed nationally under the following conditions: (a) Additional data be obtained indicating RVR performance during Category-3b visibility; and (b) Problems currently having interim work-around solutions be resolved with permanent corrections. This volume contains appendices A through G referenced in Volume-1.

DTIC

Runways; Visibility; Instrument Landing Systems; Aircraft Landing; Landing Instruments

19970012411 Armstrong Lab., Crew Technology Div., Brooks AFB, TX USA

Advanced Spatial Disorientation Demonstrator: Component, Profile, and Training Evaluation

Yauch, D. W., Armstrong Lab., USA; Ercoline, W. R., Krug Life Sciences, Inc., USA; Previc, F. H., Armstrong Lab., USA; Holo-viak, S. J., School of Aerospace Medicine, USA; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Results of the first experimental evaluation of the Advanced Spatial Disorientation Demonstrator (ASDD) installed at Brooks AFB, TX are described. The ASDD was evaluated by a mix of experienced pilots and novices. Spatial Disorientation (SD) training profiles were programmed into the device in an attempt to induce Type 1 (unrecognized) and Type 2 (recognized) SD. Reliable generation of SD illusions and visual/vestibular sensory conflicts on the ground, in a safe environment, can in principle provide

training to aircrew to aid in recognizing and coping with SD in flight, and also can be used as an environment to design instrument displays. to that end, the ASDD components, SD profiles, and training potential were evaluated.

Author

Training Evaluation; Display Devices; Aircraft Pilots; Disorientation

19970012414 Environmental Tectonics Corp., Southampton, PA USA

Review of Motion-Based Physiological Training Devices

Mitchell, William F., Environmental Tectonics Corp., USA; Leland, Richard A., Environmental Tectonics Corp., USA; Selection and Training Advances in Aviation; Nov. 1996; 16p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The use of motion based training devices permeates all of Aerospace Physiology training and continues to grow in sophistication. Motion based training devices present the opportunity for truly interactive training. However, for such devices to be completely effective, they must possess the qualities of low acquisition and operating cost, multiple task training capability, flexibility of use, and high fidelity, and they must be interactive. Future development of motion based training devices for physiological training should be a start-to-finish joint effort between customer/user groups, research centers of excellence and industry as a cooperating triad.

Derived from text

Training Devices; Physiology

19970012415 School of Aerospace Medicine, Dept. of Aerospace Physiology, Brooks AFB, TX USA

The USAF Advanced Spatial Disorientation Demonstrator Program

Holoviak, S. J., School of Aerospace Medicine, USA; Yauch, D. W., Armstrong Lab., USA; Ercoline, W. R., Krug Life Sciences, Inc., USA; Selection and Training Advances in Aviation; Nov. 1996; 8p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The search for ground-based devices that can generate realistic motion and forces of an aircraft in flight is ongoing. However, with the maturing of several technologies, mostly in the computer and visual arenas, the Advanced Spatial Disorientation Demonstrator (ASDD) has surfaced as the prime United States Air Force (USAF) candidate. It combines these new technologies to generate repeatable and sustainable flight-like forces with unsurpassed fidelity. The device, though still in its infancy, has proven that realistic spatial disorientation (SD) illusions can be generated in a safe, ground-based environment. This program overview highlights the ASDD's capabilities, which will have a dramatic impact on the way pilots will receive SD familiarization training for the next decade.

Author

Disorientation; Training Simulators

19970012416 Institute of Aviation Medicine, Div. 3, Fuerstenfeldbruck, Germany

The Flight Orientation Trainer as a Dual Purpose Device: Training Versus Aeromedical Research

Lichtschlager, A., Institute of Aviation Medicine, Germany; Scherb, W. H., Institute of Aviation Medicine, Germany; Heinz, G., Institute of Aviation Medicine, Germany; Pongratz, H., Institute of Aviation Medicine, Germany; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

German Air Force acquired the 'Flight Orientation Trainer (FOT)' and installed it in the facilities of the German Air Force Institute of Aviation Medicine (GAF IAM) in Fuerstenfeldbruck to improve its training efforts in aviation physiology and especially in spatial disorientation. In 1994 a troop trial was conducted to have the FOT tested and evaluated by experienced pilots of the German Armed Forces. Results of the troop trial are described and the best timing for training in the FOT is discussed. The evaluation and validation of the FOT requires calibration and counter-measure equipment to cover various aspects of spatial orientation, situation awareness and motion sickness. The relevance of pilot's ability to react under changing orientation can be shown in an orthostatic stress test on tilt-table. An individual susceptibility for syncopal reaction can lead to loss of awareness and motion sickness.

Author

Training Devices; Motion Sickness; Disorientation; Aircraft Pilots; Aerospace Medicine

19970012469 Federal Aviation Administration, Atlantic City, NJ USA

New Generation Runway Visual Range (RVR), Volume 1

Benner, William, Federal Aviation Administration, USA; Carty, Thomas, Federal Aviation Administration, USA; Jones, Michael, Raytheon Service Co., USA; Jul. 1996; 63p; In English

Report No.(s): AD-A315996; DOT/FAA/CT-TN95/32-Vol-1; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report summarizes Operational Test and Evaluation (OT&E) activities for the New Generation Runway Visual Range (RVR) system. Testing consisted of an initial OT&E, seven individual retests and several specialized test DOT/FAA/CT-TN92/37 provides results of the initial OT&E conducted in March 1992. This document summarizes results of seven retests as well as specialized tests conducted from August 1992 through June 1994. The purpose and intent of OT&E was to verify RVR National Airspace Requirements (NAS) and to verify the operational effectiveness and suitability of the RVR within the NAS environment. At the completion of the retest and specialized test efforts results indicated that the most significant sensor and system problems had been resolved via permanent design changes as well as interim 'work-arounds'. It was recommended that the RVR system be deployed nationally under the following conditions: (a) Additional data be obtained indicating RVR performance during Category IIIb visibility; and (b) Problems currently having interim work-around solutions be resolved with permanent corrections. This volume contains a summary of the retest and specialized tests performed during the aforementioned period.

DTIC

Performance Tests; Evaluation; System Effectiveness; Runways

19970012471 Federal Aviation Administration, Airport Technology Research and Development, Atlantic City, NJ USA

Dual-Colored Declared Distance Lighting Fixture Evaluation

Bagot, Keith W., Federal Aviation Administration, USA; Aug. 1996; 55p; In English

Contract(s)/Grant(s): DTFA03-95-D-00019

Report No.(s): AD-A315992; DOT/FAA/AR-TN96/24; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Several dual-color (red/blue) runway edge lighting configurations used to define the pre-threshold and post-runway end segments of declared distance runways were evaluated at four different airports. At three airports, Binghamton Regional Airport (BGM), New York, Baltimore-Washington International Airport (BWI), Maryland, and Atlantic City International Airport (ACY), New Jersey, the lighting configurations were in accordance with the Federal Aviation Administration (FAA) Great Lakes Region policy and procedures memorandum entitled "Guidance on Declared Distance Standards." An additional test installation at the Millville Municipal Airport (MIV), New Jersey, permitted the evaluation of different color configurations to designate areas restricted to taxi only; takeoff, but no landing; and rollout only maneuvers. FAA test pilots and visual guidance project personnel (also pilots) conducted flight and ground taxi testing using B-727 and Convair 580 type aircraft to evaluate each color configuration for its suitability in best depicting the operational limitations for each runway segment. The tests were also intended to determine the most appropriate location for red color runway end lights and the suitability of available dual-color edge lights components for this use. Evaluators were briefed prior to each test session and completed postflight questionnaires. This report describes the conduct of the evaluation and provides detailed results, conclusions, and recommendations.

DTIC

Lighting Equipment; Evaluation; Performance Tests; Color; Runway Lights

19970012474 Federal Aviation Administration, Weather/Primary Radar Div., Atlantic City, NJ USA

New Generation Runway Visual Range (RVR), Volume 3 Final Report, Mar. 1992 - Jun. 1994

Benner, William, Federal Aviation Administration, USA; Carty, Thomas, Federal Aviation Administration, USA; Jones, Michael, Raytheon Service Co., USA; Jul. 1996; 271p; In English

Report No.(s): AD-A315943; DOT/FAA/CT-TN95/32-Vol-3; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This report summarizes Operational Test and Evaluation (OT&E) activities for the New Generation Runway Visual Range (RVR) system. Testing consisted of an initial OT&E seven individual retests and several specialized tests. DOT/FAA/CT-Th92/37 provides results of the initial OT&E conducted in March 1992. This document summarizes results of seven retests as well as specialized tests conducted from August 1992 through June 1994. The purpose and intent of OT&E was to verify RVR National Airspace Requirements (NAS) and to verify the operational effectiveness and suitability of the RVR within the NAS environment. At the completion of the retest and specialized test efforts results indicated that the most significant sensor and system problems had been resolved via permanent design changes as well as interim 'work-arounds.' It was recommended that the RVR system be deployed nationally under the following conditions: (a) Additional data be obtained indicating RVR performance during Category IIIb visibility; and (b) Problems currently having interim work-around solutions be resolved with permanent corrections. This volume contains appendices H through K referenced in Volume L.

Author

Runways; Evaluation; Performance Tests; Data Acquisition

19970012489 Air Force Materiel Command, Directorate of Engineering and Technical Management, Wright-Patterson AFB, OH USA

Minutes of Aircraft/Runway Deicing/Anti-Icing Technology Crossfeed Final Report, 20 Aug. - 21 Aug 1996

Baca, Al, Air Force Materiel Command, USA; Herring, Carroll, Air Force Materiel Command, USA; Sep. 1996; 482p; In English Report No.(s): AD-A315985; AFMC-TM-96-9002; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

The Aircraft/Runway Deicing/Anti-icing Technology Crossfeed was conducted by the Air Force during 20-21 Aug 1996 in Arlington, VA. It was a joint service and industry meeting devoted to the crossfeed of information for environmentally friendly deicing and anti-icing technologies. The meeting was open to technology manufacturers and vendors. It was designed to identify various types of technologies which have potential for use by Air Force to meet the increased controls and restrictions being imposed by the clean water act. The briefings included technologies including alternative chemicals and processes, new efficient equipment, capture and recycle technologies, and treatment techniques.

DTIC

Environment Protection; Deicing; Ice Prevention; Deicers

19970012808 Operational Technologies Corp., San Antonio, TX USA

Underground Storage Tank Subsurface Site Investigation Report: Former UST, Building 1608 Site, Oct. - Nov. 1995

Jul. 1996; 535p; In English

Report No.(s): AD-A316171; No Copyright; Avail: CASI; A23, Hardcopy; A04, Microfiche

This Subsurface Site Investigation (SSI) Report presents the results of investigation activities conducted at the 151st Air Refueling Wing (ARW), Utah Air National Guard (ANG) Base, Salt Lake City, Utah, On 3 September 1993, a 30-year old, 2,000-gallon underground storage tank (UST) (state leaking UST identifier - Facility ID #4001640, Release Site EIMB) was removed, along with the associated piping (151st ARWIEM, 1993). The tank was located on the north side of Building 1608, which is situated on the south end of the Utah ANG Base, on the northeast corner of 2nd Street and F Street (Figure 1.1). The tank was used for jet fuel (JP-4) storage at the Aerospace Ground Equipment Facility (151st ARWI Environmental Management (EM) Office, 1993). The results of the investigation indicated petroleum contamination existed in site soils at levels exceeding the Utah Leaking Underground Storage Tank (LUST) site Level 2 Recommended Cleanup Levels (RCLs) for soil and state MCLs for groundwater contamination.

DTIC

JP-4 Jet Fuel; Jet Engine Fuels; Air to Air Refueling

19970012900 Alabama Univ., Research Administration, Huntsville, AL USA

Emulsion Chamber Technology Experiment (ECT) Final Report

Gregory, John C., Alabama Univ., USA; Takahashi, Yoshiyuki, Alabama Univ., USA; Sep. 30, 1996; 149p; In English Contract(s)/Grant(s): NAS8-38428

Report No.(s): NASA-CR-203950; NAS 1.26:203950; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The experimental objective of Emulsion Chamber Technology (ECT) was to develop space-borne emulsion chamber technology so that cosmic rays and nuclear interactions may subsequently be studied at extremely high energies with long exposures in space. A small emulsion chamber was built and flown on flight STS-62 of the Columbia in March 1994. Analysis of the several hundred layers of radiation-sensitive material has shown excellent post-flight condition and suitability for cosmic ray physics analysis at much longer exposures. Temperature control of the stack was 20 +/-1 C throughout the active control period and no significant deviations of temperature or pressure in the chamber were observed over the entire mission operations period. The unfortunate flight attitude of the orbiter (almost 90% Earth viewing) prevented any significant number of heavy particles (Z greater than or equal to 10) reaching the stack and the inverted flow of shower particles in the calorimeter has not allowed evaluation of absolute primary cosmic ray-detection efficiency nor of the practical time limits of useful exposure of these calorimeters in space to the level of detail originally planned. Nevertheless, analysis of the observed backgrounds and quality of the processed photographic and plastic materials after the flight show that productive exposures of emulsion chambers are feasible in low orbit for periods of up to one year or longer. The engineering approaches taken in the ECT program were proven effective and no major environmental obstacles to prolonged flight are evident.

Derived from text

Emulsions; Spaceborne Experiments; Cosmic Rays; Nuclear Interactions; High Energy Electrons; Exposure; Pressure Chambers

19970012904 NYMA, Inc., Engineering Services Div., Brook Park, OH USA

Calibration of the NASA Lewis Research Center 9- by 15-Foot Low Speed Wind Tunnel (1994 Test) Final Report

Arrington, E. Allen, NYMA, Inc., USA; Gonsalez, Jose C., NYMA, Inc., USA; Mar. 1997; 186p; In English

Contract(s)/Grant(s): NAS3-27186; RTOP 505-62-82

Report No.(s): NASA-CR-195438; NAS 1.26:195438; E-9464; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The NASA Lewis Research Center 9- by 15-Foot Low Speed Wind Tunnel (LSWT) was recently upgraded by adding several flow manipulators (turbulence-reduction screens and flow-straightening honeycomb in the settling chamber upstream of the test section and a diffuser extension fairing downstream of the test section). Flow-field surveys were conducted after the upgrade. These surveys provided the first complete test section calibration of the 9- by 15-Foot LSWT since the flow quality upgrade. The data collected were used to construct the test section calibration curves and to provide a complete mapping of the flow field in the test section. An instrumented rake was used to collect both calibration and flow-field survey data at several stations in the test section. Surveys were made throughout the test section to map the total and static pressure, total temperature, pitch and yaw flow angularity, and turbulence levels. Boundary layer total pressures were also measured at several locations in the test section. These data were also compared with data collected before the tunnel upgrade to gage the effectiveness of the flow manipulators. During this calibration entry, only the acoustic test section configuration was surveyed; the solid (hard wall) configuration will be calibrated in a future entry. Sensitivity studies of the tunnel controls were also conducted. The data indicated very good flow quality in the test section at all survey stations in terms of total pressure, total temperature, Mach number, flow angularity distributions, and turbulence levels. The data also indicated improvement in the test section total pressure variation, Mach number variation, flow angle distributions, and turbulence levels due to the installation of the flow manipulators. A spanwise total temperature gradient occurred in the test section at the higher Mach number settings but was reduced by increasing the water flow into the facility cooler.

Author

Wind Tunnel Calibration; Flow Distribution; Low Speed Wind Tunnels; Manipulators; Static Pressure; Pitch (Inclination); Yaw

19970012926 Army Aeromedical Research Lab., Aircrew Health and Performance Div., Fort Rucker, AL USA

Altitude Estimation in the UH-60 Flight Simulator Final Report

Crowley, John S., Army Aeromedical Research Lab., USA; Caldwell, J. Lynn, Army Aeromedical Research Lab., USA; Sessions, Melanie, Army Aeromedical Research Lab., USA; Tibbetts, Cynthia R., Army Aeromedical Research Lab., USA; Apr. 1996; 30p; In English

Report No.(s): AD-A310131; USAARL-96-27; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Correct perception of self-altitude above the earth is an essential skill for aviators, especially those flying nap-of-the-earth. Since much of today's helicopter training occurs in flight simulators, it is important to determine if the perceptual cues denoting altitude in the simulator transfer to the real-world flight environment. A study was performed to assess the accuracy for Army aviators in estimating self-altitude in the simulator and to determine the effects of performance feedback on the training of this capability. Results with 11 aviators showed that altitude estimation was more accurate over land than water while cruising at higher altitudes (greater than 50 ft) and more accurate over water than over land while hovering over lower altitudes. Performance feedback resulted in a dramatic improvement in overall performance.

DTIC

Flight Simulators; Helicopters; Aircraft Pilots

10

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

19970012061 New Mexico State Univ., Physical Science Lab., Las Cruces, NM USA

Unmanned Aerial Vehicle Drogsondes with Global Positioning System Windfinding Final Report

Cogan, J., New Mexico State Univ., USA; Greenling, T., New Mexico State Univ., USA; Lucas, S. A., New Mexico State Univ., USA; Thomas, J., New Mexico State Univ., USA; May 1996; 37p; In English

Report No.(s): AD-A315813; ARL-TR-1009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Detailed, quantitative, atmospheric data are essential for accurate analyses and forecasting of mesoscale phenomena for military and civilian applications. Over remote areas, environmental satellites provide qualitative and broadscale quantitative information more suitable for synoptic scale analyses. Because satellite instruments for measuring atmospheric variables have relatively large footprints and vertical resolutions, airborne systems remain the only reliable source of detailed, quantitative, accurate data for remote mesoscale areas, especially 500 by 500 km or smaller. Within remote or hazardous regions, use of manned

aircraft for gathering atmospheric data may not be feasible because of the high risk to personnel and expensive equipment. Unmanned aerial vehicles can carry small sensors and dropsondes into these areas, at no risk to personnel and at a very low cost. The Battlefield Environment Directorate of the Army Research Laboratory led the development of a dropsonde with Global Positioning System (GPS) windfinding capability, assisted by the Physical Sciences Laboratory of New Mexico State University. This report briefly discusses the dropsondes and presents the results of the flight test at the conclusion of phase 1. Phase 1 investigated current off-the-shelf capability (as of late 1994) with a modification to obtain wind profiles via GPS techniques. Plans include a phase 2 that will seek to produce proof-of-concept prototype dropsondes and dispenser.

DTIC

Global Positioning System; Mesoscale Phenomena; Pilotless Aircraft; Dropsondes; Flight Tests

11

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

19970012483 Interior Dept., National Biological Service, Columbia, MO USA

Evaluation of the Semipermeable Membrane Device (SpMB) as a Passive in Site Concentrator of Military Organic Chemicals in Water *Annual Report, 15 Jul. 1995 - 15 Jul 1996*

Petty, J. D., Interior Dept., USA; Huckins, J. N., Interior Dept., USA; Orazio, C. E., Interior Dept., USA; Lebo, J. A., Interior Dept., USA; Clark, R. C., Interior Dept., USA; Gibson, V. L., Interior Dept., USA; Aug. 1996; 48p; In English

Contract(s)/Grant(s): MIPR-94MM4568

Report No.(s): AD-A315938; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The data presented in this report relates to completion of the final laboratory phase of this project, i.e., the 180 C SPMD OrganoChlorine (OC) pesticide uptake kinetic exposure. The unanticipated Government shut-down and resulting delay in funding resulted in an approximate six month delay in completing the laboratory exposure. to date, the SPND/OC exposure study and analysis of the resultant samples have been completed. Currently, data review and analysis is ongoing. All quality control data are acceptable. Data review will be completed and a final report detailing the results of all three laboratory exposures (i.e., 100 C, 180 C, 260 C) will be prepared. The algorithm developed to calculate ambient water concentrations of OC pesticides will be calibrated using the uptake kinetic data. It is anticipated that this will provide an accurate, highly precise method for monitoring bioavailable OC residues in aquatic. ecosystems of interest to DOD.

DTIC

Military Technology; Organic Compounds; Water Resources; Aircraft Equipment

19970012651 NASA Langley Research Center, Hampton, VA USA

Evaluation of a Composite Sandwich Fuselage Side Panel with Damage and Subjected to Internal Pressure

Rouse, Marshall, NASA Langley Research Center, USA; Ambur, Damodar R., NASA Langley Research Center, USA; Bodine, Jerry, Boeing Commercial Airplane Co., USA; Dopker, Bernhard, Boeing Commercial Airplane Co., USA; Feb. 1997; 22p; In English; 11th; Fibrous Composites in Structural Design, 26-29 Aug. 1996, Forth Worth, TX, USA; Sponsored by Department of Defense, USA

Contract(s)/Grant(s): RTOP 538-10-11-05

Report No.(s): NASA-TM-110309; NAS 1.15:110309; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results from an experimental and analytical study of a composite sandwich fuselage side panel for a transport aircraft are presented. The panel has two window cutouts and three frames, and has been evaluated with internal pressure loads that generate biaxial tension loading conditions. Design limit load and design ultimate load tests have been performed on the graphite-epoxy sandwich panel with the middle frame removed to demonstrate the suitability of this two-frame design for supporting the prescribed biaxial loading conditions with twice the initial frame spacing of 20 inches. The two-frame panel was damaged by cutting a notch that originates at the edge of a cutout and extends in the panel hoop direction through the window-belt area. This panel with a notch was tested in a combined-load condition to demonstrate the structural damage tolerance at the design limit load condition. The two panel configurations successfully satisfied all design load requirements in the experimental part of the study, and the three-frame and two-frame panel responses are fully explained by the analysis results. The results of this study suggest that

there is potential for using sandwich structural concepts with greater than the usual 20-in.-wide frame spacing to further reduce aircraft fuselage structural weight.

Author

Composite Structures; Sandwich Structures; Tolerances (Mechanics); Structural Weight; Load Tests; Internal Pressure; Graphite-Epoxy Composites; Fuselages; Axial Loads; Aircraft Structures

12 ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

19970012364 Technische Hogeschool, Faculty of Aerospace Engineering, Delft, Netherlands

Orientation on quantitative IR-thermography in wall-shear stress measurements

Mayer, Roy, Technische Hogeschool, Netherlands; Oct. 1996; 102p; In English

Report No.(s): LR-812; ISBN-90-5623-050-6; Copyright; Avail: Issuing Activity (Delft University of Technology, P.O.Box 5058, 2600 GB Delft, The Netherlands), Hardcopy, Microfiche

Wall-shear stresses are highly important in the aerodynamic design of aircraft, because they determine the drag and thus the fuel consumption of an airplane. Due to this importance many different measurement techniques have been developed. Most of these techniques are intrusive, which means that the flow is disturbed by the presence of a measurement probe. The hot film technique is non-intrusive, because hot films measure the heat transfer from an electrically heated surface of an object to the flow, which is related to the wall-shear stress. Using the theory of the hot film technique, we have developed a new non-intrusive wall-shear stress measurement technique, which is based on quantitative IR-thermography. In this technique a hot spot is externally generated by a laser. The surface temperature measurements, from which the heat flux to the flow is derived, is measured externally by an IR-camera. The external heating and the external temperature measurement provides three main advantages: the measurement is non-intrusive; the measurement point can easily be varied and this technique can be applied in flight tests. This measurement technique has been tested for a laminar flow along a flat plate a wind-tunnel. The laser generates a hot spot on the plate until the steady state condition is reached. After turning off the laser the IR-camera monitors the temperature decay. From these data the heat flux to the flow and the wall-shear stress can be derived. The results show that it is indeed possible to apply quantitative IR-thermography to measure local wall-shear stresses. The obtained accuracy of the measurement technique is +/- 10% for free stream velocities larger than 10 m/s. However it has to be noted that this technique has some limitations due to the capabilities of the IR camera, such as the spatial resolution and the signal to noise ratio. In the near future this measurement technique will be extended to flows with non zero pressure gradients and with turbulence.

Author

Aerodynamics; Boundary Layers; Walls; Shear Stress; Infrared Photography; Flow Measurement

19970012643 NASA Lewis Research Center, Cleveland, OH USA

The Effect of Cooling Passage Aspect Ratio on Curvature Heat Transfer Enhancement

Meyer, Michael L., NASA Lewis Research Center, USA; Mar. 1997; 20p; In English

Contract(s)/Grant(s): RTOP 505-62-7K-00

Report No.(s): NASA-TM-107426; NAS 1.15:107426; E-10672; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of electrically heated tube experiments was performed to investigate the effect of high aspect ratio on curvature heat transfer enhancement in uniformly heated rectangular cooling passages. Three hardware geometries were tested: a baseline straight aspect ratio 10 tube, an aspect ratio 1 (square) tube with a 45 deg. curve, and an aspect ratio 10 tube with a 45 deg. curve. Gaseous nitrogen with the following properties was used as the coolant: ambient inlet temperature, pressures to 8.3 MPa, wall-to-bulk temperature ratios less than two, and Reynolds numbers based on hydraulic diameter ranging from 250,000 to 1,600,000. The measured curvature enhancement factors were compared to values predicted by three previously published models which had been developed for low aspect ratio tubes. The models were shown to be valid for the high aspect ratio tube as well the low aspect ratio tube, indicating that aspect ratio had little impact on the curvature heat transfer enhancement in these tests.

Author

Convection; Heat Transfer; Cooling; High Aspect Ratio; Inlet Temperature; Rocket Engine Design; Flow Measurement

19970012681 University of Southern California, Dept. of Aerospace Engineering, Los Angeles, CA USA
Dynamic Effects of Suction/Heating on Turbulent Boundary Layers *Final Report, 1 Oct. 1991 - 28 Feb. 1996*
Blackwelder, Ron; Sep. 30, 1996; 22p; In English
Contract(s)/Grant(s): N00014-92-J-1062

Report No.(s): AD-A316127; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals of this research were to constructively interact with and alter vortical structures embedded within boundary layers. The concept of selective interaction was developed which utilized information about the location of the vortical structures so that the interaction could be tailored to more efficiently alter the eddies. Different types of mechanisms were deployed to alter the eddies including suction, blowing, actuators, etc. These methods altered the development of streamwise vortices sufficiently that their breakdown and mixing were significantly delayed.

DTIC

Turbulent Boundary Layer; Suction; Heating; Wind Tunnel Tests; Flow Visualization; Delta Wings; Vortex Generators; Vortices

19970012796 Minnesota Univ., Dept. of Aerospace Engineering and Mechanics, Minneapolis, MN USA

Large Scale Turbulent Structures in Supersonic Jets *Final Report*

Rao, Ram Mohan, Minnesota Univ., USA; Lundgren, Thomas S., Minnesota Univ., USA; Mar. 1997; 33p; In English
Contract(s)/Grant(s): NCC2-5156

Report No.(s): NASA-CR-203838; NAS 1.26:203838; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Jet noise is a major concern in the design of commercial aircraft. Studies by various researchers suggest that aerodynamic noise is a major contributor to jet noise. Some of these studies indicate that most of the aerodynamic jet noise due to turbulent mixing occurs when there is a rapid variation in turbulent structure, i.e. rapidly growing or decaying vortices. The objective of this research was to simulate a compressible round jet to study the non-linear evolution of vortices and the resulting acoustic radiations. In particular, to understand the effect of turbulence structure on the noise. An ideal technique to study this problem is Direct Numerical Simulations (DNS), because it provides precise control on the initial and boundary conditions that lead to the turbulent structures studied. It also provides complete 3-dimensional time dependent data. Since the dynamics of a temporally evolving jet are not greatly different from those of a spatially evolving jet, a temporal jet problem was solved, using periodicity in the direction of the jet axis. This enables the application of Fourier spectral methods in the streamwise direction. Physically this means that turbulent structures in the jet are repeated in successive downstream cells instead of being gradually modified downstream into a jet plume. The DNS jet simulation helps us understand the various turbulent scales and mechanisms of turbulence generation in the evolution of a compressible round jet. These accurate flow solutions will be used in future research to estimate near-field acoustic radiation by computing the total outward flux across a surface and determine how it is related to the evolution of the turbulent solutions. Furthermore, these simulations allow us to investigate the sensitivity of acoustic radiations to inlet/boundary conditions, with possible application to active noise suppression. In addition, the data generated can be used to compute, various turbulence quantities such as mean velocities, turbulent stresses, etc. which will aid in turbulence modeling. This report will be presented in two chapters. The first chapter describes some work on the linear stability of a supersonic round jet and the implications of this for the jet noise problem. The second chapter is an extensive discussion of numerical work using the spectral method which we use to solve the compressible Navier-Stokes equations to study turbulent jet flows. The method uses Fourier expansions in the azimuthal and streamwise direction and a 1-D B-spline basis representation in the radial direction. The B-spline basis is locally supported and this ensures block diagonal matrix equations which can be solved in $O(N)$ steps. This is a modification of a boundary layer code developed by Robert Moser. A very accurate highly resolved DNS of a turbulent jet flow is produced.

Author

Turbulence Models; Supersonic Jet Flow; Jet Aircraft Noise; Mathematical Models

19970012885 Technische Hogeschool, Faculty of Aerospace Engineering, Delft, Netherlands

Galloping Behaviour of an Aeroelastic Oscillator with Two Degrees of Freedom

van Oudheusden, B. W., Technische Hogeschool, Netherlands; Aug. 1996; 123p; In English

Report No.(s): LR-811; ISBN 90-5623-047-6; Copyright; Avail: Issuing Activity (Delft University of Technology, P.O. Box 5058, 2600 GB Delft, The Netherlands), Hardcopy, Microfiche

Nonlinear dynamics of a two degrees of freedom mechanical oscillator subjected to aerodynamic forces is investigated. Dynamic tests of different oscillator configurations at various wind velocities are reported. The oscillating modes with the frequencies of the same order and the corresponding strong mode interactions are discussed.

Derived from text

Mechanical Oscillators; Aerodynamic Forces; Dynamic Tests; Aeroelasticity; Oscillations; Nonlinear Systems

13 GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

19970012761 San Jose State Univ., Dept. of Meteorology, CA USA

An Investigation of Turbulence Incidents Final Report, Period ending 14 Oct. 1996

Lester, Peter F., San Jose State Univ., USA; Chan, William, San Jose State Univ., USA; Oct. 14, 1996; 5p; In English

Contract(s)/Grant(s): NCC2-315

Report No.(s): NASA-CR-203832; NAS 1.26:203832; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This is the final report for a cooperative research project which was initiated over 12 years ago in collaboration with Ralph Bach and the late Rodney Wingrove of NASA-Ames. This successful endeavor has resulted in many journal and conference publications describing research into the causes and characteristics of aviation turbulence. This Cooperative agreement also gave students access to a leading research facility and the chance to work with internationally, recognized researchers while supporting senior and master's thesis research work. The data set used in the study were unique quantitative measurements of microscale turbulence derived from commercial aircraft. A significant result of the study was the development of a standard turbulence metric based on those available on-board measurements.

Derived from text

Research; Data Bases; Standardization; Commercial Aircraft; Atmospheric Turbulence

14 LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

19970012054 Naval Air Warfare Center, Warminster, PA USA

Quantitative Evaluation of High-Performance Flight in a Supine Crew Station Using the NAWC Dynamic Flight Simulator-Effects of Body Position and Motion Final Report, 1 Sep. 1994 - 31 May 1995

Shender, Barry S., Naval Air Warfare Center, USA; Heffner, Peggy, Naval Air Warfare Center, USA; Jun. 01, 1995; 63p; In English

Report No.(s): AD-A309421; NAWCADWAR-95040-4.6; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In an attempt to determine if high-performance supine flight is possible, the USAF Canopy Escape Module (65 supine seat) was modified and deployed into the NAWC Dynamic Flight Simulator. With its computer generated wide field of view display and HUD, aircraft controls and high fidelity high performance fighter aircraft aeromodel, it was determined if subjects could 'fly' high performance maneuvers while supine. Seven male subjects performed a flight syllabus consisting of well defined instrument flight maneuvers (vertical S-2, half Cuban 8, a series of high +Gz 360 deg level turns and ILS task), as defined in the NATOPS Instrument Flight Manual. Subjects were extensively trained and tested under both 1g (static) and under acceleration (dynamic) conditions in supine and upright postures. Data were assessed to determine the effects of motion (G) and seat position. A weighted objective grading scheme was devised to evaluate flight performance based on the ability to achieve specified levels of altitude, +Gz, airspeed and controllability. This paper reports on the analysis of the +Gz turns and the ILS task. During the turns, motion effects did not lead to significant differences in the ability to maintain specified +Gz-level loads when supine, whereas there were significant differences when upright. Subjects demonstrated a lower error rate while flying statically as compared to dynamically for all loads. During dynamic turns, there were no significant differences in error rates between actual and required +Gz-level, although upright subjects maintained a higher percentage of the turns within defined acceptable ranges. Even though supine, one subject did experience a +Gz induced loss of consciousness (G-LOC) and an almost LOC event during a high +Gz turn.

DTIC

Fighter Aircraft; Aircraft Maneuvers; Acceleration Tolerance; Flight Simulation; Posture; Physiological Tests; Physiological Effects; Pilot Performance

19970012387 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Selection and Training Advances in Aviation Les Progres Realises en Selection et Formation des Personnels Navigants

Selection and Training Advances in Aviation; Nov. 1996; 286p; In English; In French; Aerospace Medical Panel Symposium, May 1996, Prague, Czechoslovakia; Also announced as 19970012388 through 19970012416

Report No.(s): AGARD-CP-588; ISBN-92-836-0035-5; Copyright Waived; Avail: CASI; A13, Hardcopy; A03, Microfiche

These proceedings include the Technical Evaluation Report, Keynote Address, Paper Presentations, and Poster Display Presentations of the Symposium sponsored by the AGARD Aerospace Medical Panel and held at the Ministry of Defence, Prague, Czech Republic, 28-31 May 1996. Over the last few decades, aircraft and air operations have become more sophisticated. Technological innovations have resulted in higher-performance, more-complex weapons systems. That increased performance and complexity have placed greater physical and psychological demands upon aviators. Refinement of materiel and improvements in selection and training technologies have enabled aviator selection and training processes to evolve. The purpose of this Symposium was to unite military and civilian experts in the field of selection and training. The papers addressed aviator selection and training, including: human abilities measurement; anthropometric accommodation; gender differences; crew resource management; flight simulators; spatial disorientation; cost effectiveness; centrifuge training; and g-tolerance. These proceedings will be of interest to those concerned with selection criteria, progression in selection techniques, training processes, physiological training, and facility advances in aviation. Interaction of medical, physiological, cognitive, psychomotor, and personality factors in the selection process are highlighted.

Derived from text

Research and Development; Flight Operations; Aircraft Pilots; Aerospace Medicine

19970012389 Armstrong Lab., Human Engineering Div., Wright-Patterson AFB, OH USA

Assessment of Anthropometric Accommodation in Aircraft Cockpits and Pilot Body Size Selection Criteria

Zehner, Gregory F., Armstrong Lab., USA; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Designing high-performance aircraft cockpits to accommodate the wide range of body sizes existing in the US population has always been a difficult problem for Crewstation Engineers. To alleviate this problem, the US Air Force restricts the range of body sizes allowed into flight training, and then develops aircraft design standards and specifications around that reduced population. Limiting the size of the aircraft crewstation (and, therefore, the aircraft) should also reduce the cost and improve the performance of the aircraft.

Derived from text

Anthropometry; Cockpits; Crew Workstations; Pilot Selection; Aircraft Design

19970012390 Armstrong Lab., Brooks AFB, TX USA

Characteristics of Female and Male USAF Pilots: Selection and Training Implications

King, R. E., Armstrong Lab., USA; McGlohn, S. E., Armstrong Lab., USA; Selection and Training Advances in Aviation; Nov. 1996; 4p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

The determination of psychological fitness to fly is complicated, particularly when attempting to extrapolate what little we know about male aviators to women. New training needs, for both women and men, may arise as the number of a country's female aviators increases. The large numbers of aviators in the USA Air Force (USAF) enable it to do research that may be instructive to other, smaller, air forces.

Author

Aircraft Pilots; Pilot Selection; Pilot Training

19970012391 Institute of Aviation Medicine, Prague, Czechoslovakia

The Analysis of Safety Indicators in the Aviators' Training

Kolouch, Jan, Institute of Aviation Medicine, Czechoslovakia; Selection and Training Advances in Aviation; Nov. 1996; 4p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

The prevention of aviation accidents used to be, in the former Czechoslovak Air Force in the centre of Commands attention. A system access to solving this problem area achieved the lowest losses of pilots and planes in the 1970s. Within the framework of validation of the methods, used in selection and training procedures, the analysis of the level in actual combat flight training was carried out in a fighter group (150 pilots) in the last years. The achieved results confirmed the reliability of psychophysiological examination with cadets and the prognostic validity of the criteria used in the selection processes. With the 90% level of significance the hypothesis of personality predisposition to errors in flying by the individuals having a lower level of cognitive functions development and with the manifestation of the emotional irritability has been confirmed. The characteristics of test batteries and the relevant criteria used for the expertise together with account of incidents and accidents will be dealt with.

Author

Aircraft Pilots; Pilot Selection; Training Analysis; Psychophysiology; Safety; Prevention; Human Behavior; Flight Training; Errors

19970012393 Army of the Czech Republic, Expert Lab of the Inspector of the Air Force and Air Defence, Prague, Czechoslovakia
Analysis of Psychomotor Performance of Fighter Pilots During Flight

Solcova, I., Army of the Czech Republic, Czechoslovakia; Sykora, J., Danwell, Inc., Czech Republic; Dvorak, J., Army of the Czech Republic, Czechoslovakia; Gadourek, P., GETA, Czech Republic; Selection and Training Advances in Aviation; Nov. 1996; 4p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

Eighteen healthy males with different degrees of flight experience were tested during piloting an L-29 jet-trainer plane during 54 standardized aerobatic flights. In 13 pilots up to four successive aerobatic flights were realized, separated by half an hour intervals on the ground. The ranks of the expert evaluated in-flight psychomotor performances during standardized aerobatic flights and of the values of the individual total flight time hours were highly significantly correlated ($r = 0.86$). Computer based analysis of the quality of performance of flight maneuvers showed that the pattern of piloting the plane was highly individual. Nevertheless, the coefficient of reliability of the courses of repeated flights of experienced pilots (normalized as to the duration of each maneuver and the maximal G-level reached) equaled to $r = 0.97$. Evidently, the individual pattern of flying is a stable characteristic of the performance of experienced pilots. It is something like their signature. Results of analysis were compared with other indices of pilot's performance under the influence of hypergravity.

Author

Aircraft Pilots; Pilot Performance; Pilot Training; Psychomotor Performance; Flight Tests

19970012401 Armstrong Lab., Brooks AFB, TX USA

Selection of Special Duty Aviators: Cognitive and Personality Findings

Patterson, John C., Armstrong Lab., USA; Schofield, Gary L., Armstrong Lab., USA; Howe, Brian, Armstrong Lab., USA; Bonney, Jacqueline D., Armstrong Lab., USA; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper will describe a selection program for special duty aviators. Different from other selection programs, this program selects already trained pilots as well as other non trained crewmembers such as loadmasters and flight engineers for special aviation duty. These aviators are selected to fly for the U.S. Air Force Special Operations Command (AFSOC) in airframes such as the MH 53 helicopter.

Derived from text

Aircraft Pilots; Personality; Pilot Selection; Pilot Training; Pilot Performance

19970012404 Institut de Medicine Aerospatiale Armee, Bretigny sur Orge, France

The Application of Human Factors For Equipment of the French Air Force *La Formation Aux Facteurs Humains Pour Les Equipages De L'Armee De L'Air Francaise*

Doireau, P., Institut de Medicine Aerospatiale Armee, France; Grau, J. Y., Institut de Medicine Aerospatiale Armee, France; Amalberti, R., Institut de Medicine Aerospatiale Armee, France; Valot, C., Institut de Medicine Aerospatiale Armee, France; Bouvet, J. L., French Air Force, France; Selection and Training Advances in Aviation; Nov. 1996; 6p; In French; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

French air force has defined in 1994 with IMASSA an 'human factors' policy to improve flight safety. This policy contents three ways: physical training program, experience feedback increasing, and 'human factors' training program. This article summarizes the main aspects of the definition and application of the 'human factors' training program.

Author

Human Factors Engineering; Flight Safety

19970012408 Canadian Air Command Headquarters, Aviation Physiology Section, Westwin, Manitoba Canada

Aviation Physiology Training in the 21st Century

Glass, K. C., Canadian Air Command Headquarters, Canada; Wilkinson, M. O., Army Special Warfare Center, USA; Selection and Training Advances in Aviation; Nov. 1996; 8p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The Canadian Aeromedical Training Program has recently undergone significant changes. Other countries are also reviewing their aeromedical training programs and looking for new or different ways to provide the necessary academic training at the correct frequency using the best methods possible. The U.S. Navy has completed an extensive review of its program and is currently exploring the possibility of providing continuation aeromedical training in conjunction with flight simulator training. The Royal Australian Air Force already uses an innovative approach to provide night vision training that may be appropriate for use by other countries. It seems inevitable that aeromedical training programs will continue to change in the future. To ensure that these changes are appropriate and that they improve flight safety, it is essential that measurement tools be developed to assess current programs

and to determine what changes should be made. Due to current and potential changes in aeromedical training programs, it would seem appropriate, in the interests of international standardization of aeromedical training in the future, to revise the terms of STANAG 3114.

Author

Training Simulators; Aerospace Medicine; Flight Safety; Night Vision

19970012409 Defence and Civil Inst. of Environmental Medicine, School of Operational Medicine, North York, Ontario Canada
Centrifuge Training in the Canadian Forces: A Review of the First Six Years' Experience

Bateman, William A., Defence and Civil Inst. of Environmental Medicine, Canada; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

In the late 1980s, the Canadian Forces developed and implemented a centrifuge training program intended to enhance the preparedness of its aircrew for the G-stress of modern fighter aircraft. In the six years from 15 June 1989 until 25 May 1995, 439 personnel attended 97 serials of this one-day course. Although a rigid performance standard was not set, aircrew from various CF pilot populations completed the target profile with success rates ranging from 61-83% (the more experienced fighter pilot groups doing better). The lessons learned in this first six years have paved the way towards a new program, with broader mandatory target population, provisions for refresher training, and G-tolerance improvement for those unable to complete the target profile.

Author

Centrifuges; Aircraft Pilots; Flight Crews; Experience

19970012413 Thomson Training and Simulation Ltd., Clergy Pontoise, France

Thomson Training and Simulation

Lacroix, Michel, Thomson Training and Simulation Ltd., France; Fontaine, Jean-Jacques, Thomson Training and Simulation Ltd., France; Selection and Training Advances in Aviation; Nov. 1996; 6p; In French; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The performance features which a helmet visual display unit must have in order to satisfy requirements of low-altitude flight simulators and multi-purpose simulators are analyzed here. The design of the SIMEYE 90 large field helmet visual display unit which allows one to satisfy these requirements is analyzed and the technical compromises are explained. The results from using the helmet visual display unit on a helicopter simulator are then presented. They allow one to achieve better performance than when using screen projection, with the exception of weight which is found to be disturbing by pilots who are not accustomed to wearing night vision binoculars.

Author

Flight Simulators; Display Devices; Helicopters; Helmets; Night Vision

19970012692 Federal Aviation Administration, Civil Aeromedical Inst., Oklahoma City, OK USA

Use of Off-The-Shelf PC-Based Flight Simulators for Aviation Human Factors Research Final Report

Beringer, Dennis B., Federal Aviation Administration, USA; Apr. 1996; 17p; In English

Report No.(s): AD-A310015; DOT/FAA/AM-96/15; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flight simulation has historically been an expensive proposition, particularly if out-the-window views were desired. Advances in computer technology have allowed a modular, off-the-shelf flight simulation (based on 80486 processors or Pentiums) to be assembled that has been adapted, with minimal modification, for conducting general aviation research. This simulation includes variable flight instrumentation, forward, 45 and 90 degree left external world views, and a map display. Control inputs are provided by high-fidelity analog controls (e.g., damped and self-centering yoke, high-performance throttle quadrant, gear, flap, and trim controls; and navigation radio frequency select). The simulation is based upon two commercially available flight simulation software packages, one originally designed as an instrument flight trainer and the other as a game-type flight simulation. The provisions of these packages are discussed highlighting their particular research capabilities, as well as their limitations. The comparatively low cost and ease of assembly/integration allow multiple 'standardized' systems to be distributed for cooperative inter-laboratory studies. The approach appears to have utility for both research and training.

DTIC

Aviation Psychology; Applications Programs (Computers); Computerized Simulation; Flight Simulators; Flight Simulation; Flight Instruments; Computers

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

19970012040 National Aeronautics and Space Administration. Langley Research Center, Hampton, VA USA

Development of a Flight Simulation Data Visualization Workstation

Kaplan, Joseph A., National Aeronautics and Space Administration. Langley Research Center, USA; Chen, Ronnie, National Aeronautics and Space Administration. Langley Research Center, USA; Kenney, Patrick S., Unisys Corp., USA; Koval, Christopher M., Unisys Corp., USA; Hutchinson, Brian K., Unisys Corp., USA; Dec.1996; 60p; In English

Report No.(s): NASA-TM-110308; NAS 1.15:110308; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Today's modern flight simulation research produces vast amounts of time sensitive data. The meaning of this data can be difficult to assess while in its raw format. Therefore, a method of breaking the data down and presenting it to the user in a graphical format is necessary. Simulation Graphics (SimGraph) is intended as a data visualization software package that will incorporate simulation data into a variety of animated graphical displays for easy interpretation by the simulation researcher. Although it was created for the flight simulation facilities at NASA Langley Research Center, SimGraph can be reconfigured to almost any data visualization environment. This paper traces the design, development and implementation of the SimGraph program, and is intended to be a programmer's reference guide.

Author

Head-Up Displays; Flight Simulation; Scientific Visualization; Computer Animation; Applications Programs (Computers)

19970012788 NASA Langley Research Center, Hampton, VA USA

Results of a Flight Simulation Software Methods Survey

Jackson, E. Bruce, NASA Langley Research Center, USA; 1995; 10p; In English; Flight Simulation Technologies, 7-9 Aug. 1995, Baltimore, MD, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA-TM-111973; NAS 1.15:111973; AIAA Paper 95-3414; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

A ten-page questionnaire was mailed to members of the AIAA Flight Simulation Technical Committee in the spring of 1994. The survey inquired about various aspects of developing and maintaining flight simulation software, as well as a few questions dealing with characterization of each facility. As of this report, 19 completed surveys (out of 74 sent out) have been received. This paper summarizes those responses.

Author

Flight Simulation; Surveys; Computerized Simulation

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

19970012638 Florida State Univ., Dept. of Mathematics, Tallahassee, FL USA

Jet Aeroacoustics: Noise Generation Mechanism and Prediction Progress Report, 1 Jan. 1996 - 21 Dec. 1996

Tam, Christopher, Florida State Univ., USA; Dec. 31, 1996; 18p; In English

Contract(s)/Grant(s): NAG1-1776

Report No.(s): NASA-CR-203579; NAS 1.26:203579; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Progress associated with research in (1) physics and prediction of turbulent mixing noise from supersonic jets, and (2) numerical simulation of supersonic jet noise is reported.

Derived from text

Turbulent Mixing; Jet Aircraft Noise; Gas Jets; Aeroacoustics; Noise Generators

19970012644 Lockheed Martin Corp., Hampton, VA USA

A Users Guide for the NASA ANOPP Propeller Analysis System Final Report

Nguyen, L. Cathy, Lockheed Martin Corp., USA; Kelly, Jeffrey J., Lockheed Martin Corp., USA; Feb. 1997; 104p; In English

Contract(s)/Grant(s): NAS1-96014; RTOP 538-03-13-01

Report No.(s): NASA-CR-4768; NAS 1.26:4768; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The purpose of this report is to document improvements to the Propeller Analysis System of the Aircraft Noise Prediction Program (PAS-ANOPP) and to serve as a users guide. An overview of the functional modules and modifications made to the Propeller ANOPP system are described. Propeller noise predictions are made by executing a sequence of functional modules through the use of ANOPP control statements. The most commonly used ANOPP control statements are discussed with detailed examples demonstrating the use of each control statement. Originally, the Propeller Analysis System included the angle-of-attack only in the performance module. Recently, modifications have been made to also include angle-of-attack in the noise prediction module. A brief description of PAS prediction capabilities is presented which illustrate the input requirements necessary to run the code by way of ten templates. The purpose of the templates are to provide PAS users with complete examples which can be modified to serve their particular purposes. The examples include the use of different approximations in the computation of the noise and the effects of synchrophasing. Since modifications have been made to the original PAS-ANOPP, comparisons of the modified ANOPP and wind tunnel data are also included. Two appendices are attached at the end of this report which provide useful reference material. One appendix summarizes the PAS functional modules while the second provides a detailed discussion of the TABLE control statement.

Author

Applications Programs (Computers); Propeller Noise; Angle of Attack; Noise Prediction (Aircraft)

18 SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radation.

19970012891 NASA Langley Research Center, Hampton, VA USA

Optimization of an Advanced Design Three-Element Airfoil at High Reynolds Numbers

Lin, John C., NASA Langley Research Center, USA; Dominik, Chet J., McDonnell-Douglas Aerospace, USA; 1995; 114p; In English; 13th; Applied Aerodynamics, 19-22 Jun. 1995, San Diego, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA-TM-112019; NAS 1.15:112019; AIAA Paper 95-1858; Copyright Waived (NASA); Avail: CASI; A06, Hardcopy; A02, Microfiche

New high-lift components have been designed for a three-element advanced high-lift research airfoil using a state-of-the-art computational method. The new components were designed with the aim to provide high maximum-lift values while maintaining attached flow on the single-segment flap at approach conditions. This three-element airfoil has been tested in the NASA Langley Low-Turbulence Pressure Tunnel at chord Reynolds number up to 16 million. The performance of the NASA research airfoil is compared to a reference advanced high-lift research airfoil. Effects of Reynolds number on slat and flap rigging have been studied experimentally. The performance trend of this new high-lift design is comparable to that predicted by the computational method over much of the angle of attack range. Nevertheless, the method did not accurately predict the airfoil performance or the configuration-based trends near maximum lift.

Author

High Reynolds Number; Airfoils; Wind Tunnel Tests; Structured Grids (Mathematics); Navier-Stokes Equation; Computational Fluid Dynamics

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