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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
3. Author(s) and Affiliation(s)
4. Publication Date
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6. Report Number(s); Availability and Price Codes
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AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 361)

NOVEMBER 14, 1997

01 AERONAUTICS

19970031297 Army Safety Center, Fort Rucker, AL USA

Flightfax: Army Aviation Risk-Management Information, Volume 25

Aug. 1997; 12p; In English

Report No.(s): AD-A328248; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This periodical deals with all aspects of army aviation; in this issue the emphasis is on helicopter flight maneuvers, equipment, flight training, aviation accidents, safety, and risk management information.

DTIC

Helicopters; Aircraft Accidents; Safety Management; Flight Training; Aircraft Maneuvers; UH-1 Helicopter

19970032038 Georgia Inst. of Tech., Computational Mechanics Center, Atlanta, GA USA

AASERT-Structural Integrity of Aging of Aerospace Structures and Repairs Final Report, 1 Aug. 1995 - 31 Jul. 1996

Atluri, S. N., Georgia Inst. of Tech., USA; Dec. 01, 1996; 169p; In English

Contract(s)/Grant(s): F49620-93-1-0345

Report No.(s): AD-A326704; AFOSR-TR-97-0096; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This project emphasizes the development and evaluation of analytic methods for the solution of fracture mechanics problems as related to aircraft structures. Some of these methods are: finite and boundary element methods, singular/hybrid finite elements, alternating method, and path independent and domain independent integrals. When these methods are applied to various cases of aircraft structural problems, predictions of crack growth and fatigue life can be made. The final report describes these analytical methods as applied to various cases of aircraft structural problems, including the evaluation of composite patch repairs to existing cracks.

DTIC

Aircraft Structures; Crack Propagation; Cracking (Fracturing); Finite Element Method; Boundary Element Method

02 AERODYNAMICS

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

19970031160 Technische Hogeschool, Dept. of Aerospace Engineering, Delft, Netherlands

Wind Tunnel Wall Effects on the Flow around a 76/40 deg Double-Delta Wing Final Report

Verhaagen, Nicolaas G., Technische Hogeschool, Netherlands; Mar. 1997; 39p; In English

Contract(s)/Grant(s): F61708-96-W-0094

Report No.(s): AD-A327879; EOARD-SPC-96-4008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Delft University of Technology as follows: The contractor will perform a service consisting of experimental investigations of the effect of small geometry modifications at the strake/wing junction of a cropped double delta wing. The investigations will include the effect of its on surface pressure, forces, and moments for an existing double delta wing wind tunnel model at NAWC. Testing will take place in the NAWC low-speed wind tunnel facility and the experimental data will be compared with existing data NASA Langley and compared with new CFD predictions described in his proposal.

DTIC

Wind Tunnel Models; Wings; Wall Flow; Delta Wings

19970031290 Wright Lab., Flight Dynamics Directorate, Wright-Patterson AFB, OH USA

Development of Non-Linear, Low-Speed Aerodynamic Model for the F-16/Vista Final Report

Kay, Jacob, Bihle Applied Research, Inc., USA; Ralston, John N., Bihle Applied Research, Inc., USA; Lash, Stanley F., Wright Lab., USA; Aug. 1997; 14p; In English

Contract(s)/Grant(s): AF Proj. 2403

Report No.(s): AD-A327869; WL-TM-97-3065; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new low-speed aerodynamic database for the F-16/vista was developed from low-speed data sets obtained from nasa langley's facilities. This new model was designed to be continuous from -80 degrees to +90 degrees angle of attack, -30 degrees to +30 degrees of sideslip, and to incorporate all sideslip and control effectiveness interactions in a fully non-linear structure. This paper first reviews the model structure and documents the aerodynamic data source used to assemble the data. the subsequent discussion examines the methodology used to correlate and validate the model against flight test data as well as the rationales for the model changes.

DTIC

F-16 Aircraft; Aerodynamic Characteristics; Angle of Attack; Controllability; Nonlinearity; Sideslip

19970031503 NASA Lewis Research Center, Cleveland, OH USA

Progress in Grid Generation: From Chimera to DRAGON Grids

Liou, Meng-Sing, NASA Lewis Research Center, USA; Kao, Kai-Hsiung, Ohio Aerospace Inst., USA; Aug. 1994; 30p; In English

Contract(s)/Grant(s): NCC3-233; RTOP 505-62-52

Report No.(s): NASA-TM-106709; NAS 1.15:106709; ICOMP-94-19; E-9071; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Hybrid grids, composed of structured and unstructured grids, combines the best features of both. The chimera method is a major stepstone toward a hybrid grid from which the present approach is evolved. The chimera grid composes a set of overlapped structured grids which are independently generated and body-fitted, yielding a high quality grid readily accessible for efficient solution schemes. The chimera method has been shown to be efficient to generate a grid about complex geometries and has been demonstrated to deliver accurate aerodynamic prediction of complex flows. While its geometrical flexibility is attractive, interpolation of data in the overlapped regions - which in today's practice in 3D is done in a nonconservative fashion, is not. In the present paper we propose a hybrid grid scheme that maximizes the advantages of the chimera scheme and adapts the strengths of the unstructured grid while at the same time keeps its weaknesses minimal. Like the chimera method, we first divide up the physical domain by a set of structured body-fitted grids which are separately generated and overlaid throughout a complex configuration. To eliminate any pure data manipulation which does not necessarily follow governing equations, we use non-structured grids only to directly replace the region of the arbitrarily overlapped grids. This new adaptation to the chimera thinking is coined the DRAGON grid. The nonstructured grid region sandwiched between the structured grids is limited in size, resulting in only a small increase in memory and computational effort. The DRAGON method has three important advantages: (1) preserving strengths of the chimera grid; (2) eliminating difficulties sometimes encountered in the chimera scheme, such as the orphan points and bad quality of interpolation stencils; and (3) making grid communication in a fully conservative and consistent manner insofar as the governing equations are concerned. to demonstrate its use, the governing equations are discretized using the newly proposed flux scheme, AUSM+, which will be briefly described herein. Numerical tests on representative 2D inviscid flows are given for demonstration. Finally, extension to 3D is underway, only paced by the availability of the 3D unstructured grid generator.

Author

Grid Generation (Mathematics); Unstructured Grids (Mathematics); Computational Fluid Dynamics

19970031816 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

An Object-Oriented Simulation of the C-17 Wingtip Vortices in the Airdrop Environment

Petry, Hans J., Air Force Inst. of Tech., USA; Mar. 1997; 191p; In English

Report No.(s): AD-A328588; AFIT/GOA/ENS/97M-13; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This thesis effort focuses on the development of an object-oriented simulation of C-17 personnel airdrop operations and provides a tool for risk assessment of jumper and wingtip vortex interaction. Using the initial modeling efforts of the Wright Laboratory, this model expands those efforts to include random aircraft, wind and jumper movement within the simulation using MODSIM 3 as its language. Once the model was built, verified, and calibrated, it helped perform a preliminary analysis of jumper risk with varying element spacing and no crosswind. The results of the simulation provided 15 data points with which linear and logistic regression provided an estimation of the marginal rate of change of jumper/vortex encounter rate. Using the third order model shows that the encounter rate levels off around 24,000 feet spacing between element leaders at 12%, and stays as high as

11% at 32,000 feet before dropping to 0.4% at 34,000 feet. Further research and model improvements may bring the encounter rate down at the more distant spacing but that is left for post thesis analysis efforts.

DTIC

Object-Oriented Programming; Transport Aircraft; Wing Tips

19970031958 NASA Langley Research Center, Hampton, VA USA

Aerodynamic Design on Unstructured Grids for Turbulent Flows

Anderson, W. Kyle, NASA Langley Research Center, USA; Bonhaus, Daryl L., NASA Langley Research Center, USA; Jun. 1997; 12p; In English

Contract(s)/Grant(s): RTOP 522-31-21-01

Report No.(s): NASA-TM-112867; NAS 1.15:112867; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An aerodynamic design algorithm for turbulent flows using unstructured grids is described. The current approach uses adjoint (costate) variables for obtaining derivatives of the cost function. The solution of the adjoint equations is obtained using an implicit formulation in which the turbulence model is fully coupled with the flow equations when solving for the costate variables. The accuracy of the derivatives is demonstrated by comparison with finite-difference gradients and a few example computations are shown. In addition, a user interface is described which significantly reduces the time required for setting up the design problems. Recommendations on directions of further research into the Navier Stokes design process are made.

Author

Unstructured Grids (Mathematics); Aerodynamics; Design Analysis; Finite Difference Theory; Flow Equations; Turbulent Flow

19970032091 Naval Surface Warfare Center, Dahlgren, VA USA

NASA Boeing 757 Cavity Field Variability Based on Boeing 757 and Boeing 707 Test Data Final Report

Hatfield, Michael O., Naval Surface Warfare Center, USA; Johnson, Mark D., Naval Surface Warfare Center, USA; Freyer, Gustav J., Northeast Consortium for Engineering Education, USA; Slocum, Michael B., Computer Sciences Corp., USA; Jan. 1997; 29p; In English

Report No.(s): AD-A328539; NSWCDD/TR-97/25; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Langley Research Center conducted an extensive ground and flight test program to validate detailed modeling of the Boeing 757 aircraft. Most of the ground and flight test data were obtained using D-dot probes in fixed locations in the cockpit, electronics bay, and passenger cabin. An open question was the uncertainties that may be expected for the comparison of experimental measurements and model predictions. The Naval Surface Warfare Center, Dahlgren Division and the USAF Phillips Laboratory had performed cavity characterization tests on the same Boeing 757 as used for the flight tests. Extensive cavity characterization data was also available for a Boeing 707 aircraft. While the three specific flight test comparison frequencies were not investigated in these tests, sufficient data were available to provide estimates of the expected uncertainties. Some of the data in the cavity characterization tests were collected with the flight test D-dot probes in the same locations. A summary of the results is presented as a standard deviation in decibels in a series of tables for each cavity and each frequency.

DTIC

Boeing 757 Aircraft; Boeing 707 Aircraft; Characterization; Flight Tests; Frequencies; Cockpits; Ground Tests

03

AIR TRANSPORTATION AND SAFETY

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

19970031319 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

C-17/Paratrooper Risk Assessment Analysis

Belano, Jose C., Air Force Inst. of Tech., USA; Mar. 1997; 153p; In English

Report No.(s): AD-A327816; AFIT/GOR/ENS/97M-01; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The C-17 test and evaluation community has been testing different aircraft formation geometries in search of a configuration which minimizes paratrooper encounter with the wake vortices of upstream aircraft. This thesis develops a simulation tool that the C-17 test and evaluation community can utilize as an advanced risk assessment model to use on proposed formation geometries prior to live testing. The model is developed under the architecture of object-oriented simulation using MODSIM III and parallels similar efforts by the Aerodynamic Decelerator Technology community in creating object-oriented counterparts to already developed trajectory models of various degrees of freedom. This thesis develops the paratrooper object portion of the simulation model while the Petry thesis (1997) develops the C-17 aircraft and vortex objects. Once integrated with the Petry C-17 aircraft and vortex

objects, and after verification and validation, the simulation model is applied to a simplified airborne operation scenario using the mean distance of paratrooper impact location to assembly areas and DZ dispersal distribution as MOEs for different aircraft formation geometries. Lateral separation is shown to have the most influence on both MOEs, while trail distance has minimal effects. For the airborne commander, this translates into operational parameters applicable to the choice of assembly areas and formation geometries. Further operational parameters of any significance are gained when coupled with the results from Petry on encounter rates between paratroopers and wake vortices where trail distance has a significant impact.

DTIC

C-17 Aircraft; Risk; Vortices; Simulation; Wakes; Aircraft Safety

19970031683 NASA Langley Research Center, Hampton, VA USA

A Candidate Wake Vortex Strength Definition for Application to the NASA Aircraft Vortex Spacing System (AVOSS)

Hinton, David A., NASA Langley Research Center, USA; Tatnall, Chris R., George Washington Univ., USA; Sep. 1997; 36p; In English

Contract(s)/Grant(s): RTOP 538-04-11-11

Report No.(s): NASA-TM-110343; NAS 1.15:110343; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A significant effort is underway at NASA Langley to develop a system to provide dynamical aircraft wake vortex spacing criteria to Air Traffic Control (ATC). The system under development, the Aircraft Vortex Spacing System (AVOSS), combines the inputs of multiple subsystems to provide separation matrices with sufficient stability for use by ATC and sufficient monitoring to ensure safety. The subsystems include a meteorological subsystem, a wake behavior prediction subsystem, a wake sensor subsystem, and system integration and ATC interfaces. The proposed AVOSS is capable of using two factors, singly or in combination, for reducing in-trail spacing. These factors are wake vortex motion out of a predefined approach corridor and wake decay below a strength that is acceptable for encounter. Although basic research into the wake phenomena has historically used wake total circulation as a strength parameter, there is a requirement for a more specific strength definition that may be applied across multiple disciplines and teams to produce a real-time, automated system. This paper presents some of the limitations of previous applications of circulation to aircraft wake observations and describes the results of a preliminary effort to bound a spacing system strength definition.

Author

Vortices; Wakes; Air Traffic Control; Spacing; Aircraft; Real Time Operation; Aircraft Wakes; Safety

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

19970031281 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA

Report to Congressional Committees, Executive Agencies and the National Civil Aviation Review Commission. National Airspace System: Issues in Allocating Costs for Air Traffic Services to DOD and Other Users

Apr. 25, 1997; 80p; In English

Report No.(s): AD-A328343; GAO/RCED-97-106; B-275249; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The U.S. airspace system, which is in continuous operation 24 hours a day, 365 days a year, is commonly referred to as the National Airspace System (NAS). The principal component of the NAS is the ATC system—a vast network of radars; automated data processing, navigation, and communication equipment; and traffic control facilities. It is through the ATC system that FAA and DOD provide services such as controlling takeoffs and landings and managing the flow of traffic between airports. Other components of the NAS include airports or landing areas; aeronautical charts, information, and services; rules, regulations, and procedures; technical information; and personnel and material. Furthermore, portions of certain components of the ATC system, such as long-range radars, are shared jointly between FAA and DOD. Since 1958, as established by the Federal Aviation Act, FAA and DOD have been partners in jointly operating the NAS and in providing air traffic services. They also cooperate in various other areas, such as air defense, drug interdiction, and weather research. The details of how FAA and DOD work together are embodied in joint manuals and hundreds of letters of agreements at both the national and regional levels. For example, Patuxent Naval Air Traffic Control Facility in Patuxent River, Maryland, provides radar coverage for a geographic area of about 6,400 square miles; its boundaries stretch from Bethany Beach, Delaware, along the Atlantic coast to Leedstan, Virginia. Patuxent has entered into a letter of agreement with FAA'S Washington Air Route Traffic Control Center in Leesburg, Virginia, to provide approach control

services during certain hours as stipulated in the agreement. Similar agreements exist between FAA'S facilities and DOD'S facilities across the USA. In fiscal year 1995, FAA reported that it handled about 150 million aircraft movements

DTIC

Integrated Mission Control Center; National Airspace System; Air Traffic Control; Approach Control; Daytime; Data Processing

19970031598 Shanghai Observatory, China

Precise Determination and Accuracy Estimation of Shanghai VLBI, SLR and GPS Station Coordinates

Zhu, Wen-Yao, Shanghai Observatory, China; Xiong, Yong-Qing, Shanghai Observatory, China; Cheng, Zong-Yi, Shanghai Observatory, China; Zhang, Hua, Shanghai Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 1996, no. No. 17, pp. 7-17; In Chinese; Also announced as 19970031597; No Copyright; Avail: Issuing Activity (Shanghai Observatory, Chinese Academy of Sciences, Shanghai 200030), Hardcopy, Microfiche

The geocentric coordinates of Shanghai VLBI, SLR and GPS stations to be as the fiducial points of global terrestrial reference system, have been researched or redetermined, and the reliable accuracy estimation of the station coordinates determined has also been made. It become clear that there are rather too large in Shanghai SLR station coordinates published by IERS.

Author

Global Positioning System; Very Long Base Interferometry; Laser Range Finders

19970031606 Shanghai Observatory, China

The Last Measurement Results and Analysis Among Shanghai Observatory VLBI, SLR and GPS Stations

Xiong, Yong-Qing, Shanghai Observatory, China; Zhu, Wen-Yao, Shanghai Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 1996, no. No. 17, pp. 65-72; In Chinese; Also announced as 19970031597; No Copyright; Avail: Issuing Activity (Shanghai Observatory, Chinese Academy of Sciences, Shanghai 200030), Hardcopy, Microfiche

The GPS data for determining Shanghai Observatory GPS station's coordinates are reprocessed, and the relative coordinates from GPS station to VLBI, SLR phase center are presented. Compared with the results of the last geodetic measurement, the difference of the baseline vector between GPS site and VLBI site in IGS 1992 Campaign is about 2.6 cm, and the difference of the other baseline vector obtained from GPS technique is better than 1 cm.

Author

Very Long Base Interferometry; Global Positioning System; Coordinates

19970031609 Zhengzhou Surveying and Mapping Inst., Zhengzhou, China

GPS Double Difference Ambiguity Function and Baseline Search Solution

Wu, Jie, Zhengzhou Surveying and Mapping Inst., China; Annals of Shanghai Observatory, Academia Sinica; 1996, no. No. 17, pp. 89-94; In Chinese; Also announced as 19970031597; No Copyright; Avail: Issuing Activity (Shanghai Observatory, Chinese Academy of Sciences, Shanghai 200030), Hardcopy, Microfiche

The effects of cycle-slip on GPS baseline solution can be completely eliminated by using ambiguity function search method. A new kind of GPS double difference ambiguity function is put out in this paper, its shape and the GPS baseline search method based on this function are carefully researched. At the end an example is given.

Author

Global Positioning System; Difference Equations; Ambiguity; Searching

19970031617 Shanghai Observatory, China

The Effect of Fiducial Station on GPS Relative Positioning

Hu, Hua-Guan, Shanghai Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 1996, no. No. 17, pp. 150-161; In Chinese; Also announced as 19970031597; No Copyright; Avail: Issuing Activity (Shanghai Observatory, Chinese Academy of Sciences, Shanghai 200030), Hardcopy, Microfiche

The effect of the fiducial station on GPS relative positioning is discussed: When the weighted least-square adjustment is used to estimate the relative positions of a set of GPS stations, if tracking data are available only from a regional or continental network of stations, it is necessary to fix or tightly constrain at least three coordinate components of one fiducial station in order to overcome the uncertainty of solution due to the strong correlation between the estimated parameters. In this paper, the influence of coordinate deviation at fiducial station on baseline length is also analyzed.

Author

Global Positioning System; Position (Location); Networks; Estimating; Correlation; Tracking (Position); Least Squares Method

19970031621 Shanghai Observatory, China

The Multipath Effect and Instrument Noise in GPS Dual Frequency Receiver

Xiong, Yong-Qing, Shanghai Observatory, China; Zhu, Wen-Yao, Shanghai Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 1996, no. No. 17, pp. 184-192; In Chinese; Also announced as 19970031597; No Copyright; Avail: Issuing Activity (Shanghai Observatory, Chinese Academy of Sciences, Shanghai 200030), Hardcopy, Microfiche

To monitor the multipath effect and instrument noise in GPS dual frequency receiver, we use L1 and L2 phase measurements to remove the ionospheric delay in pseudorange, and derive the MP1 and MP2 expressions, then we give two instances about instrument noise and multipath effect in pseudorange measurements when AS is opened and closed.

Author

Global Positioning System; Noise; Receivers; Multipath Transmission; Frequency Ranges; Frequencies; Ionospheres; Phase Control

19970031639 Shanghai Observatory, China

The Comparison of the Long Term Results of International Time Synchronization Determinated by the Two Technologies of Time Transfer

Hu, Jin-Lun, Shanghai Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 1996, no. No. 17, pp. 301-306; In Chinese; Also announced as 19970031597; No Copyright; Avail: Issuing Activity (Shanghai Observatory, Chinese Academy of Sciences, Shanghai 200030), Hardcopy, Microfiche

According to the data published by the time bulletin of Shanghai Observatory (SO) and some time centers in the world (BIPM Time Section, U.S. Naval Observatory (USNO) etc.) from 1990-1994, we carried out comparison and analysis for the long term results of international time synchronization which are determined by the two technologies of time transfer (Loran-C and GPS) in this paper. Some results of SO time laboratory have been obtained as follows: (1) The results of international time synchronization determined by Loran - C time transfer technology are shown: the system deviation is about 600 ns, the uncertainty (1 sigma) is about 90 ns, the accuracy is better than 1 microsecond; and (2) The results of international time synchronization determined by GPS time transfer technology are shown; the system deviation is better 30 ns, the uncertainty (1 sigma) is about 15 ns, the accuracy is better than 100 ns. The comparison of these results have fully shown that the GPS time transfer technology has inevitable extension application in international time synchronization with a high level.

Author

Global Positioning System; Signal Transmission; Synchronism; Loran C; Time Signals; Time Functions

19970031927 Naval Postgraduate School, Monterey, CA USA

Application of Cyclostationary Signal Selectivity to the Carry-On Multi-Platform GPS Assisted Time Difference of Arrival System

Streight, David Alan, Naval Postgraduate School, USA; Mar. 1997; 276p; In English

Report No.(s): AD-A328686; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Traditional methods of time difference of arrival (TDOA) determination suffer significantly in environments fraught with co-channel interference and low signal to noise ratios. Cyclostationary signal processing techniques offer solutions to the shortcomings of the traditional TDOA methods. Specifically, the Spectral Coherence Alignment (SPECCOA) method of TDOA determination, developed by the Mission Research Corp. and Statistical Signal Processing Inc., performs exceptionally in very poor signal to noise ratio environments. The Applied Research Lab at the University of Texas at Austin (ARL:UT) has developed a prototype TDOA system, the Carry-on Multi-platform GPS Assisted Time Difference of Arrival System for the Naval Information Warfare Activity. It currently utilizes a traditional complex ambiguity function (CAF) to determine the TDOA(s) between multiple observers and an ARL:UT developed closed form solution for the geolocation of the emitter. The work presented here takes the first step in applying SPECCOA to the ARL:UT system. Coding both SPECCOA and the ARL:UT closed form solution in MATLAB(Trademark) makes possible a quantitative comparison between the CAF and SPECCOA using ARL:UT real world test signals.

DTIC

Electromagnetic Interference; Signal to Noise Ratios; Prototypes; Signal Processing; Low Noise

19970032687

Cycle ambiguity estimation for aircraft precision landing using the Global Positioning System

Pervan, Boris S., Stanford Univ, USA; Parkinson, Bradford W.; Journal of Guidance, Control, and Dynamics; July 1997; ISSN 0731-5090; vol. 20, no. 4, pp. 681-689; In English; Copyright; Avail: Issuing Activity

Measurements of the Global Positioning System carrier phase can provide the basis for the highest level of satellite-based navigation performance. In particular, the potential exists to exceed even the stringent navigation requirements for aircraft precision approach and landing. The principal difficulty in this use of carrier phase, however, lies in the real-time, high-integrity resolution of the unknown integer cycle ambiguities. A new methodology is introduced, using carrier phase measurements from ground-based pseudolites, for explicit estimation of the cycle ambiguities. The mathematical basis of the new approach is detailed, and high-speed nonlinear information smoothing algorithms suitable for real-time airborne execution are derived. Extensive flight-test data, including the results of automatic landings of a Boeing 737 aircraft, are presented as experimental validation of algorithm performance.

Author (EI)

Air Navigation; Aircraft Landing; Global Positioning System

19970033831

Degradation of navigational accuracy with global positioning system during periods of scintillation at equatorial latitudes

Bandyopadhyay, T., Univ of Calcutta, India; Guha, A.; Dasgupta, A.; Banerjee, P.; Bose, A.; Electronics Letters; June 5 1997; ISSN 0013-5194; vol. 33, no. 12, pp. 1010-1011; In English; Copyright; Avail: Issuing Activity

The effect of ionospheric scintillation on navigational accuracy with the GPS (global positioning system) in the equatorial region is presented. The accuracy of position fixing with the GPS as indicated by the PDOP (position dilution of precision) factor is degraded when the raypath from the satellite shows deep fading. It is understood that navigation, particularly using a moderately sophisticated GPS receiver, in the equatorial zone will be severely affected during maximum sunspot number years.

Author (EI)

Equatorial Regions; Global Positioning System; Radio Navigation; Radio Receivers; Radio Signals; Scintillation

19970034066

Optimal nonlinear filtering in GPS/INS integration

Carvalho, H., Lab d'Analyse et d'Architecture des Systemes, France; Del Moral, P.; Monin, A.; Salut, G.; IEEE Transactions on Aerospace and Electronic Systems; July 1997; ISSN 0018-9251; vol. 33, no. 3, pp. 835-850; In English; Copyright; Avail: Issuing Activity

The application of optimal nonlinear/non-Gaussian filtering to the problem of INS/GPS integration in critical situations is described. This approach is made possible by a new technique called particle filtering, and exhibits superior performance when compared with classical suboptimal techniques such as extended Kalman filtering. Particle filtering theory is introduced and GPS/INS integration simulation results are discussed.

Author (EI)

Global Positioning System; Kalman Filters; Optical Filters; Particle Theory

19970034068

Effects of ionospheric scintillation on differential demodulation of GPS data

Dana, Roger A., Mission Research Corp, USA; IEEE Transactions on Aerospace and Electronic Systems; July 1997; ISSN 0018-9251; vol. 33, no. 3, pp. 893-902; In English; Copyright; Avail: Issuing Activity

Global Positioning System (GPS) receivers that must operate under fading propagation conditions can use differential phase-shift keying (DPSK) and reference bits to reliably demodulate GPS data. The demodulation performance of such receivers is analyzed for nonfading and Rayleigh fading channels. Theoretical results derived here are compared with measured error rates taken during scintillation testing of a prototype GPS/DPSK receiver.

Author (EI)

Demodulation; Global Positioning System; Phase Shift Keying

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19970031167 General Accounting Office, National Security and International Affairs Div., Washington, DC USA

Report to Congressional Committees. B-2 Bomber: Cost and Operational Issues

Aug. 1997; 23p; In English

Report No.(s): AD-A328334; GAO/NSIAD-97-181; B-275493; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

B-2 operational requirements specify that the weapon system have 'low-observable' (stealth) characteristics and sufficient range and payload capability to deliver precision-guided conventional or nuclear weapons anywhere in the world with enhanced survivability. The B-2 combines conventional and state-of-the-art technology, such as special shaping and radar-absorbing materials, to achieve low-observability characteristics, high aerodynamic efficiency, and a large payload capacity. The blending of these technologies makes the aircraft complex and costly to develop, produce, and in some respects maintain. In the early 1990s, the number of B-2s to be acquired was reduced from 132 to 20 operational aircraft. The 20 aircraft include 15 production aircraft and 5 of 6 test aircraft that are to be modified to a fully capable operational configuration. In March 1996, the President directed that the one remaining test aircraft be upgraded to a fully capable operational configuration, bringing the total operational B-2s to be acquired to 21. B-2 development started in 1981. Production of long lead-time aircraft components began in 1986 and flight testing was initiated in 1989. The lengthy development and test program, which has been implemented concurrently with the production program for about 11 years, required the Air Force to devise a mechanism for initially accepting partially capable aircraft until their full capability could be demonstrated in the test program.

DTIC

Aerodynamic Characteristics; Antiradar Coatings; Bomber Aircraft; Production Planning; Weapon Systems

19970031254 Analytical Services and Materials, Inc., Hampton, VA USA

Structural Integrity Analysis and Verification for Aircraft Structures, Volume 2, Effects of Compressive Loading on the Fatigue Crack Growth Rates of 7075-T651 and 2024-T3 Aluminum Alloys Final Report, 1 Jan. - 31 Dec. 1995

Boyd, K. L., Analytical Services and Materials, Inc., USA; Eisner, J. H., Analytical Services and Materials, Inc., USA; Jansen, D. A., Analytical Services and Materials, Inc., USA; Harter, J. A., Wright Lab., USA; Aug. 1996; 47p

Contract(s)/Grant(s): F33615-94-D-3212; AF Proj. 2401

Report No.(s): AD-A327868; WL-TR-97-3017-Vol-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this research was to determine the effects of constant amplitude high compressive stresses on the fatigue life of 7075-T651 and 2024-T3 aluminum alloys. This project consisted of three components: finite element modeling/analysis, generation of fatigue crack growth data for AFGROW modifications, and verification testing. An elastic-plastic finite element analysis program (ZIP2D) was used to determine the stress field in the crack plane for the different testing conditions. Fatigue crack growth data from center-notched, through-cracked panels were collected for both alloys at several loads and stress ratios, and these data were used to modify tabular crack growth data for the AFGROW program. Center-notched and surface-cracked specimens were then tested to verify AFGROW predictions (with updated tabular data) for crack shape and fatigue lifetimes.

DTIC

Aircraft Structures; Crack Propagation; Elastic Properties; Fatigue (Materials); Fatigue Life; Finite Element Method; Plastic Properties; Stress Ratio; Tables (Data)

19970031272 Virginia Polytechnic Inst. and State Univ., MAD Center, Blacksburg, VA USA

Landing Gear Integration in Aircraft Conceptual Design Final Report, Jun. 1994 - Sep. 1996

Chai, Sonny T., Virginia Polytechnic Inst. and State Univ., USA; Mason, William H., Virginia Polytechnic Inst. and State Univ., USA; Mar. 1997; 194p; In English

Contract(s)/Grant(s): NAG2-919

Report No.(s): NASA-CR-205551; NAS 1.26:205551; MAD-96-09-01; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The design of the landing gear is one of the more fundamental aspects of aircraft design. The design and integration process encompasses numerous engineering disciplines, e.g., structure, weights, runway design, and economics, and has become extremely sophisticated in the last few decades. Although the design process is well-documented, no attempt has been made until now in the development of a design methodology that can be used within an automated environment. As a result, the process remains to be a key responsibility for the configuration designer and is largely experience-based and graphically-oriented. However, as industry and government try to incorporate multidisciplinary design optimization (MDO) methods in the conceptual design phase, the need for a more systematic procedure has become apparent. The development of an MDO-capable design methodology as described in this work is focused on providing the conceptual designer with tools to help automate the disciplinary analyses, i.e., geometry, kinematics, flotation, and weight. Documented design procedures and analyses were examined to determine their applicability, and to ensure compliance with current practices and regulations. Using the latest information as obtained from industry during initial industry survey, the analyses were in terms modified and expanded to accommodate the design criteria

associated with the advanced large subsonic transports. Algorithms were then developed based on the updated analysis procedures to be incorporated into existing MDO codes.

Author

Design Analysis; Multidisciplinary Design Optimization; Landing Gear; Aircraft Design; Runways; Economics

19970031283 General Accounting Office, Washington, DC USA

Testimony Before the Subcommittee on Military Research and Development and Military Procurement, Committee on National Security House of Representatives. Unmanned Aerial Vehicles: DoD's Acquisition Efforts

Apr. 1997; 19p; In English

Report No.(s): AD-A328322; GAO/T-NSIAD-97-138; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

According to DOD, its objective in acquiring UAVS is to provide unmanned systems that will complement its mix of manned and national reconnaissance assets. However, its UAV acquisition efforts to date have been disappointing. Since Aquila began in 1979, of eight UAV programs, three have been terminated (Aquila, Hunter, Medium Range), three remain in development (Outrider, Global Hawk, DarkStar), and one is now transitioning to low rate production (Predator). Only one of the eight, Pioneer, has been fielded as an operational system. We estimate DOD has spent more than \$2 billion for development and/or procurement on these eight UAV programs over the past 18 years.

DTIC

Reconnaissance; Congressional Reports; Military Technology; Pilotless Aircraft

19970031324 Wright Lab., Flight Dynamics Directorate, Wright-Patterson AFB, OH USA

Simulation Study of VISTA/F-16 Maneuverability Enhancement Using Forebody Vortex Control Final Report, 1-31 May 1997

McKeehen, Phillip D., Wright Lab., USA; Cord, Thomas J., Wright Lab., USA; May 1997; 12p; In English

Report No.(s): AD-A327802; WL-TM-97-3061; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A piloted experimental study of potential enhanced task performance resulting from improved high angle-of-attack aerodynamic and flight control capability was conducted in the Air Force Research Laboratory's engineering flight simulator facility. The simulation database used was representative of the aerodynamics and inertias of the Variable-stability In-flight Simulator Test Aircraft (VISTA)/F-16. The VISTA variable-stability control laws were not used. Three flight test pilots evaluated both baseline and three modified versions of the simulated aircraft using a variety of high angle-of-attack tasks. Aerodynamic modifications were based on wind tunnel data from a previous effort which examined various means of extending the aircraft angle-of-attack limits. These focused primarily on the lateral-directional characteristics in the twenty-nine to thirty-seven degree range. Flight control modifications came from a new approach to control of lateral-directional dynamics which used variable structure control and describing functions. This controlled the forebody vortices to achieve improved roll coordination. This paper presents the results of analyzing the entire set of experimental output data for the effects of the configuration changes on high angle-of-attack maneuverability and departure resistance. The results show that use of the modifications greatly increases departure resistance and provides significant improvement in roll maneuverability for flight up to the maximum lift angle of attack.

DTIC

F-16 Aircraft; Flight Control; Maneuverability; Vortices; Aerodynamics; Flight Tests; Stability Tests; Wind Tunnel Tests; Flight Simulators

19970031356 Defence Science and Technology Organisation, Melbourne, Australia

Implementation of a Unified Constitutive Model into the PAFEC Finite Element Package Final Report

Paul, J., Defence Science and Technology Organisation, Australia; May 1997; 46p; In English

Report No.(s): AD-A327751; DSTO-TR-0529; DODA-AR-010-220; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A unified constitutive material model was implemented in to the PAFEC Finite Element Package Level 8.1. The modifications allow the PAFEC Package to perform time dependent plasticity. This includes the calculation of the updated material Jacobian used in the formulation of the global stiffness matrix. Automated time stepping, reduced storage requirements and structural convergence features were also included in the code. A series of test analyses addressing different aspects such as element types and loading conditions were performed and shown to agree with expected results.

DTIC

Finite Element Method; Convergence; Mathematical Models; Plastic Properties

19970031372 Naval War Coll., Newport, RI USA

Marine Aviation and Operational Maneuver from the Sea *Final Report*

Bell, Billy C., Naval War Coll., USA; Jun. 13, 1997; 20p; In English

Report No.(s): AD-A328241; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The MV-22 Osprey will be the centerpiece of Operational Maneuver From the Sea. It will give the Joint Force Commander the ability to maneuver throughout the battlespace striking directly at operational objectives and exploit critical vulnerabilities. It will enhance the JFC's mobility, speed, and deception. Although MV-22 brings much needed capability, it causes a serious rift in operational capability between the Osprey, Cobras, Hueys, and CH-53E's. This rift presents the JFC with employment problems that must be solved. The Marines are 'necking down' to fewer type aircraft and thus, must continue to modernize and close the capability gap created by the MV-22. To accomplish this the new 4BN/4BW will have to be replaced. The most reasonable idea seems to be a small tilt-rotor with similar characteristics and capabilities to the MV-22. Additionally, the Marines must lighten the force and retire the CH-53E. Ultimately the Marines will have a triple punch aviation force of MV-22, MVLA, and JSF that will give much more credibility to the 9-1-1 Force when called and will make Operational Maneuver From the Sea true maneuver and power projection at the operational level.

DTIC

Tilt Rotor Aircraft; Maneuvers

19970031684 NASA Langley Research Center, Hampton, VA USA

Identification of Linear and Nonlinear Aerodynamic Impulse Responses Using Digital Filter Techniques

Silva, Walter A., NASA Langley Research Center, USA; Aug. 1997; 16p; In English; Atmospheric Flight Mechanics, 11-13 Aug. 1997, New Orleans, LA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 522-22-21-01

Report No.(s): NASA-TM-112872; NAS 1.15:112872; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper discusses the mathematical existence and the numerically-correct identification of linear and nonlinear aerodynamic impulse response functions. Differences between continuous-time and discrete-time system theories, which permit the identification and efficient use of these functions, will be detailed. Important input/output definitions and the concept of linear and nonlinear systems with memory will also be discussed. It will be shown that indicial (step or steady) responses (such as Wagner's function), forced harmonic responses (such as Theodorsen's function or those from doublet lattice theory), and responses to random inputs (such as gusts) can all be obtained from an aerodynamic impulse response function. This paper establishes the aerodynamic impulse response function as the most fundamental, and, therefore, the most computationally efficient, aerodynamic function that can be extracted from any given discrete-time, aerodynamic system. The results presented in this paper help to unify the understanding of classical two-dimensional continuous-time theories with modern three-dimensional, discrete-time theories. First, the method is applied to the nonlinear viscous Burger's equation as an example. Next the method is applied to a three-dimensional aeroelastic model using the CAP-TSD (Computational Aeroelasticity Program - Transonic Small Disturbance) code and then to a two-dimensional model using the CFL3D Navier-Stokes code. Comparisons of accuracy and computational cost savings are presented. Because of its mathematical generality, an important attribute of this methodology is that it is applicable to a wide range of nonlinear, discrete-time problems.

Author

Nonlinear Systems; Navier-Stokes Equation; Computational Fluid Dynamics; Aeroelasticity; Mathematical Models; Linear Systems; Unsteady Aerodynamics

19970031828 Tsentralni Aerogidrodinamicheskii Inst., Moscow, USSR

Service Life Investigation for Aging Aircraft *Final Report*

Nesterenko, Grigory I., Tsentralni Aerogidrodinamicheskii Inst., USSR; Aug. 1997; 16p; In English

Contract(s)/Grant(s): F61708-97-W-0080

Report No.(s): AD-A328674; EOARD-SPC-97-4016; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking TsAGI as follows: The contractor will report on investigation into structural issues effecting aging aircraft. One of the most important problems in aviation is the one of ensuring safe operation of aging aircraft. Up to date many Russian aircraft types have worked out their design service lives. It is impossible to replace all of old aircraft types by newer ones in the nearest future, so it seems obligatory to prolong service lives and durability of aging aircraft beyond the design goals. This requires testing the long-operated aircraft for fatigue resistance, ensuring damage tolerance of the structures with widespread fatigue damage (WFD), studying the degradation of crack resistance and fatigue strength after long-term opera-

tion, and ensuring safe operation of corrosion-damaged structures. This paper outlines the experience of dealing with the above problems in Russia.

DTIC

Cracks; Fatigue (Materials); Degradation; Aircraft Safety; Tolerances (Mechanics); Durability; Corrosion; Fracture Strength

19970031950 Boeing AS and T Phantom Works, Saint Louis, MO USA

Flight Testing the X-36: The Test Pilots Perspective

Walker, Laurence A., Boeing AS and T Phantom Works, USA; Oct. 1997; 14p; In English

Contract(s)/Grant(s): NAS2-1426; RTOP 529-30-04

Report No.(s): NASA-CR-198058; NAS 1.26:198058; H-2204; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The X-36 is a 28% scale, remotely piloted research aircraft, designed to demonstrate tailless fighter agility. Powered by a modified Williams International F-112 jet engine, the X-36 uses thrust vectoring and a fly-by-wire control system. Although too small for an onboard pilot, a full-sized remote cockpit was designed to virtually place the test pilot into the aircraft using a variety of innovative techniques. to date, 22 flights have been flown, successfully completing the second phase of testing. Handling qualities have been matching predictions; the test operation is flown similarly to that for full sized manned aircraft. All takeoffs, test maneuvers and landings are flown by the test pilot, affording a greater degree of flexibility and the ability to handle the inevitable unknowns which may occur during highly experimental test programs. The cockpit environment, cues, and display techniques used in this effort have proven to enhance the 'virtual' test pilot's awareness and have helped ensure a successful RPV test program.

Author

Angle of Attack; Remotely Piloted Vehicles; Thrust Vector Control; Flight Tests; Fly by Wire Control; Aircraft Performance; Controllability

19970032024 Defence Science and Technology Organisation, Air Operations Div., Canberra, Australia

The Referred Weight Flight Test Technique Applied to First of Class Flight Trials

Arney, A. M., Defence Science and Technology Organisation, Australia; Apr. 1997; 45p; In English

Report No.(s): AD-A327430; DSTO-TR-0509; DODA-AR-010-178; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The referred weight flight test technique has been used by the RAN to establish Ship Helicopter Operating Limits for a number of years. This technique involves keeping the referred weight, defined as aircraft weight divided by density ratio, constant for a given flight test. The validity of using this technique has been questioned within the RAN, specifically with respect to its relevance and application to power and flight control margins. This report illustrates the relationships between power requirements, flight control positions, and referred weight by first using simplified equations to derive the mathematical relationships. to verify these relationships, the simulation code GenHel, which allows for many of the complex factors ignored in deriving the simplified equations, has been applied over a wide range of conditions. Results suggest that the referred weight technique is valid for conditions typically encountered during First of Class Flight Trials. The referred weight flight test technique has been used by the RAN to establish Ship Helicopter Operating Limits for a number of years. This technique involves keeping the referred weight, defined as aircraft weight divided by density ratio, constant for a given flight test. The validity of using this technique has been questioned within the RAN, specifically with respect to its relevance and application to power and flight control margins. This report illustrates the relationships between power requirements, flight control positions, and referred weight by first using simplified equations to derive the mathematical relationships. to verify these relationships, the simulation code GenHel, which allows for many of the complex factors ignored in deriving the simplified equations, has been applied over a wide range of conditions.

DTIC

Flight Tests; Flight Control; Weight Analysis; Active Control

08

AIRCRAFT STABILITY AND CONTROL

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

19970031951 Raytheon Aircraft Co., Wichita, KS USA

Fuzzy Logic Decoupled Lateral Control for General Aviation Airplanes

Duerksen, Noel, Raytheon Aircraft Co., USA; Aug. 1997; 60p; In English

Contract(s)/Grant(s): NCA1-113; RTOP 538-07-11-01

Report No.(s): NASA-CR-201735; NAS 1.26:201735; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

It has been hypothesized that a human pilot uses the same set of generic skills to control a wide variety of aircraft. If this is true, then it should be possible to construct an electronic controller which embodies this generic skill set such that it can successfully control different airplanes without being matched to a specific airplane. In an attempt to create such a system, a fuzzy logic controller was devised to control aileron or roll spoiler position. This controller was used to control bank angle for both a piston powered single engine aileron equipped airplane simulation and a business jet simulation which used spoilers for primary roll control. Overspeed, stall and overbank protection were incorporated in the form of expert systems supervisors and weighted fuzzy rules. It was found that by using the artificial intelligence techniques of fuzzy logic and expert systems, a generic lateral controller could be successfully used on two general aviation aircraft types that have very different characteristics. These controllers worked for both airplanes over their entire flight envelopes. The controllers for both airplanes were identical except for airplane specific limits (maximum allowable airspeed, throttle lever travel, etc.). This research validated the fact that the same fuzzy logic based controller can control two very different general aviation airplanes. It also developed the basic controller architecture and specific control parameters required for such a general controller.

Author

Lateral Control; Fuzzy Systems; Artificial Intelligence; General Aviation Aircraft; Controllers; Flight Envelopes; Expert Systems

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.

19970031235 Dayton Univ. Research Inst., OH USA

Neural Network Technology for the Rapid Identification of Corrosion Damage in Aging Aircraft *Final Report*

Hartke, Paul M., Dayton Univ. Research Inst., USA; Gustafson, Steven C., Dayton Univ. Research Inst., USA; Tuthill, Theresa A., Dayton Univ. Research Inst., USA; Chu, Shing P., Dayton Univ. Research Inst., USA; May 1997; 18p; In English
Contract(s)/Grant(s): SPO900-94-D-0001; AF Proj. 1710

Report No.(s): AD-A328369; AL/HR-TP-1997-0029; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Corrosion damage in aging aircraft is an increasingly critical concern for the U. S. Air Force. Effective, but inexpensive, techniques are needed to identify and evaluate corrosion damage to aircraft structures. The extent of material loss due to corrosion can be reliably measured from x-ray data, but x-ray measurements are costly, slow, and usually require significant aircraft disassembly. Corrosion by-products, which typically occupy more volume than uncorroded material, often causes slight aircraft surface deformations, or 'pillowing.' Pillowing can be measured with various inexpensive, rapid, and nondestructive optical imaging techniques. However, the relationship between percent material loss and 'pillowing' surface deformation is complex, and conventional methods for quantifying the relationship typically lead to unacceptably low correct-detection rates or unacceptably high false-alarm rates. Neural net technology offers a potentially more accurate approach for establishing this relationship. This paper describes the results of a study applying neural net technology to evaluate the percent of material loss and pillowing surface deformation measured with optical imaging techniques.

DTIC

Aircraft Structures; Imaging Techniques; Neural Nets; Deformation; Corrosion

19970031250 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Evaluation of Airport Subsurface Materials

Janoo, Vincent C., Army Cold Regions Research and Engineering Lab., USA; Eaton, Robert, Army Cold Regions Research and Engineering Lab., USA; Barna, Lynette, Army Cold Regions Research and Engineering Lab., USA; May 1997; 36p; In English
Report No.(s): AD-A327880; CRREL-SR-97-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Pavement structures located in regions with seasonal changes encounter regular cycles of freezing and thawing. Such environmental factors must be considered so that it can be certain that the pavement can accommodate continuous aircraft loading. Eleven subsurface materials specified by the Federal Aviation Administration (FAA) were examined to determine their susceptibility to frost heave and thaw-weakening. All but two of the materials were found to be frost-susceptible under the U.S. Army Corps of Engineers criterion that no more than 3% of fines be smaller than 0.02 mm ($0.78 \times 10(\exp-3)\mu\text{m}$). The frost-susceptible materials were also evaluated using Asphalt Institute criteria, which also categorized them as frost-susceptible. The 11 materials were evaluated for susceptibility to thaw-weakening using the drainage model developed by Casagrande and Shannon (1951), which focuses on the permeability of the drainage layer. The final recommendations (which are based only on a literature review)

are that, to reduce frost-susceptibility and thaw-weakening, the amount passing the no. 200 sieve should be kept lower than 2% and drainage layers should be installed below the pavement.

DTIC

Annual Variations; Airports; Asphalt; Freezing; Permeability; Pavements

19970031266 Dayton Univ. Research Inst., OH USA

Transparency Durability Test Criteria Final Report, Dec. 1990 - Feb. 1996

Whitney, Thomas J., Dayton Univ. Research Inst., USA; Bowman, Daniel R., Dayton Univ. Research Inst., USA; Jun. 1996; 112p; In English

Contract(s)/Grant(s): F33615-C-90-3410; AF Proj. 2402

Report No.(s): AD-A327831; UDR-TR-96-91; WL-TR-96-3133; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The focus of the Transparency Durability Test Criteria Program was to develop a durability test methodology for aircraft transparency systems which includes laboratory coupon durability testing and field service data acquisition. These areas were used to advance the development, measurement, and comparison of coupon testing to in-service aircraft transparency durability, where durability is defined as the continued ability of the transparency to meet specified performance requirements. Summaries of coupon tests and field service data acquisition and analysis are reported. New coupon tests introduced in this program include combined testing such as dust erosion and craze testing. A relationship between craze resistance and rain erosion exposure was also demonstrated. Identification of technology voids and other approaches to improve durability assessment are discussed. This report also provides a summary of the major accomplishments of the program, including the core durability task and additional tasks including alternate QUV cycles, durability of coatings, and improved bolt hole durability.

DTIC

Life (Durability); Transparency; Aircraft Performance

19970031288 Dayton Univ. Research Inst., OH USA

Tri-Service Thermal Radiation Test Facility Xenon Flashlamp Operators Manual, 26 Apr. 1991 - 17 Jul. 1994

Sweeney, Michael, Dayton Univ. Research Inst., USA; Jun. 01, 1997; 66p; In English

Contract(s)/Grant(s): DNA001-90-C-0081

Report No.(s): AD-A327910; UDR-TR-94-66; DNA-TR-96-34; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Safe operating and servicing test procedures for the Flashlamp Thermal Simulator, the Flashlamp Thermal Simulator Voltage Monitor, and the Vortek Stabilized Arc Lamp are described in this document. The manual guides test technicians operating a Bentley 28618 microcomputer through proper safety and operational procedures while operating the Flashlamp Thermal Simulator and the Vortek Stabilized Arc Lamp. A (pre and post) safety checklist to be followed during equipment utilization is provided. A description of the instrumentation used in support of testing and procedures for servicing are also provided.

DTIC

Flash Lamps; Thermal Radiation; Arc Lamps; Simulators; Procedures

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.

19970031185 South Carolina Research Authority, Charleston, SC USA

PDES Application Protocol Suite for Composites (PAS-C) Benefits Analysis Final Report, 2 Jul. 1991 - 31 Jan. 1997

Jan. 1997; 131p; In English

Contract(s)/Grant(s): F33615-91-C-5713; AF Proj. 3095

Report No.(s): AD-A328294; WL-TR-97-8034; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report contains the accomplishments and the benefits analysis of the PDES Application Protocol Suite for Composites (PAS-C) program. The overall objective of the PAS-C program was to reduce the cost of aircraft composite structural components through the use of concurrent engineering practices enabled by standardized product data information exchange. The program's focus was on standardizing the product information that is exchanged and then developing and demonstrating two of these exchange environments (design to analysis and design to support). The PAS-C team consisted of SCRA, Northrop Grumman, Lockheed Martin, Arthur D. Little and international TechneGroup Inc. integrated Support Systems, Inc. provided key support to

the PAS-C program demonstration. Boeing was a major contributor during the initial program tasks including requirements identification and capture.

DTIC

Aircraft Structures; Composite Structures; Concurrent Engineering; Cost Reduction; Production Engineering

19970031400 Air Force Materials Lab., Nonmetallic Materials Div., Wright-Patterson AFB, OH USA

Proceedings of the 17th Annual Mechanics of Composites Review Final Report, 27-28 Oct. 1992

Apr. 1997; 263p; In English, 27-28 Oct. 1992, USA

Report No.(s): AD-A327254; WL-TR-97-4079; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This report contains the basic unedited vu-graphs of the presentations at the 'Mechanics of Composites Review' sponsored jointly by the Non-metallic Materials Division of the Air Force Materials Laboratory, the Structures Division of the Air Force Flight Dynamics Laboratory and the Directorate of Aerospace Sciences of the Air Force Office of Scientific Research. The presentations cover current in-house and contract programs under the sponsorship of these three organizations.

DTIC

Aerodynamics; Organizations

19970031570 China Nuclear Information Centre, Beijing, China

Study on preparation and quality control of (sup 111)In-DTPA radiopharmaceutical

Zhou Dehai, Sichuan Univ., China; Aug. 1996; 10p; In Chinese

Report No.(s): CNIC-01086; SUINST-0013; DE97-613780; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche

An electroplated silver target is bombarded by (alpha)-particles in the internal target installation of a 120 cm cyclotron. The energy and the beam intensity of the (alpha)-particles are 24(approx)25 MeV and 140(approx)160 (mu)A respectively. The radiochemical separation of (sup 111)In from the irradiated target is carried out by HDEHP solvent extraction. An (sup 111)InCl(sub 3) injection is prepared from the obtained (sup 111)In and determined. The (sup 111)In-DTPA for an ideal cisternography is prepared with diethylenetriaminepentaacetic acid (DTPA) and (sup 111)InCl(sub 3) injection. The radiochemical purity of the resulting (sup 111)In-DTPA radiopharmaceutical is checked by paper chromatography or thin layer chromatography (TLC) on silica gel. The R(sub f) values of (sup 111)In-DTPA and unreacted (sup 111)InCl(sub 3) in the radiopharmaceutical are 0.96 and 0.00 respectively. The separation and determination of free DTPA and (sup 111)In-DTPA in the radiopharmaceutical are realized through the difference of the retention time. The radioactivity of the (sup 111)In-DTPA radiopharmaceutical is determined by HPGe (gamma)-ray spectrometric system. The content of DTPA in the final product is 20(approx)40 (mu)g per mCi (37 MBq) of (sup 111)In-DTPA radiopharmaceutical. (14 refs., 10 tabs., 1 fig.).

DOE

Tabs (Control Surfaces); Solvent Extraction; Silica Gel; Radiochemistry; Radiochemical Separation; Paper Chromatography; Electroplating; Alpha Particles

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.

19970031153 Nielsen Engineering and Research, Inc., Mountain View, CA USA

Advanced Adaptive CFD Methodology for Dynamic Stall, 1 Apr. - 2 Jul. 1997

Reisenhel, Patrick H., Nielsen Engineering and Research, Inc., USA; Jul. 03, 1997; 7p; In English

Contract(s)/Grant(s): DAAG55-97-C-0029

Report No.(s): AD-A328333; ARO-36641.1-EG-SB2; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This is the first of four quarterly technical reports submitted under ARO contract number DAAG55-97-C-0029. This Phase 2 SBIR concerns the development of an advanced adaptive CFD capability for predicting the phenomenon of dynamic stall. The new CFD capability is based on the concept of Unstructured MacroCells (UMC). The present report is a description of the work accomplished during the period of April 1, 1997, to July 2, 1997.

DTIC

Aerodynamic Stalling; Angle of Attack; Sweep Angle

19970031268 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

Stepped Tip Gap Effects on a Transonic Axial-Flow Compressor Rotor

Thompson, Donald W., Air Force Inst. of Tech., USA; Jun. 1997; 321p; In English

Report No.(s): AD-A327828; AFIT/DS/ENY/97-5; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The effects of stepped tip gaps and clearance levels on the performance, flowfield, and stall characteristics of a transonic axial-flow compressor rotor were experimentally and numerically determined. A theory and mechanism for relocation of blockage in the rotor tip region was developed. A two-stage compressor with no inlet guide vanes was tested in the Wright Laboratories Compressor Research Facility located at Wright-Patterson Air Force Base, Ohio. The first-stage rotor was unswept and was tested for an optimum tip clearance with variations in stepped gaps machined into the casing near the aft tip region of the rotor. Nine casing geometries were investigated consisting of three step profiles at each of three clearance levels. For small and intermediate clearances, stepped tip gaps were found to improve pressure ratio, efficiency, and flow range for most operating conditions. At 100% design rotor speed, stepped tip gaps produced a doubling of mass flow range with as much as a 2.0% increase in mass flow and a 1.5% improvement in efficiency. The flowfield characteristics associated with performance improvements were experimentally and numerically analyzed. Stepped tip gaps were found to have no significant effect on the stall characteristics of the rotor; the stability characteristics attributable to tip geometry were determined by the clearance over the forward portion of the rotor blade. This study provides guidelines for engineers to improve compressor performance for an existing design by applying an optimum casing profile.

DTIC

Turbocompressors; Transonic Compressors; Flow Distribution; Blade Tips; Rotor Blades (Turbomachinery); Gaps; Numerical Analysis

19970031312 Pennsylvania State Univ., Dept. of Mechanical Engineering, University Park, PA USA

An Investigation into Computer Simulation of the Dynamic Response of a Gas Turbine Engine

Henricks, Todd B., Pennsylvania State Univ., USA; Jul. 1997; 52p; In English

Report No.(s): AD-A328006; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Transient performance of gas turbines has a strong bearing on output and component life. For this reason, several articles have been written on the dynamic simulation of gas turbine systems in electrical generation, cogeneration, and marine applications. These models provide a basis for this present work. This paper describes a mathematical and computer model that was developed to investigate the dynamic response of a simple (no reheat, regeneration, or other auxiliary equipment) single-shaft gas turbine system. The model uses design parameters normally incorporated in gas turbine design (e.g. load coefficient, flow coefficient, and deHaller Number) as well as compressor and turbine stage geometry and compressor and turbine material properties. Also incorporated is a combustion chamber model. Other input parameters are included to enable the model to be adaptable to various system sizes and environments.

DTIC

Shafts (Machine Elements); Loads (Forces); Marine Technology; Gas Turbines; Gas Turbine Engines; Computerized Simulation; Combustion Chambers

19970031432 Massachusetts Inst. of Tech., Dept. of Ocean Engineering, Cambridge, MA USA

A Numerical Study of Fluid Flow Around Two-Dimensional Lifting Surfaces

Dannecker, John D., Massachusetts Inst. of Tech., USA; Jun. 1997; 167p; In English

Report No.(s): AD-A327062; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

There are always differences between theoretical and experimental results in the study of lifting surfaces. Bounding box control volume measurements infrequently yield exact conservation of mass or consistent values for lift and drag coefficients. Numerically calculated wakes often differ from experimental data. Quite often, an empirical correction can be applied to fit theory to experiment to account for these differences. However, as the demands for state of the art foil design increase, fluid dynamicists are pressed to look carefully at these inconsistencies in order to improve current design and analysis methods. Using a Reynolds Averaged Navier Stokes (RANS) computer code and a highly refined fluid mesh, one can begin to explore the subtle characteristics of the fluid flow in the entire domain and the details of certain key regions around a foil. Specific areas of great interest are: flow around the trailing edge, flow within the boundary layer, wake profiles and the influence of tunnel wall boundaries in experimental facilities. The overall goal of this thesis is to resolve some of the discrepancies between theoretical results and experimental data. A computer code has been developed to generate the geometry for the fluid flow domain surrounding an arbitrary foil shape at a specified angle of attack in the MIT Marine Hydrodynamics Laboratory (MHL) water tunnel. This geometry is provided as input data for the RANS solver. A suite of software tools are developed to provide post processing analysis to compare the RANS solution with other numerical techniques and experimental measurements. Through the use of case studies, the numerical results

of the RANS code are compared with recent MHL experimental data and other computational tools. A comparison is made between the experimental and RANS code results using a control volume analysis.

DTIC

Hydrodynamics; Fluid Flow; Design Analysis; Continuity Equation; Conservation Laws; Computer Programs; Boundary Layers; Angle of Attack; Aerodynamic Drag; Aerodynamic Coefficients

19970031678 NASA Langley Research Center, Hampton, VA USA

Results of Aerothermodynamic and Boundary-Layer Transition Testing of 0.0362-Scale X-38 (Rev. 3.1) Vehicle in NASA Langley 20-Inch Mach 6 Tunnel

Berry, Scott A., NASA Langley Research Center, USA; Horvath, Thomas J., NASA Langley Research Center, USA; Roback, V. Eric, NASA Langley Research Center, USA; Williams, George B., Jr., NASA Langley Research Center, USA; Sep. 1997; 100p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 906-42-00-50

Report No.(s): NASA-TM-112857; NAS 1.15:112857; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The aeroheating characteristics of the X-38 Revision 3.1 lifting-body configuration have been experimentally examined in the Langley 20-inch Mach 6 Tunnel. Global surface heat transfer distributions, surface streamline patterns, and shock shapes were measured on a 0.0362-scale model of a proposed Space Station Crew Return Vehicle at Mach 6 in air. Parametric variations include angles-of-attack of 20 deg, 30 deg, and 40 deg; Reynolds numbers based on model length of 0.9 to 3.7 million; and body-flap deflections of 0 deg, 20 deg, 25 deg, and 30 deg. The effects of discrete roughness elements, which included trip height, location, size, and orientation, as well as multiple-trip parametrics, were investigated. This document is intended to serve as a quick release of preliminary data to the X-38 program; analysis is limited to observations of the experimental trends in order to expedite dissemination.

Author

Boundary Layer Transition; Aerodynamic Heating; Wind Tunnel Tests; Angle of Attack; Reynolds Number; Aerothermodynamics; Flow Visualization

19970032099 Centre National de la Recherche Scientifique, Meudon-Bellevue, France

Study of a heat flux generated by shock waves interaction on the fuel injection masts of a supersonic combustion stator reactor *Etude du flux thermique genere par interaction d'ondes de choc sur les mats d'injection de carburant d'un statoracteur a combustion supersonique*

Bertrand, F., Centre National de la Recherche Scientifique, France; Jul. 1996; 110p; In French

Report No.(s): CNRS-R-96-1; DE97-732661; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche

The realization of hypersonic vehicles induces the resolution of an important number of technological problems bound to the evolution of a body in a very speed medium. The flux can reach the values of $Mw/m(\exp 2)$, and such values are reached when an obstacle is introduced in a supersonic flow perturbed by shock waves interferences. That is the subject of the present study. The first part of this report concerns some generalities in the field of flux generated by shock waves interferences; that allows to precise the configuration chosen for this study and the justification of the experimentations. The second part gives the details of the experimentations, their results and their physical interpretation.

DOE

Heat Flux; Shock Waves; Supersonic Combustion; Fuel Injection

19970032569

Design of a permanent/electromagnetic magnetic bearing-controlled rotor system

Fan, Yi-Hua, Nat'l Chiao Tung Univ, USA; Lee, An-Chen; Hsiao, Foam-Zone; Journal of the Franklin Institute; May 1997; ISSN 0016-0032; vol. 334B, no. 3, pp. 337-356; In English; Copyright; Avail: Issuing Activity

This study proposes design procedures for the permanent-magnet-biased magnetic bearings (PEMBs) in rotor systems. Many aspects of designing magnetic bearings are discussed, e.g. the selection of a permanent magnet material, dimensions of electromagnets and permanent magnets, gap length, load capacity and maximum Ampere-turns. Linearization and DC current driver are the two constraints for determining feasible designs. According to an analytical model with a rigid body assumption for the rotor-bearing system, a decentralized output feedback control algorithm is employed to control this inherently unstable magnetic suspension rotor system. Experimental results indicate that the controlled rotor performs well at rotor speeds up to 12,000 rpm.

Author (EI)

Electromagnets; Magnetic Bearings; Permanent Magnets; Rotors

19970032695

Mean stator loading effect on the acoustic response of a rotating cascade

Sawyer, Scott, Purdue Univ, USA; Fleeter, Sanford; Journal of Propulsion and Power; July 1997; ISSN 0748-4658; vol. 13, no. 4, pp. 502-507; In English; Copyright; Avail: Issuing Activity

Discrete-frequency tones generated by unsteady blade row interactions are of particular concern in the design of advanced turbine engines. With a rotor-stator mounted in a duct, only certain specific spatial modes are generated by the rotor-stator interaction, where the generated modes are a function of the number of rotor blades and stator vanes. In addition, only some of these modes propagate to the far field, with the rest decaying before reaching the far field. Thus, it is only those spatial modes that propagate to the far field that represent the discrete-frequency noise received by an observer. This paper's aim is to determine the influence of steady stator loading on the acoustic response of an annular cascade. To accomplish this, the existence of the propagating modes generated by a rotor-stator interaction must first be verified. Microphones placed in an axial plane in the outer annulus of the inlet of the Purdue Annular Cascade Research Facility are sampled simultaneously over one rotor revolution, and an ensemble-averaged data set is acquired. With the microphone signals treated as a function of time and space, dual Fourier transforms are utilized to determine the magnitude of the spatial modes at multiples of blade pass frequency. The wave equation is used to predict the propagation characteristics of these modes in the inlet duct. The two predicted propagating modes were found to have significantly higher amplitudes than modes that were predicted to decay, or were not to be generated by the rotor-stator interaction, and steady stator loading had a profound influence on acoustic response of the cascade. The acoustic response at blade pass and twice blade pass frequency increased by more than 20 dB for angles of attack ranging from - 20 to 25 deg.

Author (EI)

Gas Turbines; Loads (Forces); Rotors; Sound Waves; Wave Propagation

19970032696 NASA Lewis Research Center, Cleveland, OH, USA

Macroscopic balance model for wave rotors

Welch, Gerard E., NASA Lewis Research Cent, USA; Journal of Propulsion and Power; July 1997; ISSN 0748-4658; vol. 13, no. 4, pp. 508-516; In English; Copyright; Avail: Issuing Activity

A mathematical model for wave rotors is described. The wave processes that affect energy exchange within the rotor passages are modeled using one-dimensional gasdynamics. Macroscopic balances relate volume-averaged thermodynamic properties in the rotor passage control volume to the mass, momentum, and energy fluxes at the ports. Simple loss models are used to estimate entropy production in boundary layers and in separating flows caused by blade-blockage, incidence, and the gradual opening and closing of rotor passages. The mathematical model provides a basis for designing port and rotor geometry, and for predicting design-point wave rotor performance. Model predictions are evaluated through comparisons with computational fluid dynamics calculations and three-port wave rotor experimental data. A four-port wave rotor design example is provided to demonstrate model applicability. The modeling approach is amenable to wave rotor optimization studies and rapid assessment of the tradeoffs associated with integrating wave rotors into gas turbine engine systems.

Author (EI)

Entropy; Gas Dynamics; Mathematical Models; Rotors

19970033062

Results of Russian/U.S. high-performance DEMG experiment

Buyko, A. M., All-Russian Scientific Research Inst of Experimental Physics, Russia; Bidylo, N. P.; Chernyshev, V. K.; Demidov, V. A.; Garanin, S. F.; Kostyukov, V. N.; Kulagin, A. A.; Kuzyaev, A. I.; Mezhevov, A. B.; Mokhov, V. N.; IEEE Transactions on Plasma Science; April 1997; ISSN 0093-3813; vol. 25, no. 2, pp. 145-153; In English; Copyright; Avail: Issuing Activity

In November 1992, the All-Russian Scientific Research Institute of Experimental Physics (VNIIEF), Arzamas-16, Russia and the Los Alamos National Laboratory, Los Alamos NM, USA embarked on a historic effort to conduct a joint explosive pulse-power experiment. With the concurrence of the Ministry of Atomic Energy (Russia) and the Department of Energy (U.S.), the two laboratories entered into a laboratory-to-laboratory collaboration in the areas of very high-energy pulse power and ultrahigh magnetic fields in order to explore problems of mutual scientific interest. The first experiment to be planned was an explosively powered, fast, high-current pulse-power system demonstration. The experiment used a flux compressor, inductive store, and high-current opening switch to demonstrate the feasibility of supplying many megajoules of electrical energy, on microsecond time scales, to high-energy density physics experiments. The experiment was conducted in Arzamas-16 on September 22, 1993.

Author (EI)

Compressors; Electric Fuses; Electric Generators; Electric Switches

19970034090

Discussion of the stable thermal equilibrium current of a superconductor during tests of high-speed rotor windings

Kaiho, Katsuyuki, Electrotechnical Lab, Japan; Nomura, Harehiko; Sekine, Seiji; Higuchi, Noboru; Ishii, Itaru; Natori, Naotake; Tateishi, Hiroshi; Fuchino, Syuichirou; Arai, Kazuaki; Kajikawa, Kazuhiro; IEEE Transactions on Applied Superconductivity; June 1997; ISSN 1051-8223; vol. 7, no. 2, pt. 1, pp. 223-226; In English; Copyright; Avail: Issuing Activity

Research and development of superconducting generation equipment has been conducted. As a part of the design research for the superconducting generator, the stability of superconducting field winding is being studied. The goal of this study is to formulate a design philosophy for a stable superconducting field winding in the presence of large disturbances. In the present paper, we describe the stable thermal equilibrium current of the superconductor, which is measured during the stability test. Modifying the equal area criterion presented by Maddock et. al., a simple graphical scheme has been presented and the minimum stable thermal equilibrium current was calculated.

Author (EI)

Electric Generators; Rotors; Superconducting Devices; Winding

19970034135

Development of a 70 MW class superconducting generator

Yamaguchi, Kiyoshi, Hitachi, Ltd, Japan; Takahashi, Miyoshi; Shiobara, Ryoichi; Kimura, Kei; IEEE Transactions on Applied Superconductivity; June 1997; ISSN 1051-8223; vol. 7, no. 2, pt. 1, pp. 527-530; In English; Copyright; Avail: Issuing Activity

A national project to develop a superconducting generator was begun in 1988 in Japan under the New Sunshine Project of AIST, MITI. This generator has merits of greater for transmission lines, higher efficiency and compactness. A 70 MW class superconducting generator is the goal of the project. The authors have been developing a rotor having a superconducting field winding and a stator having an air-gap armature winding. The field winding was designed to be cryostable so as to recover from a partial transition to normal conduction. The field winding was tested in a non-rotating cryostat, and excitation performance and stability were confirmed to be enough for the 70 MW class superconducting generator. The rotor and the stator has been completed, and a shop test is being made now.

Author (EI)

Electric Generators; Excitation; Rotors; Superconducting Devices; Superconducting Power Transmission

19970034193

Magnetic processes in hysteresis motors equipped with melt-textured YBCO

Habisreuther, T., Inst fuer Physikalische Hochtechnologie, Germany; Strasser, T.; Gawalek, W.; Goernert, P.; Ilushin, K. V.; Kovalev, L. K.; IEEE Transactions on Applied Superconductivity; June 1997; ISSN 1051-8223; vol. 7, no. 2, pt. 1, pp. 900-903; In English; Copyright; Avail: Issuing Activity

Several hysteresis motors have been constructed with an output power up to 500 W at $T = 77$ K. The rotors of these machines consist of melt-textured YBCO. In this work we present detailed investigations on the magnetic processes in these rotors. Spheres were cut from melt-textured YBCO and investigated by rotating in a vector-VSM. From these measurements torque moments on the sample, hysteretic losses and the slip between external field and the sample can be calculated. The same dependence of the output power on the magnetic field for the samples as for the constructed motors can be derived. Influences of the critical current density and the domain size can be separated by changing the temperature.

Author (EI)

Hysteresis; Oxides; Rotors; Superconducting Devices; Superconductors (Materials); Winding; YBCO Superconductors

13

GEOSCIENCES

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

19970031240 Woods Hole Oceanographic Inst., MA USA

Monthly Maps of Sea Surface Height in the North Atlantic and Zonal Indices for the Gulf Stream Using TOPEX/Poseidon Altimeter Data

Singh, Sandipa, Woods Hole Oceanographic Inst., USA; Kelly, Kathryn A., Woods Hole Oceanographic Inst., USA; Jun. 1997; 48p; In English

Contract(s)/Grant(s): NAGw-1666; NAGw-4806

Report No.(s): NASA-CR-205637; NAS 1.26:205637; AD-A327917; WHOI-97-06; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Monthly Maps of sea surface height are constructed for the North Atlantic Ocean using TOPEX/Poseidon altimeter data. Mean sea surface height is reconstructed using a weighted combination of historical, hydrographic data and a synthetic mean obtained by fitting a Gaussian model of the Gulf Stream jet to altimeter data. The resultant mean shows increased resolution over the hydrographic mean, and incorporates recirculation information that is absent in the synthetic mean. Monthly maps, obtained by adding the mean field to altimeter sea surface height residuals, are used to derive a set of zonal indices that describe the annual cycle of meandering as well as position and strength of the Gulf Stream.

DTIC

Atlantic Ocean; Ocean Surface; Hydrography; Altimeters; Gulf Stream

14 LIFE SCIENCES

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

19970031187 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA

Learning in a Synthetic Environment: The Effect of Visual Display, Presence, and Simulator Sickness *Final Report, Apr. 1995 - Jan. 1996*

Johnson, David M., Army Research Inst. for the Behavioral and Social Sciences, USA; Feb. 1997; 79p; In English

Contract(s)/Grant(s): DA Proj. 2O2-62785-A-791

Report No.(s): AD-A328285; ARI-TR-1057; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Soldiers explored a synthetic representation of an Army heliport under three visual display conditions: (1) wide field of view (FOV) helmet mounted display, (2) narrow FOV helmet mounted display, and (3) stationary, wide screen display. Pretest and post-test measures of spatial knowledge were recorded. Measures of presence in the virtual environment were recorded. Measures of simulator sickness were administered upon exit from the virtual environment and 24 hours later. Overall, soldiers acquired a significant amount of spatial knowledge from the synthetic representation. When transferred to the actual Army heliport, soldiers were able to navigate around the location with near zero errors. There was no effect of visual display on any measures of spatial knowledge. Also, there was no effect of visual display on reported presence or simulator sickness. Simulator sickness was significantly reduced after 24 hours away from the virtual environment. Presence did not correlate with spatial knowledge. Simulator sickness correlated negatively with spatial knowledge. Presence and simulator sickness were negatively correlated.

DTIC

Helmet Mounted Displays; Flight Simulators; Computerized Simulation; Human Factors Engineering; Visual Perception; Virtual Reality; Visual Acuity; Heliports; Flight Simulation

19970031284 Army Aeromedical Research Lab., Aircrew Health and Performance Div., Fort Rucker, AL USA

Evaluation of the Spatial Disorientation Sortie in Training Aviators *Final Report*

Braithwaite, Malcolm, Army Aeromedical Research Lab., USA; Alvarez, Eduardo, Army Aeromedical Research Lab., USA; Cashwell, Kenneth, Army Aeromedical Research Lab., USA; Collins, Clarence, Army Aeromedical Research Lab., USA; Estrada, Arthur, Army Aeromedical Research Lab., USA; Jun. 1997; 69p; In English

Contract(s)/Grant(s): DA Proj. 3M1-6278-A-879

Report No.(s): AD-A328235; USAARL-97-22; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Following didactic instruction, most aircrew are able to experience some of the disorientating illusions and limitations of the orientation senses in a variety of ground-based devices. In order to reinforce instruction in spatial disorientation (SD) within the environment in which they operate, British Army Air Corps helicopter pilots also receive an airborne demonstration of the limitations of their orientation senses. The objective of this assessment was to determine whether the SD demonstration sortie would be an effective adjunct in training aircrew in SD in the U.S. Army. This paper describes the sortie and records the results of the assessment. Forty-five aviators and training personnel experienced the sortie and provided their opinion in questionnaires. The following conclusions were made: The maneuvers performed in the SD demonstration sortie, and the sortie overall, were extremely effective at demonstrating the limitations of the orientation senses; the SD sortie attracted a significantly higher rating

in its effectiveness to train aviators in SD than all the currently available methods; the introduction of the sortie into the initial flight training syllabus would be a distinct enhancement to the SD training of aviators and associated personnel; and the introduction of the sortie into the refresher training in field units also would be an advantage. Recommendations to support these conclusions are made.

DTIC

Flight Crews; Flight Training; Disorientation; Helicopters; Sensory Perception

19970031300 Army Aeromedical Research Lab., Aircrew Health and Performance Div., Fort Rucker, AL USA

A Helicopter Simulator Assessment of Pilot Head Movement during Various Phases of Flight *Final Report*

Braithwaite, Malcolm G., Army Aeromedical Research Lab., USA; Alvarez, Eduardo A., Army Aeromedical Research Lab., USA; Jones, Heber D., Army Aeromedical Research Lab., USA; Higdon, Alford A., Army Aeromedical Research Lab., USA; Groh, Shannon L., Army Aeromedical Research Lab., USA; Beal, Kathleen G., Wright State Univ., USA; Estrada, Arthur, Hughes Technical Center, USA; Jul. 1997; 65p; In English

Contract(s)/Grant(s): DA Proj. 3M1-62787-A-879

Report No.(s): AD-A328240; USAARL-97-26; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The opto-kinetic cervico reflex (OKCR) is a recently hypothesized visually driven reflex that serves to stabilize the image of the external horizon on the retina during high performance aircraft roll maneuvers. Although anecdotally reported as occurring, head tilt during helicopter flight has not been formally studied. Such research is required to determine the full impact and significance it may have on a rotary-wing aviator's flying performance. The aim of this study was to investigate the relationship between horizon position and perception of orientation, and thus generate vital information to assess whether this reflex plays an important role in spatial disorientation. Twenty volunteer pilots participated in a UH-60 flight simulator study to examine the effects of this reflex. The results confirm that the OKCR occurs during simulated helicopter flight, both with and without night vision goggles. As with previous studies, head roll increased during flight under visual meteorological conditions in relation to increasing aircraft roll angle up to a maximum sustainable level and then remained constant. Head roll did not occur during flight under instrument meteorological conditions. Various aspects that impact rotary-wing operations are discussed, and recommendations made for future research.

DTIC

Aircraft Pilots; Flight Instruments; Flight Simulators; Helicopters; Head Movement; Goggles; Flight Simulation; Flight Conditions; Night Vision

19970031315 Kansas State Univ., Dept. of Psychology, Manhattan, KS USA

The Effects of Cognitive Hardiness on Stress, Health, Performance, and Cardiovascular/Neuroendocrine Function

Drummond, Johathan T., Kansas State Univ., USA; Aug. 01, 1997; 347p; In English

Report No.(s): AD-A327997; AFIT-97-097; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Cognitive hardiness is a psychological construct of stress resiliency which has been postulated to moderate stress-illness and stress-performance relationships. Hardiness has also been thought to exert main effects on health and performance outcomes. In Study 1, relationships between hardiness, perceived stress, depression, and academic performance were investigated. Hardiness was found to be positively predictive of academic performance; the effect was partially mediated by course load. Hardiness was also revealed to moderate the stress-depression relationship. The negative relationship between stress and academic performance was mediated by depression. A model explaining 30% of the variance in academic performance is presented and discussed. Study 2 was an extensive exploratory effort that investigated the relationships between hardiness, stress, performance, illness/injury, appraisal processes, and physiological reactivity to a realistic stressor in 23 helicopter pilots. Main and moderating effects for hardiness were demonstrated in stress-performance and stress-illness relationships and outcomes. Hardiness was predictive of challenge appraisals, cortisol baselines and reactivity, and performance. Mediated relationships are discussed. Relations between cortisol reactivity and performance suggest profound and disturbing adverse impact on work-related cognitive function. Higher order curvilinear relationships between hardiness, cortisol reactivity, challenge appraisals, and performance were revealed. Implications, future research initiatives, and appropriate research designs are discussed.

DTIC

Cardiovascular System; Stress (Psychology); Steroids; Physiology; Neurophysiology; Helicopters

19970031322 Logicon Technical Services, Inc., Dayton, OH USA

Operator Workload in the F-15E: A Comparison of TAWL and Micro Saint Computer Simulations *Interim Report, Apr. 1995 - Dec. 1996*

See, Judi E., Logicon Technical Services, Inc., USA; Vidulich, Michael A., Wright Lab., USA; Jan. 1997; 46p; In English
Contract(s)/Grant(s): F41624-94-C-6007; AF Proj. 7184

Report No.(s): AD-A327807; AL/CF-TR-1997-0017; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mental workload experienced by the crewmember occupying the back seat of the F-15E during a target acquisition mission was simulated via two computer modeling tools: Task Analysis/Workload (TAWL) and the microcomputer version of Systems Analysis of Integrated Networks of Tasks (Micro Saint). The primary objectives were to evaluate the similarity of the two modeling tools and compare their relative ease of use. The scenario consisted of a ten-task target acquisition mission whose goal was to detect and destroy a Scud missile target. Output from the two models was highly similar in terms of overall patterns of workload throughout the mission. In both instances, workload was greatest during the last two minutes of the mission when final decision regarding target presence and location and weapon release needed - to be made. Estimates of overall and peak workload from each model were also indistinguishable. The one area in which the models differed was in the component workload estimates obtained for four of the ten functions during the mission. The Micro Saint estimates were consistently somewhat higher than those provided by TAWL, an outcome largely attributable to the differential manner in which the transition periods between tasks are handled by the two models. In sum, the two modeling tools yielded similar results in an overall or gross level, but differed on a fine-grained level, indicating that Micro Saint is much more versatile and flexible than TAWL.

DTIC

Computerized Simulation; Workloads (Psychophysiology); F-15 Aircraft; Human Factors Engineering; Mental Performance; Target Acquisition; Crews; Missiles

19970031348 Michigan Univ., Ann Arbor, MI USA

Precis to a Practical Unified Theory of Cognition and Action: Some Lessons from EPIC Computational Models of Human Multiple-Task Performance *Interim Report, 1 Jan. 1992 - 1 Jun. 1997*

Meyer, David E., Michigan Univ., USA; Kieras, David E., Michigan Univ., USA; Jun. 01, 1997; 70p; In English
Contract(s)/Grant(s): N00014-92-J-1173

Report No.(s): AD-A327743; TR-97-ONR-EPIC-8; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Experimental psychology, cognitive science, and human factors engineering have progressed sufficiently far that a practical unified theory of cognition and action is now foreseeable. Such a theory soon may yield useful quantitative predictions about rapid human multiple task performance in applied settings. Toward this end, an Executive-Process/Interactive-Control (EPIC) architecture has been formulated with components whose assumed properties emulate fundamental perceptual, cognitive, and motor processes. On the basis of EPIC, a theorist may construct detailed computational models that characterize multiple task performance under both laboratory and real world conditions. For example, EPIC computational models provide good accounts of response latencies and accuracies from the psychological refractory period procedure, aircraft cockpit operation, and human computer interaction. As a result, major commonalities in performance across various task domains have been discovered, and efficacious principles for designing person machine interfaces have been identified. The substantive and methodological lessons learned from these advances constitute an instructive precis to further utilitarian theoretical unification.

DTIC

Human-Computer Interface; Human Factors Engineering; Flight Operations; Mathematical Models; Cockpits

19970031548 Texas Univ. Health Science Center, Houston, TX USA

Back Pain and Endurance Training of Back Muscles: Justification for Further Study in Helicopter Pilots

Ladner, Timothy J., Texas Univ. Health Science Center, USA; May 29, 1997; 39p; In English

Report No.(s): AD-A325683; AFIT-97-047; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to review the literature systematically to determine if available published evidence is sufficient to recommend endurance training of back musculature as a preventive measure for helicopter back pain. Based on this review further studies will be recommended to evaluate the effectiveness of back musculature training in helicopter back pain.

DTIC

Helicopters; Pilot Performance; Physiological Effects; Muscles

19970031562 Wright State Univ., Psychology Dept., Dayton, OH USA

Perception and Control of Locomotion *Final Report, Aug. 1993 - Aug. 1996*

Flach, John M., Wright State Univ., USA; Oct. 31, 1996; 23p; In English

Contract(s)/Grant(s): F49620-93-I-0560; AF Proj. 3484

Report No.(s): AD-A325535; WSU-662480; AFOSR-TR-97-0145; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This work has focused on perception and control of low altitude flight. The key independent variables were speed of forward motion and optical texture. Results showed an interaction between texture and speed.

DTIC

Low Altitude; Collision Avoidance; Flight Control; Pilot Performance; Motion Perception

19970031671 Army Aeromedical Research Lab., Fort Rucker, AL USA

Mass Requirements for Helicopter Aircrew Helmets

McEntire, B. Joseph, Army Aeromedical Research Lab., USA; Shanahan, Dennis F., Army Aeromedical Research Lab., USA; Aug. 25, 1997; 7p; In English

Report No.(s): AD-A328597; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Helicopter aircrew helmets are becoming more sophisticated with increased mission requirements. This increase results in additional mass being supported on the aircrew's head. Ultimately, there is a limit to how much mass can be supported by the aircrew without increasing the fatigue rates and neck injury risk in accidents. This paper reviews the past mass property requirements of Army helicopter helmets. Current requirements for the RAH-66 Comanche helmet are also detailed with the rationale for their derivation.

DTIC

Helicopters; Flight Crews; Helmets

19970031791 Armstrong Lab., Aerospace Medicine Directorate, Brooks AFB, TX USA

Female and Male Air Force Student Pilots: Attitudes toward Mixed-Gender Squadrons, Career Issues, and Combat Flying *Interim Report, Aug. 1996 - Jul. 1997*

McGlohn, Suzanne, Armstrong Lab., USA; Callister, Joseph D., Armstrong Lab., USA; King, Raymond E., Armstrong Lab., USA; Retzlaff, Paul D., Armstrong Lab., USA; Jul. 1997; 15p; In English

Report No.(s): AD-A328912; AL/AO-TR-1997-0096; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Air Force officers beginning pilot training were surveyed regarding their opinions and attitudes toward their flying and military careers. Differences between women and men were found in long term goals, opinions regarding mixed-gender squadrons, POW concerns, and combat attitudes. of particular interest are the facts that a large percentage of men believe that work situations will be worsened by the inclusion of women and that a large percentage of women believe flying in combat should be optional. Background: The integration of women into military aviation roles has largely been dictated by administrative action. The U. S. Army Aviation Flight Program was opened to women in 1973 (Voge and King, 1996), the U. S. Air Force began training women to be pilots and navigators in 1976 (Jones, 1983), and the U. S. Navy began training women to be naval flight officers in 1979 (Baisden, 1992). In 1993, many of the restrictions on women flying combat missions have also been lifted (U. S. Government Printing Office, 1992). These changes have occurred mostly for socio-political reasons, and many questions regarding the impact of these changes have not been answered.

DTIC

Aircraft Pilots; Combat; Navigators; Navy; Pilot Training

19970031938 Aeronautical Systems Div., Wright-Patterson AFB, OH USA

An Evaluation of the C-17A Forward Loadmaster Station Interface *Final Report, 1 Jun. - 31 Dec. 1996*

Anesgart, Martin N., Aeronautical Systems Div., USA; Jan. 1997; 48p; In English

Report No.(s): AD-A328628; ASC-TR-97-5004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

C-17 Human Factors conducted an evaluation of the C-17A Forward Loadmaster Station (FLS) Interface in the Loadmaster Simulator at Altus AFB, OK from 28 July to 1 August 1996. by executing five training scenarios containing malfunctions, ten airdrop certified loadmasters provided information on the quality of the Station interface through rating panels, annunciators and switches on six point scales of adequacy and through responding to questions involving 'Situation Awareness' (SA). Although the loadmasters generally viewed their interaction with the FLS as adequate, a repeated measures analysis on a composite of ratings and SA supported the contention that as the number and complexity of task elements increased, the ability of the FLS to aid the loadmaster in performance of the mission decreased. A follow-on ranking procedure of the average ratings demonstrated that

the FLS did not give clear and full information for all phases of airdrop. Uncertainty was the primary factor contributing to a potential, serious diminishment of the loadmaster's capacity to respond in anomalous situations. Suggestions for improvements included decluttering of displays and simplification of switch actuation sequences.

DTIC

Human Factors Engineering; C-17 Aircraft; Airdrops; Malfunctions; Flight Simulation

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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.

19970031164 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

An Investigation of Learning Curves and Their Use in Simulation

Lommel, Jennie H., Air Force Inst. of Tech., USA; Apr. 1996; 163p; In English

Report No.(s): AD-A327971; AFIT/GOR/ENS/96M-05; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

In 1995, the C-17 Factory Simulation Model (FSM) was developed to enable analysts to address 'what-if' questions about the resources required to build future aircraft, and is based on learning curve models that are used to both portray and simulate future aircraft production. In this thesis, we examine and develop alternate learning curve models that also utilize a small amount of initial production data to portray the relationship between the number of aircraft built and the resources required to build them. The goal is to identify a model which not only provides a good fit and forecast based on a small amount of data but is also intuitive and reasonably simple to apply. We also propose and evaluate the use of Autoregressive Moving Average (ARMA) models for modeling the effects of learning. These models are exercised in fitting simulated log-linear data, as well as in fitting and forecasting historical F-102 manufacturing data and notional C-17 manufacturing data. The results are somewhat inconclusive since they do not identify any one model as the best. They do, however, suggest that ARMA models are a promising alternative to the standard log-linear learning curve. The thesis concludes with an examination of the effects of explicitly accounting for uncertainty in parameter estimation when simulating future performance based on the traditional log-linear learning curve model. The results show that the approach employed in the FSM is viable even though it does not directly account for this uncertainty.

DTIC

Aircraft Production; Learning Curves; Manufacturing; F-102 Aircraft; Aircraft Design; Computer Aided Design; Computerized Simulation

19970031804 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

A Scalable Parallel Cell-Projection Volume Rendering Algorithm for Three-Dimensional Unstructured Data Final Report

Ma, Kwan-Liu, Institute for Computer Applications in Science and Engineering, USA; Crockett, Thomas W., Institute for Computer Applications in Science and Engineering, USA; Aug. 1997; 24p; In English

Contract(s)/Grant(s): NAS1-19480; RTOP 505-90-52-01

Report No.(s): NASA-CR-201719; NAS 1.26:201719; ICASE-97-37; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Visualizing three-dimensional unstructured data from aerodynamics calculations is challenging because the associated meshes are typically large in size and irregular in both shape and resolution. The goal of this research is to develop a fast, efficient parallel volume rendering algorithm for massively parallel distributed-memory supercomputers consisting of a large number of very powerful processors. We use cell-projection instead of ray-casting to provide maximum flexibility in the data distribution and rendering steps. Effective static load balancing is achieved with a round robin distribution of data cells among the processors. A spatial partitioning tree is used to guide the rendering, optimize the image compositing step, and reduce memory consumption. Communication cost is reduced by buffering messages and by overlapping communication with rendering calculations as much as possible. Tests on the IBM SP2 demonstrate that these strategies provide high rendering rates and good scalability. For a dataset containing half a million tetrahedral cells, we achieve two frames per second for a 400 x 400-pixel image using 128 processors.

Author

Parallel Processing (Computers); Three Dimensional Flow; Flexibility; Distributed Memory; Massively Parallel Processors; Aerodynamics

19970034483

Nonlinear iteration methods for high speed laminar compressible Navier-Stokes equations

Forsyth, P. A., Univ of Waterloo, Canada; Jiang, H.; Computers & Fluids; March 1997; ISSN 0045-7930; vol. 26, no. 3, pp. 249-268; In English; Copyright; Avail: Issuing Activity

Full Newton nonlinear iteration is compared with the use of a defect-correction approach (first-order Jacobian, second-order residual) for solving the steady-state compressible flow equations. The Jacobian is constructed numerically, and solved using a PCG-type method with block ILU(k) preconditioning. Numerical tests are carried out using the NACA 0012 airfoil, at various freestream Mach numbers and Reynolds numbers. The full Newton approximation is generally more robust and take less CPU time than the defect-correction approach. No particular difficulty was observed in solving the full Newton Jacobian using an ILU(2) (congruent to 100,000 unknowns) with CGSTAB acceleration.

Author (EI)

Airfoils; Compressible Flow; Iterative Solution; Mach Number; Navier-Stokes Equation

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PHYSICS**

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

19970033054

Noise source identification in a propfan model by means of acoustical near field measurements

Holste, F., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt e.V., Germany; Neise, W.; Journal of Sound and Vibration; June 19 1997; ISSN 0022-460X; vol. 203, no. 4, pp. 641-665; In English; Copyright; Avail: Issuing Activity

To explore the dominant aerodynamic noise sources, the pressure fluctuations in the exit plane of the propfan model CRISP (Counter Rotating Integrated Shrouded Propfan) were measured. The highest overall harmonic levels were found for the configuration with equal blade numbers. In this case, the blade passing frequency component is generated mainly by interaction of one of the two rotors to the struts, and the higher blade tone harmonics are produced by the interaction of the two rotors. With unequal wave numbers, all even harmonics of the shaft frequency can be generated by the interaction of the two rotors. However, the harmonics below 22 are excited as nonpropagational modes only and were found to have small amplitudes in the exit plane.

Author (EI)

Acoustic Measurement; Aerodynamic Noise; Counter Rotation; Noise Measurement; Turbofan Engines; Turbomachine Blades; Turboprop Engines

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