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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
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 368)

FEBRUARY 23, 1998

01 AERONAUTICS

19980008256

Aerodynamic performance of a round-to-square nozzle

Nguyen, T. V., GenCorp. Aerojet, USA; Spencer, R. G.; Siebenhaar, A.; Proceedings of the Heat Transfer and Fluid Mechanics Institute; 1997; ISSN 0097-059X, pp. 293-302; In English; 1997 35th Heat Transfer and Fluid Mechanics Institute, May 29-30, 1997, Sacramento, CA, USA; Copyright; Avail: Issuing Activity

The concept of a modular engine using small thrust cells is a viable and promising propulsion system for future launch and space flight vehicles. In this concept, several thrust cells are mounted either around a plug nozzle or an expansion-deflection nozzle, or simple as a cluster of separate rocket engines. The modular engine would be compact, light weight, and convenient for vehicle/engine integration. It is especially suited for single-stage-to-orbit spacecrafts. Packaging of the thrust cells is greatly improved if the exit nozzles of the thrust cells can be made in square or rectangular shapes rather than the conventional round shape. The square or rectangular nozzle exits also provide better transition for flow from the thrust cells to an external nozzle shroud, resulting in less performance loss in the external nozzle. A procedure has been devised to calculate the aerodynamic performance of convergent-divergent nozzles with square or rectangular exit shapes. The procedure was applied to calculate the performance of a 30:1 area ratio nozzle with a round- to-square transition. The calculated results showed that the performance of this nozzle was very high. The vacuum thrust coefficient for such a nozzle was approximately 1.864 (99.45 percent of a conventional, optimally-contoured, round nozzle with the same length and expansion area ratio).

Author (EI)

Aerodynamic Characteristics; Convergent-Divergent Nozzles; Aerodynamics; Computation

19980008988

Challenges in the repair of composite structures - Part 1

Heslehurst, R. B., Australian Defence Force Acad., Australia; SAMPE Journal; September-October, 1997; ISSN 0091-1062; Volume 33, no. 5, pp. 11-16; In English; Copyright; Avail: Issuing Activity

This two part paper discusses the development of repairs to composite aircraft structures. Through a brief history and outline of generic repair type schemes, the paper will discuss the specific requirements of composite structural repairs. A 10-step guide as how to best achieve a successful composite repair is given. This leads to a description of the aircraft structure repair manual's (SRM) explanation of how to conduct a composite structural repair. Several areas of improvement in the SRMs are discussed, covering inappropriate and poor repair scheme design and application practices.

Author (EI)

Aircraft Structures; Composite Structures; Maintenance

19980008998

Numerical simulations of interactions among aerodynamics, structural dynamics, and control system

Mook, D. T., Virginia Polytechnic Inst. and State Univ., USA; Luton, J. A.; Mechanical Sciences; June, 1997; ISSN 0100-7386; Volume 19, no. 2, pp. 147-153; In English; Copyright; Avail: Issuing Activity

A numerical simulation of the interactions among the structure of an aircraft wing, the flow around it, and the devices that control the deflections of the ailerons is described. In the present simulation, the structure, flowing air, and controls are considered to be the elements of a single dynamic system. All of the governing equations are numerically integrated simultaneously and iteratively. The procedure is illustrated by an example of a very high-aspect-ratio, very flexible wing. Instead of a simple formula for the aerodynamic forces, there is a rather involved computer code. The input to this code, needed to impose the boundary condi-

tions on the flowfield, is the velocity and position of all the points on the wing. As the airspeed increases and the angle of attack decreases in such a way that the lift force remains constant, the uncontrolled wing eventually begins to flutter. When the controls are turned on, the flutter can be suppressed up to approximately twice the critical airspeed.

Author (EI)

Dynamic Control; Dynamic Response; Dynamic Structural Analysis; Flight Control; Aerodynamics; Hydrodynamics; Computerized Simulation; Equations of Motion; Aspect Ratio

02 AERODYNAMICS

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

19980006409 Technische Univ., Faculty of Aerospace Engineering, Delft, Netherlands

Implementation of a Specified Separation in a Three-Dimensional Euler Code

Michiels, K. A., Technische Univ., Netherlands; Dec. 1996; 67p; In English

Report No.(s): PB97-190078; MEMO-740; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The purpose of this research is to improve the three-dimensional, viscous simulations using an Euler code, by extending this code with the possibility to prescribe separation lines. This research only considers the flow around the rather simple geometry of the Elac-1. In chapter 2, the numerical Euler code is discussed briefly. Chapter 3 consists of the description of conical flows. The determination of the three-dimensional and the conical grid are described in chapter 4. Chapter 5 discusses the effect of parameters on the solution when separation is prescribed. The investigation of the position of three-dimensional separation as well as the effect of this position on the solution is discussed in chapter 6. The best set of parameters, determined in chapter 5, is used here. Chapter 6 also contains the description of and the indication of a three-dimensional separation in the Euler code, and the addition of a relaxation factor to the code in order to improve the convergence of the solution procedure. Chapter 7 finishes the report with conclusions and recommendations.

NTIS

Hypersonic Aircraft; Viscous Flow; Euler Equations of Motion; Three Dimensional Models; Flow Visualization; Computational Grids

19980006412 Technische Univ., Faculty of Aerospace Engineering, Delft, Netherlands

Prediction of Blade Flapping Angles: A Coupled Rotor Model Compared with Experimental Data

Ypma, F. A. K., Technische Univ., Netherlands; Dec. 1996; 154p; In English; Figures in this document may not be legible in mic
Report No.(s): PB97-191795; MEMO-730; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The object of the report is to develop and validate a steady-state three-dimensional coupled rotor model for predicting blade flapping angles. In order to attain a favorable computing time, the flapping angles are described by a set of linear equations. To obtain linear equations, assumptions concerning geometry and aerodynamics are made. A static first harmonic inflow model has been chosen to represent the induced velocity. Three experiments with forward flight conditions are used to verify the proposed theory. In addition, a comparison with the results of textbook theories is made. A brief derivation of the main rotor model is given in chapter 2. An overview of the geometric and aerodynamic assumptions and restrictions is given. The limitations of the helicopter parameters are estimated to determine which terms can be discarded. The resulting relation has been compared with: in-flight measurements with a Pitcairn autogyro in a steady glide described in chapter 3; the flapping angles measured with a motion-picture camera on the rotor hub of a Sikorsky helicopter in chapter 4; a wind tunnel test of a complete rotor fuselage model of the Boeing CH-47C presented in chapter 5; and textbook theories and their verifications through comparison with experiments in chapter 6. Overall conclusions are drawn in chapter 7 and in chapter 8 recommendations for further research are given. The complete derivation of the main rotor model is presented in appendix A.

NTIS

Flapping; Blade-Vortex Interaction; Aerodynamics; Helicopters; Rotor Blades (Turbomachinery); Mathematical Models; Three Dimensional Models; Horizontal Flight

19980007557 Defence Science and Technology Organisation, Weapons Systems Div., Melbourne, Australia
Measurement of Drag Characteristics of Mk 82 General Purpose Low Drag Bomb using an Aeroballistic Range Facility
Krishnamoorthy, L. V., Defence Science and Technology Organisation, Australia; Glass, R., Defence Science and Technology Organisation, Australia; Kirk, D. R., Defence Science and Technology Organisation, Australia; Jun. 1997; 32p; In English
Report No.(s): AD-A329918; DSTO-TR-0545; DODA-AR-010-249; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A method is described to determine the drag characteristics of the Mk 82 low drag bomb. This involves launching half scale models from the DSTO gas gun facilities at Port Wakefield and measuring the trajectories by photogrammetric methods. The drag coefficients were calculated from the measured positional data using a three degrees of freedom parameter estimation method. The estimated drag characteristics of various Mk 82 GPLD store configurations will form the basis of a database for use with the updated F-111C aircraft.

DTIC

Aerodynamic Drag; Drag Measurement; Aerodynamic Coefficients; Ballistics; Gas Guns; Trajectories

19980008542 NASA Langley Research Center, Hampton, VA USA
Invariance of Hypersonic Normal Force Coefficients with Reynolds Number and Determination of Inviscid Wave Drag from Laminar Experimental Results

Hawkins, Richard, Analytical Services and Materials, Inc., USA; Penland, Jim A., NASA Langley Research Center, USA; Dec. 1997; 66p; In English

Contract(s)/Grant(s): RTOP 505-70-63-01

Report No.(s): NASA-TP-3673; NAS 1.60:3673; L-17595; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Observations have been made and reported that the experimental normal force coefficients at a constant angle of attack were constant with a variation of more than 2 orders of magnitude of Reynolds number at a free-stream Mach number $M(\text{sub infinity})$ of 8.00 and more than 1 order of magnitude variation at $M(\text{sub infinity}) = 6.00$ on the same body-wing hypersonic cruise configuration. These data were recorded under laminar, transitional, and turbulent boundary layer conditions with both hot-wall and cold-wall models. This report presents experimental data on 25 configurations of 17 models of both simple and complex geometry taken at $M(\text{sub infinity}) = 6.00, 6.86,$ and 8.00 in 4 different hypersonic facilities. Aerodynamic calculations were made by computational fluid dynamics (CID) and engineering methods to analyze these data. The conclusions were that the normal force coefficients at a given altitude are constant with Reynolds numbers at hypersonic speeds and that the axial force coefficients recorded under laminar boundary-layer conditions at several Reynolds numbers may be plotted against the laminar parameter (the reciprocal of the Reynolds number to the one-half power) and extrapolated to the ordinate axis to determine the inviscid-wave-drag coefficient at the intercept.

Author

Hypersonic Shock; Hypersonic Boundary Layer; Hypersonic Forces; Turbulent Boundary Layer; Reynolds Number; Mach Number; Computational Fluid Dynamics; Body-Wing Configurations; Aerodynamic Drag; Aerodynamic Coefficients

19980008581 NASA Langley Research Center, Hampton, VA USA
Hypersonic Pitching-Moment Shift for Stardust Reentry Capsule Forebody

Wood, William A., NASA Langley Research Center, USA; Oct. 1997; 24p; In English

Contract(s)/Grant(s): RTOP 242-80-01-01

Report No.(s): NASA/TM-97-206266; L-17667; NAS 1.26:206266; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aerodynamic coefficients are presented for perfect-gas and equilibrium-air solutions of the Navier-Stokes equations about the Stardust reentry-capsule forebody at Mach numbers of 4.6, 7, 8.5, and 10. A comparison with Newtonian-flow assumptions indicates a divergence of the aerodynamic coefficients from Newtonian-flow for Mach numbers less than 10. The static stability of the forebody is reduced by a factor of 2.5 with decreasing freestream Mach number between Mach 10 and 7.

Author

Mach Number; Pitching Moments; Aerodynamic Coefficients; Computational Fluid Dynamics; Hypersonic Flow; Navier-Stokes Equation; Space Capsules

19980008794 Washington Univ., Aerospace and Energetics Research Program, Seattle, WA USA
Investigation of Ram Accelerator Gasdynamic Limits Final Report, 1 Sep. 1993 - 28 Feb. 1997

Bruckner, Adam, Washington Univ., USA; Higgins, Andrew, Washington Univ., USA; Jul. 28, 1997; 166p; In English

Contract(s)/Grant(s): F49620-93-I-0538; AF Proj. 3484

Report No.(s): AD-A329670; AFOSR-TR-97-0504; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The initiation of detonation by blunt projectiles traveling at supersonic speeds was experimentally investigated. This phenomenon may be responsible for ram accelerator unstarts in subdetonative flow, while detonation initiation may be required for superdetonative operation. A blunt projectile in a detonable gas may induce combustion that is decoupled from the bow shock or may fully couple to the bow shock resulting in a free running detonation. The boundary between these two phenomena was the subject of this work. Spheres were fired from a gas gun into a mixture of stoichiometric hydrogen and oxygen with 70% argon dilution. The diameter of the spheres varied between 4.8 mm and 25 mm, and the Mach number of the spheres ranged from Mach 2 to Mach 6.5. The initial pressure of the mixture varied between 0.4 atm and 10 atm. Without an inert gas buffer, initiation occurred at Mach 2 as a result of unsteady shocks generated by the sphere impacting the diaphragm. When a buffer of inert gas was used, an autoignition limit around Mach 3.2-3.4 was observed, independent of sphere size. Below this Mach number, the sphere was unable to detonate the mixture. When the sphere was traveling at the Chapman Jouguet (CJ) detonation speed of the mixture, the critical mixture pressure required for initiation decreased as the size of the sphere increased. These results were compared to a theory of Lee and Vasiljev which equates the critical energy per unit length required to initiate a cylindrical detonation with the work done by the drag of the projectile. While this theory was formulated for speeds faster than the CJ speed, it agreed well with the results for a sphere traveling at the CJ speed, even as the sphere's size was varied by a factor of 5.

DTIC

Ram Accelerators; Supersonic Speed; Mach Number; Detonation Waves; Gas Dynamics

19980008833 NASA Langley Research Center, Hampton, VA USA

Cavity Unsteady-Pressure Measurements at Subsonic and Transonic Speeds

Tracy, Maureen B., NASA Langley Research Center, USA; Plentovich, E. B., NASA Langley Research Center, USA; Dec. 1997; 80p; In English

Contract(s)/Grant(s): RTOP 505-68-30-03

Report No.(s): NASA-TP-3669; L-17560; NAS 1.60:3669; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

An experimental investigation was conducted in the Langley 8-Foot Transonic Pressure Tunnel to determine the flow characteristics of rectangular cavities with varying relative dimensions at subsonic and transonic speeds. Cavities were tested with width-to-depth ratios of 1, 4, 8, and 16 for length-to-depth ratios l/h of 1 through 17.5. The maximum cavity depth was 2.4 in., and the turbulent boundary layer approaching the cavity was approximately 0.5 in. thick. Unsteady- and mean static-pressure measurements were made at free-stream Mach numbers from 0.20 to 0.95 at a unit Reynolds number per foot of approximately 3×10^6 ; however, only unsteady-pressure results are presented in this paper. Results indicate that as l/h increases, cavity flows changed from resonant to nonresonant with resonant amplitudes decreasing gradually. Resonant spectra are obtained largely in cavities with mean static-pressure distributions characteristic of open and transitional flows. Resonance sometimes occurred for closed flow. Increasing cavity width or decreasing cavity depth while holding l/h fixed had the effect of increasing resonant amplitudes and sometimes induced resonance. The effects due to changes in width are more pronounced. Decreasing Mach number has the effect of broadening the resonances.

Author

Cavity Flow; Unsteady Flow; Transonic Speed; Pressure Measurement; Cavity Resonators; Subsonic Speed

19980009040 Arizona State Univ., Dept. of Mechanical and Aerospace Engineering, Tempe, AZ USA

Stability of Hypersonic Boundary-Layer Flows Final Report, 15 Oct. 1994 - 17 Apr. 1997

Reed, Helen L., Arizona State Univ., USA; Sep. 1997; 24p; In English

Contract(s)/Grant(s): F49620-95-I-0033

Report No.(s): AD-A329974; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Final Report describes our program in studies of (laminar/turbulent) stability and transition in non-equilibrium-chemistry flows characteristic of those on the forebodies of hypersonic vehicles. The configuration best modelling a hypersonic vehicle is an elliptic cone. Specifically, we investigated and optimized a Parabolized Navier-Stokes solution for the basic-state flow past a sharp elliptic cone including the region between the wall and the shock. We formulated the Parabolized Stability Equations for 3-D flows.

DTIC

Hypersonic Flow; Three Dimensional Flow; Navier-Stokes Equation; Computational Fluid Dynamics; Boundary Layer Flow

AIR TRANSPORTATION AND SAFETY

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

19980006537 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Special Investigation Report: Robinson Helicopter Company R22 Loss of Main Rotor Control Accidents

Apr. 02, 1996; 113p; In English

Report No.(s): PB96-917003; NTSB/SIR-96/03; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report examines the loss of main rotor control accidents involving Robinson Helicopter Company R22 helicopters. When similar accidents occurred involving the Robinson R44 helicopters, the scope of the report expanded to include those accidents. The safety issues discussed in the report include the need for appropriate measures to reduce the probability of loss of main rotor control accidents; the need for continued research to study flight control systems and main rotor blade dynamics in light-weight, low rotor inertia helicopters; the need for operational requirements to be addressed during future certification of light-weight, low rotor inertia helicopters; and the need for the Federal Aviation Administration (FAA) to review and revise, as necessary, its procedures to ensure that internal recommendations, particularly those addressed in special certification reviews, are appropriately resolved and brought to closure.

NTIS

Helicopters; Flight Control; Rotor Dynamics; Aircraft Accidents; Rotors

19980007224 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Aircraft Accident Report: In-Flight Icing Encounter and Loss of Control, Simmons Airlines, d.b.a. American Eagle Flight 4184, Avions de Transport Regional (ATR), Model 72-212, N401AM, Roselawn, Indiana, October 31

Jul. 09, 1996; 334p; In English

Report No.(s): PB96-910401; NTSB/AAR-96/01; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Volume I of this report explains the crash of American Eagle flight 4181, an ATR 72 airplane during a rapid descent after an uncommanded roll excursion. The safety issues discussed in the report focused on communicating hazardous weather information to flightcrews, Federal regulations on aircraft icing and icing certification requirements, the monitoring of aircraft airworthiness, and flightcrew training for unusual events/attitudes.

NTIS

Aircraft Accident Investigation; Aircraft Accidents; Aircraft Icing; Aircraft Reliability; Airline Operations; Certification; Civil Aviation; Commercial Aircraft; Communicating; Crashes

19980007225 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Aircraft Accident Report: Uncontained Engine Failure/Fire Valuejet Airlines Flight 597, Douglas DC-9-32, N908VJ, Atlanta, Georgia, June 8, 1995

Jul. 30, 1995; 138p; In English

Report No.(s): PB96-910403; NTSB/AAR-96/03; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The report explains the uncontained engine failure/fire on Valujet Airlines flight 597, a Douglas DC-9-32, N908VJ, at Atlanta, Georgia, on June 8, 1995. The safety issues discussed in the report include the clarity of operations specifications for repair stations, recordkeeping requirements for foreign repair stations, regulatory guidance concerning maintenance documentation, intent of 'serviceable tags,' independently powered public address systems on all transport-category airplanes, flight attendant training programs and manuals, enforcement of occupant restraint requirements, notification of flightcrew of cabin fire, cabin material/fire safety standards, flight attendant attire, and quality of cockpit voice recordings.

NTIS

Aircraft Accident Investigation; Aircraft Accidents; Airline Operations; Commercial Aircraft; Constraints; Engine Failure; Fire Prevention; Flight Crews; Flight Training; Public Address Systems

AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

19980006463 Eurocontrol Experimental Centre, Bretigny, France

Second Continental RVSM Real-Time Simulation

Barff, A., Eurocontrol Experimental Centre, France; Deransy, R., Eurocontrol Experimental Centre, France; Feb. 1997; 193p; In English

Report No.(s): PB97-159362; EEC-309; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This report describes a real-time simulation designed to assess different proposals for the use of the additional flight levels that will become available with the introduction of Reduced Vertical Separation Minima (RVSM) between FL290 and FL410. NTIS

Computerized Simulation; Minima; Airspace; Aircraft Approach Spacing; Air Traffic Control; Real Time Operation

19980007288 Oklahoma Univ., Dept. of Psychology, Norman, OK USA

The Role of Memory in Air Traffic Control Final Report

Gronlund, Scott D., Oklahoma Univ., USA; Dougherty, Michael R. P., Oklahoma Univ., USA; Ohrt, Daryl D., Oklahoma Univ., USA; Thomson, Gary L., Oklahoma Univ., USA; Bleckley, Kathryn M., Oklahoma Univ., USA; Bain, Dana L., Federal Aviation Administration, USA; Arnell, Faith, Federal Aviation Administration, USA; Manning, Carol A., Civil Aeromedical Inst., USA; Nov. 1997; 30p; In English

Contract(s)/Grant(s): DTFA02-93-D-93088

Report No.(s): DOT/FAA/AM-97/22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We tested air traffic controllers currently serving as instructors and tried to manipulate their memory for various aircraft flight data. In Experiment 1, the amount of control exercised (the number of control actions or communications) had little effect on memory for flight data, although we did find excellent memory for the position of aircraft on the radar display. We argued that this was the basis for the mental representation of the aircraft in the sector and may serve as the foundation for situation awareness. In Experiment 2, neither the type of control exercised nor the importance of the aircraft in the scenario consistently affected memory. We considered several reasons why we were unable to manipulate memory for flight data, including how important memory is to successful task performance and whether we tapped the relevant characteristics of the situation. Resolution of these issues will contribute to improved techniques that assess situation awareness from memory performance.

Author

Memory; Air Traffic Control; Human Performance; Air Traffic Controllers (Personnel)

19980008273

Optimizing airport capacity utilization in air traffic flow management subject to constraints at arrival and departure fixes

Gilbo, Eugene P., Volpe Natl. Transportation Systems Cent., USA; IEEE Transactions on Control Systems Technology; September, 1997; ISSN 1063-6536; Volume 5, no. 5, pp. 490-503; In English; Copyright; Avail: Issuing Activity

This paper formulates a new approach for improvement of air traffic flow management at airports, which leads to more efficient utilization of existing airport capacity to alleviate the consequences of congestion. A new model is presented, which first considers the runways and arrival and departure i fixes jointly as a single system resource, and second considers arrivals and departures simultaneously as two interdependent processes. The model takes into account the interaction between runway capacity and capacities of fixes to optimize the traffic flow through the airport system. The effects are achieved by dynamic time-dependent allocation of airport capacity and flows between arrivals and departures coordinated with the operational 4 constraints at runways and arrival and departure fixes as well as with dynamics of traffic demand and weather. Numerical examples illustrate the potential benefits of the approach.

Author (EI)

Air Traffic Control; Flow Distribution; Optimization; Queueing Theory; Airports; Runways

19980008807 National Biological Service, Environmental Management Technical Center, Onalaska, WI USA

Geospatial Application: Estimating the Spatial Accuracy of Coordinates Collected Using the Global Positioning System

Owens, T., National Biological Service, USA; McConville, D., Saint Mary's Coll., USA; Apr. 1996; 29p; In English

Report No.(s): PB96-187331; LTRMP-96-T002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The advent of the Global Positioning System (GPS) has reduced the expense and complexity of traditional survey techniques for measuring the location of objects on the earth. However, a simple, clear, repeatable, and statistically sound method of determin-

ing the accuracy of GPS-generated data has not been readily available. The authors have devised a straightforward, repeatable, and statistically sound method of estimating the horizontal accuracy of GPS-derived coordinates.

NTIS

Coordinates; Global Positioning System; Position (Location); Geodetic Accuracy; Geodetic Surveys

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19980006574 Air Education and Training Command, Air Education and Training Command, Hill AFB, UT USA

C-130 E/H Handbook: Use for Training with Technical Data

1997; 188p; In English

Report No.(s): PB97-209225; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The handbook is designed to be used as a reference for the C-130E/H model aircraft systems. As a training aid, the book has the distinct advantage of having a log of pictures. It is intended as a quick reference to find a particular dimension, station number, access panel, component location, etc. Table of Contents: General Airplane; Ground Handling, Servicing, and Airframe Maintenance; Hydraulic Systems; Power Plant (C-130E and H); Fuel Systems; Instruments; Electrical Systems; Radio-Communication and Navigation Systems; Flight Control Systems; Utility Systems; Propeller; Landing Gear; and Airplane Wiring Diagrams.

NTIS

C-130 Aircraft; Aircraft Maintenance; Handbooks; Education

19980006704

Development of domestic brake assemblies of aircraft Boeing 737, Boeing 767 and MD82

Li, Dongsheng, Inst. of Aeronautical Materials, China; Tan, Qingcheng; Song, Mingdao; Yuan, Xiaoming; Miao, Xingqi; Cailiao Gongcheng/Journal of Materials Engineering; April, 1997; ISSN 1001-4381, no. 4, pp. 36-39; In Chinese; Copyright; Avail: Issuing Activity

The research and manufacture of the brake assemblies for advanced large passenger airplanes, such as Boeing 737, Boeing 767 and MD-82, had been accomplished on the basis of the FAA technical standard TSO-C26c, the CAAC technical standard CTSO-C26c and the airworthiness standard CCAR-25. Those CAAC standards are equivalent to these FAA standards in specifications. The results show that properties of domestic brake assemblies achieved and/or exceeded the level of similar imports according to the property test of material, the ground simulated test, the test flight and the results of application in airline.

Author (revised by EI)

Aircraft Reliability; Boeing 767 Aircraft; Brakes; Aircraft Equipment; Aircraft Parts

19980006856 National Aerospace Lab., Structures and Materials Div., Amsterdam, Netherlands

Aircraft Corrosion and Fatigue Damage Assessment

Wanhill, R. J. H., National Aerospace Lab., Netherlands; Oct. 17, 1995; 53p; In English

Report No.(s): PB97-194849; NLR-TP-95656-U; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The paper reviews currently available information on corrosion and fatigue in aircraft as a background to discussing the assessment of corrosion and fatigue damage. The main topics are: aircraft operating environments and loads; corrosion; fatigue; corrosion and fatigue; and corrosion and fatigue damage assessment.

NTIS

Aircraft Structures; Fatigue (Materials); Corrosion Prevention

19980008263

Active isolation of multiple structural waves on a helicopter gearbox support strut

Sutton, T. J., Univ. of Southampton, UK; Elliott, S. J.; Brennan, M. J.; Heron, K. H.; Jessop, D. A. C.; Journal of Sound and Vibration; August 07, 1997; ISSN 0022-460X; Volume 205, no. 1, pp. 81-101; In English; Copyright; Avail: Issuing Activity

A helicopter gearbox support strut has been set up in the laboratory under realistic loading conditions to investigate the active control of longitudinal and lateral vibration transmission to a connected receiving structure. Three magnetostrictive actuators were clamped to the strut to introduce secondary vibration in the frequency range 250-1250 Hz, the control objective being to minimize the kinetic energy of vibration of the receiving structure. Using an extensive set of frequency response measurements, it was possible to predict on a linear basis the attenuation in the kinetic energy of the receiving structure at any discrete frequency in the

measurement range for a wide range of conditions. Calculations based on frequency response measurements showed that with the installed steel bearings on the strut, attenuations in the kinetic energy of the receiving structure of 30-40 dB were possible over a range of frequencies between 250 and 1250 Hz. At some frequencies in this range, notably around 500 Hz and 800 Hz, the control was less effective. This was due to torsional motion of the strut which was amplified by the secondary actuators. Good control was also predicted when the primary excitation to the strut was applied laterally rather than longitudinally. Real-time active control has been implemented at discrete frequencies on the test strut and has generally confirmed the linear predictions. Attenuations in excess of 40 dB were measured in a number of cases. The tests confirmed that the active control of vibration transmission through a helicopter strut is practical at frequencies up to at least 1250 Hz.

Author (EI)

Active Control; Real Time Operation; Transmissions (Machine Elements); Struts; Helicopters; Vibration Damping; Actuators; Frequency Response

19980008393 RAND Corp., Santa Monica, CA USA

The Next Generation Attack Fighter: Affordability and Mission Needs

Stevens, Donald, RAND Corp., USA; Davis, Bruce, RAND Corp., USA; Stanley, William, RAND Corp., USA; Norton, Daniel, RAND Corp., USA; Starr, Rae, RAND Corp., USA; Jan. 1997; 87p; In English

Contract(s)/Grant(s): F49642-96-C-0001

Report No.(s): AD-A327531; RAND/MR-719-AF; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The Air Force has embarked on a course to replace the most numerous fighter aircraft in its inventory, the F-16. The Joint Strike Fighter (JSF) may evolve from the tri-service Joint Advanced Strike Technology (JAST) program to replace the F-16 (and perhaps other Air Force ground-attack aircraft) as well as other air-to-ground fighters used by the Navy and Marine Corps. As the JAST program proceeds to a hardware demonstration phase, the Air Force is drafting statements of mission needs and operational requirements for the new aircraft. The Air Force asked RAND's Project AIR FORCE to analyze inventory levels, affordability, and mission needs for the new fighter, to augment Air Force and contractor studies. The study, documented in this report, found that the constraints of future budgets will severely circumscribe Air Force options for the JSF. Without a sharp reversal in defense budget trends or the allocation of a higher share of the Air Force budget to fighter modernization, the JSF will need to be a relatively low-cost, moderate-performance aircraft to fit within Air Force budget constraints. The good news is that an aircraft with a combat radius of 650 nm, moderate stealth, and a turn rate comparable to that of today's multirole aircraft can probably meet most of the services' needs in future regional conflicts.

DTIC

Fighter Aircraft; Trends

06

AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

19980008580 NASA Dryden Flight Research Center, Edwards, CA USA

Design and Calibration of the X-33 Flush Airdata Sensing (FADS) System

Whitmore, Stephen A., NASA Dryden Flight Research Center, USA; Cobleigh, Brent R., NASA Dryden Flight Research Center, USA; Haering, Edward A., NASA Dryden Flight Research Center, USA; Jan. 1998; 36p; In English; AIAA Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 242-33-02-00-23

Report No.(s): NASA/TM-98-206540; H-2219; NAS 1.15:206540; AIAA Paper 98-0201; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents the design of the X-33 Flush Airdata Sensing (FADS) system. The X-33 FADS uses a matrix of pressure orifices on the vehicle nose to estimate airdata parameters. The system is designed with dual-redundant measurement hardware, which produces two independent measurement paths. Airdata parameters that correspond to the measurement path with the minimum fit error are selected as the output values. This method enables a single sensor failure to occur with minimal degrading of the system performance. The paper shows the X-33 FADS architecture, derives the estimating algorithms, and demonstrates a mathematical analysis of the FADS system stability. Preliminary aerodynamic calibrations are also presented here. The calibration parameters, the position error coefficient (epsilon), and flow correction terms for the angle of attack (delta alpha), and angle of sideslip (delta beta) are derived from wind tunnel data. Statistical accuracy of the calibration is evaluated by comparing the wind

tunnel reference conditions to the airdata parameters estimated. This comparison is accomplished by applying the calibrated FADS algorithm to the sensed wind tunnel pressures. When the resulting accuracy estimates are compared to accuracy requirements for the X-33 airdata, the FADS system meets these requirements.

Author

X-33 Reusable Launch Vehicle; Data Systems; Systems Integration; Calibrating; Remote Sensing; Systems Engineering

19980009057 NERAC, Inc., Tolland, CT USA

Head Up Displays. (Latest Citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867031; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, and applications of head up displays (HUDs). Applications include military aircraft, helicopters, space shuttle, and commercial aircraft. Functions of the display include instrument approach, target tracking, and navigation. The head up display provides for an integrated avionics system with the pilot in the loop.

NTIS

Display Devices; Instrument Approach; Navigation; Avionics; Tracking (Position)

07

AIRCRAFT PROPULSION AND POWER

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

19980006703

Manufacture of crack source and determination of residual cycle life for FGH95 powder metallurgical turbine disk

Wu, Jiamei, Inst. of Aeronautical Materials, China; Xie, Jizhou; Cailiao Gongcheng/Journal of Materials Engineering; April, 1997; ISSN 1001-4381, no. 4, pp. 47-48; In Chinese; Copyright; Avail: Issuing Activity

The specimen which was used for predicting residual cycle life of turbine disk had been machined by electrical discharge machining technique. The size of precracking source is 0.05mm +/- 0.025mm in width, 0.25mm +/- 0.013mm in depth and 1mm +/- 0.05mm in length. A fatigue crack of length 1.50mm +/- 0.13mm on the specimen was made by fatigue testing, and the residual cycle life of specimen with precracking source had been determined.

Author (revised by EI)

Electric Discharges; Life (Durability); Powder (Particles); Fatigue Tests; Failure Analysis; Rotating Disks; Cracks

19980008307 Army Research Lab., Aberdeen Proving Ground, MD USA

A Twisted Turbine Blade Analysis for a Gas Turbine Engine Final Report, Sep. 1996 - Feb. 1997

Korjack, T. A., Army Research Lab., USA; Aug. 1997; 28p; In English

Report No.(s): AD-A329581; ARL-TR-1469; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An analysis of a twisted turbine blade was performed to determine the regions of maximum stress and moment which occur on a typical gas turbine engine under variable revolutions per second. An extension of the Holzer and Myklestad methods was developed to simulate shear and moment effects occurring from the root of the blade to its outermost extremity. Under numerical simulations, shear force and moments of inertia were realized at changing revolutions per minute by solving the Den Hartog twisted blade equations.

DTIC

Gas Turbine Engines; Turbine Blades; Shear Stress

19980009044 Naval Air Warfare Center, Aircraft Div., Trenton, NJ USA

Evaluation of Lightweight Material Concepts for Aircraft Turbine Engine Rotor Failure Protection Final Report

Le, D. D., Naval Air Warfare Center, USA; Jul. 1997; 84p; In English

Contract(s)/Grant(s): DTFA03-95-X-90010; DTFA03-88-A-00029

Report No.(s): PB97-203129; AIR-447200P; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Results of the evaluation of lightweight materials for aircraft turbine engine rotor failure protection are presented in the report. Phase 1 was an evaluation of a group of composite materials which could possibly contain the impact energies of 1.0×10^6 (exp

6) inch-pounds generated by T53 rotor fragments. Phase 2 refined system composition and weight of the optimum materials selected from phase 1 and determined their performance under elevated temperatures. Based on the results of phase 1, the aluminum lined fiberglass is the best system, so far. The Aramid system with an aluminum liner performed almost as effective as aluminum lined fiberglass under ambient conditions. Dry Kevlar performed better than Kevlar impregnated with phenolic resin. Under elevated temperatures, the performances of the aluminum lined fiberglass system, based on energy per weight and thickness, reduced by 50 and 33% respectively. Fabric composite systems absorbed the kinetic energy of fragments through elastic deformation and interlaminated shear of composite layers.

NTIS

Aircraft Construction Materials; Aircraft Engines; Rotors; Failure Modes; Fragments; Failure Analysis; Fiber Composites; Engine Failure; Gas Turbine Engines

08

AIRCRAFT STABILITY AND CONTROL

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

19980007172 NASA Dryden Flight Research Center, Edwards, CA USA

Flight-Determined Subsonic Longitudinal Stability and Control Derivatives of the F-18 High Angle of Attack Research Vehicle (HARV) with Thrust Vectoring

Iliff, Kenneth W., NASA Dryden Flight Research Center, USA; Wang, Kon-Sheng Charles, Sparta, Inc., USA; Dec. 1997; 72p; In English

Contract(s)/Grant(s): RTOP-505-68-50-00

Report No.(s): NASA/TP-97-206539; NAS 1.60:206539; H-2175; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The subsonic longitudinal stability and control derivatives of the F-18 High Angle of Attack Research Vehicle (HARV) are extracted from dynamic flight data using a maximum likelihood parameter identification technique. The technique uses the linearized aircraft equations of motion in their continuous/discrete form and accounts for state and measurement noise as well as thrust-vectoring effects. State noise is used to model the uncommanded forcing function caused by unsteady aerodynamics over the aircraft, particularly at high angles of attack. Thrust vectoring was implemented using electrohydraulically-actuated nozzle post-exit vanes and a specialized research flight control system. During maneuvers, a control system feature provided independent aerodynamic control surface inputs and independent thrust-vectoring vane inputs, thereby eliminating correlations between the aircraft states and controls. Substantial variations in control excitation and dynamic response were exhibited for maneuvers conducted at different angles of attack. Opposing vane interactions caused most thrust-vectoring inputs to experience some exhaust plume interference and thus reduced effectiveness. The estimated stability and control derivatives are plotted, and a discussion relates them to predicted values and maneuver quality.

Author

Longitudinal Stability; Thrust Vector Control; Research Vehicles; Maximum Likelihood Estimates; Parameter Identification; Angle of Attack; Unsteady Aerodynamics; Aircraft Control; Flight Tests

19980007174 Iowa State Univ. of Science and Technology, Dept. of Aerospace Engineering and Engineering Mechanics, Ames, IA USA

Nonclassical Flight Control for Unhealthy Aircraft Final Report, 28 Mar. - 30 Nov. 1997

Lu, Ping, NASA Dryden Flight Research Center, USA; Dec. 1997; 24p; In English

Contract(s)/Grant(s): NCC4-109

Report No.(s): NASA/CR-97-206660; NAS 1.26:206660; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research set out to investigate flight control of aircraft which has sustained damage in regular flight control effectors, due to jammed control surfaces or complete loss of hydraulic power. It is recognized that in such an extremely difficult situation unconventional measures may need to be taken to regain control and stability of the aircraft. Propulsion controlled aircraft (PCA) concept, initiated at the NASA Dryden Flight Research Center. represents a ground-breaking effort in this direction. In this approach, the engine is used as the only flight control effector in the rare event of complete loss of normal flight control system. Studies and flight testing conducted at NASA Dryden have confirmed the feasibility of the PCA concept. During the course of this research (March 98, 1997 to November 30, 1997), a comparative study has been done using the full nonlinear model of an F-18 aircraft. Linear controllers and nonlinear controllers based on a nonlinear predictive control method have been designed for normal flight control system and propulsion controlled aircraft. For the healthy aircraft with normal flight control, the study shows that an appropriately designed linear controller can perform as well as a nonlinear controller. On the other hand. when the normal

flight control is lost and the engine is the only available means of flight control, a nonlinear PCA controller can significantly increase the size of the recoverable region in which the stability of the unstable aircraft can be attained by using only thrust modulation. The findings and controller design methods have been summarized in an invited paper entitled.

Derived from text

Control Equipment; Aircraft Control; Flight Tests; Flight Control; F-18 Aircraft; Damage

19980007406 NASA Langley Research Center, Hampton, VA USA

Analysis of Wind Tunnel Longitudinal Static and Oscillatory Data of the F-16XL Aircraft

Klein, Vladislav, George Washington Univ., USA; Murphy, Patrick C., NASA Langley Research Center, USA; Curry, Timothy J., George Washington Univ., USA; Brandon, Jay M., NASA Langley Research Center, USA; Dec. 1997; 68p; In English

Contract(s)/Grant(s): RTOP 522-33-11-05

Report No.(s): NASA/TM-97-206276; NAS 1.15:206276; L-17682; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Static and oscillatory wind tunnel data are presented for a 10-percent-scale model of an F-16XL aircraft. Static data include the effect of angle of attack, sideslip angle, and control surface deflections on aerodynamic coefficients. Dynamic data from small-amplitude oscillatory tests are presented at nominal values of angle of attack between 20 and 60 degrees. Model oscillations were performed at five frequencies from 0.6 to 2.9 Hz and one amplitude of 5 degrees. A simple harmonic analysis of the oscillatory data provided Fourier coefficients associated with the in-phase and out-of-phase components of the aerodynamic coefficients. A strong dependence of the oscillatory data on frequency led to the development of models with unsteady terms in the form of indicial functions. Two models expressing the variation of the in-phase and out-of-phase components with angle of attack and frequency were proposed and their parameters estimated from measured data.

Author

Aerodynamic Coefficients; Angle of Attack; Control Surfaces; F-16 Aircraft; Fourier Series; Harmonic Analysis; Wind Tunnel Tests

19980008111 Old Dominion Univ., Dept. of Aerospace Engineering, Norfolk, VA USA

Aeroelastic, CFD, and Dynamic Computation and Optimization for Buffet and Flutter Application Final Report, 1 Dec. 1996 - 30 Nov. 1997

Kandil, Osama A., Old Dominion Univ., USA; Dec. 1997; 104p; In English

Contract(s)/Grant(s): NAG1-648

Report No.(s): NASA/CR-97-206678; NAS 1.26:206678; ODURF-164069; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The work presented in this paper include: 'Coupled and Uncoupled Bending-Torsion Responses of Twin-Tail Buffet'; 'Fluid/Structure Twin Tail Buffet Response Over a Wide Range of Angles of Attack'; 'Recent Advances in Multidisciplinary Aeronautical Problems of Fluids/Structures/Dynamics Interaction'; and 'Development of a Coupled Fluid/Structure Aeroelastic Solver with Applications to Vortex Breakdown induced Twin Tail Buffeting.

CASI

Aeroelasticity; Angle of Attack; Vortex Breakdown; Aerospace Engineering; Aerodynamic Characteristics; Aircraft

19980008207 Technische Univ., Delft, Netherlands

Design of a Flight Controller for the Research Civil Aircraft Model (RCAM) Using mu-Synthesis

Looye, G. H. N., Technische Univ., Netherlands; Bennani, S., Technische Univ., Netherlands; Jul. 1996; 186p; In English

Report No.(s): PB97-204994; MEMO-780; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This document describes the design of a flight controller for the Research Civil Aircraft Model (RCAM), using mu-synthesis. The controller has to satisfy design requirements formulated in a manual prepared by action group FM(AG08) of the GARTEUR organization ((FLi96b)). The resulting control system is implemented in a software environment, in which performance and robustness characteristics are evaluated by simulating a flight along a predefined trajectory.

NTIS

Control Systems Design; Automatic Flight Control; Commercial Aircraft; Controllers

RESEARCH AND SUPPORT FACILITIES (AIR)

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

19980009064 Air Force Inst. of Tech., Graduate School of Logistics, Wright-Patterson AFB, OH USA

Aerospace Ground Equipment's Impact on Aircraft Availability and Deployment

Havlicek, Jeffrey D., Air Force Inst. of Tech., USA; Sep. 1997; 133p; In English

Report No.(s): AD-A329902; AFIT/GAL/ENS/97S-4; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The first purpose of this thesis was to study the effects of four factors on aircraft availability: the aerospace ground equipment (AGE) design configuration, the mean time between failure (MTBF) of AGE, the mean time to repair (MTTR) AGE, and the travel time to transport the AGE around the flightline. A simulation developed by Carrico (1996) that has its foundation based on the Logistics Composite Model (LCOM) was used. ANOVA results indicated that the present estimates of these factors are too broad for trade studies that include an estimate of aircraft availability to begin. The time it takes AGE to travel from one place to another around the flightline strongly affected aircraft availability. It is recommended that further AGE field observation and data collection be accomplished before the merits of one AGE cart technology is compared to another. The second purpose of this thesis was to collect as much information on the deployability and affordability of AGE as possible. Although much of the information collected was a few years old, the results suggest that new technologies improve the deployment footprint and the combined acquisition and deployment costs. Background information about support equipment and AGE is included in the study.

DTIC

Military Aircraft; Ground Support Equipment

19980009079 NERAC, Inc., Tolland, CT USA

Flight Simulators and Simulation. (Latest Citations from the Ei Compendex*Plus Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867023; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design and use of flight simulators. Flight simulators are used to train and evaluate military and civil pilots and astronauts. Flight simulators are also used to simulate flight dynamics and avionics operations. Some of the citations reference studies of new simulators expected in the future.

NTIS

Flight Simulation; Flight Simulators; Data Bases

ASTRONAUTICS

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

19980007236 National Aerospace Lab., Tokyo, Japan

Supersonic Tests of the Aerodynamic Characteristics of the Orbital Reentry Experiment Vehicle Model

Noda, J., National Aerospace Lab., Japan; Tate, A., National Aerospace Lab., Japan; Watanabe, M., National Aerospace Lab., Japan; Sekine, H., National Aerospace Lab., Japan; Yoshinaga, T., National Aerospace Lab., Japan; Jul. 1996; 34p; In Japanese; Portions of this document are not fully legible

Report No.(s): PB97-135792; NAL-TR-1300; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

To obtain the aerodynamic characteristics of the Orbital Reentry Experiment Vehicle (OREX), measurements of three force components of the OREX model and other modified models were carried out in the NAL supersonic wind tunnel (1m X 1m test cross-section) in the Mach number range 1.4 less than or equal to M(sub infinity) less than or equal to 4.0. The models have spherically blunted nose heads with the same radius. The effects of conical afterbody of 50 degree and 45 degree half-apex conical angles and four different radii of circumferential edges of 0 mm, 2 mm, 3.3 mm, (OREX) and 10 mm were tested. The tests show that the models are statically stable for the pitching movement (vane-stable). The model with the edge of 3.3 mm shows larger recover-

ing pitching moment than other models in low Mach number regions. The models with a sharp edge shows a larger drag coefficient than the one with a blunted edge.

NTIS

Aerodynamic Characteristics; Aerodynamic Coefficients; Aerodynamic Drag; Mach Number; Reentry Vehicles; Supersonic Wind Tunnels

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.

19980006705

Deformation and its control of aircraft landing gear components after vacuum heat treatment

Li, Wenyu, Inst. of Aeronautical Materials, China; Cailiao Gongcheng/Journal of Materials Engineering; April, 1997; ISSN 1001-4381, no. 4, pp. 32-33; In Chinese; Copyright; Avail: Issuing Activity

The deformation condition of large steel 300M components of aircraft landing gear after vacuum heat treatment was experimentally investigated. Some measures to control and to reduce the deformation, such as heating slowly, preheating at 600 C/1.5h, properly suspending, etc. are put forward.

Author (revised by EI)

Aircraft Control; Aircraft Landing; Heat Treatment; Landing Gear; Deformation

19980006709

Orthopaedics of turbine casing by vacuum heat treatment

Wan, Zhengxing, Liyang Mechanics Corp., China; Cailiao Gongcheng/Journal of Materials Engineering; April, 1997; ISSN 1001-4381, no. 4, pp. 18-21, 24; In Chinese; Copyright; Avail: Issuing Activity

The casing of turbine engine, which is made from cast titanium alloy ZT3 and ZT4, may be distorted due to residual stress in the casting and mechanical processing. The vacuum heat treatment can be used for eliminating residual stress on the turbine casing and the operational program has been provided in the light of experimental results. It is shown that annealing temperature being used in casting blank is 650 C for alloy ZT3 and 700 C for alloy ZT4, and that the annealing temperature for eliminating residual stress due to mechanical processing, is 600 C for these alloys.

Author (revised by EI)

Heat Treatment; Turbine Engines; Castings; Titanium; Residual Stress; Stress Relieving

19980006915

Corrosion failure analysis and corrosion control for aircraft structure materials

Mu, Zhitao, Naval Aeronautical Technical Inst., China; Zhao, Xia; Cailiao Gongcheng/Journal of Materials Engineering; March, 1997; ISSN 1001-4381, no. 3, pp. 42-45; In Chinese; Copyright; Avail: Issuing Activity

Corrosion types and feature were presented for aircraft structure materials. The service corrosive environment and major corrosion reason were analyzed. The repair method and corrosion control of corrosive damage areas in structure were proposed with practical engineering maintenance.

Author (revised by EI)

Aircraft Structures; Control Systems Design; Failure Analysis; Aircraft Construction Materials; Surface Treatment; Corrosion Prevention; Corrosion Resistance

19980006617

One of the prospective long-term refrigerant alternative-THR02

Zhu, Mingshan, Tsinghua Univ., China; Zhao, Xiaoyu; Shi, Lin; Han, Lizhong; Qinghua Daxue Xuebao/Journal of Tsinghua University; February, 1997; ISSN 1000-0054; Volume 37, no. 2, pp. 81-85; In Chinese; Copyright; Avail: Issuing Activity

The Copenhagen revision to the Montreal Protocol states that CFC-12 should be phased out by 1996 (in developed countries). But the alternatives now used have some shortcomings. by using the multiple objective decision making methods, mixture THR02 is proposed as a new alternative to CFC-12 and HFC-134a. This paper presents the screening of alternatives, characteristics of THR02, the thermal performance and long-period tests of compressors, and the domestic refrigerator test. Also, the modeling evaluation of varied working conditions is described. THR02 has characteristics: zero ODP, low GWP value, nonflammable, nontoxic,

good thermal performance. It is adaptable to existing system without modifying lubricant oil and compressor. THR02 is one of the prospective long-term refrigerants as drop-in alternative.

Author (revised by EI)

Refrigerants; Heat Measurement; Compressors

19980008537 NERAC, Inc., Tolland, CT USA

Braided Composites for Aerospace Applications. (Latest citations from the Aerospace Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867742; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, and testing of structural composites formed by braiding machines. Topics include computer aided design and associated computer aided manufacture of braided tubular and flat forms. Applications include aircraft and spacecraft structures, where high shear strength and stiffness are required.

NTIS

Aerospace Engineering; Aircraft Structures; High Strength; Shear Strength; Spacecraft Structures; Braided Composites

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.

19980006402

Experimental study of two-phase flow inside finned-tubes separator using 3-D-PDA

Liang, Shaorong, Zhejiang Univ., China; Shen, Yueliang; Yan, Jianhua; Li, Xiaodong; Cen, Kefa; Huagong Xuebao/Journal of Chemical Industry and Engineering (China); April, 1997; ISSN 0438-1157; Volume 48, no. 2, pp. 232-236; In Chinese; Copyright; Avail: Issuing Activity

By using a three-dimension particle dynamics analyzer (PDA), cold model experimental study on the characteristics of gas-solid two-phase flow around the finned-tube, the element of impact separator used in circulating fluidized bed boiler (CFBB) was conducted. The distributions of velocity, turbulent intensity, particle size and solid concentration of gas-solid two-phase flow around finned tube were obtained. The effects of upstream velocity and finned tube structure on fluid characteristics were also considered. The measured results built a sound base for gas-solid separating mechanism research and structure optimization design of finned-tube separator.

Author (EI)

Finned Bodies; Gas Flow; Two Phase Flow; Separators; Pipes (Tubes); Fins; Heat Transfer; Velocity Measurement

19980006475

Investigation on heat transfer in a fin-tube radiator under micro-gravity

Zhang, Xuexue, Tsinghua Univ., China; Zhang, Chao; Liu, Jing; Qinghua Daxue Xuebao/Journal of Tsinghua University; February, 1997; ISSN 1000-0054; Volume 37, no. 2, pp. 55-58; In Chinese; Copyright; Avail: Issuing Activity

A model for depicting the complicated heat transfer processes coupled with heat conduction, heat convection and radiation in a fin-tube radiator of aerospace cabin is established. Radiation between the tube wall and the fin surface are considered. An iterative method is applied to the whole model solution, and a SIMPLE method is used to solve the field of temperature and velocity inside the tube. The distribution of temperature in the fin, heat flux in tube wall and fin, and the mean Nusselt number in the tube are calculated respectively, and significant parameters necessary for optimally designing the fin-tube radiator are thus obtained. Influences of gravity on the radiator heat transfer are also investigated. The paper has important guidance for conducting the ground simulating experiments on the radiator.

Author (revised by EI)

Heat Transfer; Fins; Mathematical Models

19980006654

Analysis to influence of downstream component on performance of a compressor

Wang, Cuncheng, Tsinghua Univ., China; Cai, Kejun; Zhang, Dong; Qinghua Daxue Xuebao/Journal of Tsinghua University; February, 1997; ISSN 1000-0054; Volume 37, no. 2, pp. 77-80; In Chinese; Copyright; Avail: Issuing Activity

A streamline-curvature method is adopted to analyze the flow fields in a three-stage axial flow compressor with three different downstream constructions. A flow field diagnosis technique is used in the off-design analysis with the design-point data presented in literature as the target of the diagnosis. The results show that the external characteristics of the compressor, relationships between pressure-ratio, efficiency and flow-rate as well as the surge margin are affected rather severely by the construction of the downstream component, with the internal flow field in the last row of blading of the compressor is especially obviously changed. Such an effect can be attributed to the category of outlet flow distortion, which is a problem inherently more difficult than that of the inlet flow distortion.

Author (EI)

Component Reliability; Flow Distribution; Compressors; Fluid Flow

19980007817

Proceedings of the 1997 International Association for Vehicle System Dynamics, IAVSD

Palkovics, L., Editor; Vehicle System Dynamics; August, 1997; ISSN 0042-3114; Volume 28, no. 2-3; 203p; In English; Dynamics, IAVSD, Aug. 25-29, 1997, Budapest, Hungary; Copyright; Avail: Issuing Activity

The proceedings contains 6 papers on Vehicle System Dynamics. Topics discussed include: advanced chassis control systems; vehicle handling; active railway suspensions; aircraft landing gear dynamics; pantograph/catenary dynamics and control; tracked vehicles dynamics; and wheel/rail profile wear prediction.

EI

Aircraft Landing; Landing Gear; Rail Transportation; Tracked Vehicles; Automobiles; Suspension Systems (Vehicles); Locomotives

19980007914

Finite element contact algorithms in K-DYNA3D suitable for the simulation of high speed impact and penetration problems

Breidenbach, Richard F., Kaman Sciences Corp., USA; Jones, Sheldon R.; Smith, Vernon M.; Yaney, Brian L.; Division (Publication) PVP. Structures Under Extreme Loading Conditions; 1997; ISSN 0277-027X; Volume 351, pp. 375-382; In English; 1997 ASME Pressure Vessels and Piping Conference, Jul. 27-31, 1997, Orlando, FL, USA; Copyright; Avail: Issuing Activity

Slide surface subroutines in K-DYNA3D have been rewritten and augmented to extend the limitations of traditional finite elements to applications in the simulation of high speed impact and penetration problems with extensive material damage and structural failure. The new algorithms reconfigure slide surfaces at every time step to take into account solid and shell element removal after failure. Mass, in the form of free nodes and element groups, continues to interact correctly with appropriate master surfaces. Hydrodynamic material models enable the analysis of hypervelocity penetration of solid materials. Additional tools that automatically define, activate and deactivate slide surfaces in the course of a calculation minimize the cpu-intensive nature of the algorithms, allowing large assessments of complex impacting structures. Representative simulations of aircraft crash and hypervelocity impact are demonstrated.

Author (EI)

Aircraft Accidents; Applications Programs (Computers); Finite Element Method; High Speed; Hypervelocity Impact; Structural Analysis; Failure Analysis; Computerized Simulation; Subroutines

19980008005

Bending moment capacity of finned tubes

Flanders, Harry E., Westinghouse Savannah River Co., USA; McKeel, Charles A.; Rawis, George B.; Division (Publication) PVP. Current Topics in the Design and Analysis of Pressure Vessels and Piping; 1997; ISSN 0277-027X; Volume 354, pp. 11-15; In English; 1997 ASME Pressure Vessels and Piping Conference, Jul. 27-31, 1997, Orlando, FL, USA; Copyright; Avail: Issuing Activity

This paper presents a complex analysis of the bending moment capacity for a finned tube with elastically buckling thin fins. The bending moment capacity is evaluated to ASME B&PV Section III service level D acceptance criteria The buckling capacity of an individual fin is determined by the finite element method employing the boundary conditions of the fin tube. The effective

fin width produced by the postbuckled state is calculated for each individual fin in the assembly to permit the allowable bending moment of the finned tube to be calculated.

Author (EI)

Bending Moments; Finned Bodies; Pipes (Tubes); Fins; Heat Transfer; Bending; Buckling; Finite Element Method

19980008038

Safe compressor operations: General approach and standards overview

Blyukher, Boris, Indiana State Univ., USA; Division (Publication) PVP. Pumps and Valves; 1997; ISSN 0277-027X; Volume 356, pp. 65-76; In English; 1997 ASME Pressure Vessels and Piping Conference, Jul. 27-31, 1997, Orlando, FL, USA; Copyright; Avail: Issuing Activity

The basic safety requirements of compressor systems commonly used in the process industries, R&D and test facilities are discussed. A generalized international experience gained by developing and establishing a compressor safety program is also discussed. Specific recommendations cover the requirements for safety devices and protective facilities to prevent compressor accidents as a result of excessive pressure, destructive mechanical failures, internal fires or explosions, and leakage of toxic or flammable fluids.

EI

General Overviews; Compressors; Accident Prevention; Standards; Failure; Explosions

19980008046

Yield learning in integrated circuit package assembly

Balasubramaniam, Shankar, Texas Instruments, Inc., USA; Sarwar, Abul K.; Walker, D. M. H.; C: Manufacturing; April, 1997; ISSN 1083-4400; Volume 20, no. 2, pp. 133-141; In English; Copyright; Avail: Issuing Activity

This paper describes a yield learning model for integrated circuit package assembly. The goal was to provide a management tool for making yield projections, resource allocations, understanding operating practices, and performing what-if analyses. The model was developed using a series of case studies of packages entering manufacturing. These studies were a tape carrier package (TCP) at Intel, Chandler, AZ, a ceramic ball grid array (CBGA) and plastic quad flat pack (PQFP) at IBM, Bromont, P.Q., Canada, and a plastic ball grid array (PBGA) at Motorola, Austin, TX. These packages covered a wide range of technologies, including liquid and overmolded encapsulation, wirebond and controlled collapsed chip connection (C4) chip connections, and tape automated bonding (TAB), ceramic, laminate, and leadframe substrates. The factors that affect yield learning rates (e.g. process complexity, production volumes, personnel experience) were identified and a nonlinear spreadsheet-based response surface model was built. The model separates out the underlying chronic yield from excursions due to human error, equipment failure, etc. The model has been shown to accurately predict the yield ramp as a function of the factor values. One of the conclusions of this work is that all of the very dissimilar assembly processes had very similar factors, with very similar factor sensitivities and rankings in terms of how each affected the yield learning rate. In all cases, the most important factors were operator experience, changes in line volume, types of work teams, process complexity, equipment upgrades, and technology type. Since the yield ramp for a new product will hopefully be short, the model must be calibrated for a particular product very quickly. We have developed a graphical interface and tuning procedure so that when the production data is readily available, the tuning procedure takes only a few days.

Author (EI)

Electronic Packaging; Integrated Circuits; Tabs (Control Surfaces); Resource Allocation; Layouts; Encapsulating; Bonding

19980008286

Development and characteristics of servomotor for use under high temperature and radiation flux conditions

Sakai, Kazuto, Toshiba Corp., Japan; Karasawa, Hirokazu; Yagisawa, Takeshi; Mitsui, Hisayasu; Sawada, Yoshio; Ohta, Shoichi; Kai, Makoto; Ronbunshi); June, 1997; ISSN 0424-7760; Volume 119, no. 4, pp. 52-65; In English; Copyright; Avail: Issuing Activity

Recently, robots have been required to inspect the insides of nuclear reactors under high temperature and radiation flux conditions. In a FBR (fast breeder reactor), the viewing system of the robot is particularly important because the reactor vessel of the FBR is filled with opaque liquid sodium. To drive this robot, servomotors must meet special requirements. At temperatures above 220 C, the integrity of organic materials cannot be maintained for long periods. In addition, the air-gap length of the motor varies, because metals expand at high temperatures. Thus, the characteristics of induction motors with an air-gap length of 0.2-0.4 mm may vary. Furthermore, the rotor may come into contact with the stator. In this paper, a newly developed permanent magnet motor which can withstand high temperatures and radiation is presented, and the characteristics of the rotor at high temperatures are discussed. Coils for winding ceramic magnetic wires are installed in the stator and Sm(sub 2)Co(sub 17) permanent magnets are

embedded in the rotor yoke. This motor is suitable for use at up to 400 C due to the use of inorganic materials in it. In addition, the permanent magnet motor can incorporate a long air-gap length, which has little effect on the characteristics of the motor. The test results show that the motor has excellent characteristics at high temperature.

Author (EI)

High Temperature; Servomotors; Permanent Magnets; Rotors; Winding; Electric Coils

19980008299

Optimization of convecting-radiating longitudinal rectangular fins with thermal resistance at base wall

Ma, Z., Univ. of Akron, USA; Chung, B. T. F.; Proceedings of the Heat Transfer and Fluid Mechanics Institute; 1997; ISSN 0097-059X, pp. 157-167; In English; 1997 35th Heat Transfer and Fluid Mechanics Institute, May 29-30, 1997, Sacramento, CA, USA; Copyright; Avail: Issuing Activity

This study investigates the optimization of the convecting-radiating longitudinal rectangular and its heat transfer characteristics. The associated nonlinear problem with the effect of the base wall thermal resistance is solved analytically and the fin dimensions ratio is optimized by using the Golden Search Method. The investigation also reveals the effect of radiation on the optimum convection fins design. Numerical results are presented for a wide range of ambient conditions, thermophysical properties and base wall thermal resistance in terms of several non-dimensional parameters. A correlation for optimum dimensions ratio is also prepared.

Author (EI)

Thermal Resistance; Fins; Heat Transfer; Convective Heat Transfer; Heat Transmission; Optimization

19980008300

Optimization of convective longitudinal fins and spines with tip heat transfer and two-dimensional conduction effects

Chen, S. C., Univ. of Akron, USA; Chung, B. T. F.; Proceedings of the Heat Transfer and Fluid Mechanics Institute; 1997; ISSN 0097-059X, pp. 127-139; In English; 1997 35th Heat Transfer and Fluid Mechanics Institute, May 29-30, 1997, Sacramento, CA, USA; Copyright; Avail: Issuing Activity

This study applies both the fuzzy and conventional non-fuzzy optimization techniques, to the rectangular longitudinal fin and cylindrical spine with tip heat transfer using a one-dimensional model, integral model and exact two-dimensional model. The conflicting objectives of minimizing fin mass and fin height are considered simultaneously. The obtained optimal design is found to be limited to a certain range of independent variable for a fin with convection at the tip, but there is no such kind of limitation for an insulated tip fin. The error caused by neglecting tip convection is significant when tip heat transfer coefficient is comparable to that of the lateral surface even at very small Biot number at which the error due to one-dimensional model or integral model is negligible. This is also true for fuzzy optimum results.

Author (EI)

Biot Number; Heat Transfer; Fins; Convective Heat Transfer; Conductive Heat Transfer; Optimization; Fuzzy Sets

19980008335 Technische Univ., Delft, Netherlands

Presentation and Exploration Flow Data *Presentatie en Exploratie van Stromingsgegevens*

deLeeuw, W., Technische Univ., Netherlands; Jan. 27, 1997; 112p; In English; Figures in this document may not be legible in microfiche

Report No.(s): PB97-157309; No Copyright; Avail: Issuing Activity(NASA), Microfiche

This thesis discusses techniques for the presentation and exploration of flow data. The complexity of three dimensional flow data does not allow direct graphical presentation of all data to the user. A way to achieve insight into flow data is by using a collection of interactive tools which show different aspects of the data. Three such techniques are presented: a local flow probe, statistical visualization, and spot noise. The local flow probe is used to visualize a small region of the flow. Statistical visualization is used to give a compact presentation of a user-selected region of a flow field. by applying statistics to the values occurring in the region the characteristics of the data are reduced to average and variance/covariance. Spot noise is a texture synthesis technique which can be used to visualize vector fields. Enhancements and extensions of this technique are described. Two case studies were performed using spot noise. In the first, spot noise was used to generate images from numerical data which resemble photographs taken during wind-tunnel experiments. This was done to enable easy comparison of the results of wind-tunnel experiments and numerical simulation of a flow case. In the second case the visualization of turbulent flow using spot noise was investigated. Different mappings of the turbulence intensity data to parameters of the spot and the resulting texture were shown and compared.

NTIS

Flow Distribution; Flow Visualization; Three Dimensional Flow; Turbulent Flow; Wind Tunnel Tests; Wind Tunnels

19980008540 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Essential Elements of Computational Algorithms for Aerodynamic Analysis and Design Final Report

Jameson, Antony, Stanford Univ., USA; Dec. 1997; 72p; In English

Contract(s)/Grant(s): NAS1-19480; NAS1-97046; RTOP 505-90-52-01

Report No.(s): NASA/CR-97-206268; NAS 1.26:206268; ICASE-97-68; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This paper traces the development of computational fluid dynamics as a tool for aircraft design. It addresses the requirements for effective industrial use, and trade-offs between modeling accuracy and computational costs. Essential elements of algorithm design are discussed in detail, together with a unified approach to the design of shock capturing schemes. Finally, the paper discusses the use of techniques drawn from control theory to determine optimal aerodynamic shapes. In the future multidisciplinary analysis and optimization should be combined to provide an integrated design environment.

Author

Aerodynamic Characteristics; Aerodynamics; Aircraft Design; Computational Fluid Dynamics; Control Theory; Design Analysis

19980008608

Proceedings of the 1997 ASME Pressure Vessels and Piping Conference

Williams, D. K., Editor; Division (Publication) PVP. Current Topics in the Design and Analysis of Pressure Vessels and Piping; 1997; ISSN 0277-027X; Volume 354; 251p; In English; 1997 ASME Pressure Vessels and Piping Conference, Jul. 27-31, 1997, Orlando, FL, USA; Copyright; Avail: Issuing Activity

The proceedings contains 26 papers on Current Topics in the Design and Analysis of Pressure Vessels and Piping. Topics discussed include: thin-walled zirconium alloy tubing; finned tubes; steam generator tube plugs; failure analysis; chemical vapor deposition reactor muffle plates; elastoplastic fracture behavior; dynamic relaxation method; elastoplastic thermal transient stress analysis; anisotropy; zero-reinforcement vessel closures; fatigue crack growth; erosion geometry effects; autofrettaged pressurized thick-wall cylinders; computer aided engineering; blind flanged bolted joints; and bolted flanged gasketed joints.

EI

Applications Programs (Computers); Friction Factor; Pressure Vessels; Shell Theory; Vapor Deposition; Zirconium Alloys; Pipes (Tubes); Fins; Heat Transfer; Heat Pipes; Continuum Mechanics

19980008747 Research Triangle Inst., Center for Aerospace Technology, Hampton, VA USA

Radar Reflectivity in Wingtip-Generated Wake Vortices

Marshall, Robert E., Research Triangle Inst., USA; Mudukutore, Ashok, Research Triangle Inst., USA; Wissel, Vicki, Research Triangle Inst., USA; Dec. 1997; 58p; In English

Contract(s)/Grant(s): NAS1-18925; RTOP 538-04-11-15

Report No.(s): NASA/CR-97-206259; NAS 1.26:206259; RTI/4500/055-02F; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents new predictive models of radar reflectivity, with meter-scale resolution, for aircraft wakes in clear air and fog. The models result from a radar design program to locate and quantify wake vortices from commercial aircraft in support of the NASA Aircraft Vortex Spacing System (AVOSS). The radar reflectivity model for clear air assumes: 1) turbulent eddies in the wake produce small discontinuities in radar refractive index; and 2) these turbulent eddies are in the 'inertial subrange' of turbulence. From these assumptions, the maximum radar frequency for detecting a particular aircraft wake, as well as the refractive index structure constant and radar volume reflectivity in the wake can be obtained from the NASA Terminal Area Simulation System (TASS) output. For fog conditions, an empirical relationship is used to calculate radar reflectivity factor from TASS output of bulk liquid water. Currently, two models exist: 1) Atlas-based on observations of liquid water and radar reflectivity factor in clouds; and 2) de Wolf- specifically tailored to a specific measured dataset (1992 Vandenberg Air Force Base).

Author

Wakes; Vortices; Turbulent Wakes; Commercial Aircraft; Airports; Detection

19980008996

Malfunction identification in rotor systems from bearing measurements using partial models of the system

Bachschmid, Nicolo, Politecnico di Milano, Italy; Dellupi, Riccardo; Mechanical Sciences; June, 1997; ISSN 0100-7386; Volume 19, no. 2, pp. 164-175; In English; Copyright; Avail: Issuing Activity

A method for the identification of different malfunctions which cause only or mainly 1x rev. vibration components is presented. The methodology is based on the model of the shaft alone, therefore avoiding the need of a linearized model of the oil film

and of a reliable model of the casings and foundation, and uses the vibration readings in the bearings during coast-down transients. The results show that the method seems to be appropriate to distinguish between different causes such as concentrated unbalances, coupling misalignments and concentrated or distributed bows which could be produced by a partial rub (in a seal e.g.) or by a non uniform heating or cooling transient (in a generator or a steam turbine during load variations), and to determine the location along the rotor, the angular phase and the amount of unbalance or bow, in other words to identify the position and the severity of the malfunction.

Author (EI)

Rotors; Mathematical Models; Vibration; Bearings

19980009037 Massachusetts Inst. of Tech., Dept. of Materials Science and Engineering, Cambridge, MA USA

Environmental Degradation and Fatigue in Aircraft Structures: The Relationship Between Environmental Duty and Component Life *Final Report, 1 Apr. 1993 - 31 Mar. 1997*

Ballinger, R. G., Massachusetts Inst. of Tech., USA; Hobbs, L. W., Massachusetts Inst. of Tech., USA; Lanza, R. C., Massachusetts Inst. of Tech., USA; Latanision, R. M., Massachusetts Inst. of Tech., USA; May 1997; 239p; In English

Contract(s)/Grant(s): F49620-93-I-0291; AF Proj. 3484

Report No.(s): AD-A329656; AFOSR-TR-97-0413; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

A University Research Initiative, the objective of which was to develop a methodology for the detection, evaluation, and quantification of the effect of environmental degradation on the life of aircraft components. The program combined laboratory based methodology with field observations and data to develop predictive methodology for the initiation and propagation of localized corrosion damage. The focus of the program was in four major areas: (1) Non-destructive evaluation of environmental degradation, (2) Environmental degradation of structural materials, (3) High temperature environmental degradation of advanced engine materials, and (4) Predictive model development.

DTIC

Aircraft Structures; Engine Parts; Degradation; Nondestructive Tests

19980009039 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Reducing Cannon Plug Connector Pin Selection Time and Errors through Enhanced Data Presentation Methods

Webb, Robert R., Air Force Inst. of Tech., USA; Sep. 1997; 119p; In English

Report No.(s): AD-A329973; AFIT/GAL/LAL/97S-5; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The purpose of this research is to investigate the effects of data presentation methods on technician performance when the procedures are presented on a monocular, head mounted display (HMD) in a static maintenance environment. This research used two different methods to present the maintenance task data to the technicians. The first method showed the task as it is typically described in standard technical manuals. It described the task to perform and provided a basic picture of the cannon plug to be tested (unenhanced). The second method provided the same information as the first, but it also modified the information by providing visual cues as to which pins were to be selected and connected (enhanced). USA Air Force avionics maintenance technicians stationed at Barksdale Air Force Base, Louisiana were the test participants in this study. Measurements included task completion time, task error rate, and technician self reports on the HMD usability. The technicians indicated that HMDs could be a useful tool in the performance of their maintenance duties. The data collected during this study indicates that the technicians performed the tasks quicker and committed fewer errors when they used the enhanced graphical data presentation method to perform the tasks.

DTIC

Helmet Mounted Displays; Aircraft Maintenance; Human Performance; Ground Crews

14 LIFE SCIENCES

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

19980008810 Civil Aeromedical Inst., Oklahoma City, OK USA

Automation in General Aviation: Two Studies of Pilot Responses to Autopilot Malfunctions *Final Report*

Beringer, Dennis B., Civil Aeromedical Inst., USA; Harris, Howard C., Jr., Civil Aeromedical Inst., USA; Dec. 1997; 30p; In English

Report No.(s): DOT/FAA/AM-97/24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Study 1 examined four automation-related malfunctions (runaway pitch-trim up, roll servo failure, roll sensor failure, pitch drift up) and subsequent pilot responses. Study 2 examined four additional malfunctions; two more immediately obvious (runaway

pitch-trim down, runaway roll servo) and two subtler (failed attitude indicator, pitch sensor drift down) than those in Study 1, and the effect of an auditory warning. Data collection was performed in the Civil Aeromedical Institute's Advanced General Aviation Research Simulator, configured as a Piper Malibu. Results suggest that maladaptive responses to some of these failures may, in a significant percentage of cases, lead to significant altitude loss, overstress of the airframe, disorientation of the pilot, or destruction of the aircraft. Percentages of successful recoveries, detection/correction times, and related indices of performance are discussed in the context of malfunction type, flight profile, and auditory alerts.

Author

Automatic Pilots; Simulators; General Aviation Aircraft; Attitude Indicators; Malfunctions; Flight Paths; Failure; Roll; Disorientation; Data Acquisition

15

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.

19980006843 Research Inst. for Advanced Computer Science, Moffett Field, CA USA

RIACS Final Report, 1 Oct. 1996 - 30 Sep. 1997

Olinger, Joseph, Research Inst. for Advanced Computer Science, USA; 1997; 32p; In English

Contract(s)/Grant(s): NAS2-96027

Report No.(s): NASA/CR-97-206118; NAS 1.26:206118; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Topics considered include: high-performance computing; cognitive and perceptual prostheses (computational aids designed to leverage human abilities); autonomous systems. Also included: development of a 3D unstructured grid code based on a finite volume formulation and applied to the Navier-stokes equations; Cartesian grid methods for complex geometry; multigrid methods for solving elliptic problems on unstructured grids; algebraic non-overlapping domain decomposition methods for compressible fluid flow problems on unstructured meshes; numerical methods for the compressible navier-stokes equations with application to aerodynamic flows; research in aerodynamic shape optimization; S-HARP: a parallel dynamic spectral partitioner; numerical schemes for the Hamilton-Jacobi and level set equations on triangulated domains; application of high-order shock capturing schemes to direct simulation of turbulence; multicast technology; network testbeds; supercomputer consolidation project.

CASI

Aerodynamic Configurations; Numerical Analysis; Unstructured Grids (Mathematics); Navier-Stokes Equation; Turbulence

19980008270

Kalman filter approach for the control of seismic-induced building vibration using active mass damper systems

Loh, Chin-Hsiung, Natl. Taiwan Univ., Taiwan, Province of China; Lin, Pay-Yang; Structural Design of Tall Buildings; September, 1997; ISSN 1062-8002; Volume 6, no. 3, pp. 209-224; In English; Copyright; Avail: Issuing Activity

In this paper, two issues in structural control are discussed. First, the prediction-type Kalman filter approach is used to estimate the full-state variables of a building's seismic response from a limited number of measurements and the full-state feedback control strategy can be applied. The result is compared with the modal dynamic reduction method and traditional full-state feedback control. Secondly, the time-delay of an actuator is considered in the control strategy. Based on the Pade approximation, a differential equation for the delay-time of the actuator is developed; then the feedback iteration path of the actuator is included in the control algorithm. Using the example of a 6-story eccentric building with a dual active tuned mass damping system, the above two issues are discussed in relation to a strategy for the control of bending-torsion motion of a building during earthquake excitation.

Author (EI)

Approach Control; Kalman Filters; Vibration Damping; Delay Circuits; Damping; Feedback Control

16 PHYSICS

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

19980008217

Inspection and evaluation of reactor coolant pump suction bolting

Hardies, Robert O., Baltimore Gas and Electric Co., USA; Davis, Stephen M.; Division (Publication) PVP. Fatigue and Fracture (Vol 1); 1997; ISSN 0277-027X; Volume 350, pp. 463-474; In English; 1997 ASME Pressure Vessels and Piping Conference, Jul. 27-31, 1997, Orlando, FL, USA; Copyright; Avail: Issuing Activity

Start up following a refueling outage at a nuclear power plant was interrupted because of high vibration on a Reactor Coolant Pump (RCP). The cause for the high vibration was an impeller suction deflector which lodged itself in the impeller vanes. The suction deflector became loose due to intergranular cracking of the attachment capscrews. Intergranular cracking was caused by either stress corrosion cracking or fatigue. This event is significant in that it extended an already lengthy refueling outage by about three weeks to facilitate repairs. It also resulted in foreign material (broken capscrew and lock bar) entering the Reactor Vessel. Corrective actions resulting for this event include: modifications to the RCP suction deflector to eliminate the potential for both intergranular cracking and fatigue, and monitoring the condition of the capscrews until all the suction deflectors can be modified.

Author (EI)

Nuclear Reactors; Vibration; Rotors; Crack Propagation; Fatigue (Materials)

17 SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

19980007963 NASA Langley Research Center, Hampton, VA USA

NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 62: The Influence of Knowledge Diffusion on Aeronautics Innovation: The Research, Development, and Production of Large Commercial Aircraft in France, Germany, and the UK

Golich, Vicki L., California State Univ., USA; Pinelli, Thomas E., NASA Langley Research Center, USA; 1997; 36p; In English; Aviation Communication: A Multi-Cultural Forum, 9-11 Apr. 1997, Prescott, AZ, USA; Sponsored by Embry-Riddle Aeronautical Univ., USA

Report No.(s): NASA/TM-97-113026; NAS 1.15:113026; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper focuses on how European public policies-individually and collectively - influence the diffusion of knowledge and technology. It begins with an overview of the roles played historically and currently by European governments in the Research, Development and Production (RD&P) of Large Commercial Aircraft (LCA). The analytical framework brings together literature from global political economy, comparative politics, business management, and science and technology policy studies. It distinguishes between the production of knowledge, on the one hand, and the dissemination of knowledge, on the other. France, Germany, and the UK serve as the analytical cases. The paper concludes with a call for additional research in this area, some tentative lessons learned, and a discussion of the consequences of national strategies and policies for the diffusion of knowledge and technology in an era of globalizat0n.

Author

Policies; Politics; Commercial Aircraft; Management Methods

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