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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. 375)

MAY 29, 1998

01 AERONAUTICS

19980037570 Logistics Management Inst., McLean, VA USA

Aviation Maintenance Contract Management : A Survey of Defense and Commercial Practices *Final Report*

Erickson, Steven R., Logistics Management Inst., USA; Marafioti, Ronald J., Logistics Management Inst., USA; Summerour, Richard, Logistics Management Inst., USA; Nov. 1997; 82p; In English

Contract(s)/Grant(s): DASW01-95-C-0019

Report No.(s): AD-A334551; LMI-LG603T1; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Logistics Management Institute was tasked to survey the commercial and Defense processes for contract maintenance management. The study focused on two primary areas. The first addresses expanded use of contract maintenance. We found aircraft contract maintenance has proven itself to be a reliable production source within DoD and capable of expanding to accommodate further outsourcing. However, DoD needs to issue guidance to support the increasing use of contracting contemplated in Defense acquisition policy. The second area of study addresses the use of commercial practices. Rescinded military specifications and standards are being replaced by a proliferation of alternative commercial practices. Contract management activities are working to adopt single commercial practices on a site-by-site basis but would benefit from DoD-wide designation of preferred commercial standards. DoD's use of commercial sources would benefit from improved cross-service coordination of market research efforts and sharing of lessons learned. Further changes to acquisition rules may be needed to accept external (third party) certifications and audits of commercial sources of repair.

DTIC

Aircraft Maintenance; Contract Management; Defense Program; Logistics Management; Standards; Specifications; Procedures

19980037700 Logistics Management Inst., McLean, VA USA

Predicting Wartime Demand for Aircraft Spares *Final Report*

Slay, F. M., Logistics Management Inst., USA; Sherbrooke, Craig C., Logistics Management Inst., USA; Apr. 1997; 47p; In English

Contract(s)/Grant(s): DASW01-95-C-0019

Report No.(s): AD-A335362; LMI-AF501MR2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

U. S. fighter aircraft demanded surprisingly few spare parts in Desert Storm despite flying long hours. Although the sorties flown were much longer than their peacetime counterparts, demands per sortie remained about the same. This simple observation raised suspicions that parts fail on the basis of sorties flown, not hours flown, even though Air Force planning systems forecast demands on the basis of projected flying hours. This method of forecasting demands proved inadequate in 1993 when the war plans were modified to include the longer sorties that typify regional conflict scenarios. We found that demands are, for most aircraft, much more closely related to sorties flown than to flying hours. We developed a demand forecasting method that incorporates our results into the wartime spares requirements computation Called Decelerated Demand Forecasting, this method has been implemented by the Air Force for fighters and bombers, avoiding a \$1.1 billion overstatement in the gross requirement.

DTIC

Bomber Aircraft; Spare Parts; Fighter Aircraft

19980037720 University of Southern California, Behavioral Technology Labs., Redondo Beach, CA USA

An Intelligent Tutor for Diagnosing Faults in an Aircraft Power Distribution System *Final Report, 1 Jul. - 31 Dec. 1997*

Towne, Douglas M., University of Southern California, USA; Dec. 1997; 28p; In English

Contract(s)/Grant(s): N00014-97-I-0893

Report No.(s): AD-A334921; TR-118; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A domain-general authoring system, DIAG, was employed to develop an intelligent tutor for diagnosing faults in a dual generator AC/DC power distribution system. The application provides an operable simulation of the front panel used to control power distribution in a dual engine aircraft, 148 replaceable units that comprise the functional elements of tile target system, and a number of test points for performing fault isolation tests. In all, 105 faults are simulated for presentation to the learner. Based entirely upon the model of tile power distribution system, DIAG was able to generate context-specific advisement concerning (1) the effectiveness of the diagnostic strategy employed by an individual learner, (2) the rationality of the learner's suspicions considering the symptoms seen, and (3) recommended next steps to further isolate tile simulated fault. The three most significant findings resulting from this development effort were that (1) no changes were required in tile DIAG authoring system or intelligent advisement functions to implement this new and complex domain, (2) the instructional intelligence, in the form of generated dialogues, was produced automatically and required no acquisition or representation of human expertise, and (3) the application was produced in a very short time, approximately 22 man days.

DTIC

Fault Detection; Computer Assisted Instruction; Aircraft Power Supplies; Systems Health Monitoring

19980038039

Study on a low-noise current collector and the aerodynamics using a delta-wing-shaped collector head

Makino, Toshiaki; Kobayashi, Kenji; Kakehi, Yutaka; Katou, Chiyuki; Hattori, Morishige; Nippon Kikai Gakkai Ronbunshu, C Hen/Transactions of the Japan Society of Mechanical Engineers, Part C; July, 1997; ISSN 0387-5024; Volume 63, no. 611, pp. 2278-2286; In Japanese; Copyright; Avail: Issuing Activity

In the low-noise current collector using a delta-wing-shaped collector head in which the aerodynamics becomes quite large, it is desired to develop an active control using a force actuator. This paper deals with the numerical calculations of aerodynamics generated by a delta-wing-shaped collector head and a pair of insulators. A variation lift was verified to generate clear in the experiment results of high-speed test train with a full-size prototype current collector. The conclusions of this research using a new current collector are as follows; (1) In the simulation result of an active control generated the average lift at 160 N, it was verified that the contact strip has same characteristics of contact force at max. 70 N as the conventional one. (2) The variation lift of the collector head at 350 km/h is expected to be 80 N lower than that before improvement.

Author (EI)

Delta Wings; Low Noise; Loads (Forces); Vibration; Actuators

19980039257

Analysis of transport phenomena during the convective drying in superheated steam

Topin, F., Universite de Provence, France; Tadrst, L.; Drying Technology; October, 1997; ISSN 0737-3937; Volume 15, no. 9, pp. 2239-2261; In English; Copyright; Avail: Issuing Activity

This work focused on high-temperature convective drying (superheated steam drying). The process has been investigated both experimentally and numerically. The experimental analysis was carried out in an aerodynamic return-flow wind-tunnel, with very small cylinders of cellular concrete. For the local analysis, the samples were fitted with thermocouples and pressure sensors. The mean moisture content of the cylinders was measured by simple weighing while the temperature and pressure readings were being taken. Global and local analysis of heat and mass transfer in small cylinders in superheated steam were carried out. The systematical study for several sizes and aerothermal conditions show a similar behavior for moisture content, pressure and temperature values. A numerical model for high temperature drying, using the finite elements method, in a 2-D configuration, was implemented and validated.

Author (EI)

Transport Properties; Drying; Aerodynamics; Moisture; Convective Heat Transfer

02 AERODYNAMICS

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

19980037022 Cincinnati Univ., OH USA

Development of LES Methodology for the Analysis of High-Reynolds Number 2-D and 3-D Dynamic Stall Phenomenon
Final Report, 1 Jun. 1993 - 31 May 1997

Ghia, K., Cincinnati Univ., USA; Ghia, U., Cincinnati Univ., USA; Dec. 09, 1997; 87p; In English

Contract(s)/Grant(s): F49620-93-I-0393

Report No.(s): AD-A335686; AFL-97-12-86; AFRL-SR-BL-TR-98-0101; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The major objective of the AASERT Grant was to improve the analysis tools as well as assure the level of accuracy and efficiency that can be realized in the study of physics of the dynamic stall and related unsteady phenomena, through the development of the LES/DNS methodology. One M.S. and three Ph.D students were supported partially on this grant. The work carried out consisted of study of external unsteady flow using vorticity stream function formulation, analysis of boundary layer receptivity and transition using DNS methodology with spectral technique and, finally, compressibility effects in maneuvering body flows. Significant accomplishment is made in Object Oriented Numerics and high performance computing.

DTIC

Unsteady Flow; High Reynolds Number; Compressibility Effects; Boundary Layer Transition

19980037426 Virginia Polytechnic Inst. and State Univ., Engineering Science and Mechanics Dept., Blacksburg, VA USA

Wind Tunnel 'Free Flight' on a Dynamic Strut Final Report, 1 Sep. 1993 - 31 Aug. 1997

Telonis, D. P., Virginia Polytechnic Inst. and State Univ., USA; Jan. 09, 1998; 54p; In English

Contract(s)/Grant(s): F49620-93-I-0455; AF Proj. 3484

Report No.(s): AD-A335700; AFRL-SR-BL-TR-98-0100; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Work on this project was distributed to various tasks. The first was design construction and calibration of a simple, one degree of freedom model. The second was the development of fuzzy logic software needed to control the motion. The third was appropriate balance systems and dynamic calibration techniques. A roll moment balance system was designed and constructed. The system was mounted to a stepper motor via a shaft which played the role of a roll actuator. The electronic components and software necessary to provide direct feedback were constructed and tested. A computer program was written and tested. As input to the program we employed the reading of pressure transducers connected with a seven hole probe. The desired output was the actual orientation of the probe as well as the static and dynamic pressure. The program was employed to generate static pressure, dynamic pressure and three components of the velocity in terms of the signals obtained by the pressure transducers. To further test this software it was decided to employ a dynamic mechanism which is available and operational. This involved the response of a ship hull to oncoming waves. The fuzzy logic system was trained with data obtained with different wave characteristics and ship incidence. The idea was to train the artificial intelligence system to predict the response of the vessel, namely pitch and roll characteristics to new conditions. More specifically, the ship learns to recognize the condition of the sea it finds itself in. It then predicts how it will respond, if it points in a different direction.

DTIC

Shafts (Machine Elements); Pressure Sensors; Fuzzy Systems; Free Flight; Degrees of Freedom; Dynamic Pressure; Actuators

19980037670 NASA Langley Research Center, Hampton, VA USA

Hypersonic Boundary-Layer Transition for X-33 Phase 2 Vehicle

Thompson, Richard A., NASA Langley Research Center, USA; Hamilton, Harris H., II, NASA Langley Research Center, USA; Berry, Scott A., NASA Langley Research Center, USA; Horvath, Thomas J., NASA Langley Research Center, USA; Nowak, Robert J., NASA Langley Research Center, USA; 1998; 14p; In English; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Report No.(s): NASA/TM-1998-207316; NAS 1.15:207316; AIAA Paper 98-0867; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A status review of the experimental and computational work performed to support the X-33 program in the area of hypersonic boundary-layer transition is presented. Global transition fronts are visualized using thermographic phosphor measurements. Results are used to derive transition correlations for "smooth body" and discrete roughness data and a computational tool is developed to predict transition onset for X-33 using these results. The X-33 thermal protection system appears to be conservatively

designed for transition effects based on these studies. Additional study is needed to address concerns related to surface waviness. A discussion of future test plans is included.

Author

Boundary Layer Transition; Hypersonics; Flow Distribution; Wind Tunnel Tests; Finite Volume Method; Flow Visualization

19980037673 Department of the Navy, Washington, DC USA

Duct Flow Control System

Rogers, Ernest O., Inventor, Department of the Navy, USA; Feb. 19, 1997; 11p; In English

Patent Info.: US-Patent-Appl-SN-802701

Report No.(s): AD-D018658; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A duct fixed to a vehicle propelled through an ambient fluid medium is internally provided with spaced channel passages from which the fluid medium is ejected under pressure tangentially of local duct surfaces through slots at the trailing edge of the duct. The supply of the pressurized fluid medium under selective control is limited to different angular segments of the channel passages in order to modify the flow stream through the duct so as to perform certain functions such as thrust control and steering control effects enhancing vehicle maneuverability.

DTIC

Patent Applications; Shrouded Propellers; Marine Propulsion; Aerial Explosions

19980037838 NASA Ames Research Center, Moffett Field, CA USA

Boundary Layer Transition in the Leading Edge Region of a Swept Cylinder in High Speed Flow

Coleman, Colin P., NASA Ames Research Center, USA; Mar. 1998; 205p; In English

Contract(s)/Grant(s): RTOP 522-31-12

Report No.(s): NASA/TM-1998-112224; A-98-09981; NAS 1.15:112224; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Experiments were conducted on a 76 degree swept cylinder to establish the behavior of the attachment line transition process in a low-disturbance level, Mach number 1.6 flow. For a near adiabatic wall condition, the attachment-line boundary layer remained laminar up to the highest attainable Reynolds number. The attachment-line boundary layer transition under the influence of trip wires depended on wind tunnel disturbance level, and a transition onset condition for this flow is established. Internal heating raised the surface temperature of the attachment line to induce boundary layer instabilities. This was demonstrated experimentally for the first time and the frequencies of the most amplified disturbances were determined over a range of temperature settings. Results were in excellent agreement to those predicted by a linear stability code, and provide the first experimental verification of theory. Transition onset along the heated attachment line at an R-bar of 800 under quiet tunnel conditions was found to correlate with an N factor of 13.2. Increased tunnel disturbance levels caused the transition onset to occur at lower cylinder surface temperatures and was found to correlate with an approximate N factor of 1.9, so demonstrating that the attachment-line boundary layer is receptive to increases in the tunnel disturbance level.

Author

Boundary Layer Transition; Leading Edges; Wind Tunnel Tests; Reynolds Number; Swept Wings; Supersonic Flow

19980038062 NASA Ames Research Center, Moffett Field, CA USA

Turbulence Measurements on a Flap-Edge Model Final Report

Moriarty, Patrick, Stanford Univ., USA; Bradshaw, Peter, Stanford Univ., USA; Cantwell, Brian, Stanford Univ., USA; Ross, James, NASA Ames Research Center, USA; Mar. 31, 1998; 40p; In English

Contract(s)/Grant(s): NCC2-5140

Report No.(s): NASA/CR-1998-207339; NAS 1.26:207339; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Turbulence measurements have been made on a flap-edge and leading-edge slat model using hot-wire anemometry, and, later, particle image velocimetry. The properties of hot-wire anemometry were studied using facilities at NASA Ames Research Center. Hot-film probes were used because of their durability, but cross-films were limited by non-linear end effects. As a warm-up exercise, hot-film probes were used to measure velocities in the farfield wake of a cylinder with an airfoil in the near-field wake. The airfoil reduced the drag coefficient of the system by 10%. A single-wire hot-film probe was used to measure velocity profiles over the top of a NACA 63(sub 2)-215 Mod. B wing with a Fowler flap and leading-edge slat. Results showed the size of slat wake was dependent upon the slat deflection angle. Velocity increased through the slat gap with increased deflection. The acoustically modified slat decreased the chance of separation. Measurements were taken at the flap edge with a single hot-film. Trends in the data indicate velocity and turbulence levels increase at the flap edge. The acoustically modified flap modifies the mean flow near the flap edge. Correlations were made between the hot-film signal and the unsteady pressure transducers on the wing which were

published in a NASA CDTM. The principles of Particle Image Velocimetry (PIV) were studied at Florida State University. Spectral PIV was used to measure the spectra of a subsonic jet. Measured frequencies were close to the predicted frequency of jet shedding. Spectral PIV will be used to measure the spectra of the slat flow in the second 7 x 10-ft. wind tunnel test. PIV has an advantage that it can measure velocity and spectra of the entire flowfield instantaneously. However, problems arise when trying to store this massive amount of PIV data. Support for this research has continued through a NASA Graduate Student Program Fellowship which will end in June 1999. The thesis should be completed by this time.

Author

Flow Measurement; Turbulent Flow; Flapping; Models; Wind Tunnel Tests

03

AIR TRANSPORTATION AND SAFETY

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

19980038243 Illinois Univ., Dept. of Aeronautical and Astronautical Engineering, Urbana-Champaign, IL USA

The Effects of the Critical Ice Accretion on Airfoil and Wing Performance *Final Report, 24 Jan. 1995 - 30 Nov. 1996*

Selig, Michael S., Illinois Univ., USA; Bragg, Michael B., Illinois Univ., USA; Saeed, Farooq, Illinois Univ., USA; Mar. 03, 1998; 25p; In English

Contract(s)/Grant(s): NCC3-408; NCC3-509

Report No.(s): NASA/CR-96-207501; NAS 1.26:207501; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In support of the NASA Lewis Modern Airfoils Ice Accretion Test Program, the University of Illinois at Urbana-Champaign provided expertise in airfoil design and aerodynamic analysis to determine the aerodynamic effect of ice accretion on modern airfoil sections. The effort has concentrated on establishing a design/testing methodology for "hybrid airfoils" or "sub-scale airfoils," that is, airfoils having a full-scale leading edge together with a specially designed and foreshortened aft section. The basic approach of using a full-scale leading edge with a foreshortened aft section was considered to a limited extent over 40 years ago. However, it was believed that the range of application of the method had not been fully exploited. Thus a systematic study was being undertaken to investigate and explore the range of application of the method so as to determine its overall potential.

Author

Aerodynamic Characteristics; Design Analysis; Airfoils; Leading Edges; Ice Formation

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

19980037702 Department of the Navy, Washington, DC USA

Waypoint Navigation Using Exclusion Zones

Jones, Gregory B., Inventor, Department of the Navy, USA; Shaw, Christopher, Inventor, Department of the Navy, USA; Hills, J., Inventor, Department of the Navy, USA; Jul. 08, 1997; 8p; In English

Patent Info.: Filed 19 Jul. 1995; US-Patent-Appl-SN-504374; US-Patent-5,646,855

Report No.(s): AD-D018675; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method is provided for navigating a vehicle. Waypoint exclusion zones are defined as circles whose centers are known position waypoints. The vehicle is steered along a path that is tangential to the current waypoint exclusion zone. This path is maintained until a relative bearing between the vehicle and a center of the current waypoint exclusion zone is at least 90 deg if the path is left of the center of the current waypoint exclusion zone. and at most 90 deg if the path is right of the center of the current waypoint exclusion zone. When either of these conditions is met, the vehicle is located along the circle of the current waypoint exclusion zone. The vehicle is then advanced along the circle of the current waypoint exclusion zone until a heading of the vehicle matches a heading of a path that is tangential to the next waypoint exclusion zone. When the heading of the vehicle matches the heading of the path that is tangential to the next waypoint exclusion zone. the next waypoint exclusion zone becomes the current waypoint exclusion zone for carrying out the steering. maintaining and advancing of the vehicle.

DTIC

Autonomous Navigation; Navigation; Steering

19980037925 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Pseudorandom Code Generation for Communication and Navigation System Applications

Brendle, John F., Jr, Air Force Inst. of Tech., USA; Dec. 1997; 101p; In English

Report No.(s): AD-A336311; AFIT-GE-ENG-97D-16; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This research project investigated the design, construction and evaluation of a pseudorandom code generator for communication and navigation system applications. These types of codes include spreading codes, Gold codes, Jet Propulsion Laboratory (JPL) ranging codes, syncopated codes, and nonlinear codes. Such waveforms are typically used in communication and navigation system applications. The code generator uses the Stanford Telecom STEL-1032 Pseudorandom Number (PRN) coder. A coder interface was designed and constructed for manual data entry to the registers of the PRN coder. The code generator is capable of independently clocking and generating all possible codes with lengths up to $2(\exp 32) - 1(4,294,967,295)$. The codes can be started with any random phase. The code generator is capable of detecting a specific position in the code and the coders can be truncated and restarted at that point. The three independent coder outputs are combinable, expanding the lengths and versatility of the codes. The generation of a nonlinear code is possible using an internally programmable look-up table. Several test were conducted on the code generator to ensure its capability of generating Gold codes, JPL ranging codes, syncopated codes, and non-linear codes. The required documentation is being submitted for a U.S. patent.

DTIC

Coders; Communication; Navigation Aids; Detection; Computer Programs; Random Variables

19980037935 Naval Postgraduate School, Monterey, CA USA

Algorithms for LORAN-C Time Difference Error Minimization Interim Report, 1 Jan. - 30 Sep. 1997

Cristi, Roberto, Naval Postgraduate School, USA; Tummala, Murali, Naval Postgraduate School, USA; France, Frederick M., Jr., Naval Postgraduate School, USA; Jan. 09, 1998; 25p; In English

Report No.(s): AD-A337871; NPS-EC-98-002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USA Coast Guard (USCG) is in the process of upgrading the hardware of the LORAN-C Radionavigation System Control System. As part of this effort, the Computer Assisted LORAN-C Controller (CALOC), is also in need of improvement. CALOC performs four tasks: abnormality detection, time difference control, recordkeeping, and blink control. The work reported in this report focuses on time difference control. In many instances, CALOC does not accurately control the time difference error (TDE) within the established USCG control procedures. Two new algorithms are proposed here to control TDE more effectively: a proportional integral derivative (PID) controller and a Kalman filter. Actual TDE data recorded at three different master stations covering five LORAN-C chains is used to evaluate the performance of the proposed controllers. The PID controller shows a substantial improvement in control compared to CALOC, and the Kalman filter exhibits even better performance, based on preliminary results. This improvement in control correlates directly with an increase in both predictable accuracy and repeatable accuracy.

DTIC

Signal Processing; LORAN C; Algorithms

19980038248 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

Cepstral Processing For GPS Multipath Detection and Mitigation

Ormsby, Charles D., Air Force Inst. of Tech., USA; Dec. 1997; 115p; In English

Report No.(s): AD-A336668; AFIT/GE/ENG/97D-19; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This work presents a novel approach to code phase multipath mitigation for Global Positioning System (GPS) receivers. It uses the power and complex cepstra for multipath detection and mitigation prior to code phase tracking by a standard non-coherent delay lock loop. Cepstral theory is presented to demonstrate how multipath reflection delays can be detected through the use of the power cepstrum. Filtering can then be performed on the complex cepstrum to remove multipath effects in the cepstral domain. Finally, an inverse complex cepstrum is calculated yielding a theoretically multipath free direct path estimate in the time domain. Simulations are presented to verify the applicability of cepstral techniques to the problem of GPS multipath mitigation. Results show that, under noiseless conditions, cepstral processing prior to code tracking by a standard non-coherent delay lock loop leads to lower code tracking biases than direct tracking of the composite multipath signal by a narrow correlator receiver. Finally, this work shows that cepstral processing is highly sensitive to additive white Gaussian noise effects, leading to the conclusion that methods of limiting noise effects must be developed before this technique will be applicable in actual GPS receivers.

DTIC

Global Positioning System; Multipath Transmission; Cepstral Analysis

19980040968 General Accounting Office, Account and Information Management Div., Washington, DC USA

Air Traffic Control: Immature Software Acquisition Processes Increase FAA System Acquisition Risks

Mar. 21, 1997; In English

Report No.(s): PB98-119795; GAO/AIMD-97-47; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Hardcopy, Microfiche

Recognizing software's growing importance and prevalence in ATC systems, the Chairman, Subcommittee on Transportation and Related Agencies, House Committee on Appropriations, asked GAO to determine: (1) the maturity of FAA'S ATC modernization software acquisition processes, and (2) the steps/actions FAA has underway or planned to improve these processes, including any obstacles that may impede FAA's progress.

NTIS

Air Traffic Control; Congressional Reports; Risk; Transportation; Government Procurement; Computer Programs

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19980038071 NASA Langley Research Center, Hampton, VA USA

2020: Future Vision for Global Air Cargo

Logan, Michael J., NASA Langley Research Center, USA; 1998; 10p; In English; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA/TM-1998-207322; NAS 1.15:207322; AIAA Paper 98-0437; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes a study conducted as a part of the National Aeronautics and Space Administration (NASA) Scenario-Based Strategic Planning process. During this process, Global Air Cargo was identified as one of several potential high-payoff vehicle classes for the year 2020. Within this vehicle class, a goal was established to provide a ten-fold reduction in the cost per ton-mile for air cargo shipments. In order to assess the issues associated with achieving this goal, a detailed systems analysis was conducted for this class of vehicle. The current air cargo industry was examined to determine potential design requirements including range (by virtue of airport-to-airport distance pairings), operating field length requirements (determined from a statistical analysis of current airport infrastructure), and specific design features (e.g. inter-modal container carriage, joint civil/military use). Several air cargo configuration concepts were developed and examined as a part of this study. These included several exclusively all-cargo concepts sized for six range payload combinations, and two passenger configurations modified for freighter use. Performance for each configuration was compared to the baseline (existing) aircraft. Technology sensitivity analysis was conducted using the lowest payload, shortest range and highest payload, longest range concepts. For each range-payload combination, the best concept was selected for economic analysis and compared to current fleet aircraft. The results indicate that a 75% reduction in the cost per ton-mile for cargo transportation (relative to DC-10-30F) is potentially achievable. In addition, a payload increase of 3x (over C-5B maximum) with a concurrent range improvement of 2.5x (relative to a C-5B) is also potentially achievable even within the current airport infrastructure limitations.

Author

Air Cargo; Management Planning; Payloads; Economic Analysis; Statistical Analysis

19980038176 Royal Melbourne Inst. of Tech., Sir Lawrence Wackett Centre for Aerospace Design Technology, Australia

Technology Foresight in Aerostructures

Wharington, J., Royal Melbourne Inst. of Tech., Australia; Mar. 1997; 100p; In English; Sponsored in part by Aerospace Technology Forum

Report No.(s): Rept-CR-97/03-Issue-1; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This report is the result of a data collection and assessment study by the Sir Lawrence Wackett Centre for Aerospace Design Technology at RMIT during spring and summer 1996. The study was requested by the Aerospace Technology Forum (ATF) as part of an ongoing forecasting program in aerostructures technology. This study is to assist ATF members in the appropriate management of Research and Development (R&D) by providing information on current perspectives in industry and academia and advice on future strategies. This report is focused on findings from a literature review of the aerospace R&D enterprise and established foresight methodology.

Author

Data Acquisition; Forecasting; Surveys; Aerospace Technology Transfer

19980038229 Office of the Under Secretary of Defense (Acquisitions), Washington, DC USA

UAV Annual Report, FY 1997 Annual Report

Jan. 1997; 48p; In English

Report No.(s): AD-A336710; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The U.S. Military faces a challenging future in an era of dynamic change, constrained resources, potential new roles, and rapid technological advancement. These factors require innovative thinking and new ways to shape change. UAV's will help us shape this change. They represent both a revolution in military affairs and a revolution in business affairs. The capacity to dominate any adversary and control any situation in any operation will be the key capability we ask of our armed forces in the 21st century. UAV's will provide a sustained responsive, accurate picture of the battlefield.

DTIC

Armed Forces; Commerce; Aerial Reconnaissance; Remotely Piloted Vehicles; Reconnaissance Aircraft

19980038234 Army Research Lab., Aberdeen Proving Ground, MD USA

Investigation of the UH-60 Main Rotor Spindle Assembly Retaining Rods P/N 70102-08102/-103 Final Report, Apr. 1996 - Jan. 1998

Grendahl, Scott M., Army Research Lab., USA; Jan. 1998; 118p; In English

Report No.(s): AD-A337105; ARL-TR-1585; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The U.S. Army Research Laboratory (ARL) was tasked by the U.S. Army Aviation and Troop Command (ATCOM) to perform a metallurgical examination of main rotor spindle assembly retaining rods fabricated from precipitation hardened (PH 13-8 Mo) stainless steel by three different manufacturers. These components were subjected to prior spectrum load fatigue testing in order to qualify an alternate source. One of the manufacturer's components exhibited only half the fatigue resistance of the other two. The results of fatigue testing (of coupons sectioned from the original rods) showed a dramatic difference between the rods. Metallography was utilized to examine the microstructure and grain size. The structure of each rod was consistent with the prior treatment, and the grain size met the governing requirement. The amount of delta (free) ferrite within the structure varied slightly from rod to rod, but was well within the specified limits. The threads of each rod were examined metallographically, since this was the area of failure as a result of the spectrum load fatigue testing. Although differences in the surface profile of the threads from the different manufacturers were noted, there was no evidence of gross abnormalities such as tear out or chatter. The chemical analysis of each rod varied, but each composition met the governing requirements. Based upon the results of reheat treating, it was concluded that an inadequate prior heat treatment sequence was performed by the manufacturer.

DTIC

Fatigue Tests; Fracture Strength; Spindles; Rotors; Heat Treatment; Military Technology

19980039330 NASA Dryden Flight Research Center, Edwards, CA USA

Operational Concepts for Uninhabited Tactical Aircraft

Deets, Dwain A., NASA Dryden Flight Research Center, USA; Purifoy, Dana, NASA Dryden Flight Research Center, USA; Apr. 1998; 8p; In English; Symposium on System Design Considerations for Uninhabited Tactical Aircraft, 7-9 Oct. 1997, Athens, Greece

Contract(s)/Grant(s): RTOP 529-31-94

Report No.(s): NASA/TM-1998-206549; NAS 1.15:206549; H-2245; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes experiences with five remotely piloted flight research vehicle projects in the developmental flight test phase. These projects include the Pathfinder, Perseus B, Altus, and X-36 aircraft and the Highly Maneuverable Aircraft Technology (HiMAT). Each of these flight projects was flown at the NASA Dryden Flight Research Center. With the exception of the HiMAT, these projects are a part of the Flight Research Base Research and Technology (R&T) Program of the NASA Aeronautics and Space Transportation Technology Enterprise. Particularly with respect to operational interfaces between the ground-based pilot or operator, this paper draws from those experiences, then provides some rationale for extending the lessons learned during developmental flight research to the possible situations involved in the developmental flights proceeding deployed uninhabited tactical aircraft (UTA) operations. Two types of UTA control approaches are considered: autonomous and remotely piloted. In each of these cases, some level of human operator or pilot control blending is recommended. Additionally, "best practices" acquired over years of piloted aircraft experience are drawn from and presented as they apply to operational UTA.

Author

Remotely Piloted Vehicles; Research Vehicles; Product Development; Flight Tests

19980039331 NASA Dryden Flight Research Center, Edwards, CA USA

Recent Flight Test Experience with Uninhabited Aerial Vehicles at the NASA Dryden Flight Research Center

DelFrate, John H., NASA Dryden Flight Research Center, USA; Cosentino, Gary B., NASA Dryden Flight Research Center, USA; Apr. 1998; 12p; In English

Contract(s)/Grant(s): RTOP 529-10-04-M1

Report No.(s): NASA/TM-1998-206546; NAS 1.15:206546; H-2233; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Dryden Flight Research Center has had substantial involvement with uninhabited aerial vehicles (UAVs) in the past. These vehicles include the Highly Maneuverable Aircraft Technology (HiMAT) aircraft and a new breed of UAVs, such as the X-36 and the Pathfinder. This article describes lessons learned with the current UAVs which may help others in any stage of UAV design or flight testing. Topics discussed include airspace factors, weather factors, frequency availability, range safety, human factors and crew station design, hardware and software design redundancy, ground testing, simulator use, flight testing procedures, crew training, and environmental testing.

Author

Head-Up Displays; Remotely Piloted Vehicles; Cockpits; Procedures; Flight Tests

06

AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

19980041111

Contractor guidelines for preventing avionic corrosion

Taylor, Edward, Northrop Grumman Corp., USA; Materials Performance; October, 1997; ISSN 0094-1492; Volume 36, no. 10, pp. 66-70; In English; Copyright; Avail: Issuing Activity

Avionic system corrosion can be prevented by conducting a structural design and manufacturing effort synchronized with suppliers and customers. The basic tasks that have been found to withstand all of the physical, mechanical, and environmental rigors of aircraft service are addressed. The implementation of structured tasks is far more cost-effective than redesigning and rebuilding state-of-the-art avionic systems.

Author (EI)

Corrosion Prevention; Avionics; Structural Design; Cost Effectiveness

08

AIRCRAFT STABILITY AND CONTROL

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

19980037624 Department of the Navy, Washington, DC USA

Fin Assembly for a Vehicle

Cho, Chahee P., Inventor, Department of the Navy, USA; Olson, Stanley J., Inventor, Department of the Navy, USA; Aug. 26, 1997; 7p; In English

Patent Info.: Filed 1 May 1996; US-Patent-Appl-SN-649834; US-Patent-5,661,260

Report No.(s): AD-D018689; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A fin assembly for effecting guidance of a vehicle through a fluid medium includes an electromagnet fixed in a portion of the vehicle, and a rigid shaft fixed to a hull portion of the vehicle and extending outwardly therefrom and in alignment with the electromagnet. A fin is rotatably mounted on the shaft and is, at least in part, a permanent magnet. A switch assembly is provided in the vehicle for effecting in a first portion of the electromagnet an attractive force between the electromagnet and the permanent magnet, and in a second portion of the electromagnet a repelling force there between, to cause the fin to rotate on the shaft in a selected direction to effect the guidance of the vehicle.

DTIC

Fins; Permanent Magnets; Hydrodynamics; Hulls (Structures); Electromagnets; Guidance (Motion)

19980039322 NASA Langley Research Center, Hampton, VA USA

Redesign of a Variable-Gain Output Feedback Longitudinal Controller Flown on the High-Alpha Research Vehicle (HARV)

Ostroff, Aaron J., NASA Langley Research Center, USA; Mar. 1998; 36p; In English

Contract(s)/Grant(s): RTOP 522-22-21-03

Report No.(s): NASA/TP-1998-206938; NAS 1.60:206938; L-17640; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a redesigned longitudinal controller that flew on the High-Alpha Research Vehicle (HARV) during calendar years (CY) 1995 and 1996. Linear models are developed for both the modified controller and a baseline controller that was flown in CY 1994. The modified controller was developed with three gain sets for flight evaluation, and several linear analysis results are shown comparing the gain sets. A Neal-Smith flying qualities analysis shows that performance for the low- and medium-gain sets is near the level 1 boundary, depending upon the bandwidth assumed, whereas the high-gain set indicates a sensitivity problem. A newly developed high-alpha Bode envelope criterion indicates that the control system gains may be slightly high, even for the low-gain set. A large motion-base simulator in the UK was used to evaluate the various controllers. Desired performance, which appeared to be satisfactory for flight, was generally met with both the low- and medium-gain sets. Both the high-gain set and the baseline controller were very sensitive, and it was easy to generate pilot-induced oscillation (PIO) in some of the target-tracking maneuvers. Flight target-tracking results varied from level 1 to level 3 and from no sensitivity to PIO. These results were related to pilot technique and whether actuator rate saturation was encountered.

Author

Research Vehicles; Longitudinal Control; Feedback Control; Flight Characteristics

19980040072 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Multiple Model Adaptive Estimation and Control Redistribution Performance on the VISTA F-16 During Partial Actuator Impairments, Volume 2

Clark, Curtis S., Air Force Inst. of Tech., USA; Dec. 1997; 233p; In English

Report No.(s): AD-A336726; AFIT/GE/ENG/97D-23-Vol-2; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Multiple Model Adaptive Estimation with Control Reconfiguration (MMAE/CR) capability to estimate and compensate for partial actuator failures, or "impairments" is investigated using the high-fidelity, nonlinear, six-degree-of-freedom, VISTA F-16 simulation which currently resides on the Simulation Rapid-Prototyping Facility (SRF). After developing a model for inserting partial actuator impairments into the VISTA F-16 truth model, research begins with a battery of single actuator impairment tests. This stage of research explores the capability of the existing MMAE algorithm to estimate single, partial actuator impairments, and helps to define refinements and expansions needed in the MMAE algorithm for the second phase of research: the detection and estimation of dual, total and partial actuator impairments. It is seen from the first stage of research that, while MMAE is able to estimate partial impairments, there are refinements needed, such as "probability smoothing and quantization", to compensate for the quality of MMAE probability data and to provide a better, more stable estimate value to the Control Reconfiguration module. The Kalman filters and the dual, partial failure filter banks necessary for the detection of dual, partial actuator impairments are also defined as a result of the single impairment tests. Fifteen more banks of "partial first-failure" Kalman filters are added to the existing MMAE algorithm, as well as the "bank swapping" logic necessary to transition to them. Once the revised and expanded MMAE/CR algorithm is ready, research begins on dual combinations of total and partial actuator impairments. While results of these tests (for other than total impairments) are not as good as originally hoped or expected, the potential

DTIC

Failure; Algorithms; Flight Control; Control Systems Design; Jet Aircraft; Fighter Aircraft

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

19980038256 Florida Univ., Gainesville, FL USA

A Focused, Fundamental Study on the Environmental Degradation of Ceramic Materials in Aerospace Structures, Volume 1 Final Report, 1 Jun. 1993 - 31 May 1997

Whitney, E. D., Florida Univ., USA; Adair, James H., Florida Univ., USA; Holloway, Paul H., Florida Univ., USA; Mecholsky,

John J., Jr., Florida Univ., USA; Winefordner, James D., Florida Univ., USA; May 31, 1997; 373p; In English
Contract(s)/Grant(s): F49620-93-I-1349

Report No.(s): AD-A336490; AFRL-SR-BL-TR-98-0136-Vol-1; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

A multidisciplinary team of investigators from the University of Florida, the University of Utah, and the University of Tennessee conducted a comprehensive, integrated study on the wear and fatigue of ceramic and metal materials for aerospace applications. The work was focused on a study of wear and fatigue in the context of the materials silicon nitride (Si₃N₄) and M-50 steel, and environments relevant to hybrid bearings in advanced turbine engines. The four year program was initiated in May, 1993 and concluded at the end of May, 1997. This document represents the fourth and final report of the program. A fundamental approach was employed to better understand the combined effects of mechanical stress, chemical environment, and high temperatures on wear and fatigue. Individual expertise on the research team spanned the disciplines of material science, chemistry, mechanics, and physics needed to understand the tribo-chemical nature of wear and fatigue. The program was also strongly coupled to industry and national laboratories to better facilitate transfer of the fundamental knowledge and technology to be developed into existing military and commercial systems. The primary objectives in the study were to: (1) develop and evaluate ex-situ and selected in-situ methods to detect wear; (2) develop a broad-based fundamental understanding of wear and wear mechanisms; (3) develop rolling contact fatigue maps for the hybrid bearing systems; (4) develop lifetime predictions for wear and rolling contact fatigue based on the ex-situ and in-situ wear detection methods; and (5) develop surface modification systems for hybrid bearing systems that either aid in wear detection or act to minimize wear damage.

DTIC

Turbine Engines; Silicon Nitrides; Ceramics; Wear; Fatigue (Materials)

19980040056 NERAC, Inc., Tolland, CT USA

Ceramics Technology: Aircraft Engine Component Applications. (Latest citations from the Ei Compendex*Plus database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851504; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning ceramic materials that are resistant to heat, wear, and corrosion processes, and their use in aircraft engines. Fabrication techniques for ignition system components, combustion chamber parts, gas-path seals, turbine rotors, stators, nozzles, blades, and heat exchangers are discussed. Ceramic metal composites suitable for aircraft gas turbine engine components are also considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Ceramics; Aircraft Engines; Engine Parts

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.

19980037236 Department of the Navy, Washington, DC USA

Releasable Connector with Severable Line

Hennings, Elsa J., Inventor, Department of the Navy, USA; Herr, Michael D., Inventor, Department of the Navy, USA; Martin, William A., Inventor, Department of the Navy, USA; Sep. 09, 1997; 8p; In English; Supersedes US-Patent-Appl-SN-716666.

Patent Info.: Filed 29 Aug. 1996; US-Patent-Appl-SN-716666; US-Patent-5,664,897

Report No.(s): AD-D018744; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A releasable connector for a pair of tensioned elements, such as straps supporting a parachuted load, has a cylindrical body separable at a diametrical plane into a pair of blocks each adapted for connection of the block to one of the elements. A helical groove is disposed about the body and is wound in one circumferential direction with the majority of an endless line of para-aramid fiber. The line is tensioned to hold the blocks in engagement so that the elements are joined by the connector. The ends of the groove return helically in the opposite circumferential direction, and the remainder of the line is wrapped in this opposite direction about the majority of the line. The body has a pair of recesses extending radially inwardly from the groove and individually receiving

a pair of pyrotechnic line cutters. Each cutter extends into the groove and, at the groove, has an eye through which the line extends for severing by either cutter to release the blocks from engagement and disconnect the tensioned elements.

DTIC

Connectors; Parachutes; Loads (Forces); Releasing

19980037596 Department of the Navy, Washington, DC USA

Variable Shape Control Fin Assembly for Water Vehicles

Cipolla, Jeffrey L., Inventor, Department of the Navy, USA; Aug. 26, 1997; 10p; In English

Patent Info.: Filed 22 Apr. 1996; US-Patent-Appl-SN-641134; US-Patent-5,661,259

Report No.(s): AD-D018687; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A control fin assembly for a water vehicle includes a multiplicity of fins connected together and grouped in an array mounted on the vehicle. A portion of the array is of a shape memory material responsive to heat to assume selected shapes different from the shape of the array portion otherwise. The array portion is electrically conductive and adapted to increase in temperature upon application of electrical current thereto to effect the assumption of the selected shapes. The invention further relates to a control fin for a water vehicle, at least a portion of the fin being of a shape memory material responsive to heat to assume selected shapes different from the shape of the fin otherwise, the fin portion being electrically conductive and adapted to increase in temperature upon application of electrical current thereto to effect the assumption of the selected shapes.

DTIC

Fins; Control Surfaces; Underwater Vehicles; Shape Control; Water Vehicles

19980037704 NASA Johnson Space Center, Houston, TX USA

Axial Pump

Bozeman, Richard J., Jr., Inventor, NASA Johnson Space Center, USA; Akkerman, James W., Inventor, NASA Johnson Space Center, USA; Aber, Gregory S., Inventor, NASA Johnson Space Center, USA; VanDamm, George Arthur, Inventor, NASA Johnson Space Center, USA; Bacak, James W., Inventor, NASA Johnson Space Center, USA; Svejksky, Paul A., Inventor, NASA Johnson Space Center, USA; Benkowski, Robert J., Inventor, NASA Johnson Space Center, USA; Dec. 02, 1997; 18p; In English; Continuation of US-Patent-Appl-SN-153595, filed 10 Nov. 1993

Patent Info.: Filed 22 May 1996; NASA-Case-MS-C-22424-3; US-Patent-5,692,882; US-Patent-Appl-SN-653929; US-Patent-Appl-SN-153595; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A rotary blood pump includes a pump housing for receiving a flow straightener, a rotor mounted on rotor bearings and having an inducer portion and an impeller portion, and a diffuser. The entrance angle, outlet angle, axial and radial clearances of blades associated with the flow straightener, inducer portion, impeller portion and diffuser are optimized to minimize hemolysis while maintaining pump efficiency. The rotor bearing includes a bearing chamber that is filled with cross-linked blood or other bio-compatible material. A back emf integrated circuit regulates rotor operation and a microcomputer may be used to control one or more back emf integrated circuits. A plurality of magnets are disposed in each of a plurality of impeller blades with a small air gap. A stator may be axially adjusted on the pump housing to absorb bearing load and maximize pump efficiency.

Official Gazette of the U.S. Patent and Trademark Office

Blood Pumps; Impellers; Rotors; Diffusers; Axial Flow

19980037891

Design method for profile of screw rotor hob in consideration of interference (3rd Report, Method to obtain profile of a cutting edge of a hob which is ground by a given profiled relief grinding wheel)

Yoshida, Yoshitaro; Morozumi, Muneharu; Kishi, Satoshi; Horiuchi, Tomio; Saitoh, Masayuki; Nippon Kikai Gakkai Ronbunshu, C Hen/Transactions of the Japan Society of Mechanical Engineers, Part C; July, 1997; ISSN 0387-5024; Volume 63, no. 611, pp. 2504-2510; In Japanese; Copyright; Avail: Issuing Activity

A precise analysis has been made for a design method in order to obtain a profile of the cutting edge of a hob, especially in the case in which a profile of the relief grinding wheel is given as a series of dispersive points. Firstly, it is clarified that under certain circumstances a singular point (a cusp) will occur on the profile of the cutting edge of the hob corresponding to the profile of the relief grinding wheel. Secondly, numerical analysis methods are proposed to determine the interference by using a conditional equation of the cusp and to obtain a profile of the cutting edge of the hob. Then, the theories in this analysis are verified by applying these numerical analysis methods to the dimensions of screw rotor hobs and relief grinding wheels.

Author (EI)

Cutting; Threads; Machining; Grinding Machines; Rotors

19980038032

Study on the vibration and stress of copper tubes in refrigerators and air conditioners

Okutsu, Naohiro; Nippon Kikai Gakkai Ronbunshu, C Hen/Transactions of the Japan Society of Mechanical Engineers, Part C; July, 1997; ISSN 0387-5024; Volume 63, no. 611, pp. 2201-2205; In Japanese; Copyright; Avail: Issuing Activity

In this work the vibration and stress of copper tubes caused by operation of compressors in refrigerators and air conditioners are considered. Natural frequencies and stresses caused by forced deformation were calculated for both sides of fixed straight tubes of 6 mm to 32 mm diameter. Simple equations relating the natural frequency and stress to diameter, length and displacement were derived. Calculation equation for the stress of a tube by the torsional displacement of the compressor at starting stage was obtained with a compressor and a straight tube model. Furthermore, stress of the tube at resonance was calculated using the mode shape equation and a simple equation relating stress to natural frequency and maximum displacement or acceleration. Tube design can be facilitated through use of these equations relating frequency and stress of the tubes. Vibration transmission to the case and the noise caused by the vibration of the case will be discussed in a forthcoming report.

Author (EI)

Air Conditioning Equipment; Forced Vibration; Torsional Vibration; Vibration Mode; Pipes (Tubes); Torsional Stress; Compressors; Refrigerators

19980038033

Forced oscillations of a horizontal continuous rotor with geometric nonlinearity. (Combination and supercombination resonances and internal resonance)

Nagasaka, Imao; Ishida, Yukio; Lee, Seongwoo; Kojima, Sei; Nippon Kikai Gakkai Ronbunshu, C Hen/Transactions of the Japan Society of Mechanical Engineers, Part C; July, 1997; ISSN 0387-5024; Volume 63, no. 611, pp. 2206-2213; In Japanese; Copyright; Avail: Issuing Activity

Combination and supercombination resonances in a continuous rotating shaft with distributed mass are discussed. The restoring force of the shaft has geometric stiffening nonlinearity due to the extension of the shaft center line. It is considered that a distributed lateral force works. The possibility of their occurrences, the shapes of resonance curves, and internal resonance phenomena are investigated.

Author (EI)

Forced Vibration; Vibration; Rotors; Oscillations; Resonance; Resonant Frequencies

19980038072 NASA Langley Research Center, Hampton, VA USA

Direct Harmonic Linear Navier-Stokes Methods for Efficient Simulation of Wave Packets

Streett, C. L., NASA Langley Research Center, USA; 1998; 14p; In English; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA/TM-1998-207320; NAS 1.15:207320; AIAA Paper 98-0784; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Wave packets produced by localized disturbances play an important role in transition in three-dimensional boundary layers, such as that on a swept wing. Starting with the receptivity process, we show the effects of wave-space energy distribution on the development of packets and other three-dimensional disturbance patterns. Nonlinearity in the receptivity process is specifically addressed, including demonstration of an effect which can enhance receptivity of traveling crossflow disturbances. An efficient spatial numerical simulation method is allowing most of the simulations presented to be carried out on a workstation.

Author

Navier-Stokes Equation; Wave Packets; Computerized Simulation; Three Dimensional Boundary Layer; Harmonic Functions; Aerodynamics

19980038222 Army Research Lab., Adelphi, MD USA

Turbine Engine Diagnostics (TED): A Practical Application of a Diagnostic Expert System Final Report

Ingham, Holly, Army Research Lab., USA; Helfman, Richard, Army Research Lab., USA; Hanratty, Timothy, Army Research Lab., USA; Dumer, John, Army Research Lab., USA; Baur, Edmund H., Army Research Lab., USA; Jan. 1998; 28p; In English Report No.(s): AD-A337590; ARL-SR-60; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Turbine Engine Diagnostics (TED) is a diagnostic expert system that aids the M1 Abrams' mechanic in finding and fixing problems in the AGT-1500 turbine engine. TED was designed to provide the apprentice mechanic the ability to diagnose and repair the turbine engine like an expert mechanic. This report discusses the reasoning method used in TED, called the procedural reasoning system (PRS), as well as various design considerations throughout the life of the project. The expert system was designed and

built by the U.S. Army Research Laboratory (ARL) and the U.S. Army Ordnance Center and School (USAOC&S). TED has been fielded to both the Active Army and the National Guard.

DTIC

Turbine Engines; Diagnosis; Expert Systems; Maintenance

19980040091 Department of the Navy, Washington, DC USA

Adjustable Lifting and Precision Positioning Device

Moody, Paul E., Inventor, Department of the Navy, USA; Oct. 09, 1997; 15p; In English

Patent Info.: US-Patent-Appl-SN-954885

Report No.(s): AD-D018747; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A device for precision lifting and positioning of test pieces is provided. The device has a rigid connector attachment which moves the application point of a vertical lifting force over the center of gravity of a test piece despite having a lifting attachment point at its far edge. The rear to forward adjustment is provided by a screw which moves the application of the lifting force backward and forward along the axis of a rigid connector.

DTIC

Adjusting; Lift; Positioning Devices (Machinery)

19980040978 Universal Technology Corp., Dayton, OH USA

High Cycle Fatigue (HCF) Science and Technology Program Annual Report, 1 Jan. - 31 Dec. 1997

Jan. 1998; 89p; In English

Contract(s)/Grant(s): F33615-94-C-5800; AF Proj. 3066

Report No.(s): AD-A337618; AFRL-PR-WP-TM-1998-2002; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This first annual report of the National Turbine Engine High Cycle Fatigue (HCF) Program is a brief review of work completed, work in progress, and technical accomplishments. This program is a coordinated effort with participation by the Army, Navy, Air Force and NASA. The technical efforts are organized under seven Action Teams including: Materials Damage Tolerance Research, Forced Response Prediction, Component Analysis, Instrumentation, Passive Damping Technology, Component Surface Treatments, and Aeromechanical Characterization. Daniel E. Thomson, AFRL/PRTC, Wright-Patterson AFB, is the Program Manager.

DTIC

Aircraft Engines; Tolerances (Mechanics)

14

LIFE SCIENCES

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

19980038365 Defence and Civil Inst. of Environmental Medicine, North York, Ontario Canada

An Evaluation of Workload Model Predictions in a Helicopter Environment

Cain, Brad, Defence and Civil Inst. of Environmental Medicine, Canada; Dec. 1997; 71p; In English

Report No.(s): AD-A337570; DCIEM-97-R-66; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report compares the empirical workload results obtained during a field exercise involving four CH-136 Kiowa crews with results predicted from a task network simulation of the exercise. None of the correlation coefficients is outstanding and only a few of the analytical measures explained greater than 50% of the variance in the empirical workload scores. The correlations between the pilots' empirical workload scores and the analytical workload values were generally greater than that found for the observers, possibly a result of the smaller number of subjects in the observer group or perhaps reflecting greater attention focused on the workload of the pilot by the modeling community. The variation of the workload measures within each flight was substantial, suggesting individual differences between subjects as well as differences in the details of each mission played significant roles in determining the perception of workload rated by the subjects. Of the overall workload measures, the simpler measures were found to capture the greatest portion of the empirical workload variance although these measures provide little detail in what is actually causing the overload and at best only capture 50% of the workload variance. While the multi-dimensional workload measures may provide greater detail about what is causing high workloads, they do not seem to be capturing a great deal of the work-

load variance to begin with. Although the correlations found in this study are low and only half the workload variance was captured, the models may still be useful.

DTIC

Evaluation; Helicopters; Workloads (Psychophysiology); Flight Training; Numerical Analysis

19980040040 Air Force Inst. of Tech., Graduate School of Logistics and Acquisition, Wright-Patterson AFB, OH USA

USAF Pilot Perceptions of Workload Assessment in a Combat or High-Threat Environment

Kottas, Kadircan, Air Force Inst. of Tech., USA; Dec. 1997; 206p; In English

Report No.(s): AD-A335182; AFIT/GLM/LAC/97D-1; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This study analyzed the self reported survey responses of 219 Air Force Pilots concerning their perceptions of workload assessment in a combat or a high threat environment. The first objective of this study was to determine and compare the combat workload factors of varying importance in combat workload assessment by aircraft and mission type flown. The second objective was to examine the pilots' perception of combat mission inflight workload. A stepwise regression model to predict the pilots' perceptions of inflight workload using pilots' characteristics data was explored. Research conclusion varied among aircraft types. Combat workload items indicated as distractingly important were similar for all aircraft types, while items in lower level of importance were impacted by aircraft type. Mean Combat Workload (CWL) scores of pilots from each aircraft type were not significantly different. Overall, it was concluded that surveying pilots who had flown in combat or high threat environments provided useful responses to assess pilot workload; however, findings based on subjective assessments, provide tentative grounds for further research.

DTIC

Aircraft Pilots; Combat; Workloads (Psychophysiology); Aeration

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.

19980037587 General Accounting Office, National Security and International Affairs Div., Washington, DC USA

Air Force Aircraft: Reorganizing Mobility Aircraft Units Could Reduce Costs

Jan. 1998; 37p; In English

Report No.(s): AD-A334930; GAO/NSIAD-98-55; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over the past few years, the Department of Defense (DOD) has been interested in modernizing its forces with new weapons and equipment. For a variety of reasons, these efforts have been stymied, and funds that DOD expected to have available to modernize the force have been needed instead for current operational activities. Therefore, you have expressed an interest in reducing operating costs. We have been assessing various Air Force activities to determine the feasibility of reducing operating costs. A few years ago, we evaluated whether the Air Force could operate its fighter forces more cost-effectively. In May 1996, we reported that the Air Force's fighter force was not organized economically and recommended that the Air Force develop an implementation plan for operating its fighter force in larger, more cost-effective squadrons. DOD concurred with that recommendation. For this follow-on effort, we assessed the cost-effectiveness of organizing the Air Force's airlift and refueling force into fewer, larger-sized squadrons and wings. In making this assessment, we (1) evaluated the effect that reorganization may have on mission accomplishment, (2) determined whether costs could be reduced through redistributing aircraft among fewer wings, and (3) developed five possible options for redistributing C-130 and KC-135 aircraft among fewer wings at lower operating costs. This report focuses on the reserve component combat C-130 and KC-135 aircraft.

DTIC

Cost Effectiveness; Operating Costs; Cost Reduction; Air Transportation; Defense Program; Mobility

19980037801

Directionally controllable squeeze film damper using ER fluid

An, Young Kong; Morishita, Shin; Nippon Kikai Gakkai Ronbunshu, C Hen/Transactions of the Japan Society of Mechanical Engineers, Part C; July, 1997; ISSN 0387-5024; Volume 63, no. 611, pp. 2250-2255; In Japanese; Copyright; Avail: Issuing Activity

Electrorheological (ER) fluid is applied to a controllable squeeze film damper for stabilizing a flexible rotor system. ER fluid is a class of functional fluid whose yield stress varies according to the applied electric field strength, which is observed as viscosity

variation of the fluid. In applying ER fluid to a squeeze film damper, a pair of rings of the damper can be used as electrodes. When the electrodes are divided into a horizontal pair and a vertical one, the squeeze film damper can produce damping force in each direction independently. A prototype of the directionally controllable squeeze film damper was constructed and its performance was investigated in the present work. An artificial neural network was used as a control system for the damper so that it can be controlled even in the case that the characteristics of the ER fluid show strong nonlinearity or vary with time.

Author (EI)

Electrorheological Fluids; Squeeze Films; Vibration Damping; Damping; Rotors; Neural Nets; Control Equipment

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.

19980037924 Naval Facilities Engineering Service Center, Port Hueneme, CA USA

TCNOISE: A Computer Program to Calculate Noise Levels and Directivity from a Jet Engine Test Cell

Kodres, C. A., Naval Facilities Engineering Service Center, USA; Lancey, T. W., Naval Facilities Engineering Service Center, USA; Oct. 1997; 36p; In English

Report No.(s): AD-A336321; NFESC-TR-2085-ENV; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the FORTRAN program Test Cell NOISE (TCNOISE). The program predicts noise emitted by jet engine test cells. It is to be used in conjunction with the Naval Facilities Engineering Service Center's jet engine test cell aerothermal performance computer model, reading output files from this code to acquire the flow properties necessary for the calculation of jet noise and surface noise. The theoretical basis of TCNOISE, instructions for running the program, example runs, and comparisons of program predictions with measured noise emissions are included in the report.

DTIC

Computerized Simulation; Computer Programs; Applications Programs (Computers); Noise (Sound); Acoustic Measurement; Noise Measurement; Jet Aircraft Noise

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