NASA SP-7037 (348)
May 16, 1997

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

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02 Aerodynamics **1**

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

03 Air Transportation and Safety **3**

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

04 Aircraft Communications and Navigation **4**

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

05 Aircraft Design, Testing and Performance **5**

Includes aircraft simulation technology.

06 Aircraft Instrumentation **7**

Includes cockpit and cabin display devices; and flight instruments.

07 Aircraft Propulsion and Power **N.A.**

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

08 Aircraft Stability and Control **7**

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

09 Research and Support Facilities (Air) **9**

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

10 Astronautics **10**

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11 Chemistry and Materials **10**

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

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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)
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AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 348)

MAY 16, 1997

02
AERODYNAMICS

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

19970013162 Colorado Univ., Dept. of Mathematics, Denver, CO USA
Direct Numerical Simulation for the Receptivity and the Whole Process of Transition Around Joukowsky Airfoils, *1 Oct. 1994 - 29 Feb. 1996*
Liu, Chaoqun, Colorado Univ., USA; Liu, Zhining, Colorado Univ., USA; Xiong, Guohua, Colorado Univ., USA; May 1996; 47p; In English
Contract(s)/Grant(s): F49620-95-1-0018
Report No.(s): AD-A309978; AFOSR-TR-96-0252; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The two- and three-dimensional development of leading-edge receptivity and transition in a 2-D Joukowsky airfoil boundary layer are investigated by direct numerical simulation (DNS) using the incompressible Navier-Stokes equations. The numerical investigation are based on the so-called spatial approach. A contravariant based governing system is derived so that we can simulate the receptivity and transition with complex geometries. The numerical results agreed very well with the experimental results for the flat plate case, and also agreed well with the result obtained by other researchers for the 2-D elliptic leading-edge receptivity case. Some new phenomena for the transition around Joukowsky airfoils were observed which at least qualitatively agree with physics.
DTIC
Airfoils; Boundary Layer Transition; Navier-Stokes Equation; Computational Fluid Dynamics; Leading Edges; Flow Distribution

19970013282 NASA Langley Research Center, Hampton, VA USA
Experimental Aerodynamic Characteristics of the Pegasus Air-Launched Booster and Comparisons with Predicted and Flight Results
Rhode, M. N., NASA Langley Research Center, USA; Engelund, Walter C., NASA Langley Research Center, USA; Mendenhall, Michael R., Nielsen Engineering and Research, Inc., USA; Jun. 22, 1995; 22p; In English; 13th; Applied Aerodynamics, 19-22 Jun. 1995, San Diego, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA-TM-112004; NAS 1.15:112004; AIAA Paper 95-1830; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experimental longitudinal and lateral-directional aerodynamic characteristics were obtained for the Pegasus and Pegasus XL configurations over a Mach number range from 1.6 to 6 and angles of attack from -4 to +24 degrees. Angle of sideslip was varied from -6 to +6 degrees, and control surfaces were deflected to obtain elevon, aileron, and rudder effectiveness. Experimental data for the Pegasus configuration are compared with engineering code predictions performed by Nielsen Engineering & Research, Inc. (NEAR) in the aerodynamic design of the Pegasus vehicle, and with results from the Aerodynamic Preliminary Analysis System (APAS) code. Comparisons of experimental results are also made with longitudinal flight data from Flight #2 of the Pegasus vehicle. Results show that the longitudinal aerodynamic characteristics of the Pegasus and Pegasus XL configurations are similar, having the same lift-curve slope and drag levels across the Mach number range. Both configurations are longitudinally stable, with stability decreasing towards neutral levels as Mach number increases. Directional stability is negative at moderate to high angles of attack due to separated flow over the vertical tail. Dihedral effect is positive for both configurations, but is reduced 30-50 percent for the Pegasus XL configuration because of the horizontal tail anhedral. Predicted longitudinal characteristics and both longitudinal and lateral-directional control effectiveness are generally in good agreement with experiment. Due to the complex leeside

flowfield, lateral-directional characteristics are not as well predicted by the engineering codes. Experiment and flight data are in good agreement across the Mach number range.
Author
Pegasus Air-Launched Booster; Aerodynamic Characteristics; Angle of Attack; Mach Number; Ailerons; Directional Stability; Directional Control; Lateral Control; Lateral Stability; Sideslip

19970013327 Cincinnati Univ., Dept. of Aerospace Engineering and Engineering Mechanics, OH USA
Development of LES Methodology for the Analysis of High-Reynolds Number 2-D and 3-D Dynamic Stall Phenomenon
Annual Report, Jun. 1994 - Jun. 1995
Ghia, K. N., Cincinnati Univ., USA; Ghia, U., Cincinnati Univ., USA; Jun. 1996; 159p
Contract(s)/Grant(s): F49620-93-I-0393; AF Proj. 2307
Report No.(s): AD-A311398; AFL-95-6-83; AFOSR-TR-96-0376; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The ultimate objective of this project was to analyze forced unsteady separated flows, through numerical simulation of high-Reynolds number flows. The velocity-vorticity form of the Navier-Stokes equations were to be solved using the Large-Eddy Simulation (LES) or the coarse-grid Direct Numerical Simulation (DNS) approaches. In the first year of this project, an effort was initiated and reported to develop LES technique for forced unsteady separated flows using (m-V) formulation. Although an effort, which was spearheaded to obtain 3-D simulation of (m-V) formulation, required additional theoretical work due to an incomplete boundary condition at the surface for vorticity, the corresponding 2-D results were obtained using a backstep duct geometry and presented at the 14th International Conference on Numerical Methods in July 1994. This effort was carried out in the background, while new projects have been initiated.
DTIC
Aerodynamic Stalling; Navier-Stokes Equation; Separated Flow; Unsteady Flow; Computerized Simulation; Three Dimensional Flow; Two Dimensional Flow; High Reynolds Number; Computational Fluid Dynamics; Vortices; Aerodynamic Stability

19970013329 Virginia Polytechnic Inst. and State Univ., Dept. of Aerospace and Ocean Engineering, Blacksburg, VA USA
The Turbulence Structure of Trailing Vortice Wakes,
Follin, Gordon J., Virginia Polytechnic Inst. and State Univ., USA; Devenport, William J., Virginia Polytechnic Inst. and State Univ., USA; 1996; 250p; In English
Contract(s)/Grant(s): N00014-94-I-0744
Report No.(s): AD-A311825; VPI-AOE-235; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The present investigation is a two-part study of the mean flow and turbulence structure of isolated vortices and counter-rotating vortex pairs. In the first part, the turbulence structure of an isolated vortex was studied using three-component velocity measurements. Vortices were generated using two symmetrical airfoils. Measurements were made in cross-sectional grids and profiles over a range of Reynolds numbers and downstream distances. Contours of axial normal stress were high-pass filtered to remove the contributions of wandering to the velocity fluctuations. This process reveals a vortex core which is laminar and is surrounded by a region of high turbulence. Core velocity profiles reveal that maximum tangential velocity increases with Reynolds number and decreases with distance downstream. Core radius increases with distance downstream and decreases with Reynolds number. In the second part, flow visualizations of the wake behind a delta wing model were made for a range of Reynolds numbers and lift coefficients. These visualizations reveal the near-instantaneous turbulence structure of the wing wake which is dominated by a vortex pair and a connecting 'braid' wake. The braid spacing decreases with increasing Reynolds number and is independent of lift coefficient. The extent of the braid downstream of the wing increases with lift coefficient and decreases with increasing Reynolds number. The large turbulence scales in the wing wake were found to increase in discrete jumps indicating some sort of reorganization of turbulence such as pairing. This reorganization of turbulence was found to occur more quickly as Reynolds number is increased.
DTIC
Vortices; Trailing Edges; Turbulence; Velocity Measurement; Flow Visualization; Delta Wings; Lift; Wakes

19970013640 NASA Lewis Research Center, Cleveland, OH USA
Collection Efficiency and Ice Accretion Calculations for a Boeing 737-300 Inlet
Bidwell, Colin S., NASA Lewis Research Center, USA; Feb. 1997; 30p; In English; World Aviation Congress, 22-24 Oct. 1996, Los Angeles, CA, USA; Sponsored by Society of Automotive Engineers, Inc., USA
Contract(s)/Grant(s): RTOP 505-68-10
Report No.(s): NASA-TM-107347; E-10498; NAS 1.15:107347; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Collection efficiency and ice accretion calculations have been made for a Boeing 737-300 inlet using a three-dimensional panel code, an adaptive grid code, the NASA Lewis LEWICE3D grid based ice accretion code. Flow solutions for the inlet were generated using the VSAERO panel code. Grids used in the ice accretion calculations were generated using the newly developed adaptive grid code ICEGRID3D. The LEWICE3D grid based ice accretion program was used to calculate impingement efficiency and ice shapes. Ice shapes typifying rime and mixed icing conditions were generated for a 30 minute hold condition. All calculations were performed on an SGI Power Challenge computer. The results have been compared to experimental flow and impingement data. In general, the calculated flow and collection efficiencies compared well with experiment, and the ice shapes looked reasonable and appeared representative of the rime and mixed icing conditions for which they were calculated.
Author
Boeing 737 Aircraft; Ice Formation; Prediction Analysis Techniques; Engine Inlets; Inlet Pressure

19970013711 California Univ., Mechanical, Aerospace and Nuclear Engineering Dept., Los Angeles, CA USA
Manipulation of Airfoil Response in an Unsteady Stream ***Final Report, 1 Mar. 1992 - 28 Feb. 1995***
Ho, Chih-Ming, Air Force Office of Scientific Research, Bolling AFB, USA; Jan. 31, 1996; 61p; In English
Contract(s)/Grant(s): F49620-92-J-0178
Report No.(s): AD-A311791; AFOSR-TR-96-0145; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Experiments were conducted to investigate the mechanism responsible for vortex breakdown over delta-wing. by varying the free stream velocity, unsteady vortex breakdown occurs over the wing due to the alteration of the balance between leading-edge vorticity production and convection. This allows the study of vortex breakdown in both the spatial and temporal domain. It was found that parameters such as swirl angle and circulation do not correlate well with breakdown when the flow is unsteady. However, vortex breakdown seemed to follow the positive feedback mechanism proposed by Brown and Lopez. When breakdown occurs, there is a redistribution of vorticity in the vortex subcore, where the vorticity vector changes from an essentially axial direction to a generally tangential direction. Further, the helix angle for the velocity exceeds that of the vorticity globally in the vortex subcore only in the instant just before breakdown. Finally, it was found that through breakdown, global quantities such as circulation and flow rate varies in phase as the upstream vorticity and velocity changes with time. This implies that the breakdown process is essentially an inviscid mechanism.
DTIC
Airfoils; Delta Wings; Unsteady Flow; Vortices; Inviscid Flow; Aerodynamic Characteristics; Vortex Breakdown; Turbulent Flow; Unsteady Aerodynamics

19970013762 Defence Science and Technology Organisation, Canberra, Australia
F-111C Longitudinal and Lateral Aerodynamic Flight Data Analysis for Take-off and Landing Configurations
Snowden, A. D., Aeronautical Research Labs., Australia; Drobik, J. S., Aeronautical Research Labs., Australia; Apr. 1996; 73p; In English
Report No.(s): AD-A311534; DSTO-TR-0321; DODA-AR-009-660; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A series of flight trials was performed on an F-111C aircraft, tail number A8-132, at the RAAF's Aircraft Research and Development Unit. Data obtained from the tests has been analysed in Air Operations Division to determine the aircraft aerodynamic and control derivatives. In this report the longitudinal and lateral derivatives for the take-off and landing configurations are presented and compared with wind tunnel results.
DTIC
F-111 Aircraft; Aerodynamic Configurations; Flight Tests; Fighter Aircraft

03
AIR TRANSPORTATION AND SAFETY

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

19970013176 Operational Technologies Corp., San Antonio, TX USA
Site Assessment Report for F-16 Crash Site Albany County, Wyoming., Volume 1, 140th Fighter Wing Colorado Air National Guard Buckley Air National Guard Base Aurora, Colorado
Sep. 1996; 52p; In English
Report No.(s): AD-A316165; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Field effort for F-16 crash site in Albany County, Wyoming. Crash occurred Nov 93. Push technology was used to determine levels of contamination were below state standards. No further action is necessary at this site.
DTIC
F-16 Aircraft; Aircraft Accidents; Accident Investigation; Contamination

19970013298 Federal Aviation Administration, Atlantic City, NJ USA
Test and Evaluation Plan of Computer-Based Training for the CTX 5000 Explosives Detection System ***Final Report***
Cormier, S., Federal Aviation Administration, USA; Fobes, J. L., Federal Aviation Administration, USA; Sep. 1996; 43p; In English
Contract(s)/Grant(s): DTFA03-94-C-00012
Report No.(s): AD-A315037; AAR-510; DOT/FAA/AR-96/67; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This Test and Evaluation Plan evaluates the effectiveness of computer-based training (CBT) as an element of a Screener Proficiency Evaluation and Reporting System (SPEARS) for checked baggage screening with the CTX 5000. The CTX 5000 combines computed tomography imaging and automated detection of explosives. Alarm resolution with this complex system requires that screeners learn to skillfully discriminate system false alarms from system-identified true threats. Testing is designed to determine the effectiveness of the CBT to meet the critical operational and technical issues described in this plan. The testing will be conducted at airports where the CTX 5000 system is currently located.
DTIC
Warning Systems; Tomography; Explosives Detection; Computer Techniques; Complex Systems

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

19970013295 Department of the Navy, Washington, DC USA
Audio Information Apparatus for Providing Position Information
Buchwitz, Guy R., Inventor, Department of the Navy, USA; Muskat, David H., Inventor, Department of the Navy, USA; Sep. 03, 1996; 41p; In English
Patent Info.: Filed 5 Dec. 1994; US-Patent-Appl-SN-349757; US-Patent-5,552,993
Report No.(s): AD-D018265; No Copyright; Avail: US Patent and Trademark Office, Microfiche
An audio information apparatus for providing position information as to the location of a target comprising a global positioning system receiver affixed to the target for generating a string of fifty nine ASCII characters representing the latitude and longitude spherical coordinates of the global positioning receiver affixed to the target. The ASCII characters are supplied to a microprocessor, which in response to the ASCII characters, formulates a position message indicating the current location of the global positioning system receiver. A pair of voice recorder/playback circuits, coupled to the microprocessor, have a message table which includes 27 messages or words which when assembled in a predetermined sequence form a longitude and latitude coordinate position message. When the voice recorder/playback circuits are in a message cueing mode, the microprocessor provides a predetermined number of active low chip enable pulses to a selected one of the pair of voice recorder/playback circuits to select the desired word from the table. The microprocessor then disables the message cueing mode which, in turn, enables an audio amplifier of the selected one of the voice recorder/playback circuits. When the microprocessor provides a subsequent chip enable pulse the message is output from the voice recorder/playback circuit to a transmitter for transmission to a ground station. The microprocessor continues this process of utilizing the message cueing mode followed by audio playback addressing mode to output each word of the longitude and latitude coordinate position message from the voice recorder/playback circuits to the transmitter.
DTIC
Global Positioning System; Message Processing; Microprocessors; Navigation Aids

19970013577 Ohio State Univ., Cognitive Systems Engineering Lab., Cleveland, OH USA
Human-Centered Technologies and Procedures for Future Air Traffic Management: A Preliminary Overview of 1996 Studies and Results ***Interim Report, 15 Aug. 1995 - 14 Aug. 1996***
Smith, Philip, Ohio State Univ., USA; McCoy, Elaine, Ohio Univ., USA; Denning, Rebecca, Ohio State Univ., USA; Woods, David, Ohio State Univ., USA; Sarter, Nadine, Illinois Univ., USA; Dekker, Sidney, Ohio State Univ., USA; Billings, Charles, Ohio State Univ., USA; Jul. 19, 1996; 21p; In English

Contract(s)/Grant(s): NAG2-995
Report No.(s): NASA-CR-203277; NAS 1.26:203277; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this project, we have been exploring the use of a general methodology to predict the impact of future Air Traffic Management (ATM) concepts and technologies. In applying this methodology, our emphasis has been on the importance of modeling coordination and cooperation among the multiple agents within this system, and on understanding how the interactions among these agents will be influenced as new roles, responsibilities, procedures and technologies are introduced. to accomplish this, we have been collecting data on performance under the current air traffic management system, trying to identify critical problem areas and looking for exemplars suggestive of general approaches for solving such problems. Based on the results of these field studies, we have developed a set of scenarios centered around potential future system designs, and have conducted studies using these scenarios involving a total 40 controllers, dispatchers, pilots and traffic managers. The purpose of this report is to provide NASA with an early summary of the major recommendations that have resulted from our research under the AATT Program thus far. Recommendations 1-3 deal with general approaches that our findings suggest should be incorporated in future AATT Program activities, while Recommendations 4-11 identify some specific topics and technologies that merit research and development activities. Detailed technical reports containing supporting data, as well as the results of our still ongoing analyses, will be provided at a later date. The remainder of this report is organized as follows. Section 1 briefly describes the general design philosophy supported by our empirical studies. Section 2 presents the research methods we have used for identifying requirements for future system designs and for evaluating alternative design solutions. Section 3 discusses preliminary results from an initial set of investigations that we have conducted using these research methods. Section 4 then provides an overall summary. An outline of the rest of this preliminary project summary is provided on the following page.
Derived from text
Human Factors Engineering; Man Machine Systems; Air Transportation; Safety Management; Air Traffic Control

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19970013213 Bell Helicopter Co., Fort Worth, TX USA
Feasibility Study of a Rotorcraft Health and Usage Monitoring System (HUMS): Usage and Structural Life Monitoring Evaluation *Final Report*
Dickson, B., Bell Helicopter Co., USA; Cronkhite, J., Bell Helicopter Co., USA; Bielefeld, S., Bell Helicopter Co., USA; Killian, L., Bell Helicopter Co., USA; Hayden, R., Bell Helicopter Co., USA; Feb. 1996; 68p; In English
Contract(s)/Grant(s): NAS3-25455; DTFA03-89-A-0001; RTOP 505-62-36; DA Proj. 1L1-62211-A4-7A
Report No.(s): AD-A310140; NASA-CR-198447; NAS 1.26:198447; E-10093; DOT/FAA/AR-95/9; ARL-CR-290; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The objective of this study was to evaluate two techniques, Flight Condition Recognition (FCR) and Flight Load Synthesis (FIS), for usage monitoring and assess the potential benefits of extending the retirement intervals of life-limited components, thus reducing the operator's maintenance and replacement costs. Both techniques involve indirect determination of loads using measured flight parameters and subsequent fatigue analysis to calculate the life expended on the life-limited components. to assess the potential benefit of usage monitoring, the two usage techniques were compared to current methods of component retirement. In addition, comparisons were made with direct load measurements to assess the accuracy of the two techniques.
DTIC
Rotary Wing Aircraft; Systems Health Monitoring; Flight Conditions; Service Life; Aircraft Maintenance

19970013281 Department of the Navy, Washington, DC USA
Guided Wing for Aircraft Flying at High Angles of Attack
Tai, Tsze C., Inventor, Department of the Navy, USA; Nov. 19, 1996; 11p; In English
Patent Info.: Filed 19 Jan. 1995; US-Patent-Appl-SN-375031; US-Patent-5,575,442
Report No.(s): AD-D018292; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The invention is directed to an apparatus for attaching to a wing operating in a fluid medium for increasing the angle of attack at which the wing experiences aerodynamic/hydrodynamic stall. The wing includes upper and lower surfaces extending between a leading edge and a trailing edge and having a maximum thickness therebetween and between a root and a tip, wherein the leading and trailing edges define a chord and the root and tip define a span. The apparatus comprises at least one substantially triangular shaped plate member projecting normal to the upper surface of the wing. The at least one plate member has a straight top surface

and a curvilinear bottom surface which corresponds to the contour of the upper surface of the wing. The top and bottom surfaces define the height of the at least one plate member and extend in a substantially chordwise direction between an anterior end and a posterior end of the at least one plate member. The at least one plate member has its minimum height at the anterior end and its maximum height at the posterior end wherein the maximum height corresponds to a fully attached boundary layer thickness of a fluid flowing over the upper face, the boundary layer thickness determined at the trailing edge at a predetermined operating condition.
DTIC
Wings; Aerodynamic Stalling; Angle of Attack; Wing Profiles; Boundary Layer Control; Three Dimensional Flow; Control Surfaces; Lift; Leading Edges; Trailing Edges; Separated Flow

19970013563 Illinois Univ., Fracture Research Lab., Chicago, IL USA
Development of a New Technique to Monitor Physical Aging of Aircraft Canopy Materials ***Final Report***
Ivanova, E., Illinois Univ., USA; Chudnovsky, A., Illinois Univ., USA; Bosnyak, C. P., Illinois Univ., USA; Feb. 1996; 31p; In English
Contract(s)/Grant(s): F49620-95-1-0072
Report No.(s): AD-A309973; Rept-1-02-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new technique to monitor physical aging of aircraft canopy materials has been developed and proposed in this report. It involves the use of photochrome molecules from the class of spiropyrans which, on UV excitation, undergo reversible photochromic conversion to differently colored merocyanine dyes (photoisomerization). The rate of transformation of the merocyanine dye back to the spiropyran in a polymer depends on the segmental mobility and fluctuations of density of the polymer molecules and can be easily followed through their spectral absorbance characteristics. The characteristic relaxation time changes with physical aging of a polymer due largely to densification accompanying the aging process. Thus, employment of photochromes allows quantification of physical aging of polymers. This technique offers a unique, low-cost and non-destructive way to measure the aging without perturbing the system itself. A potential for the development of a portable device for field measurements should be considered as well.
DTIC
Aircraft Structures; Canopies; Aging (Materials); Photochemical Reactions

19970013675 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Test and Evaluation of the V-22 Osprey at NAWC AD Patuxent River, Maryland ***Final Report***
Standridge, E. L., Naval Air Warfare Center, USA; Garner, R. D., Naval Air Warfare Center, USA; Aug. 1995; 147p; In English
Report No.(s): AD-A311767; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The proposed action is to test and evaluate several initial production Vertical/Short Takeoff and landing (Tilt Rotor) aircraft, the V-22 Osprey, during the Engineering and Manufacturing Development (EMD) and Low Rate Initial Production (LRIP) phases. The current EA addresses potential environmental impacts associated with site-specific impacts at NAWC AD Patuxent River during EMD and LRIP phases of the V-22 program. Three versions of the V-22 Osprey aircraft are proposed to be tested at NAWC AD Patuxent River: four MV-22 (Marine Corps version); one CV-22 (Special Operations Command version); and two HV-22 (Navy version). Flight tests are proposed to occur within restricted flight areas controlled by NAWC AD Patuxent River. The test program has a goal of 20 flight hours per month with an average 1.5 hours per flight. Ground testing will occur close to existing aircraft hangers and near an abandoned taxiway. The purpose for the tests is to evaluate and ensure that V -22 aircraft can meet the specified mission requirements. The development and production of the V-22 is needed to meet the current shortfall in the medium lift force and correct inadequacies in quality/capability of the existing medium lift force within the Services.
DTIC
Vertical Takeoff; V-22 Aircraft; Tilt Rotor Aircraft; Flight Tests; Air Quality; Air Pollution

19970013698 Galaxy Scientific Corp., Egg Harbor Township, NJ USA
Survey and Analysis of Rotorcraft Flotation Systems ***Final Report***
Muller, Mark, Galaxy Scientific Corp., USA; Greenwood, Richard, Galaxy Scientific Corp., USA; Richards, Marvin, Simula, Inc., USA; Bark, Lindley, Simula, Inc., USA; May 1996; 75p; In English
Report No.(s): AD-A310050; DOT/FAA/AR-95/53; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The primary goals of this study were: (1) to evaluate rotorcraft flotation system performance in water related incidents and accidents; and (2) to identify areas of potential improvements of rotorcraft flotation system operation and occupant fatality reduction. Four tasks were conducted: a survey of both civilian and U.S. Navy rotorcraft flotation technology, a review of civilian flotation accident and incident data, definition of generic flotation system improvements, and evaluation of available analytical

methods for assessing flotation system performance. This study suggested upgrades of the civil regulations and potential design improvements to current deployable flotation systems. Further development work is required to determine the effectiveness of the proposed design improvements. Existing analytical methods for four significant aspects of the water landing sequence were described.
DTIC
Rotary Wing Aircraft; Water Landing; Floats; Ditching (Landing)

06
AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

19970013370 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Common Airborne Instrumentation System. Configuration ID List
Jones, Sidney R., Naval Air Warfare Center, USA; May 13, 1996; 16p; In English
Report No.(s): AD-A308577; A00.00-C009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Office of the Secretary of Defense has established the CAIS Joint Program Office (JPO) as the overall controlling activity for the CAIS program. The CAIS JPO is responsible for changes and contents of this document. This document will identify the configuration ID's for all CAIS and CAIS compliant line replaceable units (LRU's). CAIS compatible LRU's will be covered only to the extent vendors have requested ID's for their CAIS compatible equipment.
DTIC
Global Positioning System; Airborne Equipment

08
AIRCRAFT STABILITY AND CONTROL

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

19970013349 Air Force Inst. of Tech., Air Univ., Wright-Patterson AFB, OH USA
Multiple Model Adaptive Control of the Vista F-16
Stepaniak, Michael J., Air Force Inst. of Tech., USA; Dec. 1995; 177p; In English
Report No.(s): AD-A309938; AFIT/GE/ENG/95D-26; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
Multiple model adaptive control (MMAC) is investigated using the high-fidelity, nonlinear, six-degree-of-freedom Simulation Rapid-Prototyping Facility VISTA F-16. Detection of single actuator and sensor failures is considered, with an MMAC algorithm initially pursued which allows a controller specifically designed for each particular failure condition to replace the standard F-16 Block 40 flight control system (FCS) once the failure is detected. The synthesis of certain discrete-time LQG/PI controllers (those using control variables linearly dependent on state derivatives) is shown to be unattainable due to numerical difficulties. A novel control technique, termed control redistribution, is introduced which redistributes control commands (that would normally be sent to failed actuators) to the non-failed actuators, accomplishing the same control action on the aircraft. Multiple model adaptive estimation-based control redistribution is demonstrated to detect single failures in less than one second and to provide a response nearly identical to that anticipated from a fully functional aircraft in the same environment. Moreover, this method directly employs the proven Block 40 FCS, and no other, thereby guaranteeing desirable closed loop performance. A description of modifications necessary for in-flight testing is also provided. This research represents the most realistic simulation of multiple model adaptive control for flight control to date.
DTIC
F-16 Aircraft; Feedback Control; Flight Control; Model Reference Adaptive Control

19970013562 Air Force Inst. of Tech., Air Univ., Wright-Patterson AFB, OH USA
Design of Flight Control Laws for Aircraft with Flexible Wings Using Quantitative Feedback Theory
Osmon, Christina L., Air Force Inst. of Tech., USA; Dec. 1995; 133p; In English
Report No.(s): AD-A309939; AFIT/GE/ENG/95D-20; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Aircraft composed of lightweight composite materials are extremely enticing since their structural weight is greatly reduced. However, the control of these aircraft is complicated by the resultant flexibility of the wings. Two avenues of approach are possible; stiffen the wings thus losing some of the weight reduction benefits, or design the lateral/directional flight control system

cognizant of the wing's flexibility. In this thesis the second approach is taken. The design of three lateral/directional flight control systems for the sub-sonic flight envelope of the F-18 is presented. The Quantitative Feedback Theory (QFT) robust control design technique is used. These designs incorporate weighting matrices to distribute generalized aileron and rudder commands to the five control surfaces available on the F-18. The degree of freedom afforded by the use of ail control surfaces allows for the reduction of the load on the wings, while at the same time meeting military specifications for roll maneuvers. A baseline flight control system is designed and then improved upon; the final design incorporates load alleviation concepts to reduce the load on the wings thus avoiding wing twisting. All flight control systems designed in this thesis are shown to meet military specifications, as verified with nonlinear time simulations.
DTIC
Flight Control; Ailerons; Control Surfaces; Control Theory; Feedback Control; Lateral Control

19970013579 Iowa State Univ. of Science and Technology, Dept. of Aerospace Engineering and Engineering Mechanics, Ames, IA USA
An Investigation of Nonlinear Controller for Propulsion Controlled Aircraft ***Final Report, 1 Feb. 1996 - 31 Jan. 1997***
Lu, Ping, Iowa State Univ. of Science and Technology, USA; Feb. 1997; 33p; In English
Contract(s)/Grant(s): NCC4-104
Report No.(s): NASA-CR-203716; NAS 1.26:203716; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Aircraft control systems are usually very reliable because of redundancy and multiple control surfaces. However, there are rare occasions when potentially disastrous flight control system failures do occur. At such times, the use of appropriate modulation of engine thrust to stabilize the aircraft may be the only chance of survival for the people aboard. In several cases where complete loss of control systems has occurred in multi-engine aircraft, pilots used the propulsion system to regain limited control of the aircraft with various degrees of success. In order to evaluate the feasibility of using only engine thrust modulation for emergency backup flight control, the NASA Dryden Flight Research Center has been conducting a series of analytical studies and flight tests on several different types of aircraft in a propulsion controlled aircraft (PCA) program. Simulation studies have included B-720, B-727, MD-11, C-402, C-17, F-18, and F-15, and flight tests have included B-747, B-777, MD-11, T-39, Lear 24, F-18, F-15, T-38, and PA-30. One objective was to determine the degree of control available with manual manipulation (open-loop) of the engine throttles. Flight tests and simulations soon showed that a closed loop controller could improve the chances of making a safe runway landing. The major work to date has concentrated on three aircraft (F-15, F-18, and the MD-11). Successful landings using PCA controllers were performed on the F-15 and MD-11 without the use of control surfaces. During the course of the research, some unique challenges have been identified. Compared to the conventional flight control surfaces, the engines are slow and have limited control effectiveness. Hence the ability of the system to promptly respond to aerodynamic changes is limited. Consequently, many nonlinear effects, which are easily accommodated by a conventional flight control system, become significant issues in the design of an effective controller when the engines are used as the only control effectors. A number of nonlinear behaviors observed during PCA flight tests, which are not meant to be exhaustive, are reviewed in the next section.
Author
Aircraft Control; Flight Control; Thrust; Controllability; Nonlinear Systems

19970013754 Naval Postgraduate School, Monterey, CA USA
Launch Detection Satellite System Engineering Error Analysis
Beaulieu, Martin R., Naval Postgraduate School, USA; Mar. 1996; 126p; In English
Report No.(s): AD-A311524; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
An orbiting detector of InfraRed (IR) energy may be used to detect the rocket plumes generated by ballistic missiles during the powered segment of their trajectory. by measuring angular directions of the detections over several observations, the trajectory properties, launch location, and impact area may be estimated using a nonlinear least-squares iteration procedure. observations from two or more sensors may be combined to form stereoscopic Lines of Sight (LOS), increasing the accuracy of the estimation algorithm. The focus of this research has been to develop a computer-model of an estimation algorithm, and determine what parameter, or combination of parameters will significantly affect on the error of the tactical parameter estimation. This model is coded in MATLAB, and generates observation data, and produces an estimate for time, position, and heading at launch, at burnout, and calculates an impact time and position. The effects of time errors, LOS measurement errors, and satellite position errors upon the estimation accuracy were then determined using analytical and Monte Carlo simulation techniques.
DTIC
Systems Engineering; Detection; Error Analysis; Guidance (Motion); Errors; Trajectories; Missile Detection; Rocket Exhaust

09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

19970013265 HazWaste Technologies Corp., Boulder, CO USA
Fueling Area Site Assessment
Aug. 15, 1996; 297p; In English
Report No.(s): AD-A316169; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This report provides results of a Site Assessment performed at the Fuel Storage Area at Buckley ANG Base in Aurora, Colorado. Buckley ANG Base occupies 3,328 acres of land within the City of Aurora in Arapahoe County, Colorado. The Fuel Storage Area (also known as the Fueling Area) is located on the west side of the Base at the intersection of South Powderhorn Street and East Breckenridge Avenue. The Fueling Area consists of above ground storage tanks in a bermed area, pumps, piping, valves, an unloading stand and a fill stand. Jet fuel from the Fueling Area is used to support aircraft operations at the Base. Jet fuel is stored in two 200,000 gallon above ground storage tanks. Fuel is received in tanker trucks at the unloading stand located south and east of the storage tanks. Fuel required for aircraft fueling and other use is transferred into tanker trucks at the fill stand and transported to various points on the Base. The Fuel Storage Area has been in operation for over 20 years and handles approximately 7 million gallons of jet fuel annually.
DTIC
Jet Engine Fuels; Storage Tanks; Ground Operational Support System; Aircraft Fuels

19970013553 Sverdrup Technology, Inc., Engineering Development Center Group, Arnold AFS, TN USA
Initial Calibration of the AEDC Impulse Tunnel ***Interim Report, Oct. 1992 - Sep. 1995***
Blanks, James R., Sverdrup Technology, Inc., USA; Aug. 1996; 106p; In English
Contract(s)/Grant(s): AF Proj. 0116
Report No.(s): AD-A311751; AEDC-TR-95-36; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Shakedown and calibration tests are being conducted in the new free-piston shock-heated Impulse Tunnel at AEDC. These tests have successfully demonstrated the facility's ability to produce high-velocity test gas at high density. The low-pressure calibration is considered completed, Nozzle stagnation pressures to 650 bar at enthalpies to 12.5 MJ/kg are available for test programs.
DTIC
Shock Tubes; Shock Heating; Calibrating; Piston Engines; Rarefied Gases

19970013588 Old Dominion Univ., Dept. of Aerospace Engineering, Norfolk, VA USA
Applications of Magnetic Suspension Technology to Large Scale Facilities: Progress, Problems and Promises
Britcher, Colin P., Old Dominion Univ., USA; 1997; 10p; In English
Contract(s)/Grant(s): NAG1-1056
Report No.(s): NASA-CR-203235; NAS 1.26:203235; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper will briefly review previous work in wind tunnel Magnetic Suspension and Balance Systems (MSBS) and will examine the handful of systems around the world currently known to be in operational condition or undergoing recommissioning. Technical developments emerging from research programs at NASA and elsewhere will be reviewed briefly, where there is potential impact on large-scale MSBSS. The likely aerodynamic applications for large MSBSs will be addressed, since these applications should properly drive system designs. A recently proposed application to ultra-high Reynolds number testing will then be addressed in some detail. Finally, some opinions on the technical feasibility and usefulness of a large MSBS will be given.
Author
Magnetic Suspension; Wind Tunnels; Aerodynamic Balance; Wind Tunnel Apparatus; Wind Tunnel Tests

19970013682 Naval Postgraduate School, Dept. of Systems Management, Monterey, CA USA
Re-Engineering a Computer-Based Trainer for a Helicopter Night Vision System
Kern, Dabney R., Naval Postgraduate School, USA; Shaffer, Kenan J., Naval Postgraduate School, USA; Sep. 1996; 98p; In English
Report No.(s): AD-A311753; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

While there have been unfavorable responses to Department of Defense right-sizing efforts, this force restructuring has actually produced certain positive results. Capitalizing on technological advances, the aviation community, in particular, has adapted to personnel cuts and reduced budgets without sacrificing the quality of training. As a result, considerable emphasis is currently placed on computer-based training (CBT) applications. The development of this type of training for critical, high-risk, missions, such as those involving scarce night vision equipment, has encouraged numerous research projects including this thesis. Sponsored by Naval Air Systems Command (PMA-205), this thesis discusses methods used to re-engineer the UH-1N helicopter Aviator's Night Vision Imaging System/Heads-Up Display (ANVIS/HUD) CBT for use in the HH-60H community. by using portions of code, graphics, and text originally designed for the UH-1N CBT, the HH-60H version was developed through a revision process which incorporated new material as required. The final product is a trainer consisting of five instructional modules, combining student evaluation and remediation features through interactive lessons and exercises. In accordance with current design principles, an object-oriented authoring system enabled the production of a quality CBT that meets the sponsor's budget and time constraints, and promises to be a key training asset for HH-60H personnel.
DTIC
Aircraft Pilots; Night Vision; Flight Simulators; Head-Up Displays; Helicopters; Computer Assisted Instruction; Goggles; UH-1 Helicopter

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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.

19970013293 Air Force Inst. of Tech., National Air Intelligence Center, Wright-Patterson AFB, OH USA
Some Progress by China in the Area of Space Sciences,
Wang, Da-Heng; Zhongguo Hangtian (Aerospace China); Aug. 20, 1996, No. 190, pp. 13-16; Transl. into ENGLISH of Zhongguo Hangtian (Aerospace China) (China), n190 p13-16, Feb 94; In English; Translated by SCITRAN, Inc.
Contract(s)/Grant(s): F33657-84-D-0165
Report No.(s): AD-A315033; NAIC-ID(RS)T-0182-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
What is discussed here is not only the development of space technology itself or scientific and technical questions due to the development of technology which need solving. The emphasis is, however, on making a summary description of the accomplishments which have been achieved by space technology with regard to developments which it has promoted in other scientific fields.
DTIC
Aerodynamics; Aerospace Engineering

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CHEMISTRY AND MATERIALS

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

19970013547 Georgia Tech Research Inst., Atlanta, GA USA
Kinetics and Phase Equilibria in Supercritical Fluids for Advanced Fuel Composition and Use ***Final Report, 1 Sep. 1995 - 31 May 1996***
Eckert, Charles A., Georgia Inst. of Tech., USA; Dillow, Angela K., Georgia Inst. of Tech., USA; May 31, 1996; 37p; In English
Contract(s)/Grant(s): F49620-93-1-0214; AF Proj. 2303
Report No.(s): AD-A309971; AFOSR-TR-96-0269; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Fuels for advanced high performance aircraft engines will approach and traverse the critical region; therefore, the unique properties of supercritical fluid solvents on solubilities and reaction rates are applicable here. In the past years we have developed models for the prediction of various thermodynamic properties of compounds which are representative of fuel components and we have studied several reactions in supercritical fluids. The reactions studied in the past three years represent both fuel model

reactions and reactions which will provide an increased understanding of molecular level events in SCF reaction mixtures, such as local composition effects in ternary systems.
DTIC
Aircraft Engines; Fuels; Reaction Kinetics; Supercritical Fluids; Thermodynamic Properties

19970013753 Pratt and Whitney Aircraft, West Palm Beach, FL USA
Combustor LBO Design Model Evaluation ***Final Report, 11 Sep. 1987 - 31 May 1994***
Sturgess, G., Pratt and Whitney Aircraft, USA; May 01, 1995; 350p; In English
Contract(s)/Grant(s): F33615-87-C-2822; AF Proj. 3048
Report No.(s): AD-A308753; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Long-term goals of the Air Force are to develop high-performance gas turbine combustors, and the design systems that can produce them. One aspect of an advanced combustor design system is the ability to calculate flame stability under fuel-lean conditions. Towards satisfying this latter desire the program had three principal objectives: (1) design, conduct and analyze experiments that establish a fundamental understanding of lean blowout, (2) provide a data base for evaluating and refining computer models of gas turbine combustion, and, (3) devise a calculation procedure for lean blowout. Two laboratory and one rig-standard combustors were successfully designed, fabricated and operated. A novel procedure using excess nitrogen as a diluent for simulating subatmospheric pressures was calibrated and verified. The sequence of events leading to lean blowout was identified, and observed to be common in all the combustors. Advanced diagnostic techniques were applied to enhance understanding of blowout. Some advanced mathematical modeling was shown to be inadequate for calculating blowout. A hybrid calculation pr ocedure was devised that successfully modeled the influences on blowout of many important operating conditions and design variables. In this manner the program objectives were met.
DTIC
Design Analysis; Aircraft Engines; Combustion Chambers; Engine Design; Gas Turbine Engines; Flame Propagation; Combustion Stability

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.

19970013268 Virginia Polytechnic Inst. and State Univ., Center for Intelligent Material Systems and Structures, Blacksburg, VA USA
Electro-Mechanical Modeling of the Dynamics of Active Control Systems Based on an Impedance Approach ***Final Report, 1 Apr. 1993 - 31 Mar. 1996***
Lalande, Frederic, Virginia Polytechnic Inst. and State Univ., USA; Rogers, Craig A., Virginia Polytechnic Inst. and State Univ., USA; Mar. 31, 1996; 111p; In English
Contract(s)/Grant(s): F49620-93-1-0166
Report No.(s): AD-A311647; AFOSR-TR-96-0410; Rept-93-1-0166; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

In this fundamental research program, the focus was to develop an understanding of the physics of actively controlled material systems, especially the power consumption and energy transfer mechanisms. A new impedance approach was further developed, giving particular attention to applications involving structures with impedance characteristics similar to aircraft structures. This newly developed impedance approach has an advantage over conventional approaches, such as the quasi-static and equivalent thermal force approaches, in that it includes the dynamic interaction between the structure and the actuator. A comprehensive impedance model for plate and shell structures was completed. By taking into account the dynamic interaction between the base structure and the induced strain actuator, the impedance model can accurately predict the dynamic response of the base structure. The electro-mechanical impedance model for plate structures was then extended to determine the power consumption and actuator conversion energy efficiency. This later extension of the impedance model allows the optimization of the actuator parameters based on power considerations. Also, the temperature rise and resulting thermal stresses, which can be significant at resonant fre-

quencies, was investigated. Finally, the impedance approach was shown to be applicable to other types of actuators, namely magnetostrictive actuators and piezoelectric stack actuators.
DTIC
Energy Conversion Efficiency; Magnetostriction; Resonant Frequencies; Thermal Stresses; Energy Transfer; Aircraft Structures

19970013280 NASA Langley Research Center, Hampton, VA USA
Application of a Navier-Stokes Solver to the Analysis of Multielement Airfoils and Wings Using Multizonal Grid Techniques
Jones, Kenneth M., NASA Langley Research Center, USA; Biedron, Robert T., Analytical Services and Materials, Inc., USA; Whitlock, Mark, Stanford Univ., USA; Jun. 22, 1995; 26p; In English; 13th; Applied Aerodynamics, 19-22 Jun. 1995, Palo Alto, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA-TM-112005; NAS 1.15:112005; AIAA Paper 95-1855; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A computational study was performed to determine the predictive capability of a Reynolds averaged Navier-Stokes code (CFL3D) for two-dimensional and three-dimensional multielement high-lift systems. Three configurations were analyzed: a three-element airfoil, a wing with a full span flap and a wing with a partial span flap. In order to accurately model these complex geometries, two different multizonal structured grid techniques were employed. For the airfoil and full span wing configurations, a chimera or overset grid technique was used. The results of the airfoil analysis illustrated that although the absolute values of lift were somewhat in error, the code was able to predict reasonably well the variation with Reynolds number and flap position. The full span flap analysis demonstrated good agreement with experimental surface pressure data over the wing and flap. Multiblock patched grids were used to model the partial span flap wing. A modification to an existing patched- grid algorithm was required to analyze the configuration as modeled. Comparisons with experimental data were very good, indicating the applicability of the patched-grid technique to analyses of these complex geometries.
Author
Aerodynamic Configurations; Grid Generation (Mathematics); Structured Grids (Mathematics); Navier-Stokes Equation; Airfoils; Wing Flaps; Wings; Multiblock Grids

19970013350 McDonnell-Douglas Aerospace, Saint Louis, MO USA
Novel NDE Corrosion Detection: Nuclear Magnetic Resonance ***Final Report, 30 Sep. 1993 - 30 Nov. 1995***
Palmer, Donald D., McDonnell-Douglas Aerospace, USA; Snyderman, David M., Washington Univ., USA; Conradi, Mark S., Washington Univ., USA; Jan. 1996; 98p; In English
Contract(s)/Grant(s): F33615-93-C-5369; AF Proj. 2418
Report No.(s): AD-A309972; WL-TR-95-4094; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Nuclear magnetic resonance (NMR), a technique utilized extensively in the medical, chemical and petroleum industries, has shown to be very sensitive to corrosion and moisture entrapped in aircraft structures in cursory studies performed prior to this program. Both aluminum and hydrogen NMR techniques were evaluated relative to sensitivity to thin layers of corrosion on several aluminum alloys and a high strength steel. Other hydrogen-bearing aerospace materials were characterized to determine if discrimination between these materials and corrosion could be made relative to hydrogen NMR. RF magnetic field modelling was performed using two- and three-dimensional electromagnetic modelling codes to determine if RF magnetic fields could penetrate through gaps in joints and around fasteners. Actual RF magnetic field penetration was determined experimentally using simplified butt-joint, lap joint and fastener hole structures. The potential for detecting actual corrosion in these structures was also evaluated experimentally. In addition, the ability to detect corrosion under paint, primer and sealant was determined. Recommendations for future work relative to NMR as an inspection tool for detection and characterization of corrosion are included.
DTIC
Aluminum Alloys; Nuclear Magnetic Resonance; Nondestructive Tests; Corrosion; Spin-Lattice Relaxation; Aircraft Maintenance; Inspection; Aircraft Structures; High Strength Steels; Magnetic Fields; Corrosion Tests

19970013544 Purdue Univ., School of Mechanical Engineering, West Lafayette, IN USA
Bladed Disk Forced Response Augmentation for Research Training (AASERT) ***Final Report, 15 Aug. 1994 - 14 Aug 1995***
Fleeter, Sanford, Purdue Univ., USA; Oct. 1995; 12p; In English
Contract(s)/Grant(s): F49620-92-J-0315
Report No.(s): AD-A309956; AFOSR-TR-96-0282; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two AASERT students have actively participated in research in turbomachinery fluid dynamics and bladed disk forced response. The academic programs of the AASERT students were individually tailored. One AASERT student investigated nonlin-

ear friction dampers for control of blade row aero-mechanics. The energy balance, harmonic balance, and time integration solution methods were applied to an unstable aero-mechanical model thereby requiring a dry friction damper for stability. The results showed that the linearized harmonic and energy balance solutions can be used in preliminary design or as first guesses for nonlinear methods. The second AASERT student experimentally investigated the fundamental unsteady flow interaction phenomena significant to forced response and unsteady turbine heat transfer. The technical approach involved a series of experiments performed in a low speed research turbine. The rotor blade wake generated unsteady flow field, i.e., the unsteady forcing function, were measured over a range of turbine steady aerodynamic loading conditions. In addition, the unsteady heat transfer to the stator vane row was measured.
DTIC
Aerodynamic Loads; Flow Distribution; Fluid Dynamics; Turbomachinery; Turbulent Heat Transfer; Unsteady Flow; Wakes

19970013584 Department of the Navy, Washington, DC USA
Apparatus and Method for Predicting Flow Characteristics
Huyer, Stephen A., Inventor, Department of the Navy, USA; Grant, John R., Inventor, Department of the Navy, USA; Uhlman, James S., Inventor, Department of the Navy, USA; Aug. 13, 1996; 14p; In English
Patent Info.: Filed 20 Jul. 1995; US-Patent-Appl-SN-506583; US-Patent-5,544,524
Report No.(s): AD-D018243; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method and apparatus for predicting flow over an object such as an airfoil or hydrofoil is disscussed. The vortex strength for each of a plurality of vortex segments is obtained over an area of interest. The vortex segments are grouped into a series of square area defined by a series of boxes having different sizes. Initially a vortex strength is established for each of the smallest boxes and the coefficients then provide characteristic vortex strengths for a given box. The conversion of these vortex strengths into velocities is accomplished by directly computing the velocity of a given vorticity segment as influenced by all the vorticity segments in the box containing the given vorticity segment and the direct influence of each vortex segment in that box and any neighboring boxes. The influence of other vorticity segments outside the neighboring boxes is provided by using the influence of the average vortex strength of a given box or group of boxes. This approach significantly reduces the number of computations required to obtain the prediction.
DTIC
Flow Characteristics; Computational Fluid Dynamics; Airfoils; Hydrofoils; Vortices

19970013585 Department of the Navy, Washington, DC USA
Drag Reducing Rapid Solvating Slurry Concentrate and Preparation
Supcoe, Robert F., Inventor, Department of the Navy, USA; Felsen, Ira M., Inventor, Department of the Navy, USA; Donahue, William T., Inventor, Department of the Navy, USA; Sep. 03, 1996; 4p; In English
Patent Info.: Filed 26 Aug. 1974; US-Patent-Appl-SN-500428; US-Patent-5,552,456
Report No.(s): AD-D018237; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The invention relates to a gel used as a drag reducing slurry. The slurry is stored aboard a vessel and is pumped into the region of laminar flow adjacent the vessel to reduce drag. The slurry is a thixotropic media composed of a surfactant coating the individual particles of drag reducing polymer resin as well as an anionic surfactant and a carrier liquid. The slurry forms a micelle structure and thus has an extremely long shelf life.
DTIC
Coating; Drag Reduction; Gels; Laminar Flow; Surfactants; Aerodynamic Drag

19970013658 NASA Langley Research Center, Hampton, VA USA
Compression Response of a Sandwich Fuselage Keel Panel With and Without Damage
McGowan, David M., NASA Langley Research Center, USA; Ambur, Damodar R., NASA Langley Research Center, USA; Feb. 1997; 36p; In English; 6th; Advanced Composites Technology, 7-11 Aug. 1995, Anaheim, CA, USA; Sponsored by Department of Defense, USA
Contract(s)/Grant(s): RTOP 538-10-11-05
Report No.(s): NASA-TM-110302; NAS 1.15:110302; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results are presented from an experimental and analytical study of a sandwich fuselage keel panel with and without damage. The fuselage keel panel is constructed of graphite-epoxy skins bonded to a honeycomb core, and is representative of a highly loaded fuselage keel structure. The face sheets of the panel contain several terminated or dropped plies along the length of the panel. The results presented provide a better understanding of the load distribution in damaged and undamaged thick-face-sheet composite sandwich structure with dropped plies and of the failure mechanisms of such structure in the presence of low-speed

impact damage and discrete-source damage. The impact-damage condition studied corresponds to barely visible impact damage (BVID), and the discrete-source damage condition studied is a notch machined through both face sheets. Results are presented from an impact-damage screening study conducted on another panel of the same design to determine the impact energy necessary to inflict BVID on the panel. Results are presented from compression tests of the panel in three conditions: undamaged; BVID in two locations; and BVID in two locations and a notch through both face sheets. Surface strains in the face sheets of the undamaged panel and the notched panel obtained experimentally are compared with finite element analysis results. The experimental and analytical results suggest that for the damage conditions studied, discrete-source damage influences the structural performance more than BVID.
Author
Sandwich Structures; Graphite-Epoxy Composites; Composite Structures; Finite Element Method; Fuselages; Honeycomb Cores; Impact Damage

19970013665 NASA Lewis Research Center, Cleveland, OH USA
Designing for Maintainability and System Availability
Lalli, Vincent R., NASA Lewis Research Center, USA; Packard, Michael H., Raytheon Co., USA; Feb. 1997; 18p; In English; Product Quality and Integrity, 13-16 Jan. 1997, Philadelphia, PA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS3-26764; RTOP 323-93-03
Report No.(s): NASA-TM-107398; E-10603; NAS 1.15:107398; IEEE-155NO897-5000; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The final goal for a delivered system (whether a car, aircraft, avionics box or computer) should be its availability to operate and perform its intended function over its expected design life. Hence, in designing a system, we cannot think in terms of delivering the system and just walking away. The system supplier needs to provide support throughout the operating life of the product. Here, supportability requires an effective combination of reliability, maintainability, logistics and operations engineering (as well as safety engineering) to have a system that is available for its intended use throughout its designated mission lifetime. Maintainability is a key driving element in the effective support and upkeep of the system as well as providing the ability to modify and upgrade the system throughout its lifetime. This paper then, will concentrate on maintainability and its integration into the system engineering and design process. The topics to be covered include elements of maintainability, the total cost of ownership, how system availability, maintenance and logistics costs and spare parts cost effect the overall program costs. System analysis and maintainability will show how maintainability fits into the overall systems approach to project development. Maintainability processes and documents will focus on how maintainability is to be performed and what documents are typically generated for a large scale program. Maintainability analysis shows how trade-offs can be performed for various alternative components. The conclusions summarize the paper and are followed by specific problems for hands-on training.
Author
Avionics; Logistics; Maintainability; Reliability; Service Life

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GEOSCIENCES

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

19970013671 Metrica, Inc., San Antonio, TX USA
The Use of Weather Information in Aeronautical Decision-Making
Driskill, Walter E., Metrica, Inc., USA; Weissmuller, Johnny J., Metrica, Inc., USA; Quebe, John, Metrica, Inc., USA; Hand, Darryl K., Metrica, Inc., USA; Dittmar, Martin J., Metrica, Inc., USA; Hunter, David R., Federal Aviation Administration, USA; Feb. 1997; 70p; In English
Report No.(s): DOT/FAA/AM-97/3; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An investigation was conducted of the values or worth functions pilots attribute to weather and terrain variables in making decision about flight in a single-engine aircraft under visual flight rules. The research employed a scenario-based judgment task designed to elicit pilot worth functions for visibility, ceiling, precipitation, and terrain features (specifically, flight over flat terrain, mountainous terrain, and over water). Subjects were asked to consider a proposed cross-country flight of approximately one hour duration over each of the three terrain conditions. They were then given a deck of cards describing various combinations of ceiling, visibility, and precipitation and asked to first rank order the cards in descending order of comfort with flying under the described

conditions over the specified terrain and then to assign a numerical rating to each card using a scale of 0 (least comfortable) to 100 (most comfortable). For each subject a linear model was constructed using the comfort ratings as the dependent variable and the visibility, ceiling, and terrain values as the independent variables. A separate linear model was constructed for each subject for each of the three terrain conditions. The regression weights associated with each terrain type were then subjected to hierarchical clustering to identify groups of weight sets differing significantly with respect to worth function emphasis. Examination of the clusters indicated that pilots could be reliably grouped into four groups for the flat and mountainous terrain scenarios and two groups for the over-water scenario. These clusters are characterized primarily by the average degree of comfort which the subjects expressed in flying under the conditions described, by the nature of their efficiency of utilization of information (multiplicative models compared to simpler single variable models), and demographic characteristics such as age and aircraft ownership.
Author
Visual Flight Rules; Aircraft Pilots; Decision Making; Weather; Flight Safety; Flight Conditions; Mathematical Models; Single Engine Aircraft

14
LIFE SCIENCES

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

19970013233 Army Aeromedical Research Lab., Fort Rucker, AL USA
Leaders Guide to Crew Endurance
Comperatore, Carlos A., Army Aeromedical Research Lab., USA; Caldwell, John A., Army Aeromedical Research Lab., USA; Caldwell, J. Lynn, Army Aeromedical Research Lab., USA; Jul. 1996; 53p; In English
Report No.(s): AD-A314781; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This leader's guide is about enabling soldiers to perform at their best by controlling Stress, fatigue, sleep deprivation, and problems resulting from jet lag and shift lag. It is also about controlling the hazards associated with these stressors when they cannot be completely eliminated. Key users including Mission planners who must design missions in ways that optimize soldier performance. Army and unit trainers who must teach leaders about the deleterious effects of these stressors on soldier performance and how to use risk management to prevent and control the hazards they cause. Safety managers who must design and maintain the programs. Crew endurance impacts everything soldiers do. In nearly every case, the stressor reduces the soldier's mental or physical performance. For aviators, this means a larger part of their mental resources must be committed to operating the aircraft, leaving less resources to fight the enemy. For the planner and maintainer, it means less resources available for dealing with the important details of their critical tasks. Controlling these decrements in performance is critical to mission effectiveness. Today's aviation equipment requires more alertness and concentration of aviators and maintainers than ever before. The demand on mental resources, coupled with the Army's 'We own the night' philosophy, increases the potential for crew endurance related problems.
DTIC
Aircraft Pilots; Alertness; Hazards; Mental Performance

19970013541 Army Aeromedical Research Lab., Aircrew Health and Performance Div., Fort Rucker, AL USA
Female and Male Aviators are not Affected Differently by Sleep Deprivation and Continuous Task Demands ***Final Report***
Caldwell, John A., Jr., Army Aeromedical Research Lab., USA; Caldwell, J. L., Army Aeromedical Research Lab., USA; Jun. 1996; 25p; In English
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-879
Report No.(s): AD-A311655; USAARL-96-28; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent changes in U.S. military regulations have brought about the assignment of female aviators to combat roles. This has been the topic of serious debate, but there are few facts concerning differences between males' and females' abilities to withstand combat-relevant stressors. This study was conducted to determine whether there are gender differences in responses to a common operational stressor, sleep deprivation. Six male and six female UH-60 helicopter pilots were exposed to a 40-hour period of continuous wakefulness and tested on flight performance and mood. The flight performance results indicated that gender produced virtually no operationally significant differences in the effects of sleep loss. Furthermore, although mood evaluations showed that women felt less tense and more energetic overall than their male counterparts, there were no interactions between sleep deprivation and gender. Thus, male and female aviators appear equally capable of performing flight-related tasks despite moderate sleep loss.
DTIC
Sleep Deprivation; Aircraft Pilots; Sex Factor; Human Performance; Wakefulness

19970013637 Ohio State Univ., Columbus, OH USA

A New Approach to Aeronautical Decision-Making: The Expertise Method ***Final Report***

Kochan, Janeen A., Ohio State Univ., USA; Jensen, Richard S., Ohio State Univ., USA; Chubb, Gerald P., Ohio State Univ., USA; Hunter, David R., Federal Aviation Administration, USA; Mar. 1997; 50p; In English

Contract(s)/Grant(s): DTFA01-93-C-00041; DTFA01-92-C-10204

Report No.(s): DOT/FAA/AM-97/6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Four studies of pilot decision-making were conducted to formulate a general model of the expert pilot that might be applied to novice pilots in order to increase their decision-making skills and reduce their risk of accident involvement. This set of studies began with a series of unstructured interviews of pilots to identify and compile characteristics of the pilot. Each succeeding study, then, became more structured in its approach as the characteristics of an expert pilot were more closely defined. From structured interviews conducted as part of the second study, a preliminary definition was obtained that stressed motivation, confidence, superior learning and performance skills, and an intuitive decision-making style. The third study evaluated these characteristics as they were possessed by pilots of three types of relatively high-performance general aviation aircraft. In the final study, experienced pilots were presented with a plausible general aviation flight scenario using a verbal protocol methodology. The responses of the pilots to this table-top simulation were recorded and analyzed. These data suggest that, when compared to competent pilots, expert pilots tend to (1) seek more quality information in a more timely manner; (2) make more progressive decisions to solve problems; and, (3) communicate more readily with all available resources.

Author

Decision Making; Aircraft Performance; Aircraft Pilots; General Aviation Aircraft

19970013670 Civil Aeromedical Inst., Oklahoma City, OK USA

Effects of Simulated General Aviation Altitude Hypoxia on Smokers and Nonsmokers ***Final Report***

Nesthus, Thomas E., Civil Aeromedical Inst., USA; Garner, Robert P., Civil Aeromedical Inst., USA; Mills, Scott H., Civil Aeromedical Inst., USA; Wise, Robert A., OMNI Corp., USA; Mar. 1997; 78p; In English

Report No.(s): DOT/FAA/AM-97/7; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

General aviation pilots are permitted to fly without the use of supplemental oxygen up to an altitude of 12,500 ft. However, hypoxia occurs at altitudes under 12,500 ft, Personal lifestyle, physical conditioning, and illness can interact with hypoxia to affect performance. This study evaluated physiological and cognitive performance of smokers and nonsmokers during sessions of mild hypoxia. Nine male smokers and 9 nonsmokers, after passing a Class 3 flight physical, performed the Multi-Attribute Task Battery (MATB) during separate 2-hr. sessions while breathing oxygen mixtures that simulated sea level, 5,000 ft., 8,000 ft., and 12,500 ft. altitude conditions. RESULTS: Four physiological measures: transcutaneous partial pressures of oxygen and carbon dioxide (P(sub tc)O2 and P(sub tc)CO2), heart rate (HR), and oxyhemoglobin saturation (SaO2), demonstrated significant trends across the simulated altitude conditions and for some measures, between groups. Significant effects were found for MATB monitoring task measures. Smoking group and group by altitude interaction effects were also found for the monitoring task measures. Significant smoking group differences were found in tracking performance. Results of the physiological measures obtained, confirmed the study's targeted levels of hypoxia. Smokers exhibited elevated HR and lower P(sub tc)CO2 values, compared with nonsmokers. Elevated HR is consistent with nicotine effects. Reduced P(sub tc)CO2 values may indicate greater hyperventilation among the smokers. Group differences in MATB performance involved tasks that were adjacent to the attention demanding fuel management task for which performance results were the same. Consistent with smoking research and studies of combined lowered oxygen tension and carbon monoxide, smokers may have experienced a reduction of peripheral vision and their ability to visually monitor several tasks simultaneously. The smoker group exhibited higher error rates and false alarms for the peripherally-located monitoring tasks, and showed significantly poorer tracking task performance, compared to the nonsmoker group.

Author (revised)

General Aviation Aircraft; Pilots (Personnel); Carbon Monoxide; Human Performance; Hyperventilation; Hypoxia; Oxygen Tension; Oxyhemoglobin

19970013672 Civil Aeromedical Inst., Oklahoma City, OK USA

Inflight Medical Care: An Update

DeJohn, Charles A., Civil Aeromedical Inst., USA; Veronneau, Stephen J. H., Civil Aeromedical Inst., USA; Hordinsky, Jerry R., Civil Aeromedical Inst., USA; Feb. 1997; 16p; In English

Report No.(s): DOT/FAA/AM-97/2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A major concern in aviation medicine is the cabin inflight emergency that may result in the diversion of a flight. At the present time there is no convenient way to monitor the incidence of inflight medical emergencies because airline companies are not regularly required to report medical emergencies or resulting diversions. A survey of one major US airline revealed that one out of

every one million passengers may be deplaned by an unscheduled landing because of a life-threatening medical emergency. During a two-year FAA survey of US domestic flights there were 2,322 inflight medical emergencies, averaging approximately three per day, which resulted in an annual diversion rate of approximately 9%. In a 1989 study, inflight emergencies among arriving passengers at the Los Angeles International airport were analyzed. During the six-month period of the investigation 0.003% of 8.5 million passengers developed symptoms in flight that required follow-up assistance on the ground, and 10% of these passengers required hospitalization. A survey of the status of inflight medical care aboard domestic US air carriers was undertaken to determine the impact of current changes in the airline industry. Information for the years 1990 to 1993 was obtained from two airlines and two inflight medical care delivery companies, representing a total of nine major US Part 121 air carriers. This sample accounted for approximately 65% of US domestic air carrier activity for the period 1990 to 1993. The information was reviewed to determine which category of inflight medical emergency occurred most frequently and which category accounted for the greatest number of diversions. The trend in the frequency of diversions for medical reasons was also assessed. The impact of inflight medical advice was then evaluated by comparing the number of diversions that resulted in hospitalizations to the number that did not. Our findings show that neurological, syncopal, and cardiac episodes respectively, were the most frequent categories of medical emergencies encountered inflight, while cardiac, neurological, and respiratory events, in that order, accounted for the most diversions. However, obstetrical-gynecological, cardiac, and neurological cases had the greatest probability of diverting. The diversion rate, expressed as a ratio of diversions to emergencies or diversions to enplanements, remained fairly constant. It appeared that flight crews complied with medical advice in 97% of cases, and diversions resulted in hospital admissions 86% of the time. Renewed interest in the problems of inflight medical care delivery from all segments of the air carrier industry and government has led to a great deal of research into the medical problems of patients flying with a variety of health problems. Several organizations are evaluating the inflight medical kit and its impact on medical care delivery inflight. Recently, the Air Transport Association and the FAA's Office of Aviation Medicine have independently formed working groups to investigate this topic. This increased level of interest should result in greater cooperation within the aviation industry and a deeper understanding of all aspects of the problem.
Author
Emergencies; Medical Services; Air Transportation; Commercial Aircraft; Passengers; Aerospace Medicine

19970013679 Institute for Human Factors TNO, Soesterberg, Netherlands
Physiological Workload Reactions to Increasing Levels of Task Difficulty
Veltman, J. A., Institute for Human Factors TNO, Netherlands; Gaillard, A. W. K., Institute for Human Factors TNO, Netherlands; Jun. 21, 1996; 32p; In English
Report No.(s): AD-A311411; TNO-TM-96-A026; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The sensitivity of physiological measures to mental workload has been investigated in a flight simulator. Twelve pilots had to fly through a tunnel with different Levels of difficulty. Additionally, they had to perform a memory task with four levels of difficulty. The easiest memory task was combined with the easiest tunnel task and the most difficult memory task with the most difficult tunnel task. Between each tunnel session, subjects had to fly a pursuit task in which a target jet had to be followed at a large distance. Rest periods before and after the experiment were used as a baseline for the physiological measures. Mental workload was measured with heart period, continuous blood pressure, respiration and eye blinks. Heart rate variability, blood pressure variability and the gain between systolic blood pressure and heart period (modulus) was derived from the measures. All measures showed differences between rest and flight, and between the pursuit task and the tunnel task. Only heart period was sensitive to the different levels of the tunnel. Heart rate variability is affected by respiration, and therefore, can only be interpreted together with the respiratory data. The modulus was hardly influenced by respiration and therefore, appears to be a better measure than heart rate variability. From the respiratory parameters, the duration of a respiratory cycle was the most sensitive to changes in workload. The time in between two successive eye blinks (blink interval) increased and the blink duration decreased as more visual information had to be processed. Increasing the difficulty of the memory task leaded to a decrement in blink interval, probably caused by subvocal activity during the rehearsal of the letters. Blink duration was not influenced by the memory load.
DTIC
Workloads (Psychophysiology); Flight Simulators; Aircraft Pilots; Physiological Responses; Task Complexity; Mental Performance; Stress (Physiology); Memory

19970013680 Institute for Human Factors TNO, Soesterberg, Netherlands
Predictive Information in the Cockpit as a Target Acquisition Aid ***Final Report Helpt Predictie-Infornatie in de Cockpit bij het Opsporen van Doelvliegtuigen***
vanBreda, L., Institute for Human Factors TNO, Netherlands; Veltman, J. A., Institute for Human Factors TNO, Netherlands; May 06, 1996; 32p; In Dutch

Report No.(s): AD-A311427; TNO-TM-96-A021; TDCK-RP-96-0155; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Under contract to the Royal Netherlands Airforce, the TNO Human Factors Research Institute conducts background research concerning effects of advanced interface principles in the cockpit on flight performance, (des)orientation and workload. In this connection, a simulator experiment was conducted to investigate the potential benefits of predictive information for tracking targets. Eight fighter pilots had to trace as soon as possible a target aircraft, initially flying from an arbitrary position at a fixed distance from the own aircraft. During the search of the target aircraft, the pilots received visual support by a perspective excentric radar display with inside-out motion reference. In two experimental conditions, additional predictive graphics information was presented: based on extrapolation of translations of own aircraft and target aircraft, and based on translation and pitch. The difficulty of the scenarios was varied by directing the target towards and away from the observatory. The experimental results show that pilots were not able to find the target faster when additional predictive information was presented in the radar image. The perspective radar display offered so many anticipation possibilities that no increase of target search time was possible. There even appeared a tendency to decreased search performance. This may be caused by the fact that too much information deteriorated the interpretation (display clutter). A follow-up study is proposed, investigating whether the situational awareness of the pilot still can be increased. The results of the ongoing experiments suggest that inside-out referenced displays cause more frequent controlled flight into ground.

DTIC

Aircraft Pilots; Target Acquisition; Workloads (Psychophysiology); Human Factors Engineering; Flight Control; Cockpits; Flight Characteristics; Radar Tracking; Fighter Aircraft

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.

19970013604 Science Applications International Corp., Torrance, CA USA

An Integrated Thermal Management Analysis Tool

Issacci, F., Science Applications International Corp., USA; Farr, J. L., Jr., Science Applications International Corp., USA; Wassel, A. T., Science Applications International Corp., USA; Griethuysen, V. Van, Wright Lab., USA; 1996 JANNAF Propulsion Meeting; Dec. 1996; Volume 1, pp. 173-182; In English; Also announced as 19970013589; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC, Hardcopy, Microfiche

A thermal management computational tool, developed to perform subsystem and system integrated thermal management assessment and design calculations, is described in this paper. The Vehicle Integrated Thermal Management Analysis Code (VITMAC) simulates the coupled thermal-fluid response of aircraft airframe/engine active cooling circuits, airframe/engine structural components, and fuel tanks subject to aeroheating and thermal/engine heat loads. VITMAC simulates both the steady-state and transient thermal hydraulics along coolant flow paths, and provides the distribution of mass flow rate, pressure, and temperature, together with the temperature of surrounding airframe/engine structures. A graphical user interface which enables the user to quickly construct and analyze thermal management systems has also been incorporated into VITMAC. Sample calculations are presented, illustrating selected code features. These examples demonstrate the analysis of cooling network concepts for: (1) aircraft and engine thermal management, (2) airplane fuel cooling systems, and (3) satellite thermal management and control. The examples also illustrate the interaction between cooling loops via heat exchangers, and the use of performance maps in the evaluation of component characteristics.

Author

Engine Airframe Integration; Applications Programs (Computers); Temperature Control; Structural Members; Fuel Tanks; Graphical User Interface; Aircraft Design; Spacecraft Design; Management Analysis; Temperature Effects

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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.

19970013748 NASA Langley Research Center, Hampton, VA USA
NASA/DOD Aerospace Knowledge Diffusion Research Project. Paper 59: Japanese Technological Innovation. Implications for Large Commercial Aircraft and Knowledge Diffusion
Pinelli, Thomas E., NASA Langley Research Center, USA; Barclay, Rebecca O., Knowledge Management Associates, USA; Kotler, Mindy L., Japanese Information Access Project, USA; 1997; 36p; In English; 37th; International Studies Association, 18-22 Mar. 1997, Toronto, Canada
Report No.(s): NASA-TM-112428; NAS 1.15:112428; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper explores three factors-public policy, the Japanese (national) innovation system, and knowledge-that influence technological innovation in Japan. to establish a context for the paper, we examine Japanese culture and the U.S. and Japanese patent systems in the background section. A brief history of the Japanese aircraft industry as a source of knowledge and technology for other industries is presented. Japanese and U.S. alliances and linkages in three sectors-biotechnology, semiconductors, and large commercial aircraft (LCA)-and the importation, absorption, and diffusion of knowledge and technology are examined next. The paper closes with implications for diffusing knowledge and technology, U.S. public policy, and LCA.
Author
Japan; Policies; Economic Development; Industries; Technology Utilization; Biotechnology; Commercial Aircraft; Semiconductors (Materials); Cultural Resources; Histories; International Relations

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GENERAL

19970013645 Federal Aviation Administration, Washington, DC USA
1997 Federal Aviation Administration Plan for Research, Engineering, and Development
Jan. 1997; 230p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The 1997 Research, Engineering and Development (R,E&D) Plan contains programs that are active in calendar year 1997 and beyond. They were chosen to bring FAA's vision of the future system to reality in the mission areas of efficiency, safety, security, capacity, and environment. The R,E&D milestones included in this Plan are based on projected funding levels during a 5-year planning horizon and cover the following programs: capacity and air traffic management technology; communications, navigation, and surveillance; weather; airport technology; aircraft safety technology; system security technology; human factors and aviation medicine; and the environment and energy.
CASI
Research and Development; Systems Engineering; Aircraft Safety; National Airspace Utilization System; Navigation Aids; Air Traffic Control

Subject Term Index

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Report Documentation Page

1. Report No. NASA SP-7037 (348)	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Aeronautical Engineering A Continuing Bibliography (Supplement 348)		5. Report Date May 16, 1997 6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No. 10. Work Unit No.
9. Performing Organization Name and Address NASA Scientific and Technical Information Program Office		11. Contract or Grant No.
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Langley Research Center Hampton, VA 23681		13. Type of Report and Period Covered Special Publication 14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

This report lists reports, articles and other documents recently announced in the NASA STI Database.

17. Key Words (Suggested by Author(s)) Aeronautical Engineering Aeronautics Bibliographies	18. Distribution Statement Unclassified – Unlimited Subject Category – 01

19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 40	22. Price A03/HC

For sale by the NASA Center for AeroSpace Information, 800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934