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19960042824 Advisory Group for Aerospace Research and Development, Missions Systems Panel., Neuilly-Sur-Seine, France

System Implications and Innovative Applications of Satellite Navigation *Les Applications Nouvelles Offertes par la Navigation par Satellite et Leurs Incidences au Niveau Systemes*

Jun. 1996, 168p; In English, 1-2 Jul. 1996, Paris, Rome, Madrid, Saint Petersburg, France, Italy, Spain, Russia; Also announced as 19960042825 through 19960042834

Report No.(s): AGARD-LS-207; ISBN-92-836-1038-5; Copyright Waived; Avail: CASI; A08 Hardcopy; A02 Microfiche

The Global Positioning Satellite System (GPS) is now operational and GLONASS will soon be declared operational. Meanwhile, INMARSAT has announced its intent to expand its services to include navigation signals broadcast from geostationary satellites, and several industrial organizations plan to provide commercial, satellite-based, navigation services. With prospects for reliable worldwide service becoming a reality, the technical and financial barriers to innovative applications are being overcome. This Lecture Series will provide an appreciation of the technical, operational and performance features of satellite-based navigation including the signal-in-space and the user equipment for GPS, GLONASS, and integrated GPS/GLONASS implementations; assessment of the quality of service that has been achieved and an introduction to projected service enhancements. The introductory lecture will provide an overview of Satellite based navigation and some of the imaginative uses to which it has already been put. The application of satellite signals to precision approach and landing for civil aviation and for the determination of vehicle attitude (orientation) will be featured in the following lectures. Other topics include quality moni-

toring of user's navigation solutions, the integration of satellite navigation with inertial measurements and high-precision relative and differential positioning. This Lecture Series, sponsored by the Mission Systems Panel of AGARD, has been implemented by the Consultant and Exchange Program. Author

Lectures; Global Positioning System; GLONASS; Inmarsat Satellites; Geosynchronous Orbits; Satellite Constellations; Civil Aviation; Navigation Satellites; Accuracy; Position (Location)

19960045365 Advisory Group for Aerospace Research and Development, Aerospace Medical Panel, Neuilly-Sur-Seine, France

Anthropomorphic Dummies for Crash and Escape System Testing *Mannequins Anthropometriques Utilises Lors des Tests d'Impact et d'Ejection*

Jul. 1996, 120p; In English

Report No.(s): AGARD-AR-330; ISBN-92-836-1039-3; Copyright Waived; Avail: CASI; A06 Hardcopy; A02 Microfiche

Anthropomorphic dummies for crash and escape system testing have been used by military and civilian agencies for many years to assess, develop and standardize safer occupant restraint systems for land and air vehicles. The automotive industry has spent considerable effort in designing crash test dummies that are biofidelic; i.e., dummies that duplicate the properties of a representative human subject on which injury risk is to be assessed. This advisory report addresses the status and direction of the technology of aircraft ejection and automotive crash test dummies from the point of view of the following: historical review of important dummies developed in NATO; human biomechanical response requirements of current adult dummies; anthropometry of current adult dummies;

injury tolerance criteria for impact exposure of these dummies; dummy instrumentation and data acquisition systems; new developments in dummies; mathematical models as human surrogates; and dummy users in NATO. Recommendations include the need for the following: relating aircraft system effectiveness testing to dummy injury criteria; full line of dummy sizes to accommodate entire flying population; enhanced dummy instrumentation and data acquisition systems; affordability of dummy acquisition, use and maintenance; and validation and increased use of mathematical models as human surrogates.

Author

Dummies; Escape Systems; Crashes; Anthropometry; Safety Devices; Ejection Seats; Bionics; Test Equipment

19960047286 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Turbulent Boundary Layers in Subsonic and Supersonic Flow *Les couches limites turbulentes dans les écoulements subsoniques et supersoniques*

Saric, William S., Editor, Arizona State Univ., USA; Dussauge, J. P., Institut de Recherche sur les Phenomenes Hors d'Equilibre, France; Smith, R. W., Applied Research Labs., USA; Smits, A. J., Princeton Univ., USA; Fernholz, H., Technische Hochschule, Germany; Finley, P. J., Imperial Coll. of Science and Technology, UK; Spina, Eric F., Syracuse Univ., USA; Jul. 1996, 84p; In English
Report No.(s): AGARD-AG-335; ISBN-92-836-1040-7; Copyright Waived; Avail: CASI; A05 Hardcopy; A01 Microfiche

Current research on the structure of zero pressure gradient, flat plate turbulent boundary layers is reviewed. The behavior of boundary layers in subsonic and supersonic flow is discussed, with a particular emphasis on scaling laws with respect to Reynolds number and Mach number. For subsonic flows, it is shown that for the mean flow the classic arguments on inner and outer layer similarity hold extremely well over a large range of Reynolds numbers (approximately 350 less than or equal to $R(\text{sub } e(\theta))$ greater than or equal to 210,000), and the overlap region is well established over the same region. In contrast, the Reynolds number can have a significant effect on the level of the maximum turbulence stresses, and the location of that maximum in the boundary layer. In particular, the streamwise scaling of the outer-layer is rather sensitive, where the scale increases with the Reynolds number. For supersonic flows with moderate Mach number, it appears that the direct effects of compressibility on wall turbulence are rather small: the most notable differences between subsonic and supersonic boundary layers may be attributed to the variation in fluid properties across the layer. However, certain characteristics cannot be collapsed by simple scaling. Among other observations, there exists strong

evidence to indicate that the streamwise length scales are reduced significantly by increasing Mach number.

Author

Subsonic Flow; Supersonic Flow; Turbulent Boundary Layer; Scaling Laws; Reynolds Number; Mach Number

19960047377 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Twenty-five years of contributions to air traffic handling (research, development, operations and history): A bibliography *Vingt-cinq annees de contributions au controle du trafic aerien (recherches, developpement, operations et historique): une bibliographie*

Benoit, Andre, Editor, European Organization for the Safety of Air Navigation, Belgium; Feb. 1996, 157p; In English
Report No.(s): AD-A305389; AGARD-R-811; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)) Microfiche

The Air Traffic Control Community has appreciated the quality and value of the forum offered by AGARD and continuously supported the related activities. No conferences or organizations, and that includes those in the US, have equalled these AGARD meetings in bringing together the world's leaders in ATC research and in providing a venue for presenting original research papers of the highest technical quality. Unlike other ATC meetings I could name, here the tradition is technical depth, not superficial round table discussions by managers. The contributions of AGARD to the Handling of Air Traffic have been essentially generated by the Guidance and Control Panel, which since 1970 has sponsored five symposia (Edinburgh, Scotland, 1972; Cambridge, Mass. USA, 1975; Copenhagen, Denmark, 1979; Brussels, Belgium, June 1986; Berlin, Germany, October 1993), one specialists meeting (Lisbon, Portugal, 1982), one specialist mission (Rome, Italy, 1980), and three AGARDographs (1975, 1990, 1994) totalling twelve volumes, addressing most of the areas of this complex but challenging field. Automatic generation of control advisories remains a key issue and the question 'The air traffic controller facing automation: conflict or co-operation?' is still, even more than ever, very pertinent. Similar remarks apply to other issues raised 25 years ago, both for major concepts and subsystems options.

DTIC

Control Boards; Organizations; Air Traffic Control; Automatic Control; Bibliographies; Air Traffic Controllers (Personnel)

19960048697 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Tactical Aerospace C3I in Coming Years *Commandes, Pilotage, Communications, Renseignements Tactiques Aérospatiaux dans les Prochaines Annees*

Oct. 1995, 217p; In English; In French, 15-18 May 1995, Lisbon, Portugal; Limited Reproducibility: More than 20% of

this document may be affected by microfiche quality
Report No.(s): AD-A304301; AGARD-CP-557; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)) Microfiche

The conference brought together representatives from MODs, manufacturers and academics from most of the Alliance countries. It demonstrated that major C3I developments for air forces are underway, particularly in the USA (Theater Battle Management), in France (SCCOA) and at NATO (ACCS). These C3I systems combine all the real time (surveillance, air mission control), and deferred functions (force planning and management) at a very high level of complexity. In effect, they constitute 'system systems' and as such, justify the development of suitable methodologies. The problem is to organise, manage and control data flows between complex elements; tools are being developed around the programmes concerned. Quite the opposite to the top-down approach, the way in which commercially available hardware and software is integrated into C3I has been the subject of much discussion. Although interesting from the cost point of view, the use of off-the-shelf components presents a number of trade-off problems with regard to conformity to system specifications and invariably leads to a cost-efficiency analysis. From the technical point of view, the first applications of the real time fusion of complex data were presented: multiradar tracking, fusion of identification data, generation of situational displays with multiple aircraft and targets. A variety of methods were successfully applied. Finally, future developments will probably concentrate on: (1) the extensive use of digital data links, with a trend towards very wide bandwidths; (2) the real-time application of high resolution radar and optical sensors for observation of future theaters of operations; and (3) the introduction of decision making aids for ops. planning and air mission preparation.

DTIC

Communication; Command and Control; Image Processing; Radar Tracking; Surveillance; Optical Measuring Instruments; Digital Data; Cost Effectiveness

19960052861 Advisory Group for Aerospace Research and Development, Structures and Materials Panel, Neuilly-Sur-Seine, France

Structures and materials panel working group 27 on evaluation of loads from operational flight maneuvers

Apr. 1996, 124p; In English

Report No.(s): AGARD-AR-340; Copyright Waived; Avail: CASI; A06 Hardcopy; A02 Microfiche

This AGARD Advisory Report describes an evaluation of a method to derive loads from operational flight maneuvers. The basic assumption of this method is that all operational maneuvers performed in service can be verified as a set of Standard Maneuvers (normalized parameter time histories for each independent maneuver type). The verification of Standard Maneuvers is based on recordings of relevant

maneuver parameters in service and for new tactics/missions on special flights or simulations. The initial evaluation of the concept done by the Working Group (WG.27) has demonstrated the feasibility of determining loads from operational flight maneuvers.

Author

Aircraft Maneuvers; F-16 Aircraft; Load Distribution (Forces); F-18 Aircraft; Flight Tests

19960053042 Advisory Group for Aerospace Research and Development, Mission Systems Panel, Neuilly-Sur-Seine, France

Technologies for Precision Air Strike Operations in Rapid-Reaction and Localized-Conflict Scenarios *Les Techniques pour les Operations Air-Sol dans les Situations de Conflits Localises et de Reactions Rapides*

Jun. 1996, 180p; In English; In French; 4th, 16-19 Oct. 1995, Seville, Spain; Also announced as 19960053043 through 19960053058

Report No.(s): AGARD-CP-576; ISBN-92-836-0028-2; Copyright Waived; Avail: CASI; A09 Hardcopy; A02 Microfiche

This volume contains the Technical Evaluation Report and the 16 unclassified papers presented at the Mission Systems Panel Symposium held in Seville, Spain from 16-19 October 1995. Papers were presented covering the following headings: Operational Aspects; Mission Planning/Mission Management; Navigation; Reconnaissance and Target Identification; Targeting and Weapon Delivery Guidance.

Author

Conferences; Mission Planning; Weapons Delivery; Target Acquisition; Global Positioning System; Precision Guided Projectiles; Command and Control

19960053167 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Progress and Challenges in CFD Methods and Algorithms *Progres realises et defis en methodes et algorithmes (CFD)*

Apr. 1996, 454p; In English; In French; 77th; Fluid Dynamics Panel Symposium, 2-5 Oct. 1995, Seville, Spain; Also announced as 19960053168 through 19960053204; Original contains color illustrations

Report No.(s): AGARD-CP-578; ISBN-92-836-0026-6; Copyright Waived; Avail: CASI; A20 Hardcopy; A04 Microfiche

The papers prepared for the AGARD Fluid Dynamics Panel (FDP) Symposium on 'Progress and Challenges in Computational Fluid Dynamics (CFD) Methods and Algorithms', which was held 2-5 October 1995 in Seville, Spain are contained in this report. In addition, a Technical Evaluator's Report aimed at assessing the success of the Symposium in meeting its objectives, and an edited transcript of the General Discussion held at the end of the Symposium are also included. Papers presented during nine sessions addressed the

following subjects: - parallel computing; - advanced spatial discretization techniques; - unstructured, hybrid and overlapping grids; - adaptive meshes; - fast implicit and iterative solvers; - large eddy and direct numerical simulations of turbulent flows; - chemically reacting flows; - unsteady aerodynamics. Author

Algorithms; Computational Fluid Dynamics; Conferences; Parallel Processing (Computers); Computational Grids; Vortices; Navier-Stokes Equation

19960053795 Advisory Group for Aerospace Research and Development, Aerospace Medical Panel, Neuilly-Sur-Seine, France

Neurological Limitations of Aircraft Operations: Human Performance Implications *Les Limitations Neurologiques des Operations Aeriennes: Les Consequences pour les Performances des Equipages*

Neurological Limitations of Aircraft Operations: Human Performance Implications; Apr. 1996, 316p; In English; In French, 9-12 Oct. 1995, Cologne, Germany; Sponsored by Advisory Group for Aerospace Research and Development, France; Also announced as 19960053796 through 19960053827

Report No.(s): AGARD-CP-579; ISBN-92-836-0027-4; No Copyright; Avail: CASI; A14 Hardcopy; A03 Microfiche

These proceedings include the Technical Evaluation Report, three Keynote Addresses, 33 solicited papers and four special session papers of the Symposium sponsored by the AGARD Aerospace Medical Panel and held at the Deutsche Forschungsanstalt für Luft- und Raumfahrt, Linder Höhe, Cologne, GE from 9-12 October 1995. NATO air operations in the future will have improved capabilities for mobility, flexibility, rapid augmentation and situation awareness. The rapid changes and sophisticated innovations taking place in technology imply that air warfare will become more knowledge intensive and, accordingly, more dependent on a well conditioned nervous system. Advancements in technology are also driving air and the concomitant support operations into the outer limits of human mental and physical endurance. There is also the requirement of doing more work with fewer resources. The purpose of this Symposium was to address some of the factors that impose limitations on the nervous system, and to consider the practical challenges for enhancing neurological performance in such operational conditions as described above. The papers addressed neurological limitations imposed by: (1) the Gz environment; (2) the hypoxia environment; (3) disease and trauma; (4) neurosensory limitations; (5) fatigue and sleepiness in workload; (6) stress effects; and (7) sustained operations. The practical challenges in enhancing neurological performance were addressed for: (1) heavy jet operations; (2) rotary wing operations; (3) air traffic control operations; and (4) ground and support operations. These proceedings will be of interest to those concerned with the health and safety of personnel in air and support opera-

tions, and the aerospace scientist wanting a review of relevant research in the field of air operations neuroscience.

Author

Warfare; Aerospace Medicine; Conferences; Flight Operations; Human Performance; Hypoxia; Nervous System; Neurology; Physical Fitness; Workloads (Psychophysiology)

19960054418 Advisory Group for Aerospace Research and Development, Propulsion and Energetics Panel, Neuilly-Sur-Seine, France

Advanced Aero-Engine Concepts and Controls *Les Concepts Avances et Les Commandes des Nouveaux Moteurs d'Avion*

Jun. 1996, 428p; In English; In French, 25-29 Sep. 1995, Seattle, WA, USA; Sponsored by Advisory Group for Aerospace Research and Development, France; Also announced as 19960054419 through 19960054454

Report No.(s): AGARD-CP-572; ISBN-92-836-0025-8; Copyright Waived; Avail: CASI; A19 Hardcopy; A04 Microfiche

The Propulsion and Energetics Panel Symposium on Advanced Aero-Engine Concepts and Controls was held from 25-29 September 1995 in Seattle, Washington, USA. It dealt with propulsion, including thrust vectoring, for future combat aircraft, vertical landing aircraft and transport aircraft. Better fuel efficiency, longer range and higher operational flexibility will be gained from aero engines with advanced cycles which require improvements in fluid dynamics, materials and cooling. Five Sessions (37 papers including the keynote): Engine research and demonstration, requirements and programmes (3); Aircraft engine integration (5); Propulsion system and component technology (IO); Engine control systems (I 3); Integrated flight and propulsion control (5). Dual use application of results is intended.

Author

Aircraft Engines; Conferences; Engine Control; Thrust Vector Control; Propulsion System Configurations; Propulsion System Performance; Engine Airframe Integration; Inlet Airframe Configurations; Engine Design; Control Systems Design

19960054488 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Aging Combat Aircraft Fleets- Long Term Applications *les Consequences a Long Terme du Vieillissement des Flottes d'Avions de Combat*

1996, 240p; In English; The Structures and Materials Panel of AGARD and the Consultant and Exchange Programme of AGARD, 7 - 8 Oct. 1996, Madrid, Pomezia, Atlanta, GA, Brussels, Spain, Italy, USA, Belgium

Report No.(s): AGARD-LS-206; ISBN-92-836-1044-X; Copyright Waived; Avail: CASI; A11 Hardcopy; A03 Microfiche

This Lecture Series covers systems update and structural airworthiness aspects of aging, fixed-wing aircraft. It highlights the aspect of retrofit/rejuvenation of aging aircraft through presentations relating to three front-line combat aircraft in NATO's inventory. The presentations describe implementation strategies and ways to improve the ability of an airframe to accommodate new systems to meet present day mission requirements. Technical issues pertaining to structural safety, maintenance management, and proactive rehabilitation/retrofit schemes are also discussed. It provides technical information to fleet operators and managers to assist them to better manage aging aircraft fleets and be able to deal with aging related problems as they arise. It also targets industry personnel responsible for upgrading the capabilities of combat aircraft, maintenance personnel at air logistics centers, and specialists involved with the design of repairs and prescription of inspection methods. 'Aging aircraft' has several connotations, amongst them technological obsolescence, performance upgrading, changing mission requirements unanticipated during design specification and development, the specter of runaway maintenance costs, decreased safety, impairment of fleet readiness, and unavailability of home depot facilities.

Author

Fighter Aircraft; Airframes; Structural Design Criteria; Safety; Lectures