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This is a listing of recent unclassified RTO technical publications processed by the NASA Center for AeroSpace Information. Reports may be downloaded for free from the RTO website at <http://www.rta.nato.int> or they may be purchased from the NASA Center for AeroSpace Information, 7121 Standard Drive, Hanover, MD 21076-1320 USA, phone 301-621-0390, fax 301-621-0134. Prices and order forms are available from the NASA STI website at <http://www.sti.nasa.gov>. An automatic distribution of unclassified RTO technical publications in CD-ROM is also available within the U.S. through the NASA Standing Order Service from the NASA Center for AeroSpace Information.

20010028476 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Aging Aircraft Fleets: Structural and Other Subsystem Aspects *le Vieillessement des Flottes d'Avions Militaires: Aspects Structures et Autres Sous-Systemes*

Aging Aircraft Fleets: Structural and Other Subsystem Aspects; March 2001; 220p; In English, 13-16 Nov. 2000, Sofia, Bulgaria; See also 20010028477 through 20010028491; CD-ROM containing full-text document in PDF format
Report No.(s): RTO-EN-015; AC/323(AVT-053)TP/33; RTO-LS-218; ISBN 92-837-1056-8; Copyright Waived; Avail: CASI; A10, Hardcopy; A03, Microfiche; C01, CD-ROM

Aging Aircraft concerns have dramatically escalated in the military community and commercial aviation during the past decade. Some models, which have already been in service for more than 40 years, will need to be retained for another two decades or longer, often serving in roles and in theatres very different from what was envisioned when they were originally designed. Aging Aircraft has several connotations. to name a few: technological obsolescence, the spectre of runaway maintenance costs, and safety. Moreover, spare parts, processes and tooling may no longer be available, logistic procedures may have changed and suppliers may be out of the business. Budgetary limitations and higher fleet utilisation will increase the demand to cope with aging structures and major subsystems like engines and avionics. Specific topics covered by this Lecture Series are: 1) Aircraft Loads; 2) Aging Systems and Sustainment Technology; 3) SNECMA ATAR Engines 1960-2020. Smarter Ideas and Less Money; 4) Repair Options for Airframes; 5) Risk Assessments of Aging Aircraft; 6) Occurrence of Corrosion in Airframes; 7) Human Factors in Aircraft Maintenance; 8) Extension of the Usable Engine Life by Modelling and Monitoring; 9) Loads Monitoring and HUMS; 10) Depot Level Maintenance of U.S. Aircraft Engines in NATO Air Forces. Role of Private Industry and Procedures with U.S. and European Air Forces; 11) Prevention and Control in Corrosion; 12) Safety and Service Difficulty Reporting; 13) Tutorial on Repair Software; 14) Inspection Technologies; 15) Inspection Reliability and Human Factors; 16) Material and Process Technology Transition to Aging Aircraft

Derived from text

Aircraft Maintenance; Aging (Materials); Commercial Aircraft; Aircraft Structures; Airline Operations

20010032429 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France
The Effect of Prolonged Military Activities in Man. Physiological and Biochemical Changes. Possible Means of Rapid Recuperation *Les Effets d'Activites Militaires Prolongees sur l'Homme. Changements Physiologiques et Biochimiques. Moyens Possibles de Recuperation Rapide*

March 2001; 134p; In English, 3-5 Apr. 1995, Oslo, Norway; See also 20010032430 through 20010032439; CD-ROM contains full text document in PDF format; Compatible with MAC and IBM platforms

Report No.(s): RTO-MP-042; AC/323(HFM)TP/23; ISBN 92-837-1054-1; Copyright Waived; Avail: CASI; A07, Hardcopy; A02, Microfiche; C01, CD-ROM

New technology and operational concepts have provided new challenges to military personnel's health, safety and performance. These proceedings include ten papers, dealing with different aspects of the biomedical consequences of continuous military operations. They were presented at a workshop organized by the former DRG of NATO in Soria Moria, Oslo, Norway, 3-5 April 1995, and this publication has been sponsored by the Human Factors and Medicine Panel (HFM) of RTO. The papers show large alterations in hormones, metabolites, red and white blood cells, as well as mental performance. There was an adrenergic desensitization, decrease in thyroid function due to energy deficiency, and decrease in androgens due to physical exercise. Unspecific immune function (granulocytes and monocytes) were stimulated, while specific immune function (lymphocytes) were inhibited. Acute sleep deprivation mainly affects mental functions and have limited influence on endocrine, metabolic and immune functions. The key questions addressed by the workshop were how to select and train personnel for continuous operations, and how to intervene to enhance physical and mental performance by such means as nutrition, sleep, work-rest schedules and drugs. The optimal treatment for soldiers' recovery and reentry to the battlefield following high intensity direct action missions was also discussed. The participants agreed that there is a need for more realistic field studies with systematic interventions with different stress factors to reveal their relative significance and to find counter measures.

Author

Biochemistry; Desensitizing; Drugs; Health; Human Factors Engineering; Mental Performance; Personnel; Physical Exercise; Procedures

20010033253 Research and Technology Organization, Neuilly-sur-Seine, France

RTO Technical Publications: A Quarterly Listing *Quarterly Report, 1 Jan. - 31 Mar. 2001*

April 2001; 6p; In English

Report No.(s): RTO-01-01; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

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Author

Indexes (Documentation); Bibliographies; Aeronautics; Aerospace Medicine; Research; Aeronautical Engineering

20010033269 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France

What is Essential for Virtual Reality Systems to Meet Military Human Performance Goals? *Les Caracteristiques Essentielles des Systemes VR pour Atteindre les Objectifs Militaires en Matiere de Performances Humaines*

What is Essential for Virtual Reality Systems to Meet Military Human Performance Goals?; March 2001; 172p; In English, 13-15 Apr. 2000, The Hague, Netherlands; See also 20010033270 through 20010033286

Report No.(s): RTO-MP-058; AC/323(HFM-058)TP/30; ISBN 92-837-1057-6; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

This workshop aimed to identify the functional requirements of potential military applications of Virtual Reality (VR) technology, to report the state-of-the-art and projected capabilities of VR technologies, and to propose future research requirements and directions for military applications. During the workshop discussions, forty participants from military organisations, academia and industry put forward their opinions on the significant bottlenecks and opportunities in the development of military VR applications. Presentations discussed visual, haptic, auditory and motion feedback, navigation interfaces, and scenario generation, modelling software and rendering hardware. VR research transition opportunities include the domains of training, planning & mission rehearsal, simulation supported operation, remotely operated systems and product design. Critical bottlenecks are a lack of natural interfaces, a lack of technology standardisation and a lack of behavioural models and team interaction tools in VR. In general, better co-ordination between military organisations, industry and academia is necessary in order to identify gaps in current knowledge and to co-ordinate research. Suggestions for closing gaps are included. Derived from text

Functional Design Specifications; Systems Engineering; Virtual Reality; Human-Computer Interface; Computerized Simulation; Military Technology; Technology Assessment; Computer Programs

20010035146 Research and Technology Organization, Systems Concepts and Integration, Neuilly-sur-Seine, France
Systems Concepts for Integrated Air Defense of Multinational Mobile Crisis Reaction Forces *Concepts de systemes pour la defense aerienne integree de forces internationales mobiles d'intervention en situation de crise*

Systems Concepts for Integrated Air Defense of Multinational Mobile Crisis Reaction Forces; March 2001; 246p; In English; Systems Concepts and Integration Panel (SCI) Symposium, 22-24 May 2000, Valencia, Spain; See also 20010035147 through 20010035164; CD-ROM contains full text document in PDF format

Report No.(s): RTO-MP-063; AC/323(SCI-085)TP/29; ISBN 92-837-1052-5; Copyright Waived; Avail: CASI; A11, Hardcopy; A03, Microfiche; C01, CD-ROM

The meeting proceedings from this symposium on "System Concepts for Integrated Air Defense of Multinational Mobile Crisis Reaction Forces" was organized and sponsored by the Systems Concepts and Integration (Set) Panel of the Research and Technology Organization of NATO in Valencia, Spain on 22 to 24 May 2000. The symposium's goal was to describe techniques and technologies viable for the lay-out and design of operational air defense systems that meet multinational requirements. The papers were presented under the following headings: Description of typical scenarios; Enabling Technologies for Air Defense Systems (Sensors (IR, RADAR, UV, LASER), Sensor Fusion, Pointing and Tracking, Soft Computing, Information Processing, High Level knowledge-based (KB) Automation, Data-Link, and communication); System Architecture and Mechanization; Man-Machine Interface, Visualization techniques; Interface with Weapon Systems and higher level Battlefield Management; and Systems Design for Interoperability.

Author

Conferences; International Cooperation; Air Defense; Command and Control; Communication; Military Operations

20010041343 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
In-Flight Flow Visualization Results of The F-106B With a Vortex Flap

Brandon, Jay M., NASA Langley Research Center, USA; Hallissy, James B., NASA Langley Research Center, USA; Brown, Philip W., NASA Langley Research Center, USA; Lamar, John E., NASA Langley Research Center, USA; [2001]; 36p; In English; Symposium on Advanced Flow Management. Part A: Vortex Flow and High Angle of Attack, 7-11 May 2001, Loen, Norway; Original contains color illustrations

Report No.(s): RTO-MP-69-P-43; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Surface and off-surface flow visualization techniques were used to visualize the three-dimensional vortex flows on the F-106 aircraft with vortex flaps installed. Results at angles of attack between 9 deg to 18 deg and Mach numbers from 0.3 to 0.9 are presented. A smoke flow vapor screen technique was used to document leading-edge vortex paths and sizes, while an oil flow technique was employed to provide detailed information on reattachment and separation line locations and other flow details. Results were obtained for two vortex flap deflection angles, 30 deg and 40 deg. Flow visualization revealed the existence of a multiple vortex system that had not previously been seen in subscale tests or predicted for this configuration. The vortex flap generated a leading-edge vortex system that reattached near the flap hinge over a wide angle of attack range. In addition to the primary vortex, flow visualization revealed the presence of several distinct vortices which traced a path from the vortex flap and then over the wing.

Author

Flow Visualization; Three Dimensional Flow; Vortex Flaps; Vortices; Wind Tunnel Tests

20010041357 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France
Operational Colour Vision in the Modern Aviation Environment *la Vision des Couleurs dans l'environnement Aeronautique Operationnel d'aujourd'hui*

March 2001; 176p; In English

Report No.(s): RTO-TR-016; AC/323(HFM-012)TP/6; ISBN 92-837-1026-6; Copyright Waived; Avail: CASI; A09, Hardcopy; C01, CD-ROM

In the past, standards and procedures for the examination of colour vision were based on red, green and white colour signals, together with the beacons associated with traditional navigational aids, originally developed for maritime or rail transport and subsequently adapted to the aeronautical environment. Many of these systems are still in service today. The role of colour in the military environment has been considerably extended, with the whole of the spectrum sometimes being used, rather than just a few limited colours. The visual requirements associated with this proliferation of colours call into question not only operational or ergonomical colour choices but also the procedures used to test professional colour sense. This can no longer be based solely on red, green and white discrimination or on screening for congenital masculine defective colour vision. Colour deficiencies of various origins are frequent and affect men and women to an equal extent. They affect both red and green vision and blue and yellow vision, which can be problematic when using modern day electronic displays. Finally, multiple filters can be placed

between the outside world and the operator's eyes so as to protect him from high intensity light, lasers etc. These protective devices can themselves cause modification of colour vision, thereby interfering with the task to be carried out. What, then, is the latest data available on colour perception? How, and with what equipment or procedures can we test professional colour sense rather than colour vision anomalies? These two questions illustrate in part the purpose of the explanations and the scientific and technical bases provided in this document.

Author

Color; Color Vision; Human Factors Engineering

20010047042 Research and Technology Organization, Information Systems Technology Panel, Neuilly-sur-Seine, France
New Information Processing Techniques for Military Systems *Les Nouvelles Techniques de Traitement de l'Information pour les Systemes Militaires*

April 2001; 300p; In English; New Information Processing Techniques for Military Systems, 9-11 Oct. 2000, Istanbul, Turkey; See also 20010047043 through 20010047072; CD-ROM contains full text document in PDF format

Report No.(s): RTO-MP-049; AC/323(IST-017)TP/8; ISBN 92-837-1061-4; Copyright Waived; Avail: CASI; A13, Hardcopy; A03, Microfiche; C01, CD-ROM

This volume contains the Technical Evaluation Report, 2 Keynote Addresses and 29 unclassified papers, presented at the Information Systems Technology Panel Symposium held in Istanbul, Turkey, 9-11 October 2000. The papers were presented under the following headings: Information Systems and Techniques I; Information Systems and Techniques II; Security and Reliability; Communications; Detection, Fusion, Decision Support; and Virtual Reality and Human-Computer Interface.

Author

Conferences; Data Processing; Information Systems; Military Operations; Command and Control; Multisensor Fusion; Fuzzy Systems; Decision Making

20010048002 Research and Technology Organization, Concepts and Integration (SCI) Panel, Neuilly-sur-Seine, France
Flight Control Design: Best Practices

December 2000; 214p; In English

Report No.(s): AD-A387777; RTO-TR-029; AC/323(SCI)TP/23; ISBN 92-837-1047-9; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

Accidents due to adverse aircraft-pilot coupling phenomena in the latest technology aircraft occurred in the US and in Europe, while other programs had less well-publicized flight control development problems. These events showed that a robust and affordable solution to the development process of digital flight control systems was not universally available. This Technical Report begins with a review of some examples of flight control problems. They span the history of flight from the time when the practices of flying was preceding theoretical developments up to the recent events. There is a chapter detailing lessons learned from various programs with positive results. The review of problems and lessons learned leads into a chapter detailing a series of recommended design best practices. The best practices are laid out as a logical process with recommendations for avoiding the pitfalls that have lead to problems in the past. The second part of the report continues with some theoretical aspects, such as flying qualities criteria and 'carefree handling', the latest results from analytical and research activities into PIOs, and modelling and system identification to support the design process. The report concludes with suggestions for required future research.

Author

Flight Control; Aircraft Safety; Computerized Simulation; Procedures

20010054773 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France
The Requirements for an Emergency Breathing System (EBS) in Over-Water Helicopter and Fixed Wing Aircraft Operations *Specification d'un Respirateur de Sauvetage Pour Aeronefs a Voilure Fixe et a Voilure Tournante en Mission de Survol Maritime*

Brooks, Chris J., Survival Systems Ltd., Canada; Tipton, Mike J., Portsmouth Univ., UK; May 2001; 92p; In English; CD-ROM contains full text document in pdf format

Report No.(s): RTO-AG-341; AC/323(HFM-054)TP/22; ISBN 92-837-1058-4; Copyright Waived; Avail: CASI; A05, Hardcopy; A01, Microfiche; C01, CD-ROM

This AGARDograph provides the latest worldwide statistics on survivability from a helicopter ditching. It concludes that the persistent 15% fatality rate is basically caused by drowning. The principal cause of drowning is due to inability to breath-hold long enough to make an escape. The provision of some form of Emergency Breathing System (EBS), whether a re-breather or compressed air unit, would extend the time underwater and hence improve survivability. The development of such units since the Second World War are described, and current available units are included to aid NATO and PfP Nations to review their choice.

The importance of producing a course training package prior to the introduction of any new EBS into service is presented. Two examples are specifically cited. Finally, a summary is made of the current EBS situation as we enter into the 21st Century.

Author

Underwater Breathing Apparatus; Life Support Systems; Survival Equipment; Escape (Abandonment)

20010055573 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France

Officer Selection Final Report la Selection des officiers

Lescreve, F. J., Belgian Air Force, Belgium; May 2001; 154p; In English; CD ROM contains full text document in PDF format
Report No.(s): RTO-TR-034; AC/323(HFM-023)TP/26; ISBN 92-837-1067-3; Copyright Waived; Avail: CASI; C01, CD-ROM; A08, Hardcopy; A02, Microfiche

From the end of 1997 till mid 2000, members of the Research and Study Group 31 (RSG 31) from Belgium, Canada, Denmark, France, Germany, the Netherlands, the UK, and the USA focused on the topic of Officer Selection. In order to share information and foster a scientific and professional approach to Officer Selection, two major products were delivered. The first was a workshop on Officer Selection held in November 1999 from which the proceedings were published. The final report on Officer Selection is the second achievement of the RSG. After the introduction, an overview is given of the current officer selection practice. A detailed review of the systems used in the countries participating to the research and study group is given and a summary is provided. Then the main results of a survey on officer selection are presented. This survey covers the current practice in nineteen NATO and non-NATO countries. The actual questionnaire is also included. Following the description of the current practice, the search for an ideal system is commented, a conceptual approach is developed, the qualities of an officer are discussed, a personnel selection primer is given and guidelines for test-use are highlighted. The RSG is convinced that a re-examination of any national system in the light of the practice in other countries together with the scientific and professional guidelines developed in this report and reported at the RSG workshop, can significantly improve the outcome of the current officer selection practice.

Author

Personnel Selection; Decision Making

20010056302 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France

NATO Guidelines on Human Engineering Testing and Evaluation Final Report Directives OTAN en Matiere d'Essais et d'Evaluations Ergonomiques

May 2001; 108p; In English; CD-ROM contains full text document in PDF format
Report No.(s): RTO-TR-021; AC/323(HFM-018)TP/19; ISBN 92-837-1068-1; Copyright Waived; Avail: CASI; C01, CD-ROM; A06, Hardcopy; A02, Microfiche

Testing and Evaluation (T&E) is an integral part of the system development process. Human Engineering T&E addresses the quality and effectiveness of the interface between the humans who participate as part of a human-machine system and the hardware and other non-human components. In the interest of supporting among NATO nations the co-development, co-production of systems, and shared use of T&E resources as a means of sharing more effective and less expensive systems, this document describes techniques and methods that are recommended for common use in NATO. The measurement categories addressed are: (1) Description of test participants; (2) Measurement of operator workload; (3) Human task performance measurement; (4) User opinion; and (5) Engineering measurement of hardware characteristics. It is recommended that the techniques and methods described be used to the maximum extent possible, and that the list be revised periodically to support currency and continued usefulness.

Author

Human Factors Engineering; Human Performance; Human-Computer Interface; Evaluation

20010056513 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France

Human Consequences of Agile Aircraft Facteurs Humains Lies au Pilotage des Avions de Combat Tres Manoeuvrants

May 2001; 186p; In English, 15-17 Apr. 1997, Istres AFB, Nellis AFB, NV, Linkoping, Manching, Edwards AFB, CA, Wright-Patterson AFB, OH, France, USA, Sweden, Germany, USA, USA; See also 20010056514 through 20010056525; CD-ROM contains full text document in PDF format

Report No.(s): RTO-TR-015; AC/323(HFM-015)TP/15; ISBN 92-837-1065-7; Copyright Waived; Avail: CASI; C01, CD-ROM; A09, Hardcopy; A02, Microfiche

While historically agile flight was first seen as an issue of airframe agility with a consequent emphasis on acceleration issues, there has been an evolution in the understanding of agility. WG 27 adopted WG 19's recommendations that airframe agility is only one aspect of agility which when combined with weapons agility and systems agility results in operational agility. The experienced pilots that we interviewed saw a real operational need for agile aircraft. They consistently rated both high

angle-of-attack/nose pointing and off-boresight missiles/helmet-mounted display/sight systems as very important capabilities. They denied physiologic problems related to acceleration or spatial disorientation, although their sorties to date have been with a clear sky, in active control. Experts predict an increase in both G-LOC and spatial disorientation mishaps in future agile aircraft. In particular, there are significant gaps in our understanding of the effects of multi-axis accelerations. With minimal constraints on angle-of-attack and expanded weapon launch envelopes, novel displays will be required that enable pilots to fly with references well beyond conventional fields-of-view. Intelligent interfaces, and automated subsystems will be required to help pilots cope with the tactical situation, while also maintaining situational awareness. Efficient controls are also needed to enable pilots to command and operate equipment quickly and accurately. The thrust-vectoring and post-stall operations should be fully integrated into the flight control system. Pilots still prefer controlling aircraft functions via HOTAS (hands-on-throttle-and-stick) although voice and gaze-based control may also be useful. Current pilot protection systems will be inadequate in an unconstrained flight envelope and during ejection. Both basic and applied research will be needed to ensure that the potential benefits of increased agility are realized.

Author

Aerodynamic Characteristics; Maneuverability; Thrust Vector Control; Pilots (Personnel); Flight Control; Human Factors Engineering; Highly Maneuverable Aircraft; Conferences