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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Introduction

This issue of *Aerospace Medicine and Biology, A Continuing Bibliography with Indexes* (NASA SP-7011) lists 37 reports, articles, and other documents recently announced in the NASA STI Database.

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Typical Report Citation and Abstract

ACCESSION NUMBER ↓

DOCUMENT ID NUMBER → **19960021053;** 96N24540 NASA Langley Research Center, Hampton, VA USA. ← CORPORATE SOURCE

TITLE → **An Extended Compact Tension Specimen for Fatigue Crack Propagation and Fracture**

AUTHORS → Piascik, R. S., NASA Langley Research Center, USA; Newman, J. C., Jr., NASA Langley Research Center, USA; ← AUTHORS' AFFILIATION

PUBLICATION DATE → Mar. 1996, pp. 16; In English

CONTRACTS/GRANTS → Contract(s)/Grant(s): RTOP 538–02–10–01

REPORT NO.(S) → Report No.(s): NASA–TM–110243; NAS 1.15:110243; No Copyright; Avail: CASI A03, Hardcopy; A01, Microfiche ← AVAILABILITY AND PRICE CODE

ABSTRACT → An extended compact tension specimen, EC(T) has been developed for fatigue and fracture testing. Documented herein are stress-intensity factor and compliance expressions for the EC(T) specimen.

ABSTRACT AUTHOR → Author

SUBJECT TERMS → *Crack Propagation; Stress Intensity Factors; Fatigue (Materials)*

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 418)

JULY 22, 1996

51
LIFE SCIENCES (GENERAL)

19960023320; 96N26099 International Centre for Theoretical Physics, Trieste, Italy
Simulation of ultrasound interaction with tissue
Edee, M. K. A., International Centre for Theoretical Physics, Italy; Ogulu, A., University of Science and Technology, Nigeria; Aug. 1995, pp. 14; In English
Report No.(s): IC-95/257; DE96-607013; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

We model the effect of an ultrasound beam on a water phantom by considering water as an incompressible Newtonian viscous fluid. The two-dimensional flow velocities (u,v) induced in the water phantom, mimic displacement in living tissues for a phantom of unit width. The displacements depend on the ultrasound signal which is emitted and the model also predicts the nature of the signal received.
DOE
Viscous Flow; Two Dimensional Flow; Ultrasonic Tests; Incompressible Fluids; Newtonian Fluids; Navier-Stokes Equation; Analog Simulation

19960023412; 96N26175 International Centre for Theoretical Physics, Trieste, Italy
Cyril Ponnamperuma Memorial. Trieste conference on chemical evolution., Part 4, Physics of the origin and evolution of life
Aug. 1995, pp. 24; In English; International Conference and Workshop on Modeling and Mitigating the Consequences of Accidental Releases of Hazardous Materials, 26 - 29 Sep. 1995, New Orleans, LA, USA
Report No.(s): IC-95/238; CONF-950927-; DE96-605365; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The document includes 19 summaries of papers presented at the Trieste Conference on Chemical Evolution, 4: Physics of the Origin and Evolution of Life (Cyril Ponnamperuma Memorial), Miramare, Trieste, 4-8 September 1995. The abstracts have been indexed individually.
DOE
Biological Evolution; Molecular Biology; Genetics; Biochemistry

19960023416; 96N26179 NASA Ames Research Center, Moffett Field,CA USA
Use of KC-135 parabolic flights to determine if brief changes in the gravity field can influence the phase and/or period of the circadian clock *Final Report*
Turek, Fred W., Principal Investigator, NASA Ames Research Center, USA; Jan 1994, pp. 10; In English
Contract(s)/Grant(s): NAG2-774
Report No.(s): NASA-CR-201013; NAS 1.26:201013; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In February 1994 a total of 10 hampsters flew on two separate KC-135 flights. On one flight, 25 animals experienced 31 parabolas, thus going through 31 cycles of hypergravity (up to about 1.8 G). On the other flight, the animals were exposed to 43 parabolas. fifty additional animals served as ground based controls and were treated in the same fashion as the experimental animals. The profiles of plasma GH, corisol and coricosterone from representative parabolic flight and ground control animals during pre-flight, in-flight, and post-flight conditions are depicted.
Derived from text
C-135 Aircraft; Circadian Rhythms; Parabolic Flight; Hamsters; Blood Plasma; Gravitational Effects

19960023800; 96N26447 Los Alamos National Lab., NM USA
The first synthesis of (9,Amino-(15)N2)adenine and (beta)- 2'-Deoxy-(9,Amino-(15)N2)adenosine
Orji, C. C., Los Alamos National Lab., USA; Silks, L. A. III, Los Alamos National Lab., USA; 1995, pp. 11; In English; 40th Annual Meeting of the Biophysical Society, 17 - 21 Feb. 1996, Baltimore, MD, USA
Contract(s)/Grant(s): W-7405-ENG-36
Report No.(s): LA-UR-95-3921; CONF-960243-1; DE96-004111; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

(beta)-2'-Deoxy-(9, Amino-(15)N2) Adenosine has been constructed in 4 steps from commercially available

5-amino-4,6-dichloropyrimidine and (15)NH3. The reactions have been scaled provide grams quantities of labeled nucleoside.
DOE
Adenosines; Synthesis (Chemistry); Adenines; Ammonia

52
AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19960023131; 96N25930 Institute of Aviation Medicine, Fuerstenfeldbruck, Germany
Reaction Time and the EEG Under Hyperventilation
Freund, Wolfgang, Institute of Aviation Medicine, Germany; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 24-1 - 24-8; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

EEG recordings at rest and during controlled hyperventilation (HV) with simultaneous recording of reaction time measurements taken from 59 pilots and candidates in the German Air Force Institute of Aviation Medicine (GEAF IAM) are used to investigate: the correlation of visible EEG changes during HV and changes of cognitive functions; and the feasibility of two different methods of measuring the CO2 (infrared absorption gas analyzer vs. solid body ceramic transdermal electrode) during this experiment. Under HV the CO2 decreases from a median of 37 at rest to 22mm Hg during HV. The amplitude of the EEG activity increases as the main frequency decreases. No paroxysmal activity is recorded. Reaction time increases markedly under HV (from 184ms to 226ms). Surprisingly, no correlation shows between EEG changes and reaction time. Both methods of CO2 measurement prove their feasibility, while the gas analyzer is faster and easier to operate. The implications of these findings are discussed.
Author
Electroencephalography; Hyperventilation; Aerospace Medicine

19960023132; 96N25931 Air Force Hospital (251th), Athens, Greece
Physiological Vestibular Limitations of Motion Perception in Aviation Environment
Diamantopoulos, I. I., Air Force Hospital (251th), Greece; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 25-1 - 25-19; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Perception of angular & linear acceleration provides together with vision the fundamental cues for situational awareness in aviation environment. Therefore, the function of the otoliths & the semicircular canals as the end-organ of balance and their perception limitations play an important role in a flight environment employing mainly high performance aircraft. This paper addresses the need to identify & provide the physiological basis for the vestibular limitations of motion perception which accounts for several disorientation illusions. Under this view, certain areas of flight configuration envelope known as precipitators of illusions are outlined and the consequent most common vestibular illusions are attributed to their physiological basis. Vestibular behavior continuoum is also outlined both in a non-lG environment and in Motion Sickness. The danger upon flight safety imposed by the vestibular function limitations can be alleviated by proper training, selection & noumerous technology aids integrated in modern cockpits.
Author
Vestibules; Semicircular Canals; Precipitators; Physiology; Motion Perception; Flight Safety; Aerospace Medicine

19960023399; 96N26162 San Jose State Univ., Dept. of Psychology., CA USA
Neural Connectivity and Immunocytochemical Studies of Anatomical Sites Related to Nauseogenic and Emetic Reflexes *Final Report*
Fox, Robert A., Principal Investigator, San Jose State Univ., USA; Jan. 1992, pp. 7; In English
Contract(s)/Grant(s): NCC2-449
Report No.(s): NASA-CR-201008; NAS 1.26:201008; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The studies conducted in this research project examined several aspects of neuroanatomical structures and neurochemical processes related to motion sickness in animal models. A principle objective of these studies was to investigate neurochemical changes in the central nervous system that are related to motion sickness with the objective of defining neural mechanisms important to this malady. For purposes of exposition, the studies and research finding have been classified into five categories. These are: immunoreactivity in the brainstem, vasopressin effects, lesion studies of area postrema, role of the vagus nerve, and central nervous system structure related to adaptation to microgravity.
Derived from text
Adaptation; Animals; Central Nervous System; Motion Sickness; Brain Stem; Immunology; Gravitational Effects

19960023548; 96N26242 Marquette Univ., Milwaukee, WI USA
Alterations in Skeletal Muscle With Disuse Atrophy: The Effects of Countermeasures *Final Report*
Fitts, Robert H., Marquette Univ., USA; Jan. 1996, pp. 7; In English
Contract(s)/Grant(s): NAG2-212
Report No.(s): NASA-CR-201014; NAS 1.26:201014; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The specific aims of this project concerned three general areas: (1) studies on the contractile function of single skinned fibers designed to determine the time course and cellular basis of the Hindlimb Suspension (HS) induced increase in fiber Vo (maximal shortening velocity), and the decrease in peak tension (Po); (2) studies designed to understand the effect of HS on single fiber substrate utilization during contractile activity, and how if at all such changes contribute to the increased muscle fatigue associated with HS; and (3) studies evaluating the effectiveness of standing and ladder climbing as countermeasures to the deleterious effects of HS. We have constructed all of the necessary equipment, and are currently conducting preliminary studies on T-tubular charge movement. A list of publications from this contract is included at the end of this report. The three objectives are (1) Functional Studies on the Single Skinned Fiber; (2) Fiber Substrate Utilization and Muscle Fatugue with Contracting Activity and (3) Exercise Countermeasures.
Derived from text
Musculoskeletal System; Muscular Fatigue; Muscular Strength; Atrophy; Fibers; Substrates

19960024014; 96N26608 Illinois Univ., Urbana, IL USA
Functional Transcutaneous Electrical Stimulation of the Vestibular System ***Final Report, Dec. 1991 - Dec. 1994***
Riccio, Gary E., Illinois Univ., USA; McMillan, Grant R., Illinois Univ., USA; Cress, Jeffrey D., Logicon Technical Services, Inc., USA; Schnurer, John H., Logicon Technical Services, Inc., USA; Aug. 1995, pp. 18; In English
Contract(s)/Grant(s): F41624-94-C-6000; ILIR
Report No.(s): AD-A302220; AL/CF-SR-1995-0014; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research described in this report is being conducted to support the development of a new technology. This technology builds on prior research and existing technology in which humans and machines work synergistically to control self motion in situations that are demanding because of limitations to sensory or motor systems. Significant improvement in the simulation of self motion could be made if there were a means to control independently the stimulation of the vestibular system. A related need in the domain of sensory prosthetics is for a device that could enhance or restore vestibular function as a conventional 'hearing aid' restores auditory function. Such a vestibular prosthesis could have a significant impact on the lives of people with balance disorders. We chose to develop the technology for transcutaneous electrical stimulation because of its potential for independently controlling stimulation of inner-ear structures (EVS) and because of the existence of supporting technology and research. We replicated the results of other investigators in that we have produced sensations of self motion and manipulated them with EVS. The central issues involved in the development and use of EVS in aerospace and prosthetic applications are discussed in this report.
DTIC
Vestibules; Electric Stimuli; Technology Transfer; Electrophysiology; Sensory Stimulation

19960024015; 96N26609 Battelle Pacific Northwest Labs., Richland, WA USA
Real-Time 3D Ultrasound for Physiological Monitoring ***Annual Report***
Doctor, Steven R., Battelle Pacific Northwest Labs., USA; Oct. 1995, pp. 35; In English
Contract(s)/Grant(s): DAMD17-94-C-4127
Report No.(s): AD-A302224; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents the first year of a 3-year project to develop a field prototype Advanced Imaging System (AIMS). This prototype will consist of a lightweight, portable ultrasonic imaging system containing a two-dimensional transducer array, computer hardware and software for real-time 3-D holographic image reconstruction and visualization, and a stereovision headset for 3-D image display. During the reporting period, technology was developed to acquire and reconstruct 3-D images in the laboratory, using ultrasonic holography with a point transducer and 2-axis mechanical scanning, and to render these images using volume visualization. In addition, a 3-D imaging testbed system based on 'sequential B-scan' technology was developed and placed at Army Medical Center to gain extensive physician experience with in-vivo 3-D ultrasound.
DTIC
Acoustical Holography; Physiological Factors; Imaging Techniques; Earphones; Image Reconstruction; Computer Programs

19960024075; 96N26662 Advisory Committee on Human Radiation Experiments, Washington, DC USA
Advisory Committee on human radiation experiments ***Final Report***
Oct. 1995, pp. 934; In English
Report No.(s): DOE/EH-96000437; DE96-000437; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

When the Advisory Committee began work in April 1994 we were charged with determining whether the radiation experiments design and administration adequately met the ethical and scientific standards, including standards of informed consent, that prevailed at the time of the experiments and that exist today and also to determine the ethical and scientific standards and criteria by which it shall evaluate human radiation experiments. Although this charge seems straightforward, it is in fact difficult to determine what the appropriate standards should be for evaluating the conduct and policies of thirty or fifty years ago. First, we needed to determine the extent to which the standards of that time are

similar to the standards of today. To the extent that there were differences we needed to determine the relative roles of each in making moral evaluations. In Chapter 1 we report what we have been able to reconstruct about government rules and policies in the 1940s and 1950s regarding human experiments. We focus primarily on the Atomic Energy Commission and the Department of Defense. In Chapter 2 we turn from a consideration of government standards to an exploration of the norms and practices of physicians and medical scientists who conducted research with human subjects during this period. Using the results of our Ethics Oral History Project, and other sources, we also examine how scientists of the time viewed their moral responsibilities to human subjects as well as how this translated into the manner in which they conducted their research.
DOE
Ethics; Policies; Procedures; Histories; Radiation Effects; Biological Effects; Nuclear Electric Power Generation; Nuclear Research

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19960023107; 96N25906 Advisory Group for Aerospace Research and Development, Aerospace Medical Panel., Neuilly-Sur-Seine, France
Situation Awareness: Limitations and Enhancement in the Aviation Environment ***la Conscience de la situation: les Limitations et l'amelioration en environnement aeronautique***
Jan. 1996, pp. 272; In English; In French; Aerospace Medical Panel Symposium, 24-27 Apr. 1995, Brussels, Belgium; Also announced as 1996039349
Report No.(s): AGARD-CP-575; ISBN-92-836-0021-5; Copyright Waived; Avail: CASI; A12, Hardcopy; A03, Microfiche

These proceedings include the Technical Evaluation Report, two keynote addresses and 25 papers from the Symposium sponsored by the Aerospace Medical Panel and held in Brussels, Belgium 24-27 April 1995. Situational Awareness is seen as key to mission success and aircraft safety. There are several questions that the Symposium addressed: how effectively Situation Awareness can be measured, whether it is possible to select for it and whether training strategies can improve it. The Symposium also examined the research carried out into the contribution of new Cockpit Technologies to enhance it. Loss of Situation Awareness has been the predominant cause of fatal accidents in both military and civil aviation and several examples were cited where the aircraft had been lost or put in jeopardy due to pilot error. These proceedings will be of interest to those involved in cockpit system design, human performance, human perception, cognition and accident investigation.
Author
Aircraft Safety; Accident Investigation; Cockpits; Human Performance; Systems Engineering

19960023108; 96N25907 Defence and Civil Inst. of Environmental Medicine, North York, Ontario Canada
Loss of Aviation Situation Awareness in the Canadian Forces
Cheung, Bod, Defence and Civil Inst. of Environmental Medicine, Canada; Money, Ken, Defence and Civil Inst. of Environmental Medicine, Canada; Sarkar, Paul, Defence and Civil Inst. of Environmental Medicine, Canada; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 1-1 - 1-8; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The ability of a pilot to maintain situation awareness has been recognized as crucial to mission success for some time. Situation awareness has been used to refer narrowly to a combination of tactical awareness and spatial orientation. However, situation awareness is the accurate perception and comprehension of a number of factors and conditions that could affect the aircraft and the air crew within a period of time. The present study concentrates on accidents and incidents in which there was a loss of situation awareness excluding spatial disorientation . Each accident and incident were systematically reviewed to assess the role of situation awareness. Loss of situation awareness has been implicated in many close calls and accidents. A total of 64 mishaps between 1982-1993 were found to be related to loss of situation awareness in the Canadian Forces (CF) and it appeared throughout all mission and aircraft types. A focused and structured training program in managing cockpit resources and in maintaining attention would assist air crew in identifying conditions where situation awareness could potentially be lost and where appropriate strategies could be used to avoid the loss or to deal with the loss. Such training could be implemented through real-time man-in-the-loop flight simulator training of pilots in various flight scenarios. Similar training could also improve the performance and efficiency of air traffic controllers.
Author
Pilot Training; Flight Crews; Education; Cockpits

19960023109; 96N25908 Spanish Air Force, 23th Wing., Talavera AFB, Spain
Loss of Aviation Situational Awareness Caused by a Bird-Aircraft Collision
Garcia-Alcon, Jose L., Spanish Air Force, Spain; Moreno-Vazquez, Juan M., Spanish Air Force, Spain; Situation Awareness: Limitations and Enhancement in the Aviation

Environment; Jan. 1996, pp. 2-1 - 2-3; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

The history of aerial combat shows that tactical mission effectiveness depends on a few of the superior fighter-attack pilots. These few superior pilots appear to possess a heightened situational awareness that is decisive in the complex and highly fluid air combat environment. Pilot situational awareness is not a well understood concept. Most attempts at understanding situation awareness have relied almost exclusively on subjective reports, and have not led to a clear understanding of the concept. One approach to lending structure to defining situational awareness measures is to decide the information elements the pilot uses to develop an adequate 'state of knowing' concerning specific tasks, and to optimize the mission performance. Operational requirements for situational awareness have implications for flight safety and combat effectiveness. After a series of interviews with air combat experts, some authors developed a taxonomy of skills, traits and performance measures important for air-to-air combat which included aggressiveness, decisiveness, hands-on flying skills, knowledge, ability and situational awareness. This last concept was described as 'probably the sum of many perceptual and cognitive skills'. In 1984, loss of situational awareness was cited as a probable contributory factor in twenty out of forty one USAF operator-factor accident review. And loss of situational awareness is related to and a potential contributor to spatial disorientation. However, situational awareness is intended to be a more wide term encompassing more than spatial disorientation references and include more clearly psychological aspects of attention and cognition as well as sensory physiology considerations. In addition, future combat aircraft should be capable of flying anywhere, anytime and to engage air-to-air or air-to-ground attacks against a very unfavorable ratio of enemy forces. It is a clear consequence that the pilot's role will ever more turning to supervisory control, handling engines and the managing short term tactical decisions. In this way, and because the airplanes are of comparable technology in various countries, the quality of situational awareness will probably explain the pilot's variation of performance. Here we report a case in which the loss of situational awareness was the secondary consequence of an incident, and was on the point of provoking a fatal accident itself.

Derived from text

Bird-Aircraft Collisions; Flight Safety; Fighter Aircraft

19960023110; 96N25909 Armstrong Lab., Brooks AFB, TX USA

Determinants of Situational Awareness in US Air Force F-15 Pilots

Carretta, Thomas R., Armstrong Lab., USA; Ree, Malcolm James, Armstrong Lab., USA; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 3-1 - 3-10; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Situational awareness (SA) is often cited as essential in pilot performance in both military and civil aviation. A study was conducted to investigate whether SA in U.S. Air Force (USAF) F-15 pilots could be predicted using the constructs of general cognitive ability, psychomotor ability, personality, and previous job (i.e., flying) experience. These constructs were chosen because they have demonstrated validity for the prediction of performance in a wide variety of military and civilian jobs, including pilots. The participants were 171 active duty F-15 A/C pilots. Test scores, flying experience data, and supervisor and peer ratings of SA were collected at the pilots' duty locations. The first unrotated principal component extracted from the supervisor and peer ratings accounted for 92.5 percent of the variability of the ratings, which indicated substantial agreement between supervisors and peers. The unrotated first principal component was used as the measure of job performance (i.e., SA). Flying experience as measured by number of hours in the F-15 was the best predictor of SA. After controlling for the effects of F-15 experience, the measure of general cognitive ability based in divided attention, spatial reasoning, and working memory was predictive of SA. Psychomotor and personality measures did not add to the predictiveness of general cognitive ability. With additional F-15 flying experience, it is expected that pilots would improve their SA ratings. Implications for pilot selection and follow-on research are discussed.

Author

Aircraft Pilots; F-15 Aircraft; Pilot Performance; Performance Prediction; Human Performance; Mental Performance

19960023111; 96N25910 Systems Research Labs., Inc., San Antonio, TX USA

Near-Threshold Visual Perception and Manual Attitude Tracking: Dual-Task Performance and Implications for Situational Awareness

Beer, Jeremy M. A., Systems Research Labs., Inc., USA; Gallaway, Robert A., Systems Research Labs., Inc., USA; Previc, Fred H., Armstrong Lab., USA; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 4-1 - 4-11; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This study tested viewers' near-threshold recognition throughout the visual field, examined the effect of this task on a concurrent tracking task, and tested whether individuals' performance on each cockpit task would predict dual-task performance. An underlying assumption was that efficient multitasking supports SA. Experiment 1 measured recognition duration thresholds at different non-foveal locations. Subjects classified briefly-presented aircraft as fighters or

non-fighters. An adaptive procedure adjusted viewing duration to reach 75% performance. Critical tracking ability was assessed also, using a central attitude display. Recognition deteriorated with eccentricity, and a wide distribution of threshold recognition and tracking abilities was found. Experiment 2 combined the two tasks; instructions emphasized recognition as primary. Measures included decrease in recognition accuracy, change in response latency, and increase in tracking RMS in dual-task conditions. Thresholds from Experiment I predicted dual-task recognition (viewers requiring longer durations classified fewer aircraft correctly), but not the increase in tracking error. Under dual-task stress, viewers with low recognition thresholds were less likely to abandon that primary task early in favor of tracking. Notably, critical tracking ability was linked to success preserving aircraft recognition: Viewers who tolerated higher instability before crashing suffered less in dual-task recognition. Field biases were identified in near-threshold performance under workload; this parallels visual search findings and is consistent with a spatially biased attention system. Findings are potentially relevant to SA assessment/selection and to the design of cockpit displays.
Author
Visual Perception; Cockpits; Display Devices; Human Performance; Workloads (Psychophysiology)

19960023112; 96N25911 Armstrong Lab., Neuropsychiatry Branch., Brooks AFB, TX USA
Development of Techniques to Identify Individuals with Superior Potential for Situational Awareness
King, R. E., Armstrong Lab., USA; Flynn, C. F., Armstrong Lab., USA; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 5-1 - 5-6; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Certain cognitive abilities and personality traits may be conducive to the development of situational awareness. The USA Air Force Neuropsychiatrically Enhanced Flight Screening (N-EFS) program screens pilot candidates before they enter undergraduate pilot training (UPT). The Multidimensional Aptitude Battery (MAB), a highly timed IQ test, and CogScreen, a computer-based cognitive test, are now administered to all UPT candidates. CogScreen measures attention, memory, visual scanning, response speed, visual-spatial orientation, capacity for divided attention, and resistance to response interference. CogScreen approximates and measures response to the multiple, competing activities requiring prompt and prioritized attention. Traditional neuropsychological tests do not gauge the subtle abilities that performance in a high-demand environment requires on account of their clinical, rather than occupational, emphasis. The Personal Characteristics Inventory (PCI) and the Revised NEO-Personality Inventory (NEO-PI-R) comprise the optional (requiring participant informed consent) portion of NEFS. PCI measures decision-making strategies and interpersonal style, gauging potential for effective crew resource management. The NEO-PI-R may suggest optimal personality styles for developing situational awareness in particular aircraft. Preliminary results suggest that prospective pilots have a wide range of intelligence and cognitive ability (from average to very superior) and distinct personality styles. Testing results captured prior to the commencement of training will be compared to occupational outcome (whether or not the candidate became a mission-ready pilot) to assess their predictive value in the development of situational awareness.
Author
Psychological Tests; Personality; Pilot Training; Abilities; Cognitive Psychology; Mental Performance

19960023113; 96N25912 Defence Research Agency, Farnborough, Centre for Human Sciences., Hampshire, UK
Situational Awareness, Trust, and Compatibility: Using Cognitive Mapping Techniques to Investigate the Relationships Between Important Cognitive Systems Variables
Taylor, R. M., Defence Research Agency, Farnborough, UK; Shadrake, R., Defence Research Agency, Farnborough, UK; Haugh, J., Defence Research Agency, Farnborough, UK; Bunting, A., Defence Research Agency, Farnborough, UK; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 6-1 - 6-14; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Situational awareness (SA), trust, and compatibility are considered as variables associated with cognitive systems. Three studies are reported investigating the relationships between these variables using experimental methods, subjective ratings, and cognitive mapping techniques. In the first study, a computer simulation of an Air Traffic Control (ATC) task was used to investigate the relationship between task performance and subjective estimates of situational awareness using the Situational Awareness Rating Technique (SART). The results show a strong association between rated SA and performance, and provide evidence of the predictive power of a unitary SART index. In the second study, a simulated aircraft task environment was used to investigate the effects of unreliable computer aiding on task performance, and ratings of SA, and of attitudes associated with trust in task automation. The results show evidence of performance compensation without awareness of automation failure. Trust was associated with attitudes to computer performance; task performance was associated with ratings of understanding. In the third study, a task requiring directional responses to a multi-modal display of situational information was used to elicit personal constructs associated with the cognitive compatibility (CC) of the task. Constructs were elicited using the Repertory Grid procedure. Analysis of subjective ratings of the construct dimensions indicate the multi-dimensional structure of the

constructs associated with CC namely: ease or difficulty of reasoning and understanding; depth of processing or stimulus-response compatibility; learning, and experience or schema compatibility. The development of tools for the subjective measurement and prediction of SA and cognitive compatibility is discussed.
Author
Human Performance; Tasks; Air Traffic Control; Computer Systems Performance

19960023114; 96N25913 British Aerospace Aircraft Group, Bristol, UK
Situational Awareness Measurement in Cockpit Evaluation Trials
McGuinness, Barry, British Aerospace Aircraft Group, UK; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 7-1 - 7-8; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Maintaining good situational awareness has always been a necessary task for pilots. However, the influx of more and more new technological capabilities in aircraft systems and the growing demands made by these on the pilot's attention has highlighted the vulnerability of situational awareness and its critical effects on pilot performance and mission success. In developing and evaluating novel displays and other new cockpit systems, measuring any differences in the pilot's situational awareness as well as performance has become a growing priority. We therefore require suitable tools for effective situational awareness measurement in simulation research rigs. This paper presents several insights into measuring situational awareness in cockpit systems research, and discusses in detail the rationale for a proposed test-battery approach that incorporates a variety of measurement techniques.
Author
Pilot Performance; Cockpits; Display Devices

19960023115; 96N25914 Armstrong Lab., Aircrew Training Research Div., Mesa, AZ USA
Development of Criterion Measures of Situation Awareness for Use in Operational Fighter Squadrons
Waag, Wayne L., Armstrong Lab., USA; Houck, Michael R., Dayton Univ. Research Inst., USA; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 8-1 - 8-8; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper describes the development of three Situation Awareness Rating Scales (SARS) that were used to measure pilot performance in an operational fighter environment. These instruments rated situation awareness (SA) from three perspectives: supervisors, peers, and self-report. SARS data were gathered from 239 mission-ready USAF F-15C pilots from 11 operational squadrons. Reliabilities of the SARS were quite high as measured by their internal consistency (.97 to . 99) and inter-rater agreement (.84). Correlations between the supervisory and peer SARS were strongly positive (.85 to .87), while correlations with the self-report SARS were positive, but smaller (.50 to .58). A composite SA score was developed from the supervisory and peer SARS using a principal components analysis. The resulting score was found to be highly related to previous flight experience and current flight qualification. A prediction equation derived from available background and experience factors accounted for 73% of its variance. Implications for use of the composite SA score as a criterion measure are discussed.
Author
Pilot Performance; Principal Components Analysis; Qualifications

19960023116; 96N25915 Illinois Univ. at Urbana-Champaign, Aviation Research Lab., Savoy, IL USA
Situation Awareness: Impact of Automation and Display Technology
Wickens, Christopher D., Illinois Univ. at Urbana-Champaign, USA; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. K2-1 - K2-13; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this paper we first offer two compatible definitions of situation awareness, present an information processing model of how it is maintained and lost, and discuss different techniques by which it is measured. Causes for the loss of situation awareness related to low visibility, dense airspace, free flight, and automation are briefly described, and then problems related to automation-induced situation awareness loss with the flight management system are discussed in detail. These problems are related to a poor mental model, high system complexity, removal of the pilot from the control loop, and inadequate displays. The next section of the paper focuses on display technology that has been used to support situation awareness of aviation hazards (traffic, weather, terrain). We discuss research issues related to electronic map scale, rotation, and dimensionality as these influence flight path guidance and hazard awareness. It is concluded that the more egocentric levels of these dimensions that do the best job of supporting flight guidance do not necessarily support situation awareness. The final section briefly discusses the less well researched area of task awareness.
Author
Display Devices; Tasks; Airspace; Free Flight; Flight Management Systems; Air Traffic

19960023119; 96N25918 Mooij and Associates, Oegstgeest, Netherlands
Point-of-Gaze Measurement in Aviation Research
Mooij, H. A., Mooij and Associates, Netherlands; Situation

Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 12-1 - 12-9; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Traditional assessment methods (performance and subjective) may not be sufficient for the evaluation of man-machine systems, in which an appropriate level of situation awareness of the operator is of crucial importance. Eye Point-Of-Gaze (POG) and eye-blink measurement is one of the psychophysiological methods which may be helpful, as it can be continuously available without being intrusive to the operator's task. Eye point of gaze can provide data about where in the environment information is sought, as well as about the pattern of eye-scanning as evidenced in different situations. After a feasibility study, subsidised by the Netherlands' Agency for Aerospace Programmes (NIVR) in 1990, the European Space Agency (ESA) contracted Mooij & Associates in mid-1991 to develop a system capable of determining point of gaze in real time in digital form, for the evaluation of competing designs of user interfaces for controlling life-support systems as well as scientific experiments on board future space craft. The system was developed over a period of three years. A successful pilot experiment on a Graphical User Interface, also performed under ESA contract, concluded the initial development of the system at the end of 1993. The commercial version of the system is called Observer. The application of eye point-of-gaze data in aviation research will be set out in this report, followed by a description of the Observer system. In conclusion, an overview of Observer USAge in two simulator programs is given.

Author

Eye (Anatomy); Graphical User Interface; Man Machine Systems

19960023120; 96N25919 Institute of Aviation Medicine, Prague, Czechoslovakia

Speech Characteristics of Situational Awareness in the Course of Coping with In-Flight Emergencies

Sulc, J., Institute of Aviation Medicine, Czechoslovakia; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 13-1 - 13-11; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

A pilot, posed with an in-flight emergency works often under considerable pressure of strong emotions, resulting from an imperative threat to life. They can either destroy the situational awareness or leave it unaffected. Sonographic analysis allows to distinguish the emotional strain from behavioral breakdown with sufficient exactitude. While the information on emotional activation is mediated through the pitch variations, its impact on behaviour can be deduced from the temporal course of utterances. A relatively reliable sign of the loss of situational awareness in life threating situations is represented by the s.c. 'open scissors phenomenon', formed by an antagonistic movement of the pitch in relation to the speech rate. Its essence resides in the uncontrollable effect of asthenic emotions, leading to the enhancement of muscular stiffness, which increases the pitch and retards the speech rate. External appearance of disadaptation to the emotionally demanding situation conceivably correlates with the impaired quality of perceptual and cognitive processes, forming a basis for the in-flight situational awareness.

Author

Emotional Factors; Emergencies

19960023121; 96N25920 Sextant Avionique, Military Avionics Div., Saint Medard en Jalles, France

Enhancing Spatial Situation Awareness in Helmet Mounted Displays: An Approach of Interest and Limitations Through Experimental Results ***Viseur de casque et amelioration de la perception de la situation spatiale: Approache experimentale de l'interet et des limitations***

Leger, A., Sextant Avionique, France; Cursolle, J. P., Sextant Avionique, France; Leppert, F., Sextant Avionique, France; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 14-1 - 14-8; In French; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Maintaining spatial situation awareness in modern fighter aircraft is generally considered as a challenging issue. In regards of recent progress made in HUDs (Head Up Displays) formats, HMDs (Head Mounted Displays) format requirements appear far from being clearly established. Encouraging results obtained by Osgood pointed out the potential interest of offboresight symbology for low level flying and ground attack missions. Such symbology could be of considerable interest to enhance in HMDs the usually poor quality imagery (I(sup 2), IR) used during night attack mission. A binocular night attack HMD has been developed by SEXTANT on an exploratory development launched by the French DGA in 1991. Part of this development was devoted to definition and implementation of a set of symbology to be used in conjunction with imagery during flight tests on a Mirage 2000 test-bed Aircraft at the Flight Test Center(Bretigny sur Orge). To achieve this goal, an experiment was carried out using the equipment developed for the flight tests. In a first experiment, short operational scenarios including low level navigation through mountains, runway attack and ground threats escape maneuvers were flown by experienced test and military pilots. Symbology and imagery were generated by a Silicon graphics 'Onyx' graphic workstation. Symbolic and sensor imagery presentations were slaved to head movement and the pilot was fully in control of aircraft maneuvers. A virtual immersion technique was used to compare conformal and non-conformal formats (attitude and trajectory). Results showed that most pilots recognized the potential interest of conformal symbology, but also that the format used ('bird cage') was too disorienting to be really useful. Though

nonconformal symbology was seen as a rupture in the logic of presentation between HUD and HMD, it was also felt that, provided some improvements were made, it remained the most readily acceptable format.
Author
Helmet Mounted Displays; Fighter Aircraft; Head Movement; Mirage Aircraft; Aircraft Pilots; Aircraft Control

19960023124; 96N25923 Centre d'Etudes et de Recherches de Medecine Aerospatiale, Bretigny sur Orge, France
Situational Awareness in Aerial Combat *La conscience de la situation en aeronautique de combat*
Grau, J. Y., Centre d'Etudes et de Recherches de Medecine Aerospatiale, France; Menu, J. P., Centre d'Etudes et de Recherches de Medecine Aerospatiale, France; Amalberti, R., Centre d'Etudes et de Recherches de Medecine Aerospatiale, France; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 17-1 - 17-9; In French; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Situation awareness is a key psychological concept improving safety and performance in aircrafts. However, for a long time, any definition was commonly accepted. Now, works in cognitive psychology and ergonomics allow to propose new ways to describe features of situation awareness. Time pressure, risk taking, level of understanding, representation adjustment and anticipation are the elements in order to build dynamical models of situation awareness. These news aspects of situation awareness allow to identify different ergonomic recommendations to drive future interface design and to enhance situation awareness in combat aircrafts.
Author
Cognitive Psychology; Human Factors Engineering; Combat

19960023125; 96N25924 Armstrong Lab., Wright-Patterson AFB, OH USA
Attentional Control and Situational Awareness in a Complex Air Combat Simulation
Vidulich, M. A., Armstrong Lab., USA; McCoy, A. L., Logicon Technical Services, Inc., USA; Crabtree, M. S., Logicon Technical Services, Inc., USA; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 18-1 - 18-5; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Situational awareness (SA) refers to a pilot's cognitive understanding of the mission situation. SA is complex and difficult to define because it involves a wide variety of cognitive processes. However, the present research hypothesized that one cognitive process, attentional control, would be key to understanding and enhancing pilot SA. To test this hypothesis a training procedure that was expected to improve an individual's attentional control was performed by one experimental group. Another group performed a placebo training procedure. Both groups received their training embedded within a larger program of performing complex air combat simulation missions. Performance and SA of the groups was measured both before and after the attentional control or placebo training. As expected, the group that received the attentional control training showed a greater improvement in performance than did the placebo control group. However, although the SA metrics appeared to be sensitive to an SA manipulation within the simulation, there did not appear to be any SA benefit associated with the attentional control training.
Author
Simulation; Combat

19960023126; 96N25925 Abertay Univ., Dundee, UK
Agent Based Multimedia Dialogues for Reduced Workload and Increased Situational Awareness
Cook, Malcom James, Abertay Univ., UK; Elder, Leona, Abertay Univ., UK; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 19-1 - 19-9; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Situational awareness is the term used to describe the crew or pilot's awareness of operational conditions and contingencies and it has been implicated as a contributory factor in incidents and accidents in the air. Analysis of incidents reveals that pilots often fail to perceive a problem existed or that the significance of the cues with respect to the safety of the flight was overlooked. Presenting information in a suitable way can increase the probability that a specific event is noticed by the pilot. The method of presentation. however, can not ensure that the knowledge of the event is maintained or that its significance in situational terms is recognised. This paper examines evidence from the literature on vigilance tasks (sustained attention tasks) and dual task experiments which indicates that limits of short term memory, switching attention or time taken to access long-term memory can exacerbate the problem of maintaining situational awareness. Evidence from two experiments are discussed which indicate that the bottleneck for processing information in complex tasks may be related to attention switching and limits on short term (working memory).
Author
Workloads (Psychophysiology); Multimedia; Human Performance; Task Complexity; Alertness

19960023127; 96N25926 Armstrong Lab., Aircrew Training Research Div., Mesa, AZ USA
Use of Multiship Simulation as a Tool for Measuring and Training Situation Awareness
Wang, Wayne L., Armstrong Lab., USA; Houck, Michael R., Dayton Univ. Research Inst., USA; Greschke, David A., Dayton Univ. Research Inst., USA; Raspotnik, William B., Dayton Univ. Research Inst., USA; Situation Awareness:

Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 20-1 - 20-8; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper presents the findings of a research investigation that explored the use of networked multiship simulation as a tool for measuring and training situation awareness (SA). The Division's research simulation facility was used which permitted two F-15s to fly against a suite of manned and unmanned adversaries in a realistic combat environment. Controller support was provided using a long-haul network linked to an AWACS simulation located at Brooks AFB, IX. A week-long evaluation syllabus was designed consisting of 9 sorties with 4 engagements per sortie. A building block approach was taken so that scenarios increased in difficulty over the week. Sixty-three mission ready F-15 pilots participated in the study. Performance ratings of SA were gathered using two trained observers. Additionally, mission outcome, network communications, video recordings, and eye movement data were gathered. As expected, SA, as measured in the simulation environment, was found to be positively correlated with ratings of SA previously obtained from the pilot's home squadron. Performance in the simulation was found to improve for identical engagements flown early and late in the syllabus. Positive opinions were expressed by study participants regarding the potential value of multiship simulation for training SA skills. Areas of greatest payoff appear to be the training of flight resource management and decision-making skills. It was concluded that multiship simulation can be an effective tool for both measuring and training SA.
Author
Flight Management Systems; Simulation; Resources Management; Performance Prediction; Decision Making

19960023128; 96N25927 Defence and Civil Inst. of Environmental Medicine, North York, Ontario Canada
Situation Awareness and Workload: Birds of a Feather?
Hendy, K. C., Defence and Civil Inst. of Environmental Medicine, Canada; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 21-1 - 21-7; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this paper it is argued that an hierarchical t information processing model, with a basis in s perceptual control theory, provides the necessary r framework for interpreting a large, unfocused empirical c literature on the topics of workload and situation(al) awareness (SA). The fundamental importance of situation awareness will emerge in considering the role of the mental model in providing the reference signal for a closed loop perceptual control system. It will be asserted that those aspects of the mental model generally covered by the SA rubric result from high level information processing activity that requires spare capacity to service. Increasing time pressure (workload) reduces the capacity available for this activity. An experiment in the application of a workload scale (NASA TLX) and a situation awareness] metric (SART) to a simulated air traffic control environment is cited. It will be shown that the situation awareness scale taps largely into the workload side of the equation rather than the SA side. Implications for the measurement of SA will be drawn.
Author
Workloads (Psychophysiology); Air Traffic Control; Data Processing

19960023129; 96N25928 Defence Research Agency, Farnborough, Human Factors Group., Hampshire, UK
Will the Mission Workload Profile Allow Effective Situational Awareness?
Jensen, S. E., Defence Research Agency, Farnborough, UK; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 22-1 - 22-5; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper describes a video-based technique, C-SAW (pronounced 'see-saw'), for developing a time- and task-ordered mission profile of workload with a resolution of as little as 3 seconds real time and much less if used freeze-frame. The rating scale can be based on any uni-dimensional rating scale and can also be used with some multi-dimensional scales. When C-SAW is based on the Bedford scale, the result gives a good indication of the 'spare' attentional capacity which can be devoted to situational awareness. A proposed extension of the C-SAW approach to provide a specifically SA mission profile, based on SWAT, is described.
Author
Workloads (Psychophysiology); Effectiveness

19960023133; 96N25932 University Hospital, Dept. of Neurosurgery., Nottingham, UK
Neurological Dimensions of Situational Awareness
Firth, J. L., University Hospital, UK; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 26-1 - 26-8; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The first problem in the Situational Awareness (SA) field is that of definition. The how, why, where and whens? Above all what is SA? Neurologically, SA is defined as the accurate, comprehensive, four dimensional appreciation of a situation at any one point in time. To be operationally effective SA has to be continuously up-rated, modified and developed throughout the time course of the operational epoch. The operational epoch is the significant period of time under consideration. This can be the duration of an engagement. a flight sector, a detail, a crisis, an operation, a detachment, a campaign, an electoral session or a historical era. SA is the first of the three essential, inter-linked and inter-dependent components of air-

crew operational ability and the foundation for the other two: appropriate decision and effective action.
Derived from text
Neurology; Flight Crews

19960023698; 96N26355 Western Aerospace Lab., Inc., Los Gatos, CA USA
A Study of Automation and Accountability in Part-task Laboratory Simulation ***Final Report***
Heers, SUSAn T., Principal Investigator, Western Aerospace Lab., Inc., USA; May 1996, pp. 9; In English; 8thj; Symposium on Aviation Psychology, Apr. 1995, Columbus, OH, USA
Contract(s)/Grant(s): NCC2-832
Report No.(s): NASA-CR-201009; NAS 1.26:201009; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Preliminary evidence suggests that rather than reducing error, automated procedural and decision aids may in some cases have the paradoxical effect of increasing it, or of promoting different errors. Recent research investigating the use of automated systems suggests that crews have a tendency to over-rely on automation to perform tasks and make decisions for them rather than using the aids as one component of thorough monitoring and decision-making processes, a phenomenon we are labeling automation bias (Mosier, Skitka, & Korte, 1994). Potential negative effects of automation bias can be broken down into two major types: (1) automation commission errors, i.e., errors made because crews take inappropriate action because they over-attend to automated information or direction, and (2) automation omission errors, i.e., errors made when crews do not take appropriate actions because they are not informed of an imminent problem or situation by automated aids. A wide body of social psychological research has found that many cognitive biases and resultant errors can be ameliorated by imposing pre-decisional accountability, which sensitizes decision makers to the need to construct compelling justifications for their choices and how they make them. Accountability demands cause decision makers to employ more multidimensional, self- critical, and vigilant information seeking, and more complex data processing, and have been shown to reduce cognitive 'freezing' or premature closure on judgmental problems (Kruglanski & Freund, 1983), and to lead decision makers to employ more J consistent patterns of cue utilization (Hagafors & Brehmer, 1983). In the cockpit, accountability demands should lead to increased vigilance in decision making. Specifically, pilots should be less susceptible to automation bias, and more apt to check all relevant information before making decisions or taking actions. To date, accountability effects have all been produced under controlled laboratory conditions and have not been demonstrated in a machine context. If similar shifts to more careful, data-based decision-making strategies can be produced in the cockpit, accountability may provide a means of decreasing automation bias and of promoting increased vigilance in decision making. Research into the effect of accountability on the use of automated decision aids needs to be conducted to determine the characteristics of any benefits in mitigating automation bias, as well as the potential trade-offs of imposing accountability (e.g., time factors). This paper describes the first laboratory study in a program of research investigating the existence of automation bias in decision-making, and incorporating accountability demands as an ameliorative variable. Accountability for performance, as well as workload, and the reliability and ease of verification of an automated aid were manipulated in a complex, multi-task situation. Participants monitored and responded to gauge, text, and positional data, while performance a compensatory tracking task. The degree to which they followed the directives of an Automated Monitoring Aide (AMA), i.e., relied on the automation to dictate their responses without cross-checking with other, more relible information, was a measire of automation bias. We expected this bias to be exacerbated by highly automation, and attenuated by instructions concerning accountability for performance.
Author
Decision Making; Automatic Control; Compensatory Tracking; Reliability

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19960023122; 96N25921 Defence Research Agency, Farnborough, Human-Factors Group., Hampshire, UK
Designing Novel Head-Up Displays to Promote Situational Awareness
Hardiman, T. D., Defence Research Agency, Farnborough, UK; Dudfield, H. J., Defence Research Agency, Farnborough, UK; Selcon, S. J., Defence Research Agency, Farnborough, UK; Smith, F. J., Defence Research Agency, Farnborough, UK; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 15-1 - 15-7; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper considers the design of attitude symbology for Head-Up Displays and describes two experimental studies conducted at DRA Farnborough. In these studies, novel and current HUD formats were compared in a range of tasks requiring attitude awareness. Both studies compared the novel formats in a fixed-based simulator using a 'recovery from unusual position' flight task and task-performance was measured. The trials differed in terms of the 'design driver' data taken. The first used workload ratings (NASA Task Lead Index) and the second situational awareness (SA) ratings (Sit-

uational Awareness Rating Technique). Significant reaction time differences were found between the conditions in both studies. However, although these significant differences were supported by the SA ratings they were not reflected in the workload ratings. It is suggested that under certain trial conditions SA is a superior design driver to measure than workload, since workload does not include cognitive aspects of pilot performance such as prior knowledge and understanding.
Author
Head-Up Displays; Pilot Performance; Workloads (Psychophysiology); Tasks

19960023123; 96N25922 NASA Ames Research Center, Moffett Field, CA USA
Scene-Linked Symbology to Improve Situation Awareness
McCann, Robert S., NASA Ames Research Center, USA; Foyle, David C., NASA Ames Research Center, USA; Situation Awareness: Limitations and Enhancement in the Aviation Environment; Jan. 1996, pp. 16-1 - 16-11; In English; Also announced as 1996039349; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper reviews recent research conducted in the Flight Management and Human Factors Division of NASA Ames Research Center on superimposed symbology (as found on HUDs and HMDs). We first identify various performance problems which suggest that superimposed symbology impairs pilots' ability to maintain simultaneous awareness of instrument information and information in the forward visual scene. Results of experiments supporting an attentional account of the impairment are reported. A design solution involving the concept of 'scene-linked' symbology is developed, and experiments testing the design solution are reported. An application of the scene-linking concept, in the form of a candidate HUD to support ground taxi operations for civil transport, is described.
Author
Head-Up Displays; Human Factors Engineering

19960023265; 96N26050 Army Aeromedical Research Lab., Fort Rucker, AL USA
Physical Evaluation of the Integrated Helmet and Display Sighting System (IHADSS) Helmet Display Unit (HDU) ***Final Report***
Harding, Thomas H., Army Aeromedical Research Lab., USA; Beasley, Howard H., Army Aeromedical Research Lab., USA; Martin, John S., Army Aeromedical Research Lab., USA; Rash, Clarence E., Army Aeromedical Research Lab., USA; Aug. 1995, pp. 43; In English
Report No.(s): AD-A300705; USAARL-95-32; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Helmet Display Unit (HDU) of the Integrated Helmet and Display Sighting System (IHADSS) of the AH-64 Apache helicopter was evaluated to establish baseline data for performance figures-of-merit for comparison of future helmet mounted display designs. Measured parameters included physical and optical eye relief, exit pupil size, position, field-of-view, luminance range, transmittance and reflectance characteristics, and static and temporal response.
DTIC
AH-64 Helicopter; Helmet Mounted Displays; Performance Tests; Human Factors Engineering

19960024013; 96N26607 Princeton Electronic Systems, Inc., Cranbury, NJ USA
Develop a Diode Laser Spectroscopy System for Continuous Monitoring of Certain Gases in the Expire Air and Blood with a High Degree of Accuracy ***Final Report, 26 Sep. 1994 - 25 Sep. 1995***
Zhang, Jiamin, Princeton Electronic Systems, Inc., USA; Oct. 1995, pp. 20; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-94-C-4147
Report No.(s): AD-A302219; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Development of a monitor prototype to accurately measure medical gases such as O2 and CO2 content in the expired air is the objective of this program. By using the frequency modulation spectroscopy technique, we have fabricated a diode laser based sensor prototype for measuring O2 content in different concentration gas mixtures and the expired air. The prototype provides the good detection accuracy and signal-to-noise ratio. For an application purpose of breath-by-breath oxygen content monitoring, the death volume of the gas cell in the current sensor is still big and the related sample replacement time is still relatively long. The single board lock-in amplifier has to be improved. Further modifications on the lock-in amplifier and the gas cell are underway.
DTIC
Oxygen; Carbon Dioxide; Expired Air; Gas Mixtures; Diodes

19960024043; 96N26635 Army Aeromedical Research Lab., Fort Rucker, AL USA
Communication and Noise Hazard Survey of CH-47D Crewmembers ***Final Report***
Ribera, John E., Army Aeromedical Research Lab., USA; Mozo, Ben T., Army Aeromedical Research Lab., USA; Mason, Kevin T., Army Aeromedical Research Lab., USA; Murphy, Barbara A., Army Aeromedical Research Lab., USA; Nov. 1995, pp. 16; In English
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U.S. Army CH-47D cargo helicopter crewmembers are exposed to high levels of noise on a routine basis, yet must accomplish demanding missions which rely heavily on clear communication. This study looked at the auditory influences affecting communication by surveying 17 crewmembers of a CH-47D Army Reserve unit. Results revealed (1) noise levels

that exceed other Army rotary-winged aircraft, (2) different exposure levels for aviators and crew chiefs, (3) an overall preference to hear 'critical or diagnostic' aircraft sounds rather than wear double hearing protection, (4) complaints of postflight tinnitus or muffled hearing, (5) helmet discomfort among the majority of crewmembers (6) a high incidence of hearing loss, (7) difficulties in adjusting radio volume controls for aviators, and (8) the effects of eyeglasses or protective masks on hearing and communications.

DTIC

Helicopters; Aircraft Noise; Voice Communication; Flight Crews; Noise Propagation; Radio Communication; Noise Intensity; Physiological Effects

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