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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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51 Life Sciences (General) 1

52 Aerospace Medicine 3

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

53 Behavioral Sciences 7

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

54 Man/System Technology and Life Support 17

Includes human engineering; biotechnology; and space suits and protective clothing.

55 Space Biology N.A.

Includes exobiology; planetary biology; and extraterrestrial life.

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Subject Term Index ST-1

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 438)

MAY 5, 1997

51
LIFE SCIENCES (GENERAL)

19970012059 Jarvis Christian Coll., Hawkins, TX USA
Retrieval of Water Channels by Endocytosis in Renal Epithelia ***Annual Report, 5 Jun. 1995 - 4 Jun 1996***
Mia, Abdul J., Jarvis Christian Coll., USA; Yorio, Thomas, Jarvis Christian Coll., USA; Jul. 1996; 78p; In English
Contract(s)/Grant(s): DAMD17-95-C-5086
Report No.(s): AD-A315829; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Combat crew effectiveness is crucial during sustained and demanding military operations. In particular, how soldiers cope with conditions of excess heat and fluid deprivation will ultimately impact on their ability to carry out their stated objectives. If the kidney should become damaged or obstructed, the kidney will fail to respond to the hormone vasopressin, which is responsible for regulating water balance. Understanding the specific mechanisms involved in the regulation of water balance by the kidney will provide information needed to design preventive measures f or dealing with potential adverse conditions that may result in water deprivation and decreased renal responsiveness to vasopressin. The present study is designed to determine the cellular mechanisms involved in reduced fluid reabsorption and membrane reorganization following the removal of the actions of ADH. It is proposed that following removal of hormone, proteinaceous water channels, located in the apical membrane, are internalized through a process of endocytosis, delivered to the eytosol as a consequence of changes in intracellular calcium concentrations, PKC enzyme activation and reorganization of the microfilament/microtubule system. These studies may lead to new drug or non-drug treatment regimes that could be used to enhance the kidney's responsiveness to vasopressin or to maintain the level of water reabsorptive capacity of soldiers facing harsh environmental conditions of prolonged exposure to dehydration and water deprivation or impaired renal function from injury. Such preventive measures will be essential for maintaining the performance and combat effectiveness of our military forces.
DTIC
Pituitary Hormones; Water Deprivation; Antidiuretics; Enzymes; Hormones; Dehydration

19970012074 California Univ., Davis, CA USA
Single-Pulse Dual-Energy Mammography Using a Binary Screen Coupled to Dual CCD Cameras ***Annual Report, 15 Jul. 1995 - 14 Jul 1996***
Boone, John M., California Univ., USA; Aug. 1996; 28p; In English
Contract(s)/Grant(s): DAMD17-94-J-4424
Report No.(s): AD-A315697; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This past year we have been working on a wide variety of different research topics, where each relates to the global objective of this proposal but the individual projects are only loosely related to each other. The projects that are reported here are (1) x-ray spectral measurements, (2) novel screen evaluation, (3) analytical screen comparisons, (4) evaluation of attenuation coefficient data, (5) the development of a sine wave test pattern approach to measuring the MTF, (6) development of an image registration algorithm, (7) calculation of breast density from digital mammograms, and (8) mechanical fabrication of the digital mammography system. Progress in each of these projects has been substantial, and five manuscripts have been or will be shortly submitted covering these topics. Here we report, in vignette format, representative examples of the results of each of the projects. With these parallel efforts completed or close to completion (depending on which project) and the groundwork laid, in the upcoming year we can turn our focus towards putting together the actual dual energy mammography system, testing it, and evaluating its potential.

We look forward to these continuing efforts with enthusiasm and optimism that dual energy mammography may be a realistic tool in the diagnostic work-up for breast cancer.
DTIC
Cancer; Mammary Glands; Pattern Registration

19970012075 State Univ. of New York, Buffalo, NY USA
Ligands for Stretch Activated Ion Channels ***Final Report***
May 1996; 6p; In English
Contract(s)/Grant(s): DAAL032-92-G-0014
Report No.(s): AD-A315807; ARO-28775.7-LS; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During tenure of the grant we have made tremendous strides in finding active ligands for the mechanosensitive channels. We developed a simple screen for the toxins based upon hypotonic swelling of GH3 clonal neurons which produced increases in internal Ca(2+) levels that could be measured using Fura-2. Addition of active venoms would lead to a decrease in Ca(2+) levels following swelling. Screening a variety of spider and scorpion venoms, we found that none of the scorpions tested (equal to 12) but one of the 8 spiders tested was able to block volume activated Ca(2+) uptake. The raw venom also blocked stretch activated ion channels in Xenopus oocytes, chick heart cells and GH3 cells, and whole cell mechanical currents in chick heart cells.
DTIC
Ligands; Cells (Biology); Toxins and Antitoxins; Calcium; Heart

19970012131 Utah Univ., Salt Lake City, UT USA
Identification of BRCA1 and 2 Other Tumor Suppressor Genes on Chromosome 17 Through Positional Cloning ***Annual Report, 1 Jul. 1995 - 30 Jun. 1996***
White, Raymond L., Utah Univ., USA; Jul. 1996; 21p; In English
Contract(s)/Grant(s): DAMD17-94-J-4129
Report No.(s): AD-A315787; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the past year we have made good progress on several aspects of the research outlined in our original proposal. In particular, we have identified the human homologue of the mouse FKBP65 gene and a novel gene with strong protein homology to an uncharacterized gene in C. clegans in the region of LOH surrounding plakoglobin, a region which is lost in human breast tumors. We have also begun to establish a physical map in the telomeric region of the short arm of chromosome 17, as art of an approach to cloning the tumor suppressor gene(s) thought to be present there. In the process, by comparing available LOH mapping information with our genetic maps we have identified a preliminary 15-cM target region for the putative tumor suppressor gene(s). In our other focus of investigation, we are characterizing the biological effects of inhibiting the two DLG genes we have identified as located 1Mb telomeric of BRCA1. We have also tested 9 paired samples of breast tumors and corresponding normal tissues for LOH in the region containing the DLG2 and DLG3 loci. As 3 of the tumors in these sets exhibited LOH, we are determining whether either the DLG2 or DLG3 gene is the target by means of sequencing experiment s based on templates prepared from RNA isolated from all the tumors showing LOH. In one sample tested for LOH, micro-satellite instability was observed.
DTIC
Chromosomes; Tumors; Genes; Mammary Glands; Biological Effects

19970012142 University of South Florida, Tampa, FL USA
Digital Image Database with Gold Standard and Performance Metrics for Mammographic Image Analysis Research ***Annual Report, 1 Jul. 1995 - 30 Jun. 1996***
Bowyer, Kevin W., University of South Florida, USA; Jul. 1996; 13p; In English
Contract(s)/Grant(s): DAMD17-94-J-4015
Report No.(s): AD-A315935; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Digital Database for Screening Mammography (DDSM) is an infrastructure resource for the mammographic image analysis research community. The purpose of the DDSM is to make it possible for researchers to rigorously compare the performance of different image analysis techniques. An initial volume of DDSM has been made publicly available. A volume corresponds to an amount of data that would fit on one exabyte tape for purposes of transfer through the mail. This volume contains approximately 120 normal cases. Over 30 distinct sites around the world have already accessed (portions of) this data over the internet. In addition to the image data, a software utility for viewing the images has been made available.
DTIC
Cancer; Image Analysis; Computer Programs; Data Bases

19970012329 Alaska Univ., Inst. of Marine Science, Fairbanks, AK USA
Biochemical Indices of High Pressure Tolerance in Marine Mammals ***Final Report, Apr. 1993 - Nov. 1995***
Castellini, Michael A., Alaska Univ., USA; May 13, 1996; 6p; In English
Contract(s)/Grant(s): N00014-93-1-0457
Report No.(s): AD-A308618; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The metabolic effects associated with the dramatic and repeated hydrostatic pressure changes faced by marine mammals are unknown. by measuring glucose utilization and lactate production, the effect of 2000 psi of pressure on glycolysis in red blood cells was compared among marine and terrestrial mammals. The effect of pressure on the kinetics of lactate dehydrogenase in cardiac tissue of marine and terrestrial mammals was also evaluated. Pressure affected LDH kinetics similarly in both groups, causing no change in Vmax or Km for pyruvate or NAD(+), a decrease in lactate Km and n increase in NADH Km. At pressure, marine mammal RBCs generally had little change in glucose utilization rates relative to terrestrial mammals, in which the rate decreased. Lactate production rate was enhanced in some marine mammals, remained relatively unchanged in others and generally decreased in terrestrial mammals. Lactate/glucose was well below the theoretical value of 2.0 except for dolphins and humans. In most cases, lactate/glucose shifted to higher values under pressure, suggesting a shift in metabolic pathway toward glycolysis. The effect of pressure on glycolysis is apparently complex, involving individual enzymes, possibly a shift in metabolic pathway and possibly glucose transport.
DTIC
Marine Mammals; Hydrostatic Pressure; Glycolysis; Lactates; Erythrocytes

19970012739 Massachusetts Univ., Dept. of Chemistry, Amherst, MA USA
1995 Summer: Gordon Research Conference on Molecular Membrane Biology ***Final Report***
Gierasch, Lila M., Massachusetts Univ., USA; 1995; 2p; In English; Molecular Membrane Biology, 9-15 Jul. 1995, Andover, NH, USA
Contract(s)/Grant(s): N00014-95-I-0856
Report No.(s): AD-A310192; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Gordon Conference on 'Molecular Membrane Biology' was held July 9 to 15, 1995 in Andover, New Hampshire at Proctor Academy. One hundred and thirty six scientists attended, including the major figures in the cell biology and biophysics of protein localization, vesicle sorting, and membrane protein biogenesis. Represented among the attendees were established students as well as post-doctoral fellows (15%) and students (10%). Sixty percent of the participants were from the U.S. and 40% foreign.
DTIC
Conferences; Cells (Biology); Membranes; Molecular Biology

52
AEROSPACE MEDICINE

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

19970012055 Naval Health Research Center, Cognitive Performance and Psychophysiology Dept., San Diego, CA USA
Cortisol Secretion Under Stress: Test of a Stress Reactivity Model in Young Adult Males ***Interim Report, Oct. 1993 - Sep. 1994***
Vickers, Ross R., Jr., Naval Health Research Center, USA; Hervig, Linda K., Naval Health Research Center, USA; Poth, Merrilee, Naval Medical Research and Development Command, USA; Hackney, Anthony C., North Carolina Univ., USA; Apr. 05, 1995; 36p; In English
Report No.(s): AD-A309366; NHRC-95-17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A three-group stress reactivity typology was compared to a five-factor dimensional personality model as predictors of cortisol secretion in two samples of U.S. Navy recruits (n = 40 and n = 53) during military basic training. Initial exposure to basic training was associated with elevated cortisol levels compared to later in training. Individual differences in cortisol were moderately stable over the course of basic training, but neither personality model predicted the stable individual differences reflected in cortisol. In the typological model, stress reactive individuals showed higher cortisol at the end of training. In the dimensional model, agreeableness was associated with higher cortisol in the middle of training, and conscientiousness was associated with lower cortisol at the end of training, so the dimensional model predicted cortisol over a wider range of training conditions. These results are interpreted as consistent with a conditional person-environment fit model of stress. The model postulates that different personality

attributes predict cortisol secretion when social stimuli relevant to those attributes are present. The relationships are conditional in that they are present only in a stable social situation.
DTIC
Stress Analysis; Males; Psychological Tests; Predictions

19970012081 Analytic Sciences Corp., San Antonio, TX USA
Retinal Damage and Laser-Induced Breakdown Produced by Ultrashort-Pulse Lasers ***Final Report, Oct. 1993 - May 1995***
Cain, Clarence P., Analytic Sciences Corp., USA; DiCarlo, Cheryl D., Analytic Sciences Corp., USA; Rockwell, Benjamin A., Analytic Sciences Corp., USA; Kennedy, Paul K., Analytic Sciences Corp., USA; Noojin, Gary D., Analytic Sciences Corp., USA; Stolarski, David J., Analytic Sciences Corp., USA; Hammer, Daniel X., Analytic Sciences Corp., USA; Toth, Cynthia A., Analytic Sciences Corp., USA; Roach, W. P., Analytic Sciences Corp., USA; Sep. 1996; 12p; In English
Contract(s)/Grant(s): F33615-92-C-0017; AF Proj. 2312
Report No.(s): AD-A315588; AL/OE-JA-1995-0079; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In vivo retinal injury studies using ultrashort-pulse lasers at visible wavelengths for both rabbit and primate eyes have been completed, and the results are presented herein for laser-induced breakdown (LIB) and bubble generation. Results of previous measurements for the minimum visible lesion (MVL) threshold doses for both primate and rabbit eyes were reported earlier for pulsewidths from 4 nanoseconds (ns) to as low as 90 femtoseconds (fs). We have recorded on video the first in vivo LIB in vitreous using both albino (New Zealand white) and pigmented (Dutch-belted) rabbit and rhesus monkey eyes with 580-nanometer (nm), 120-fs pulses. We believe the phenomena responsible for bubble generation to be LIB because of the extremely high irradiances within the focused beam and because of the very low absorption properties of the vitreous humor. The laser-generated LIB-ED(50) bubble threshold for the monkey eye was 0.56 microJ at 120 fs. Results of our nonlinear modeling and calculations for self-focusing within the eye and for LIB thresholds are presented and are compared with our experimental results. Data is presented which show that LIB thresholds cannot be reached with MVL-ED(50) doses until the pulsewidth drops to less than 600 fs and the retinal image diameter is close to 10 micrometers. Self-focusing and LIB are the two nonlinear effects shown to affect the visible lesion thresholds, and our results also explain why it is so difficult to produce hemorrhagic lesions in either the rabbit or primate eye with visible 100 microJ, 100-fs laser pulses.
DTIC
Pulsed Lasers; Retina; Retinal Images; Injuries; Bubbles; Self Focusing

19970012124 Georgia Inst. of Tech., School of Mechanical Engineering, Atlanta, GA USA
Response of the Lungs to Low Frequency Underwater Sound ***Final Report, 1 Sep. 1993 - 31 Dec. 1995***
Rogers, Peter H., Georgia Inst. of Tech., USA; Caille, Gary W., Georgia Tech Research Inst., USA; Lewis, Thomas N., Georgia Inst. of Tech., USA; Jan. 31, 1996; 29p; In English
Contract(s)/Grant(s): N00014-93-1-1263
Report No.(s): AD-A314796; E25-W28; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Because of their high compliance, the lungs are probably more vulnerable to damage by high intensity, low frequency underwater sound than any other part of the human anatomy. The objective of this research was to study the effects of low frequency (50-1200 Hz) underwater sound on the lungs to assist in estimating safe exposure conditions for swimmers and divers. to accurately assess the risk, it is necessary to have a complete understanding of the vibrational response of the lungs as well as knowledge of the potential damage mechanism. Lung resonances in an animal model (pigs) and humans were measured at low intensities using NIVAMS (Non-Invasive Vibration Amplitude Measurement System). The results from the human subjects indicated that the fundamental lung resonance was below the lowest frequency used (50 Hz) and that a secondary resonance appeared in the 100 to 200 Hz range for subjects with their head above the surface. Also an attempt was made to determine damage mechanisms by exposing animals to high intensity sound while submerged. There was no damage detected for the three pigs exposed to sound pressure levels up to 177 dB.
DTIC
Lungs; Underwater Acoustics; Low Frequencies; Vibration; Resonance; Human Beings

19970012397 Army of the Czech Republic, Expert Lab of the Inspector of the Air Force and Air Defence, Prague, Czechoslovakia
Single Beat Late Potentials and the Risk of Human Factor Failure Due to the Sudden Cardiac Death
Drska, Z., Army of the Czech Republic, Czechoslovakia; Polankova, M., Army of the Czech Republic, Czechoslovakia; Selection and Training Advances in Aviation; Nov. 1996; 4p; In English; Also announced as 19970012387
Contract(s)/Grant(s): ACR-406/95/0737; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

Especially due to the catecholamines compartment of stress managing, the microfocal dispersed changes of the myocardium are observed, the result of which is the myocardial electrical instability. In clinic these changes are known as predisposition to the life-threatening arrhythmias and/or to the sudden cardiac death. Late potentials (LP) are considered the manifestation of myocardial electrical instability in the body surface potential distribution within the electrical field of the heart. Standard procedure of late potential extraction is based on signal averaging of 3 ECG's from 200 to 400 electrical systoles, i.e., in the interval of two to six minutes. Discussed limitations are suppressed by developed procedure of LP extraction from single electrical systole. Input data is the matrix of eighty simultaneously measured ECG's and three vectorcardiographic ECG's from single systole. Singular Value Decomposition allows the noise suppression by exclusion of higher order (i.e., over the twentieth) orthogonal components from final signal reconstruction. From the mentioned the hypothesis of the relationship between coping with influence of psychosocial stressors and LP origination was adopted. Data from 48 healthy subjects (mean age = 42.68 years, SD = 14.65) and 29 subjects (mean age = 49.14 years, SD = 19.15) with sustained ventricular tachycardia proved by programmed ventricular electrical stimulation were analyzed. Using the logistic regression 81.82% (81.25% of healthy and 82.76% of subjects with sustained ventricular tachycardia) were correctly classified. Thus, single beat LP extraction appears to be a suitable compartment of methods for the early diagnostic of health risks of influence of psychosocial stressors especially within the subjects with high level of importance of possible risk of human factor failure (as pilots and/or air-traffic controllers).
Author
Cardiac Output; Failure; Arrhythmia; Tachycardia; Risk; Heart

19970012398 Royal Danish Air Force, Vojens, Denmark
Anaerobic Capacity and Height Relationship to Simulated Air Combat Maneuver (SACM) - Duration
Lenler-Eriksen, O., Royal Danish Air Force, Denmark; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

A method to measure a pilots anaerobic capacity, correlated for height transfer this to an arbitrary measure for 'G duration tolerance' (GDT) is described. Results from 10 subjects form The Armstrong Laboratory, shows a significant correlation between GDT and SACM duration (P = 0.03). The method could be an inexpensive tool to get a picture af pilots SACM duration tolerance.
Author
Training Simulators; Combat

19970012410 Centre d'Essais en Vol, Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge, France
Training of Test Pilots: to Ventilate High Pressure Under A Load Factor ***Entrainement des Pilotes d'essais a la Supression Ventilatoire sous Facteur de Charge***
Ossard, G., Centre d'Essais en Vol, France; Clere, J. M., Centre d'Essais en Vol, France; Kerguelen, M., Centre d'Essais en Vol, France; Selection and Training Advances in Aviation; Nov. 1996; 6p; In French; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Anti-G protection by means of ventilator high pressure is currently being evaluated within the Rafale test program. Before use of this means of protection in actual flight, training of pilots in a centrifuge unit is recommended. This training has the goal to demonstrate to the pilots the tolerance improvement that can be achieved by means of positive pressure ventilation and sensitizing them to ergonomic and physiological particular features of this kind of anti-G protection. It is also intended to verify nominal functioning of pilot personal protection devices. Eighteen test pilots were subjected to three acceleration profiles. For the first profile they did not have any anti-G equipment. For the following profiles they wore an anti-G suit, either alone (second profile) or combined with ventilator high pressure device (third profile).
Author
Pilot Training; Ventilation; Test Pilots; Pressure Distribution; Loads (Forces); High Pressure; Centrifuges; Antigravity

19970012742 Army Armament Research and Development Command, Benet Lab., Watervliet, NY USA
Wavelet Transform Signal Processing of Electroencephalograph Signals ***Final Report***
Abbate, A., Army Armament Research and Development Command, USA; Das, P., Army Armament Research and Development Command, USA; Mar. 1996; 33p; In English
Report No.(s): AD-A310113; ARCCB-TR-96007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The wavelet transform (WT) has been used to study the nonstationary information in the electroencephalograph (EEG) as an aid in determining the anesthetic depth. The WT provides an alternative to the classical Short-Time Fourier Transform or Gabor Transform. The reason for that is the self-adjusting window structure of the WT which results in a time-scale representation that displays the growth of the spectral components with varying resolutions. The WT is briefly introduced, and its application in the analysis of transient nonstationary signals is presented. The technique is utilized for the detection and spectral analysis of transient

and background processes in the awake and asleep states. It can be observed that the response of both states before the application of the stimulus is similar in amplitude but not in spectral contents, which suggests a background activity of the brain. The brain reacts to the external stimulus in two different modes depending on the state of consciousness of the subject. In the awake state there is an evident increase in response while in the sleep state a reduction in this activity is observed. This analysis seems to suggest that the brain has an ongoing background process that monitors the external stimulus in both sleep and awake states.
DTIC
Electroencephalography; Wavelet Analysis; Signal Processing; Central Nervous System

19970012798 Kentucky Univ., Wenner-Gren Lab., Lexington, KY USA
Validation of Spectral Analysis as a Noninvasive Tool to Assess Autonomic Regulation of Cardiovascular Function ***Final Report, 15 May 1993 - 31 Dec. 1996***
Knapp, Charles F., Kentucky Univ., USA; Evans, Joyce M., Kentucky Univ., USA; Dec. 31, 1996; 97p; In English
Contract(s)/Grant(s): NAGw-3786
Report No.(s): NASA-CR-203820; NAS 1.26:203820; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

A major focus of our program has been to develop a sensitive noninvasive procedure to quantify early weightlessness-induced changes in cardiovascular function or potential dysfunction. Forty studies of healthy young volunteers (10 men and 10 women, each studied twice) were conducted to determine changes in the sympatho-vagal balance of autonomic control of cardiovascular regulation during graded headward and footward blood volume shifts. Changes in sympatho-vagal balance were classified by changes in the mean levels and spectral content of cardiovascular variables and verified by changes in circulating levels of catecholamines and pancreatic polypeptide. Possible shifts in intra/extravascular fluid were assessed from changes in hematocrit and plasma mass density while changes in the stimulus to regulate plasma volume were determined from Plasma Renin Activity (PRA). Autonomic blockade was used to unmask the relative contribution of sympathetic and parasympathetic efferent influences in response to 10 min each of 0, 20 and 40 mmHg Lower Body Negative Pressure (LBNP) and 15 and 30 mmHg Positive Pressure (LBPP). The combination of muscarinic blockade with graded LBNP and LBPP was used to evoke graded increases and decreases in sympathetic activity without parasympathetic contributions. The combination of beta blockade with graded LBNP and LBPP was used to produce graded increases and decreases in parasympathetic activity without beta sympathetic contributions. Finally, a combination of both beta and muscarinic blockades with LBNP and LBPP was used to determine the contribution from other, primarily alpha adrenergic, sources. Mean values, spectral analyses and time frequency analysis of R-R interval (HR), Arterial Pressure (AP), peripheral blood flow (RF), Stroke Volume (SV) and peripheral resistance (TPR) were performed for all phases of the study. Skin blood Flow (SF) was also measured in other studies and similarly analyzed. Spectra were examined for changes in three frequency regions (low 0.006 - 0.005 Hz (LF), mid 0.05 - 0.15 Hz (W), and high 0.15 - 0.45 Hz (EF)). The primary objective of the study was to indicate which changes in the mean values and/or spectra of cardiovascular variables consistently correlated with changes in sympatho-vagal balance in response to headward and footward fluid shifts. A secondaey objective was to quantify the vascular and extravascular fluid shifts evoked by LBNP and LBPP. The principal hypothesis being tested was that headward fluid shifts would evoke an increase in parasympathetic activity and footward fluid shifts would evoke an increase in sympathetic activity both of which would be detected by spectral analysis and verified by circulating hormones. Hematocrit (HCT), plasma mass density and plasma renin activity increased with muscarinic blockade and with LBNP, a response indicative of a plasma shift to extravascular spaces. Beta blockade alone or after muscarinic blockade had no effect on HCT or plasma mass density. With respect to intravascular fluid volume distribution, LBNP and LBPP produced sufficient upper body vascular fluid shifts to evoke appropriate autonomic regulatory responses.
Author
Spectrum Analysis; Cardiovascular System; Weightlessness; Intravascular System; Sympathetic Nervous System; Proving

19970012816 Mayo Foundation, Rochester, MN USA
Mechanisms of Hypertension After Cross-Linked Hemoglobin Blood Substitute Transfusion ***Final Report, 1 May 1993 - 30 Jun. 1996***
Joyner, Michael J., Mayo Foundation, USA; Jul. 1996; 223p; In English
Contract(s)/Grant(s): DAMD17-93-C-3116
Report No.(s): AD-A314667; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The USAMRDC has developed a ’blood substitute’, consisting of a cross-linked human hemoglobin in saline solution. The rationale for developing such a product is that it might be useful in the acute resuscitation of soldiers in the battlefield, and also might have utility as an oxygen-carrying volume expander in situations where administration of blood is logistically difficult. In animal models, this material can sustain life in the absence of red cells. It is also effective in resuscitating experimental animals after acute hemorrhage. A common side effect of XL-Hgb administration in animals has been marked arterial and pulmonary hy-

pertension. while the mechanism of this hypertension is unknown, it is thought that XL-llgb scavenges the endogenous vasodilating substance nitric oxide (NO). In the execution of this contract our group has attempted to determine the effects of this XL-Hgb administration on (1) NO-mediated vasodilation in isolated blood vessels; (2) the metabolism of vasoconstricting catecholamines in the adrenal medulla and sympathetic nerve endings; (3) NO-mediated vasodilation in vivo; and (4) the effects on renal sodium and volume regulation in vivo. The studies conducted as part of this contract generally confirm the hypothesis that XL-Hgb interferes with NO function on isolated tissues in whole animals. It also appears that other vasoconstricting mechanisms might contribute to the hypertension observed during XL-Hgb administration.
DTIC
Adrenal Gland; Arteries; Blood Vessels; Catecholamine; Hemoglobin; Hemorrhages; Metabolism

19970012923 Naval Medical Research Inst., Bethesda, MD USA
Administration of 1-Tyrosine Prevents Cold-Induced Memory Deficits in Naval Special Warfare Personnel*, Jan. 1992 - Apr. 1994*
Schrot, J., Naval Medical Research Inst., USA; Thomas, J. R., Naval Medical Research Inst., USA; Shurtleff, D., Naval Medical Research Inst., USA; Feb. 01, 1996; 31p; In English
Contract(s)/Grant(s): AF Proj. M0095
Report No.(s): AD-A310104; NMRI-96-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Thirty-six members of SEAL Team Two volunteered to serve as subjects in a field study to determine the efficacy of tyrosine to prevent cold-induced memory deficits. Members of three different platoons, over a three-year period of time, participated during annual Winter Warfare Training conducted in Alaska from January through March of each year. The subjects were first recruited, medically screened, and trained on a computerized cognitive Performance Assessment Battery (PAB) at the Naval Amphibious Base, Little Creek, VA approximately one month prior to deploying to Alaska. Baseline test scores were obtained indoors under normothermic (70 F) conditions once training was completed. Once in Alaska the subjects were divided into two equivalent groups based on the test scores obtained during training. Both groups were then exposed to outdoor ambient cold temperatures, which ranged over the three years from approximately -22 C to -3 C (-1O F to 28 F), for one hour subsequent to consuming either 6.0 g of tyrosine or an equal amount of placebo. At the end of the cold exposure the subjects were brought inside and were administered the PAB. A 5 ml blood sample was obtained prior to consuming tyrosine or placebo and after completion of the test battery. The results indicate that consumption of tyrosine prevented cold-induced PAB deficits observed with the placebo group. On average the subjects who consumed placebo showed performance decrements on acquisition and memory tasks following cold exposure, while the subjects who consumed tyrosine had test scores comparable to those obtained under baseline conditions. Blood levels of tyrosine were elevated two- to three-fold in the tyrosine group compared with the placebo group 1.5 hrs after consumption; the blood levels of the two groups were comparable prior to consumption.
DTIC
Low Temperature; Winter; Cold Weather; Electric Batteries; Mental Performance; Warfare; Education

53
BEHAVIORAL SCIENCES

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

19970012070 University of Southern California, Information Sciences Inst., Marina del Rey, CA USA
A Gentle Introduction to Soar, an Architecture for Human Cognition *Topical Report*
Lehman, Jill Fain, Carnegie-Mellon Univ., USA; Laird John F., Michigan Univ., USA; Rosenbloom, Paul S., University of Southern California, USA; May 1996; 47p; In English
Report No.(s): AD-A314690; ISI/RS-96-439; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Many intellectual disciplines contribute to the field of cognitive science: psychology, linguistics, anthropology, and artificial intelligence, to name just a few. Cognitive science itself originated in the desire to integrate expertise in these traditionally separate disciplines in order to advance our insight into cognitive phenomena - phenomena like problem solving, decision making, language, memory, and learning. Each discipline has a history of asking certain types of questions and accepting certain types of answers. and that, according to Allen Newell, a founder of the field of artificial intelligence, is both an advantage and a problem.
DTIC
Artificial Intelligence; Cognition; Architecture (Computers); Knowledge Based Systems; Complex Systems; Machine Learning

19970012387 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Selection and Training Advances in Aviation ***Les Progres Realises en Selection et Formation des Personnels Navigants***

Selection and Training Advances in Aviation; Nov. 1996; 286p; In English; In French; Aerospace Medical Panel Symposium, May 1996, Prague, Czechoslovakia; Also announced as 19970012388 through 19970012416

Report No.(s): AGARD-CP-588; ISBN-92-836-0035-5; Copyright Waived; Avail: CASI; A13, Hardcopy; A03, Microfiche

These proceedings include the Technical Evaluation Report, Keynote Address, Paper Presentations, and Poster Display Presentations of the Symposium sponsored by the AGARD Aerospace Medical Panel and held at the Ministry of Defence, Prague, Czech Republic, 28-31 May 1996. Over the last few decades, aircraft and air operations have become more sophisticated. Technological innovations have resulted in higher-performance, more-complex weapons systems. That increased performance and complexity have placed greater physical and psychological demands upon aviators. Refinement of materiel and improvements in selection and training technologies have enabled aviator selection and training processes to evolve. The purpose of this Symposium was to unite military and civilian experts in the field of selection and training. The papers addressed aviator selection and training, including: human abilities measurement; anthropometric accommodation; gender differences; crew resource management; flight simulators; spatial disorientation; cost effectiveness; centrifuge training; and g-tolerance. These proceedings will be of interest to those concerned with selection criteria, progression in selection techniques, training processes, physiological training, and facility advances in aviation. Interaction of medical, physiological, cognitive, psychomotor, and personality factors in the selection process are highlighted.

Derived from text

Research and Development; Flight Operations; Aircraft Pilots; Aerospace Medicine

19970012388 Armstrong Lab., Aircrew Selection Research Branch, Brooks AFB, TX USA

Advances in USAF Pilot Selection

Weeks, Joseph L., Armstrong Lab., USA; Zelenski, Warren E., Armstrong Lab., USA; Carretta, Thomas R., Armstrong Lab., USA; Selection and Training Advances in Aviation; Nov. 1996; 12p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Although modern aviation technology provides tremendous advantages, there is concern that complex cockpit systems may introduce psychological problems for aircrew. This concern is particularly relevant for pilot training. Such problems could result in loss of life and increased training costs. For trainer aircraft currently used in USA Air Force (USAF) Undergraduate Pilot Training (UPT), training costs are high. The cost of an eliminee from pilot training can be as much as $350,000 depending on when elimination occurs in the training process. In the past, pilot selection systems have helped identify those individuals most capable of successful performance in UPT. In the future, pilot selection systems can be developed to help minimize any adverse training impacts of modern aviation technology. Analyses of new cockpit systems can reveal the human capabilities required for successful training performance. In addition, advances in the measurement of human abilities allow us to fine tune pilot selection systems to identify candidates having the ability profiles required for training with complex modern aircraft. Use of candidate ability information by pilot selection boards results in improved person job match, higher quality trainees, lower training wastage and ultimately, improved air combat readiness.

Author

Pilot Training; Pilot Selection; Psychological Factors; Human Performance

19970012390 Armstrong Lab., Brooks AFB, TX USA

Characteristics of Female and Male USAF Pilots: Selection and Training Implications

King, R. E., Armstrong Lab., USA; McGlohn, S. E., Armstrong Lab., USA; Selection and Training Advances in Aviation; Nov. 1996; 4p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

The determination of psychological fitness to fly is complicated, particularly when attempting to extrapolate what little we know about male aviators to women. New training needs, for both women and men, may arise as the number of a country's female aviators increases. The large numbers of aviators in the USA Air Force (USAF) enable it to do research that may be instructive to other, smaller, air forces.

Author

Aircraft Pilots; Pilot Selection; Pilot Training

19970012391 Institute of Aviation Medicine, Prague, Czechoslovakia

The Analysis of Safety Indicators in the Aviators' Training

Kolouch, Jan, Institute of Aviation Medicine, Czechoslovakia; Selection and Training Advances in Aviation; Nov. 1996; 4p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

The prevention of aviation accidents used to be, in the former Czechoslovak Air Force in the centre of Commands attention. A system access to solving this problem area achieved the lowest losses of pilots and planes in the 1970s. Within the framework of validation of the methods, used in selection and training procedures, the analysis of the level in actual combat flight training was carried out in a fighter group (150 pilots) in the last years. The achieved results confirmed the reliability of psychophysiological examination with cadets and the prognostic validity of the criteria used in the selection processes. With the 90% level of significance the hypothesis of personality predisposition to errors in flying by the individuals having a lower level of cognitive functions development and with the manifestation of the emotional irritability has been confirmed. The characteristics of test batteries and the relevant criteria used for the expertise together with account of incidents and accidents will be dealt with.
Author
Aircraft Pilots; Pilot Selection; Training Analysis; Psychophysiology; Safety; Prevention; Human Behavior; Flight Training; Errors

19970012392 Canadian Forces Personnel Unit, North York, Ontario Canada
The Canadian Automated Pilot Selection System (CAPSS): Validation and Cross Validation Results
Adams-Roy, J. E., Canadian Forces Personnel Unit, Canada; Selection and Training Advances in Aviation; Nov. 1996; 2p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

The current pilot selection system used by the Canadian Forces to assess pilot applicants incorporates paper and pencil ability tests, and an evaluation of psychomotor skill measured on a general aviation trainer. Each measure is weighted differently and the scores are then combined together to give candidates a final Pilot Stanine (PS). Although able to satisfactorily select candidates for pilot training, the increasing complexity of modern aircraft and the high costs associated with training have led the CF to adopt a new selection measure, the Canadian Automated Pilot Selection System (CAPSS) which will be implemented in January 1997.
Derived from text
Pilot Training; Pilot Selection; Training Devices; Psychomotor Performance; Psychological Tests

19970012393 Army of the Czech Republic, Expert Lab of the Inspector of the Air Force and Air Defence, Prague, Czechoslovakia
Analysis of Psychomotor Performance of Fighter Pilots During Flight
Solcova, I., Army of the Czech Republic, Czechoslovakia; Sykora, J., Danwell, Inc., Czech Republic; Dvorak, J., Army of the Czech Republic, Czechoslovakia; Gadourek, P., GETA, Czech Republic; Selection and Training Advances in Aviation; Nov. 1996; 4p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

Eighteen healthy males with different degrees of flight experience were tested during piloting an L-29 jet-trainer plane during 54 standardized aerobatic flights. In 13 pilots up to four successive aerobatic flights were realized, separated by half an hour intervals on the ground. The ranks of the expert evaluated in-flight psychomotor performances during standardized aerobatic flights and of the values of the individual total flight time hours were highly significantly correlated ($r = 0.86$). Computer based analysis of the quality of performance of flight maneuvers showed that the pattern of piloting the plane was highly individual. Nevertheless, the coefficient of reliability of the courses of repeated flights of experienced pilots (normalized as to the duration of each maneuver and the maximal G-level reached) equaled to $r = 0.97$. Evidently, the individual pattern of flying is a stable characteristic of the performance of experienced pilots. It is something like their signature. Results of analysis were compared with other indices of pilot's performance under the influence of hypergravity.
Author
Aircraft Pilots; Pilot Performance; Pilot Training; Psychomotor Performance; Flight Tests

19970012394 Royal Air Force, Directorate of Recruiting and Selection, Cranwell, UK
Current Status and Future Developments of RAF Aircrew Selection
Bailey, M., Royal Air Force, UK; Woodhead, R., Royal Air Force, UK; Selection and Training Advances in Aviation; Nov. 1996; 10p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper summarizes the current status of the RAF aircrew aptitude selection process against work conducted during the previous decade and identifies a number of problems and possible future directions. An ability domain structure was explored and incorporated into the current test development policy. This concept was further expanded to develop a validation model which uses wider and more detailed criteria to provide a more accurate and informative estimate of selection measure validity.
Author
Aptitude; Flight Crews; Pilot Training; Pilot Selection; Pilot Performance

19970012395 German Air Force, Institute of Aviation Medicine, Koenigsbrueck, Germany

Selection of Future Fighter Pilots

Welsch, H., German Air Force, Germany; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

A new concept in selection of the future fighter pilot generation was created in 1992 by the Surgeon General of the German Air Force. In addition to the basic medical, physical, and psychological examination at the German Air Force Institute of Aviation Medicine (GAFIAM) at Fuerstenfeldbruck the natural, unprotected, relaxed G-tolerance of the healthy young men, which have passed the examination successfully, was determinated in the human centrifuge on a voluntary basis. In connection with the consideration of the medical and psychosomatic findings just before and during the determination of the G-tolerance the individuals were scored. Based on this score three categories were established as recommendation for a possible pilot career of the candidates in high performance aircraft. The mean age of the 304 pilot candidates was 20 + 1.6 years. They reached a relaxed, unprotected G-tolerance of 4.6 + 0.5 gz. The classification of this evaluation, with regard of the heart rate and mental stress reaction signs, of the last 129 of these 304 candidates, was: 45 especially qualified, 75 qualified, and 9 less qualified. The score of the first 22 re-evaluated candidates during the G-training course in Koenigsbrueck about two years later showed no major change in the score in comparison with the first screening results. These first findings in the comparison of the results of the early phase evaluation and the G-tolerance during the G-training course allows to suppose, that the selection of pilots, added by the human centrifuge screening methods, offer a new chance to make the screening more effective and reach both: satisfy the candidates, and the German Air Force.

Author

Physical Examinations; Stress (Psychology); Aerospace Medicine; Pilot Performance; Pilot Selection; Pilot Training

19970012396 Royal Air Force, Headquarters Strike Command, High Wycombe, UK

Flying Training - Past Achievements and Future Challenges

Spiller, N. B., Royal Air Force, UK; Selection and Training Advances in Aviation; Nov. 1996; 12p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The cost of modern combat aircraft requires that they are operated safely in peacetime. Equally, the nature of air operations demands their aggressive operation in war. The challenge is to recruit people who can satisfy these 2 differing requirements. Moreover, this has to be done against a background of the difficult recruiting, manning and experience issues facing many modern Air Forces. The challenge is to identify and train effectively the correct number and balance of fighter pilots for the 21st Century.

Author

Fighter Aircraft; Pilot Performance; Pilot Training

19970012399 Armstrong Lab., Brooks AFB, TX USA

The USAF's Enhanced Flight Screening Program: Psychological Assessment of Undergraduate Pilot Training Candidates

Callister, J. D., Armstrong Lab., USA; Retzlaff, P. D., University of Northern Colorado, USA; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The Enhanced Flight Screening (EFS) program consists of both flying and medical screening. This paper will focus on the psychological assessment techniques of the EFS program. Measures of intelligence and cognitive abilities are included. Undergraduate Pilot Training candidates are required to take the Multidimensional Aptitude Battery, an intelligence test, and the CogScreen-Aeromedical Edition, a measure of cognitive skills. Over 1,500 candidates have completed the EFS program. Ninety-four percent of the candidates have consented to allow their data to be used for research. Intelligence testing scores are well above average. Pilot candidates differed from commercial pilots on several cognitive measures. Commercial pilots were more accurate on measures of math abilities, while pilot candidates were more accurate on measures of memory. Commercial pilots were more efficient with most cognitive tasks, except that pilot candidates were more efficient with dual and divided tasks. Commercial pilots made more perseverative errors, while pilot candidates made more impulsive errors. Computer administration of psychological tests makes it possible to efficiently collect clinically relevant data on all candidates. Collection of this data for each candidate will improve the quality of medical waiver recommendations through the use of idiographic data. Collectively, this process provides an infrastructure for productive longitudinal selection research.

Author

Pilot Training; Psychological Tests; Intelligence; Mental Performance; Aptitude; Abilities

19970012400 Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck, Germany

Simulator Based Test Systems as a Measure to Improve the Prognostic Value of Aircrew Selection

Gress, W., Air Force Inst. of Aviation Medicine, Germany; Willkomm, B., Air Force Inst. of Aviation Medicine, Germany; Selection and Training Advances in Aviation; Nov. 1996; 4p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

A simulator based aviation psychological test system in use in the German Air Force called the 'FPS 80' which is the German abbreviation of 'Aviation Psychological Selection System 80' is described to point out the advantages and the disadvantages of simulator based tests in comparison to classical psychological tests. While classical psychological tests try to examine single abilities simulator based test systems measure a student pilot's abilities in a complex test situation similar to a real training situation. The role of the FPS 80 within the sequential selection strategy of the GAF will be described in the study. The results of a study based on the data of over 300 student pilots of the years 1994 and 1995 show that the prognostic value of the whole selection system could be increased considerably by using simulator based tests. The prognostic value of the selection process becomes evident in the correlations of psychological data and the results of academic training and of flight training in the flying screening. A comparison of the prognostic value with and without the use of the FPS 80 shows that the correlation of the whole selection process could be increased from .3 to over .5. The results also show that the prognostic value of the FPS 80 itself could be increased by adding data from a psychological observation of behaviour to the computer generated test scores. As a conclusion the advantages and the limits of such a simulator based test system are pointed out.

Author

Flight Training; Flight Crews; Pilot Selection; Pilot Training

19970012401 Armstrong Lab., Brooks AFB, TX USA

Selection of Special Duty Aviators: Cognitive and Personality Findings

Patterson, John C., Armstrong Lab., USA; Schofield, Gary L., Armstrong Lab., USA; Howe, Brian, Armstrong Lab., USA; Bonney, Jacqueline D., Armstrong Lab., USA; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper will describe a selection program for special duty aviators. Different from other selection programs, this program selects already trained pilots as well as other non trained crewmembers such as loadmasters and flight engineers for special aviation duty. These aviators are selected to fly for the U.S. Air Force Special Operations Command (AFSOC) in airframes such as the MH 53 helicopter.

Derived from text

Aircraft Pilots; Personality; Pilot Selection; Pilot Training; Pilot Performance

19970012402 Armstrong Lab., Aircrew Training Research Div., Mesa, AZ USA

R and D Advances in USAF Pilot Training

Carroll, Lynn A., Armstrong Lab., USA; Andrews, Dee H., Armstrong Lab., USA; Selection and Training Advances in Aviation; Nov. 1996; 10p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Recent advances in aircrew training methods and technologies now allow the Air Force to conceptualize training as the peacetime manifestation of war. That is, ground-based pilot training can now move beyond simply training procedural skills to training wartime mission skills on a much more frequent basis than past training range training has allowed. We discuss R&D advances in three key areas that will truly allow the Air Force to train as it intends to fight. These three areas are 'Warfighter Training Behavioral Research', "Distributed Mission Training Engineering Development', and 'Night Vision Device Training R&D'. Under each of these three main categories of R&D we discuss specific advances made in our laboratory. We also discuss future directions that we believe aircrew R&D should advance in order to provide synthetic training environments that will allow the full measure of warfighting skills to be trained.

Author

Pilot Training; Mission Planning; Flight Crews

19970012403 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Institute of Aerospace Medicine, Hamburg, Germany

Training of Aircrew Decision Making

Hormann, Hans-Jurgen, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Aircrew decision making is one central element of the CRM-training course for cockpit crews which was developed recently by the DLR-Department of Aviation and Space Psychology in cooperation with Lufthansa German Airlines and Condor. Exam-

ples of the course contents and methods are illustrated. As a framework for the training units of aircrew decision making the FOR-DEC model is proposed. FOR-DEC is an acronym which stands for six different phases of the decision making process: Facts, Options, Risks & Benefits, Decision, Execution and Check. The paper describes how this model is integrated into the training units on team problem solving and decision making. First evaluation results of the course are shown which are based on the seminar critiques of 750 participants. These feedbacks are very positive in regard to the overall relevance of the course contents and methods. However, they also indicate the importance of authentic in-house scenarios for the effectiveness of the seminar processes.
Author
Aviation Psychology; Decision Making; Flight Crews; Problem Solving; Pilot Performance; Pilot Training; Pilot Selection

19970012405 Abertay Univ., Dundee, UK
Understanding the Requirement: A Review of Common Problems in Training, Selection and Design
Cook, Malcolm, Abertay Univ., UK; Ward, George, ESE Associates, UK; Selection and Training Advances in Aviation; Nov. 1996; 20p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

A recent review of pilot selection procedures cast doubt upon the predictive capabilities of pilot selection batteries to identify the specific qualities that identify good pilots in the initial stages of the selection process. In other contributions to the same text many authors poured scorn on the relatively poor quality of psychological tools in selecting out ineffective pilots or in evaluating pilot's performance with laboratory based tasks. Three conclusions can logically be drawn from this work, presentations at the AGARD Spring Symposium in 1995 on Situational Awareness and other papers in the open literature. Either the tests applied in selection of pilots are poor in themselves, the understanding of the cognitive demands placed on pilots is poor or the both the tests, understanding of tasks and their application are suspect. Although there have been reports which suggest that predictive validity may, indeed, be declining in tests used in pilot selection the problem underpinning the ineffective selection may be inadequate quantitative and qualitative descriptions of the pilot's tasks.
Derived from text
Pilot Selection; Predictions; Pilot Performance

19970012406 Defence Research Agency, Systems Integration Dept., Farnborough, UK
Performance and Workload Measurement in Simulation-Based Training
Newman, P., Defence Research Agency, UK; Farmer, E. W., Defence Research Agency, UK; Belyavin, A. J., Royal Air Force, UK; Selection and Training Advances in Aviation; Nov. 1996; 12p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Experiments were conducted to determine the utility of measures of skill acquisition in simulator-based training. Objective performance measures were supplemented by workload measures, to permit assessment of possible changes in demand for mental resources during task learning. In the two experiments reported here, performance measures of speed, accuracy and continuous manual control were found to satisfy criteria such as sensitivity to practice and to individual differences. Several workload measures, particularly the DRA Workload Scales, also provided useful and reliable information. However, provision of performance feedback to the subject during training sessions had a limited effect on skill acquisition. On completion of this series of experiments, standardised batteries of measures will be specified for application to training.
Author
Workloads (Psychophysiology); Training Simulators; Pilot Performance; Pilot Plants; Pilot Training

19970012407 German Air Force, Institute of Aviation Medicine, Koenigsbrueck, Germany
Training of Future Fighter Pilots
Welsch, H., German Air Force, Germany; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Before starting the pilot school in USA the young, G-inexperienced student pilots were trained on the human centrifuge (HC) at Koenigsbrueck near Dresden, Saxony. This G-training is an integrated part of their one-week basic physiological training course. The objective of this course is, that the students become familiar with the G-environment safely. In the beginning of the G-training the student pilots were exposed to the same G-profiles as the pilot candidates. On the second day they were trained in muscle straining and anti-G-breathing technique during moderate HC runs with and without anti-G-equipment. Then they were able to use these techniques in the HC during active profiles. The result and effectiveness of this training will be documented by a special qualification profile. This qualification profile consists of the same passive linear profile as on the first day. The student pilots don't wear anti-G-trousers. During the increasing G-load they should first stay relaxed, until they reach their 50% peripheral light loss (1. PLL). In this moment they activate their muscle straining, until they reach the second time PLL (2.PLL). Now they

start the anti-G-breathing technique until they reach their individual maximum active G-tolerance (3. PLL). The results of the G-training of the first 198 student pilots, mean age 22.9 + 1.7 years, mean height 180.3 + 5.5 cm, body mass 76.8 i 7.9 kg indicate, that that the muscular straining manoeuvre will increase the G-tolerance by about 1.0 gz, and the additional breathing manoeuvre will increase the G-tolerance by another 1.5 gz, totally 2.5 gz even under artificial, not operational conditions.
Author
Pilot Training; Qualifications; Physiology

19970012408 Canadian Air Command Headquarters, Aviation Physiology Section, Westwin, Manitoba Canada
Aviation Physiology Training in the 21st Century
Glass, K. C., Canadian Air Command Headquarters, Canada; Wilkinson, M. O., Army Special Warfare Center, USA; Selection and Training Advances in Aviation; Nov. 1996; 8p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The Canadian Aeromedical Training Program has recently undergone significant changes. Other countries are also reviewing their aeromedical training programs and looking for new or different ways to provide the necessary academic training at the correct frequency using the best methods possible. The U.S. Navy has completed an extensive review of its program and is currently exploring the possibility of providing continuation aeromedical training in conjunction with flight simulator training. The Royal Australian Air Force already uses an innovative approach to provide night vision training that may be appropriate for use by other countries. It seems inevitable that aeromedical training programs will continue to change in the future. to ensure that these changes are appropriate and that they improve flight safety, it is essential that measurement tools be developed to assess current programs and to determine what changes should be made. Due to current and potential changes in aeromedical training programs, it would seem appropriate, in the interests of international standardization of aeromedical training in the future, to revise the terms of STANAG 3114.
Author
Training Simulators; Aerospace Medicine; Flight Safety; Night Vision

19970012409 Defence and Civil Inst. of Environmental Medicine, School of Operational Medicine, North York, Ontario Canada
Centrifuge Training in the Canadian Forces: A Review of the First Six Years' Experience
Bateman, William A., Defence and Civil Inst. of Environmental Medicine, Canada; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

In the late 1980s, the Canadian Forces developed and implemented a centrifuge training program intended to enhance the preparedness of its aircrew for the G-stress of modern fighter aircraft. In the six years from 15 June 1989 until 25 May 1995, 439 personnel attended 97 serials of this one-day course. Although a rigid performance standard was not set, aircrew from various CF pilot populations completed the target profile with success rates ranging from 61-83% (the more experienced fighter pilot groups doing better). The lessons learned in this first six years have paved the way towards a new program, with broader mandatory target population, provisions for refresher training, and G-tolerance improvement for those unable to complete the target profile.
Author
Centrifuges; Aircraft Pilots; Flight Crews; Experience

19970012412 Institut de Medicine Aerospatiale Armee, Dept. Sciences Cognitives et Ergonomie, Bretigny sur Orge, France
At the Heart of Simulator Formation: the Transfer of Training ***Au coeur de la Formation sur Simulateur: le Transfert d'Entrainement***
Grau, J. Y., Institut de Medicine Aerospatiale Armee, France; Doireau, P., Institut de Medicine Aerospatiale Armee, France; Poisson, R., Institut de Medicine Aerospatiale Armee, France; Selection and Training Advances in Aviation; Nov. 1996; 10p; In French; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Simulation used in aviation has been with us in some shape or form since the early 40's. These early devices were primarily used to teach basic flying skills and because of their simplicity had known limitations. Today's simulators are very expensive, complex and demanding devices which attempt to approximate the real world. They provide, not unlike the real aircraft, a multi-use capability where they are used for everything from teaching basic flying skills to mission rehearsals and accident investigation. These costly complicated systems sometimes provide questionable results because the designers, buyers, users and human factors specialists (which are all to often not involved) have not established a well defined set of requirements with respect to the simulators primary use. Nor do they fully understand the transfer of training from the simulator to the real world. to help understand or

improve the transfer of training, human factors personnel should be involved in almost every facet of the simulators from conception to inception.
Author
Human Factors Engineering; Training Simulators; Transfer of Training

19970012413 Thomson Training and Simulation Ltd., Clergy Pontoise, France
Thomson Training and Simulation
Lacroix, Michel, Thomson Training and Simulation Ltd., France; Fontaine, Jean-Jacques, Thomson Training and Simulation Ltd., France; Selection and Training Advances in Aviation; Nov. 1996; 6p; In French; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The performance features which a helmet visual display unit must have in order to satisfy requirements of low-altitude flight simulators and multi-purpose simulators are analyzed here. The design of the SIMEYE 90 large field helmet visual display unit which allows one to satisfy these requirements is analyzed and the technical compromises are explained. The results from using the helmet visual display unit on a helicopter simulator are then presented. They allow one to achieve better performance than when using screen projection, with the exception of weight which is found to be disturbing by pilots who are not accustomed to wearing night vision binoculars.
Author
Flight Simulators; Display Devices; Helicopters; Helmets; Night Vision

19970012696 Army Research Inst. of Environmental Medicine, Natick, MA USA
Hyperhydration: Physiologic and Thermoregulatory Effects During Compensable and Uncompensable Exercise-Heat Stress
Latzka, William A., Army Research Inst. of Environmental Medicine, USA; Sawka, Michael N., Army Research Inst. of Environmental Medicine, USA; Matott, Ralph P., Army Research Inst. of Environmental Medicine, USA; Staab, Janet E., Army Research Inst. of Environmental Medicine, USA; Montain, Scott J., Army Research Inst. of Environmental Medicine, USA; Pendolf, Kent B., Army Research Inst. of Environmental Medicine, USA; May 1996; 111p; In English
Report No.(s): AD-A309115; USARIEM-TR-T96-6; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study examined the efficacy of hyperhydration approaches during compensable and uncompensable exercise-heat stress and the impact of hyperhydration on physiologic response and tolerance to heat strain. The general approach was to determine if 1-h pre-exercise hyperhydration (29.1 ml-kg LBM-1 with or without glycerol 1.2 g-kg LBM-1) provided a physiologic advantage. During Compensable Heat Stress (CHS) the evaporative heat loss required (E(sub req) = 293 W.m-2) to maintain steady-state core temperature was less than the maximal capacity (E(sub max) = 462 W.m-2) of the climate for evaporative heat loss (E(sub req)/E(sub max) = 63%). During UnCompensable Heat Stress (UCHS) the E(sub req) (366 W.m-2) was greater than E(sub max)(88 W.m-2; E(sub req)/E(sub max) = 416%) and core temperature continued to rise until exhaustion from the heat strain occurred. Eight heat-acclimated men completed 5 trials (euhydration, glycerol hyperhydration, and water hyperhydration both with and without rehydration (replace fluid lost during exercise) in CHS and 3 trials (control, glycerol hyperhydration and water hyperhydration) in UCHS. During exercise in the heat (35 C, 45% rh) there was no difference between hyperhydration methods for increasing total body water. During CHS, hyperhydration did not alter core temperature, skin temperature, whole body sweating rate, local sweating rate, sweating threshold temperature, sweating sensitivity, or heart rate responses compared to euhydration trial. Likewise, no difference was found between water and glycerol hyperhydration for these physiologic responses. During UCHS, hyperhydration did not alter thermal or cardiovascular (stroke volume, cardiac output, blood pressure, total peripheral resistance) responses or heat strain tolerance compared to the control trial.
DTIC
Physiological Effects; Temperature Effects; Heart Rate; Physical Exercise

19970012697 Haifa Univ., Center for Study of Psychological Stress, Israel
Enhancing Cognitive Performance by Information Management Techniques ***Final Report, Jan. - Nov. 1995***
Breznitz, Shlomo, Haifa Univ., Israel; Ben-Zur, Hasida, Haifa Univ., Israel; Vardi, Naomi, Haifa Univ., Israel; Mar. 1996; 70p; In English
Contract(s)/Grant(s): DAJA45-91-C-0024
Report No.(s): AD-A309122; ARI-RN-96-30; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Ten experimental groups totaling 200 subjects were given free recall tasks with different information about list length. Manipulations consisted of exact information, discouraging information, and no information, as well as information on route, and encouraging and discouraging disconfirmation during the task proper. Information management principles that were effective in

enhancing endurance of stressful tasks were successfully applied to the area of free recall. Information conditions significantly affected performance. The conceptual framework focusing on the role of information in determining expected effort, resource mobilization, and within tasks resource allocation, was found useful in generalizing from earlier studies that enhanced endurance, to the present one. It suggests a variety of potentially effective interventions aiming at maximizing performance.
DTIC
Mental Performance; Memory; Cognitive Psychology; Information Processing (Biology); Retention (Psychology)

19970012703 Army Research Inst. of Environmental Medicine, Natick, MA USA
Evaluation of USARIEM Heat Strain Model: MOPP Level, Exercise Intensity in Desert and Tropic Climates
Cadarette, Bruce S., Army Research Inst. of Environmental Medicine, USA; Montain, Scott J., Army Research Inst. of Environmental Medicine, USA; Kolka, Margaret A., Army Research Inst. of Environmental Medicine, USA; Stroschein, Leander A., Army Research Inst. of Environmental Medicine, USA; Matthew, William T., Army Research Inst. of Environmental Medicine, USA; Sawka, Michael N., Army Research Inst. of Environmental Medicine, USA; Apr. 1996; 55p; In English
Report No.(s): AD-A309112; USARIEM-TR-T96-4; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

USARIEM has developed a series of models which predict physiologic strain (body temperature, heart rate sweating rate) and tolerance time to heat strain under a variety of conditions. These heat strain models have been incorporated into the P2NBC2 decision aid, JANUS, MERCURY and other military modeling efforts. The present study was conducted to fill-in information gaps for the database and provide validation of current algorithms. Specifically, this study reports physiologic information on the effects of: (1) light, moderate and hard exercise intensities; (2) MOPP 1 and MOPP 4; (3) desert (43 deg C (109 deg F), 20% rh) and tropic (35 deg C (95 deg F), 50% rh) climates. The physiologic information from these conditions were compared to values predicted by the ARIEM, HSDA and ARIEM-EXP (experimental) models. These experiments demonstrated: (1) harder work levels resulted in greater heat strain, which was more pronounced in MOPP 4 than in MOPP 1; (2) the energy cost of exercise and the heat strain was greater in MOPP 4 than MOPP 1 for the same task; (3) physiologic strain and tolerance times were similar during exercise in the two climates with matched WBGT temperatures; (4) the ARIEM and HSDA models were inaccurate in predicting the experimental core temperature responses, conservatively predicting core temperature responses, and over predicting tolerance time; (5) the ARIEM-EXP model accurately predicted core temperature responses, especially at moderate and hard exercise intensities, but it also over predicted tolerance time. These data indicate that the experimental model should replace the ARIEM and HSDA models to predict soldier responses in hot climates.
DTIC
Physiological Effects; Heat Tolerance; Heart Rate; Tropical Regions; Physical Exercise; Deserts; Performance Prediction

19970012815 BBN Systems and Technologies Corp., Cambridge, MA USA
Testing and Refining a Core Theory of Human Plausible Reasoning ***Final Report, Sep. 1985 - Sep 1989***
Collins, Allen, BBN Systems and Technologies Corp., USA; Burstein, Mark, BBN Systems and Technologies Corp., USA; Baker, Michelle, BBN Systems and Technologies Corp., USA; Mar. 1996; 81p; In English
Contract(s)/Grant(s): MDA903-85-C-0411
Report No.(s): AD-A308778; ARI-RN-96-32; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report contains two papers prepared during the last year on the contract. The first paper details our extensions of a formal theory of human plausible reasoning, and the second paper is an overview of the theory and experimental work that appeared as a book chapter.
DTIC
Cognition; Perception; Cognitive Psychology; Decision Making

19970012876 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Gender, Stress & Coping in the U.S. Military, Trauma, Stress & Health: Military Women in Combat, Deployment & Contingency Operations. A Conference to Explore the Effects of Combat, Trauma, & Extreme Environments on Women's Health and Perfor, vol. 1 ***Final Report***
Norwood, A. E., Uniformed Services Univ. of the Health Sciences, USA; Norwood, Ann E., Uniformed Services Univ. of the Health Sciences, USA; Fullerton, Carol S., Uniformed Services Univ. of the Health Sciences, USA; Sutton, Loree K., Uniformed

Services Univ. of the Health Sciences, USA; Jackson, Steven A., Uniformed Services Univ. of the Health Sciences, USA; Dec. 1995; 317p; In English, 16-18 Jun. 1995, Airlie, VA, USA
Report No.(s): AD-A309980; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
Mortality implications for our population.
DTIC
Conferences; Medical Services; Shock (Physiology); Mortality

19970012915 Army Research Inst. Field Unit, Infantry Forces Research Unit, Fort Benning, GA USA
Night Vision Goggle Field-Expedient Visual Acuity Adjustment Procedures: Initial Experiment ***Final Report, Jul. - Dec. 1995***
Dyer, Jean L., Army Research Inst. Field Unit, USA; Young, Keith M., Army Research Inst. Field Unit, USA; Watson, Scott A., Army Research Inst. Field Unit, USA; McClure, Nancy R., Army Research Inst. Field Unit, USA; May 1996; 46p; In English
Contract(s)/Grant(s): 2O262785A791
Report No.(s): AD-A310099; ARI-RR-1692; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The third-generation image intensification technology in night vision goggles (NVGs) used by ground forces provides at best 20/40 or 20/45 visual acuity. These acuity levels cannot be achieved unless soldiers adjust their NVGs properly. Documentation available to soldiers does not address optimum adjustment techniques developed by the aviation community nor does it address what can be used in the field to achieve a good setting. We examined the effectiveness and utility of 15 different objects commonly available to soldiers to determine which provided the best visual acuity readings with the AN/PVS-713 NVGs. After training and practice acuity improved by 25% over the baseline assessment. No large differences in readings occurred among the objects. However, a more definitive picture emerged when the average readings were combined with measures of variability and soldier preferences. The initial recommendation is to use one of the following objects for NVG adjustment: trec trunk, vehicle, vehicle trail, stars, blue chem light, or an infrared chem light. Not recommended are bright and/or red light sources, white paper, and trees silhouetted against the night sky. Problems in assessing acuity with NVGs are also discussed
DTIC
Goggles; Night Vision; Visual Acuity; Optimization; Image Intensifiers

19970012931 Yale Univ., New Haven, CT USA
Tacit Knowledge in Military Leadership: Supporting Instrument Development ***Interim Report, Oct. 1993 - Nov. 1995***
Horvath, Joseph A., Yale Univ., USA; Sternberg, Robert J., Yale Univ., USA; Forsythe, George B., Military Academy, USA; Sweeney, Patrick J., Military Academy, USA; Bullis, Richard C., Military Academy, USA; Williams, Wendy M., Yale Univ., USA; Dennis, Martin, Yale Univ., USA; May 1996; 90p; In English
Contract(s)/Grant(s): MDA903-92-K-0125; 2O262785A790
Report No.(s): AD-A310258; ARI-TR-1042; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Army officers, drawn from three different institutional settings, evaluated tacit-knowledge items to Support development of tests of tacit knowledge for military leadership. Items were identified that differentiated leaders varying in leadership experience (at a level of leadership) or in rated leadership effectiveness. Subject-matter experts also sorted the items into categories of like items. Analyses of the categories identified dimensions that described the organization of the items. Item discrimination and organizational location will be used to select materials for construction of tests of tacit knowledge for each three levels of Army Leadership: platoon leader, company commander, and battalion commander.
DTIC
Management Methods; Leadership

19970012958 North Dakota State Univ., Fargo, ND USA
Threshold and Suprathreshold Lateral Spatial Interactions in Brightness, Contrast and Stereoscopic Depth Perception ***Final Report, 1 Sep. 1994 - 29 Feb. 1996***
McCourt, Mark E., North Dakota State Univ., USA; Blakeslee, Barbara, North Dakota State Univ., USA; Apr. 30, 1996; 114p; In English
Contract(s)/Grant(s): F49620-94-1-0445; AF Proj. 3484
Report No.(s): AD-A310102; AFOSR-TR-96-0255; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
We measured the effects of stereoscopic and pictorial depth separation on a variety of phenomena involving lateral interactions in the luminance and contrast domains (e.g., grating induction, perceptual transparency, simulataneous brightness contrast and contrast-contrast). In addition, the early visual mechanisms underlying the formation of illusory contours were assessed by measuring the effects of illusory contours on the visibility of spatiotemporally limited targets (i.e., Gabor patches); and by measur-

ing the effects of filtered noise textures on the strength of illusory contours. Finally, the temporal characteristics of the mechanisms underlying grating induction and simultaneous brightness contrast were measured.
DTIC
Visual Aids; Stereoscopic Vision; Brightness

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

19970012054 Naval Air Warfare Center, Warminster, PA USA
Quantitative Evaluation of High-Performance Flight in a Supine Crew Station Using the NAWC Dynamic Flight Simulator-Effects of Body Position and Motion ***Final Report, 1 Sep. 1994 - 31 May 1995***
Shender, Barry S., Naval Air Warfare Center, USA; Heffner, Peggy, Naval Air Warfare Center, USA; Jun. 01, 1995; 63p; In English
Report No.(s): AD-A309421; NAWCADWAR-95040-4.6; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In an attempt to determine if high-performance supine flight is possible, the USAF Canopy Escape Module (65 supine seat) was modified and deployed into the NAWC Dynamic Flight Simulator. With its computer generated wide field of view display and HUD, aircraft controls and high fidelity high performance fighter aircraft aeromodel, it was determined if subjects could 'fly' high performance maneuvers while supine. Seven male subjects performed a flight syllabus consisting of well defined instrument flight maneuvers (vertical S-2, half Cuban 8, a series of high +Gz 360 deg level turns and ILS task), as defined in the NATOPS Instrument Flight Manual. Subjects were extensively trained and tested under both 1g (static) and under acceleration (dynamic) conditions in supine and upright postures. Data were assessed to determine the effects of motion (G) and seat position. A weighted objective grading scheme was devised to evaluate flight performance based on the ability to achieve specified levels of altitude, +Gz, airspeed and controllability. This paper reports on the analysis of the +Gz turns and the ILS task. During the turns, motion effects did not lead to significant differences in the ability to maintain specified +Gz-level loads when supine, whereas there were significant differences when upright. Subjects demonstrated a lower error rate while flying statically as compared to dynamically for all loads. During dynamic turns, there were no significant differences in error rates between actual and required +Gz-level, although upright subjects maintained a higher percentage of the turns within defined acceptable ranges. Even though supine, one subject did experience a +Gz induced loss of consciousness (G-LOC) and an almost LOC event during a high +Gz turn.
DTIC
Fighter Aircraft; Aircraft Maneuvers; Acceleration Tolerance; Flight Simulation; Posture; Physiological Tests; Physiological Effects; Pilot Performance

19970012058 Aeronautical Research Labs., Melbourne, Australia
Annotated Bibliography of Helmet Mounted Sight Systems
Saliba, A. J., Aeronautical Research Labs., Australia; Meehan, J. W., Aeronautical Research Labs., Australia; Jan. 1996; 33p; In English
Report No.(s): AD-A315872; DSTO-GD-0097; DODA-AR-009-740; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A search of literature was conducted on helmet mounted sights (HMSs) and related helmet mounted displays (HMDs). The result was 42 entries that are grouped under broad subject headings of human factors, design and evaluation, and other related areas. Human factors deals with issues relating to human performance with HMSs and HMDs. Design and evaluation covers work that is focused more on the helmet systems. Work in related areas includes material that fits neither of the other categories, but which is relevant. Entries are accompanied by an abstract, annotation, or both. This bibliography represents present understanding of issues involved with the current state of technology. Rapid growth in computer technology suggests that developments in this area will accelerate rapidly, indicating a need for maintaining commensurate research effort in human performance in the virtual environments that this technology is providing.
DTIC
Bibliographies; Helmet Mounted Displays; Human Factors Engineering

19970012120 Yale Univ., New Haven, CT USA
New Physical Models and Methods for Source Localization ***Final Report, Feb. 1993 - Aug. 1996***
Nehorai, Arye, Yale Univ., USA; Aug. 1996; 11p; In English
Contract(s)/Grant(s): F49620-93-1-0096
Report No.(s): AD-A315606; AFOSR-TR-96-0485; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research focuses on the development of sensor processing methods for source localization and parameter estimation. The main contributions are: the introduction of electromagnetic and acoustic vector-sensor processing; development of radar polarimetric methods, including remote sensing applications, and optimum choices of transmitting signals and polarizations; methods for sensor calibration using active sources; localizing sources using a small number of mobile sensors that can replace methods with a large number of stationary sensors; localization of vapor emitting sources with chemical sensor arrays; detection of radioactive sources with projection-based sensor arrays; localization of current dipoles with SQUID magnetic sensors. The methods have been analyzed using performance bounds, statistical techniques, and computer simulations. Several fundamental results have been established on source parameter identifiability, such as expressions for the maximum number of sources identifiable in array processing models. Other results include techniques for quantifying and tracking non-rigid object motion and for spectral line filtering. Transition of the acoustic work has been made to the Naval ASTO Office and NUWC Lab. Potential transitions to civilian applications include seismology, biomedicine, and environmental sensing.
DTIC
Polarimetry; Signal Detectors; Remote Sensing; Parameter Identification; Signal Processing; Computerized Simulation

19970012322 Wright Lab., Flight Dynamics Directorate, Wright-Patterson AFB, OH USA
Scaleable Expert Systems for Adding Crisp Knowledge to Pilot-Vehicle Interfaces ***Final Report, 1 Jan. 1993 - 30 Mar. 1996***
Raeth, Peter G., Wright Lab., USA; Montecalvo, Anthony J., Wright Lab., USA; Noyes, James L., Wright Lab., USA; May 1996; 98p; In English
Contract(s)/Grant(s): AF Proj. 2402
Report No.(s): AD-A315080; WL-TR-96-3087; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Vehicle systems operations, from automobiles, to airliners, through craft for sea and space, are heavily dependent on automated uses of data generated by both on-board and off-board sources. Not only are vehicles affected, but so are diverse systems such as process, manufacturing, and power generation plants. Historically, the volume of data in each instance keeps growing because of such factors as task and system complexity. Other factors are environmental, accuracy, safety, cost effectiveness, and customization requirements. A crowded operational domain is also a factor for vehicle operations and communications networks. Tragedies such as that which occurred at the Three-Mile Island nuclear power plant and during the V-22 Osprey Tiltrotor crash are examples that point out the volume and complexity of the data and automation involved. These incidents also point out that it is essential to have a ’scaleable framework for the organization and prioritization of raw data. In this way, the operator gets pertinent information necessary for reaching critical decisions. This framewor k also should support decision aids that offload operational details so that human resources can be applied more appropriately to goal achievement and other management issues. This paper outlines such a framework and gives examples.
DTIC
Expert Systems; Man Machine Systems; Artificial Intelligence

19970012332 Wright Lab., Wright-Patterson AFB, OH USA
The Human-Electronic Crew: Can We Trust The Team?
Taylor, Robert m., Wright Lab., USA; Reising, John, Wright Lab., USA; Dec. 19, 1995; 196p; In English
Contract(s)/Grant(s): AF Proj.2403
Report No.(s): AD-A308589; WL-TR-96-3039; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

With the emergence of increasing numbers of aircraft systems involving human operators interacting with intelligent automation, concerns have been raised regarding the trustworthiness of the Human-Electronic crew team’s decisions. Many of the decisions that the team is required to make occur in an imprecise world in which the judgements may be made based on such vague concepts as high, low, near, or far. The most effective decision aids in this type of environment may be those which can interpret inexact data and still achieve sound solutions, such as fuzzy logic decision aiding systems. Essentially, the problem comes down to the level of confidence that higher authorities should have in the decisions, and the resulting actions of the team. The Human-

Electronic crew needs to be successfully developed and integrated such that it can function effectively as a trustworthy team in this inexact real world.
DTIC
Decision Making; Fuzzy Systems; Artificial Intelligence; Flight Crews; Attack Aircraft

19970012389 Armstrong Lab., Human Engineering Div., Wright-Patterson AFB, OH USA
Assessment of Anthropometric Accommodation in Aircraft Cockpits and Pilot Body Size Selection Criteria
Zehner, Gregory F., Armstrong Lab., USA; Selection and Training Advances in Aviation; Nov. 1996; 6p; In English; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Designing high-performance aircraft cockpits to accommodate the wide range of body sizes existing in the US population has always been a difficult problem for Crewstation Engineers. to alleviate this problem, the US Air Force restricts the range of body sizes allowed into flight training, and then develops aircraft design standards and specifications around that reduced population. Limiting the size of the aircraft crewstation (and, therefore, the aircraft) should also reduce the cost and improve the performance of the aircraft.
Derived from text
Anthropometry; Cockpits; Crew Workstations; Pilot Selection; Aircraft Design

19970012404 Institut de Medicine Aerospatiale Armee, Bretigny sur Orge, France
The Application of Human Factors For Equipment of the French Air Force ***La Formation Aux Facteurs Humains Pour Les Equipages De L'Armee De L'Air Francaise***
Doireau, P., Institut de Medicine Aerospatiale Armee, France; Grau, J. Y., Institut de Medicine Aerospatiale Armee, France; Amalberti, R., Institut de Medicine Aerospatiale Armee, France; Valot, C., Institut de Medicine Aerospatiale Armee, France; Bouvet, J. L., French Air Force, France; Selection and Training Advances in Aviation; Nov. 1996; 6p; In French; Also announced as 19970012387; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

French air force has defined in 1994 with IMASSA an 'human factors' policy to improve flight safety. This policy contents three ways: physical training program, experience feedback increasing, and 'human factors' training program. This article summarizes the main aspects of the definition and application of the 'human factors' training program.
Author
Human Factors Engineering; Flight Safety

19970012557 Michigan Univ., Div. of Research and Development, Ann Arbor, MI USA
Perceptual-Motor Control in Human-Computer Interaction ***Interim Report, Dec. 1988 - Dec 1993***
Nilsen, Erik Lloyd, Michigan Univ., USA; Mar. 1996; 113p; In English
Contract(s)/Grant(s): MDA903-89-K-0025
Report No.(s): AD-A309859; ARI-RN-96-33; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report isolates and examines some of the emergent perceptual-motor issues raised by the new style in human- computer interaction. It concerns the use of a mouse to select commands from menus. Herein I describe the physical and perceptual characteristics of the menus and selection procedures to be studied. I also cover research from both the motor-control and the human-computer interaction literature that applies to perceptual and motor aspects of menu selection.
DTIC
Human-Computer Interface; Performance Tests

19970012692 Federal Aviation Administration, Civil Aeromedical Inst., Oklahoma City, OK USA
Use of Off-The-Shelf PC-Based Flight Simulators for Aviation Human Factors Research ***Final Report***
Beringer, Dennis B., Federal Aviation Administration, USA; Apr. 1996; 17p; In English
Report No.(s): AD-A310015; DOT/FAA/AM-96/15; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flight simulation has historically been an expensive proposition, particularly if out-the-window views were desired. Advances in computer technology have allowed a modular, off-the-shelf flight simulation (based on 80486 processors or Pentiums) to be assembled that has been adapted, with minimal modification, for conducting general aviation research. This simulation includes variable flight instrumentation, forward, 45 and 90 degree left external world views, and a map display. Control inputs are provided by high-fidelity analog controls (e.g., damped and self-centering yoke, high-performance throttle quadrant, gear, flap, and trim controls; and navigation radio frequency select). The simulation is based upon two commercially available flight simulation software packages, one originally designed as an instrument flight trainer and the other as a game-type flight simulation. The provisions of these packages are discussed highlighting their particular research capabilities. as well as their limitations. The com-

paratively low cost and ease of assembly/integration allow multiple 'standardized' systems to be distributed for cooperative inter-laboratory studies. The approach appears to have utility for both research and training.
DTIC
Aviation Psychology; Applications Programs (Computers); Computerized Simulation; Flight Simulators; Flight Simulation; Flight Instruments; Computers

19970012760 Alabama Univ., Huntsville, AL USA
Virtual Keyboard for Hands-Free Operations ***Final Report***
Abou-Ali, Abdel-Latief, Alabama Univ., USA; Porter, William A., Alabama Univ., USA; Sep. 05, 1996; 31p; In English
Contract(s)/Grant(s): NAS8-38609; UAH Proj. 534336/534337
Report No.(s): NASA-CR-203850; NAS 1.26:203850; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The measurement of direction of gaze (d.o.g.) has been used for clinical purposes to detect illness, such as nystagmus, unusual fixation movements and many others. It also is used to determine the points of interest in objects. In this study we employ a measurement of d.o.g. as a computer interface. The interface provides a full keyboard as well as a mouse function. Such an interface is important to computer users with paralysis or in environments where hand-free machine interface is required. The study utilizes the commercially available (ISCAN Model RK426TC) headset which consists of an InfraRed (IR) source and an IR camera to sense deflection of the illuminating beam. It also incorporates image processing package that provides the position of the pupil as well as the pupil size. The study shows the ability of implementing a full keyboard, together with some control functions, imaged on a head mounted monitor screen. This document is composed of four sections: (1) The Nature of the Equipment; (2) The Calibration Process; (3) Running Process; and (4) Conclusions.
Derived from text
Detection; Sicknesses; Image Processing; Computer Programs; Mice; Dogs

Subject Term Index

A

ABILITIES, 10
ACCELERATION TOLERANCE, 17
ADRENAL GLAND, 7
AEROSPACE MEDICINE, 8, 10, 13
AIRCRAFT DESIGN, 19
AIRCRAFT MANEUVERS, 17
AIRCRAFT PILOTS, 8, 9, 11, 13
ANTHROPOMETRY, 19
ANTIDIURETICS, 1
ANTIGRAVITY, 5
APPLICATIONS PROGRAMS (COMPUTERS), 20
APTITUDE, 9, 10
ARCHITECTURE (COMPUTERS), 7
ARRHYTHMIA, 5
ARTERIES, 7
ARTIFICIAL INTELLIGENCE, 7, 18, 19
ATTACK AIRCRAFT, 19
AVIATION PSYCHOLOGY, 12, 20

B

BIBLIOGRAPHIES, 17
BIOLOGICAL EFFECTS, 2
BLOOD VESSELS, 7
BRIGHTNESS, 17
BUBBLES, 4

C

CALCIUM, 2
CANCER, 2
CARDIAC OUTPUT, 5
CARDIOVASCULAR SYSTEM, 6
CATECHOLAMINE, 7
CELLS (BIOLOGY), 2, 3
CENTRAL NERVOUS SYSTEM, 6
CENTRIFUGES, 5, 13
CHROMOSOMES, 2
COCKPITS, 19
COGNITION, 7, 15
COGNITIVE PSYCHOLOGY, 15
COLD WEATHER, 7
COMBAT, 5
COMPLEX SYSTEMS, 7
COMPUTER PROGRAMS, 2, 20
COMPUTERIZED SIMULATION, 18, 20
COMPUTERS, 20
CONFERENCES, 3, 16
CREW WORKSTATIONS, 19

D

DATA BASES, 2
DECISION MAKING, 12, 15, 19
DEHYDRATION, 1
DESERTS, 15
DETECTION, 20
DISPLAY DEVICES, 14
DOGS, 20

E

EDUCATION, 7
ELECTRIC BATTERIES, 7
ELECTROENCEPHALOGRAPHY, 6
ENZYMES, 1
ERRORS, 9
ERYTHROCYTES, 3
EXPERIENCE, 13
EXPERT SYSTEMS, 18

F

FAILURE, 5
FIGHTER AIRCRAFT, 10, 17
FLIGHT CREWS, 9, 11, 12, 13, 19
FLIGHT INSTRUMENTS, 20
FLIGHT OPERATIONS, 8
FLIGHT SAFETY, 13, 19
FLIGHT SIMULATION, 17, 20
FLIGHT SIMULATORS, 14, 20
FLIGHT TESTS, 9
FLIGHT TRAINING, 9, 11
FUZZY SYSTEMS, 19

G

GENES, 2
GLYCOLYSIS, 3
GOGGLES, 16

H

HEART, 2, 5
HEART RATE, 14, 15
HEAT TOLERANCE, 15
HELICOPTERS, 14
HELMET MOUNTED DISPLAYS, 17
HELMETS, 14
HEMOGLOBIN, 7
HEMORRHAGES, 7
HIGH PRESSURE, 5
HORMONES, 1
HUMAN BEHAVIOR, 9
HUMAN BEINGS, 4
HUMAN FACTORS ENGINEERING, 14, 17, 19
HUMAN PERFORMANCE, 8
HUMAN-COMPUTER INTERFACE, 19
HYDROSTATIC PRESSURE, 3

I

IMAGE ANALYSIS, 2
IMAGE INTENSIFIERS, 16
IMAGE PROCESSING, 20
INFORMATION PROCESSING (BIOLOGY), 15
INJURIES, 4
INTELLIGENCE, 10
INTRAVASCULAR SYSTEM, 6

K

KNOWLEDGE BASED SYSTEMS, 7

L

LACTATES, 3
LEADERSHIP, 16
LIGANDS, 2
LOADS (FORCES), 5
LOW FREQUENCIES, 4
LOW TEMPERATURE, 7
LUNGS, 4

M

MACHINE LEARNING, 7
MALES, 4
MAMMARY GLANDS, 2
MAN MACHINE SYSTEMS, 18
MANAGEMENT METHODS, 16
MARINE MAMMALS, 3

MEDICAL SERVICES, 16
MEMBRANES, 3
MEMORY, 15
MENTAL PERFORMANCE, 7, 10, 15
METABOLISM, 7
MICE, 20
MISSION PLANNING, 11
MOLECULAR BIOLOGY, 3
MORTALITY, 16

N

NIGHT VISION, 13, 14, 16

O

OPTIMIZATION, 16

P

PARAMETER IDENTIFICATION, 18
PATTERN REGISTRATION, 2
PERCEPTION, 15
PERFORMANCE PREDICTION, 15
PERFORMANCE TESTS, 19
PERSONALITY, 11
PHYSICAL EXAMINATIONS, 10
PHYSICAL EXERCISE, 14, 15
PHYSIOLOGICAL EFFECTS, 14, 15, 17
PHYSIOLOGICAL TESTS, 17
PHYSIOLOGY, 13
PILOT PERFORMANCE, 9, 10, 11, 12, 17
PILOT PLANTS, 12
PILOT SELECTION, 8, 9, 10, 11, 12, 19
PILOT TRAINING, 5, 8, 9, 10, 11, 12, 13
PITUITARY HORMONES, 1
POLARIMETRY, 18
POSTURE, 17
PREDICTIONS, 4, 12
PRESSURE DISTRIBUTION, 5
PREVENTION, 9
PROBLEM SOLVING, 12
PROVING, 6
PSYCHOLOGICAL FACTORS, 8
PSYCHOLOGICAL TESTS, 4, 9, 10
PSYCHOMOTOR PERFORMANCE, 9
PSYCHOPHYSIOLOGY, 9
PULSED LASERS, 4

Q

QUALIFICATIONS, 13

R

REMOTE SENSING, 18
RESEARCH AND DEVELOPMENT, 8
RESONANCE, 4
RETENTION (PSYCHOLOGY), 15
RETINA, 4
RETINAL IMAGES, 4
RISK, 5

S

SAFETY, 9
SELF FOCUSING, 4
SHOCK (PHYSIOLOGY), 16
SICKNESSES, 20
SIGNAL DETECTORS, 18
SIGNAL PROCESSING, 6, 18
SPECTRUM ANALYSIS, 6
STEREOSCOPIC VISION, 17
STRESS (PSYCHOLOGY), 10
STRESS ANALYSIS, 4
SYMPATHETIC NERVOUS SYSTEM, 6

T

TACHYCARDIA, 5
TEMPERATURE EFFECTS, 14
TEST PILOTS, 5
TOXINS AND ANTITOXINS, 2
TRAINING ANALYSIS, 9
TRAINING DEVICES, 9
TRAINING SIMULATORS, 5, 12, 13, 14
TRANSFER OF TRAINING, 14
TROPICAL REGIONS, 15
TUMORS, 2

U

UNDERWATER ACOUSTICS, 4

V

VENTILATION, 5
VIBRATION, 4
VISUAL ACUITY, 16
VISUAL AIDS, 17

W

WARFARE, 7
WATER DEPRIVATION, 1
WAVELET ANALYSIS, 6
WEIGHTLESSNESS, 6
WINTER, 7
WORKLOADS (PSYCHOPHYSIOLOGY), 12

Personal Author Index

A

Abbate, A., 5
Abou-Ali, Abdel-Latief, 20
Adams-Roy, J. E., 9
Amalberti, R., 19
Andrews, Dee H., 11

B

Bailey, M., 9
Baker, Michelle, 15
Bateman, William A., 13
Belyavin, A. J., 12
Ben-Zur, Hasida, 14
Beringer, Dennis B., 19
Blakeslee, Barbara, 16
Bonney, Jacqueline D., 11
Boone, John M., 1
Bouvet, J. L., 19
Bowyer, Kevin W., 2
Breznitz, Shlomo, 14
Bullis, Richard C., 16
Burstein, Mark, 15

C

Cadarette, Bruce S., 15
Caille, Gary W., 4
Cain, Clarence P., 4
Callister, J. D., 10
Carretta, Thomas R., 8
Carroll, Lynn A., 11
Castellini, Michael A., 3
Clere, J. M., 5
Collins, Allen, 15
Cook, Malcolm, 12

D

Das, P., 5
Dennis, Martin, 16
DiCarlo, Cheryl D., 4
Doireau, P., 13, 19
Drska, Z., 4
Dvorak, J., 9
Dyer, Jean L., 16

E

Evans, Joyce M., 6

F

Farmer, E. W., 12
Fontaine, Jean-Jacques, 14
Forsythe, George B., 16
Fullerton, Carol S., 15

G

Gadourek, P., 9
Gierasch, Lila M., 3
Glass, K. C., 13
Grau, J. Y., 13, 19
Gress, W., 11

H

Hackney, Anthony C., 3
Hammer, Daniel X., 4
Heffner, Peggy, 17
Hervig, Linda K., 3
Hormann, Hans-Jurgen, 11
Horvath, Joseph A., 16
Howe, Brian, 11

J

Jackson, Steven A., 16
Joyner, Michael J., 6

K

Kennedy, Paul K., 4
Kerguelen, M., 5
King, R. E., 8
Knapp, Charles F., 6
Kolka, Margaret A., 15
Kolouch, Jan, 8

L

Lacroix, Michel, 14
Laird John F., 7
Latzka, William A., 14
Lehman, Jill Fain, 7
Lenler-Eriksen, O., 5
Lewis, Thomas N., 4

M

Matott, Ralph P., 14
Matthew, William T., 15
McClure, Nancy R., 16
McCourt, Mark E., 16
McGlohn, S. E., 8
Meehan, J. W., 17
Mia, Abdul J., 1
Montain, Scott J., 14, 15
Montecalvo, Anthony J., 18

N

Nehorai, Arye, 18
Newman, P., 12
Nilsen, Erik Lloyd, 19
Noojin, Gary D., 4
Norwood, A. E., 15
Norwood, Ann E., 15
Noyes, James L., 18

O

Ossard, G., 5

P

Patterson, John C., 11
Pendolf, Kent B., 14
Poisson, R., 13
Polankova, M., 4
Porter, William A., 20
Poth, Merrilee, 3

R

Raeth, Peter G., 18
Reising, John, 18
Retzlaff, P. D., 10
Roach, W. P., 4
Rockwell, Benjamin A., 4
Rogers, Peter H., 4
Rosenbloom, Paul S., 7

S

Saliba, A. J., 17
Sawka, Michael N., 14, 15
Schofield, Gary L., 11
Schrot, J., 7
Shender, Barry S., 17
Shurtleff, D., 7
Solcova, I., 9
Spiller, N. B., 10
Staab, Janet E., 14
Sternberg, Robert J., 16
Stolarski, David J., 4
Stroschein, Leander A., 15
Sutton, Loree K., 15
Sweeney, Patrick J., 16
Sykora, J., 9

T

Taylor, Robert m., 18
Thomas, J. R., 7
Toth, Cynthia A., 4

V

Valot, C., 19
Vardi, Naomi, 14
Vickers, Ross R., Jr., 3

W

Ward, George, 12
Watson, Scott A., 16
Weeks, Joseph L., 8
Welsch, H., 10, 12
White, Raymond L., 2
Wilkinson, M. O., 13
Williams, Wendy M., 16
Willkomm, B., 11
Woodhead, R., 9

Y

Yorio, Thomas, 1
Young, Keith M., 16

Z

Zehner, Gregory F., 19
Zelenski, Warren E., 8

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